Department
for Environment
Food & Rural Affairs

Outcome Indicator Framework for the 25 Year Environment Plan: 2022 update

May 2022

We are the Department for Environment, Food and Rural Affairs. We're responsible for improving and protecting the environment, growing the green economy, sustaining thriving rural communities and supporting our world-class food, farming and fishing industries.

We work closely with our 33 agencies and arm's length bodies on our ambition to make our air purer, our water cleaner, our land greener and our food more sustainable. Our mission is to restore and enhance the environment for the next generation, and to leave the environment in a better state than we found it.

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Summary

In May 2019, we published the Outcome Indicator Framework. It is a comprehensive set of indicators describing environmental change that relates to the 10 goals within the 25 Year Environment Plan. It describes the state of the environment and supports the strengthened framework for monitoring and reporting on environmental improvement as established by the Environment Act, (2021). We designed the framework using the concept of natural capital, with guidance from stakeholders and experts.

Our 2022 Outcome Indicator Framework report provides an update on these indicators and their development. This update is published in support of the planned 25 Year Environment Plan Progress Report for 2021 to 2022 which will subsequently draw upon the indicators, and additional evidence, to inform reporting of government's progress against the plan's 10 goals.

The framework contains 66 indicators, arranged into 10 broad themes. The indicators are extensive; they cover natural capital assets (for example, land, freshwater, air and seas) and together they show the condition of these assets, the pressures acting upon them and the provision of services or benefits they provide.

In this report, we provide data corresponding to 50 indicators. This includes statistics for 5 indicators which are newly reported this year and, where available, updated statistics for indicators previously reported. Further development of numerous indicators is required and we continue to review, update and develop these to provide an effective, systematic and comprehensive means for measuring environmental change in England.

Impact of the coronavirus (COVID-19) pandemic

The coronavirus (COVID-19) pandemic has had severe and wide-ranging effects on many formerly routine activities. In some instances, this has temporarily affected the data collection of some of the indicators within this publication. This will be detailed in the 'Notes' section of affected indicators.

Section A: Outcome Indicator Framework

Introduction and aim of the Outcome Indicator Framework

The government published the 25 Year Environment Plan in January 2018 setting out goals for improving the environment in England. A commitment was made to develop a comprehensive set of indicators to measure environmental change. These indicators help us to show how the environment is changing over time. This will support the assessment of policies and other interventions, including how we are delivering on international and domestic commitments. In particular, the Outcome Indicator Framework can support the statutory cycle of monitoring, planning and reporting on progress in improving the environment as established by the Environment Act, (2021).

The first Outcome Indicator Framework report: 'Measuring environmental change: Outcome Indicator Framework for the 25 Year Environment Plan', was published in May 2019. Drawing on advice from a wide range of experts and stakeholders, it presented 66 indicators to give a comprehensive view of the environment and how it is changing. The 2019 report set out in detail the purpose of the Outcome Indicator Framework and examples of how the indicators can be used.

The Outcome Indicator Framework has an important role in our longer-term understanding of the effectiveness of policies and interventions. The indicators are a systematic means of monitoring environmental change, recognising that complex natural and social systems will respond to change on a range of timescales.

The Outcome Indicator Framework will:

- enable clear communication of important environmental trends in England
- provide a set of indicators which relate to all aspects of the environment and all goals within the 25 Year Environment Plan
- communicate data which gives a high-level picture of the environment and how it is changing – more extensive data and indicators may additionally be available from other sources
- be used for assessment of changes in the natural environment, for example against the goals of the 25 Year Environment Plan, or in applying a natural capital approach

In 2021, we presented data showing trends of environmental change for 45 of the framework indicators. In this 2022 update, we present data for 50 of the indicators.

In the remainder of Section A, we describe the structure of the framework, how it can be used, and future developments. Section B includes detailed descriptions for all 66

indicators, including published data for 50 of them. Section C contains additional detail of a new quantitative assessment undertaken this year.

Structure of the Outcome Indicator Framework

Outcome indicators are:

- based on a natural capital framework – each indicator is assigned as a condition of, pressure on, or service/benefit from, natural capital
- designed to make best use of existing monitoring programmes
- to be used to show changes in the environment over the period of the 25 Year Environment Plan
- voluntarily compliant with the Code of Practice for Statistics and some are official statistics in themselves (see Annex 1: Official statistics)
- reported showing their connections to relevant actions, commitments, targets and strategies as well as links to relevant datasets

The 66 indicators are arranged into 10 broad themes. These are topics that people will generally recognise as relating to different aspects of the environment (for example, air, water, seas and estuaries, wildlife). Some indicators may be applicable to one or more themes but have been allocated to just one of them. A full list of indicators by theme, headline status (where relevant) and primary goal in the 25 Year Environment Plan is provided in Tables 1a to 1j and detailed descriptions of each of the indicators are presented in Section B. The 25 Year Environment Plan goals and targets relevant to each indicator are also detailed within these descriptions.

The inclusion of 66 indicators in the framework provides a comprehensive and systematic means to observe and convey environmental change. However, for some purposes it may not be necessary to examine this large number of indicators. Therefore, in the framework we identify a sub-set of the indicators under 16 headlines (see Tables 1a to 1j). The headline indicators relate to key aspects of the environment which are a focus of policy intervention and should make intuitive sense to a wide range of readers. When complete, the framework will present a large amount of information and so we will highlight key indicators under headlines to provide a way to simplify this information and provide clear communication.

Further examples on how the headlines and indicators may be used are given in Section B of the 2019 Outcome Indicator Framework report.

Table 1a: Air themed indicators

Indicator title	Headline (where relevant)	Primary goal	Data published in 2022 update
A1: Emissions for five key air pollutants	Air quality	Clean air	Yes
A2: Emissions of greenhouse gases from natural resources	Greenhouse gas emissions	Mitigating and adapting to climate change	Yes
A3: Concentrations of fine particulate matter ($PM_{2.5}$) in the air	Air quality	Clean air	Yes
A4: Rural background concentrations of ozone (O_3)		Clean air	Yes
A5: Roadside nitrogen dioxide (NO_2) concentrations		Clean air	Yes
A6: Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems		Clean air	Yes
A7: Area of land exposed to damaging levels of ammonia (NH_3) in the atmosphere		Clean air	Yes

Table 1b: Water themed indicators

Indicator title	Headline (where relevant)	Primary goal	Data published in 2022 update
B1: Pollution loads entering waters		Clean and plentiful water	Yes
B2: Serious pollution incidents to water		Clean and plentiful water	Yes
B3: State of the water environment	Water and water environment	Clean and plentiful water	Yes
B4: Condition of bathing water	Water and water environment	Clean and plentiful water	Yes

Indicator title	Headline (where relevant)	Primary goal	Data published in 2022 update
B5: Water bodies achieving sustainable abstraction criteria	Water and water environment	Clean and plentiful water	Yes
B6: Natural functions of water and wetland ecosystems		Clean and plentiful water	No
B7: Health of freshwater assessed through fish populations		Clean and plentiful water	Yes

Table 1c: Seas and estuaries themed indicators

Indicator title	Headline (where relevant)	Primary goal	Data published in 2022 update
C1: Clean seas: marine litter		Minimising waste	Yes
C2: Seabed subject to high pressure from human activity		Thriving plants and wildlife	Yes
C3: Diverse seas: status of marine mammals and marine birds	Diversity of our seas	Thriving plants and wildlife	Yes
C4: Diverse seas: condition of seafloor habitats	Diversity of our seas	Thriving plants and wildlife	Yes
C5: Diverse seas: condition of pelagic habitats		Thriving plants and wildlife	Yes
C6: Diverse seas: status of threatened and declining features	Diversity of our seas	Thriving plants and wildlife	No
C7: Healthy seas: fish and shellfish populations	Health of our seas	Thriving plants and wildlife	Yes
C8: Healthy seas: marine food webs functioning	Health of our seas	Thriving plants and wildlife	No
C9: Healthy seas: seafloor habitats functioning		Thriving plants and wildlife	No

Indicator title	Headline (where relevant)	Primary goal	Data published in 2022 update
C10: Productive seas: fish and shellfish stocks fished sustainably		Using resources from nature more sustainably and efficiently	Yes
C11 Productive seas: status of sensitive fish and shellfish stocks		Using resources from nature more sustainably and efficiently	Yes

Table 1d: Wildlife themed indicators

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
D1: Quantity, quality and connectivity of habitats	Nature on land and water	Thriving plants and wildlife	No
D2: Extent and condition of protected sites – land, water and sea	Wildlife and wild places	Thriving plants and wildlife	Yes
D3: Area of woodland in England		Thriving plants and wildlife; Enhancing beauty, heritage and engagement	Yes
D4: Relative abundance and/or distribution of widespread species	Nature on land and water	Thriving plants and wildlife	Yes
D5: Conservation status of our native species	Wildlife and wild places	Thriving plants and wildlife	No
D6: Relative abundance and distribution of priority species in England		Thriving plants and wildlife	Yes
D7: Species supporting ecosystem functions	Nature on land and water	Thriving plants and wildlife	Yes

Table 1e: Natural resources themed indicators

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
E1: Area of productive agricultural land	Production and harvesting of natural resources	Using resource from nature more sustainably and efficiently	Yes
E2: Volume of agricultural production		Using resource from nature more sustainably and efficiently	Yes
E3: Volume of inputs used in agricultural production	Production and harvesting of natural resources	Using resource from nature more sustainably and efficiently	Yes
E4: Efficiency of agricultural production measured by Total Factor Productivity	Production and harvesting of natural resources	Using resource from nature more sustainably and efficiently	Yes
E5: Percentage of the annual growth of trees in English woodlands that is harvested		Using resource from nature more sustainably and efficiently	Yes
E6: Volume of timber brought to market per annum from English sources		Using resource from nature more sustainably and efficiently	Yes
E7: Healthy soils	Production and harvesting of natural resources	Using resource from nature more sustainably and efficiently	No
E8: Efficient use of water		Using resource from nature more sustainably and efficiently	Yes
E9: Percentage of our seafood coming from healthy ecosystems, produced sustainably		Using resource from nature more sustainably and efficiently	No

Table 1f: Resilience themed indicators

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
F1: Disruption or unwanted impacts from flooding or coastal erosion	Resilience to natural hazards	Reducing the risks of harm from natural hazards	No
F2: Communities resilient to flooding and coastal erosion	Resilience to natural hazards	Reducing the risks of harm from natural hazards	No
F3: Disruption or unwanted impacts caused by drought	Resilience to natural hazards	Reducing the risks of harm from natural hazards	No

Table 1g: Natural Beauty and Engagement themed indicators

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
G1: Changes in landscape and waterscape character	Landscapes and waterscapes	Enhancing beauty and engagement	No
G2: Condition of heritage features including designated geological sites and scheduled monuments	Landscapes and waterscapes	Enhancing beauty and engagement	Yes
G3: Enhancement of green/blue infrastructure	Landscapes and waterscapes	Enhancing beauty and engagement	Yes
G4: Engagement with the natural environment	People enjoying and caring about the natural environment	Enhancing beauty and engagement	Yes
G5: People engaged in social action for the environment	People enjoying and caring about the natural environment	Enhancing beauty and engagement	Yes
G6: Environmental attitudes and behaviours	People enjoying and caring about the natural environment	Enhancing beauty and engagement	Yes

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
G7: Health and wellbeing benefits	People enjoying and caring about the natural environment	Enhancing beauty and engagement	Yes

Table 1h: Biosecurity, Chemical and Noise themed indicators

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
H1: Abatement of the number of invasive non-native species entering and establishing against a baseline	Exotic and invasive non-native species	Enhancing biosecurity	Yes
H2: Distribution of invasive non-native species and plant pests and diseases	Exotic and invasive non-native species	Enhancing biosecurity	Yes
H3: Emissions of mercury and persistent organic pollutants to the environment	Exposure of people and wildlife to harmful chemicals	Managing exposure to chemicals	Yes
H4: Exposure and adverse effects of chemicals on wildlife in the environment	Exposure of people and wildlife to harmful chemicals	Managing exposure to chemicals	Yes
H5: Exposure to transport noise		Enhancing beauty and engagement	No

Table 1i: Resource Use and Waste themed indicators

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
J1: Carbon footprint and consumer buying choices		Minimising waste; Mitigating and adapting to climate change	Yes
J2: Raw material consumption	Resource efficiency and waste	Using resource from nature more sustainably and efficiently	Yes
J3: Municipal waste recycling rates		Minimising waste	Yes
J4: Residual waste arising by type and sector	Resource efficiency and waste	Minimising waste	Yes
J5: Prevent harmful chemical from being recycled	Resource efficiency and waste	Managing exposure to chemicals	No
J6: Waste crime	Resource efficiency and waste	Minimising waste	Yes

Table 1j: International themed indicators

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
K1: Overseas environmental impacts of UK consumption of key commodities	Impacts on the natural environment overseas	No specific 25 Year Environment Plan goal	Yes
K2: Developing countries better able to protect and improve the environment with UK support	Impacts on the natural environment overseas	No specific 25 Year Environment Plan goal	No
K3: Status of endemic and globally threatened species in the UK Overseas Territories	Impacts on the natural environment overseas	No specific 25 Year Environment Plan goal	No

Indicator title	Headline (where relevant)	Primary Goal	Data published in 2022 update
K4: Extent and condition of terrestrial and marine protected areas in the UK Overseas Territories	Impacts on the natural environment overseas	No specific 25 Year Environment Plan goal	Yes

Using the framework

The Outcome Indicator Framework is designed to be adaptable for multiple uses. For example, it can be used to communicate environmental change or to support management of natural capital. By presenting a wide variety of data in a single location, the framework enables a comprehensive approach to analysis of environmental issues and decision making.

The concept of natural capital was used to develop the framework. Natural capital is defined as the elements of the environment which provide valuable goods and services to people such as clean air, clean water, food, and recreation. A natural capital approach is advocated by the 25 Year Environment Plan as it accounts for all the different ways the environment benefits society and so can inform better decision making. A natural capital framework sets out the need to:

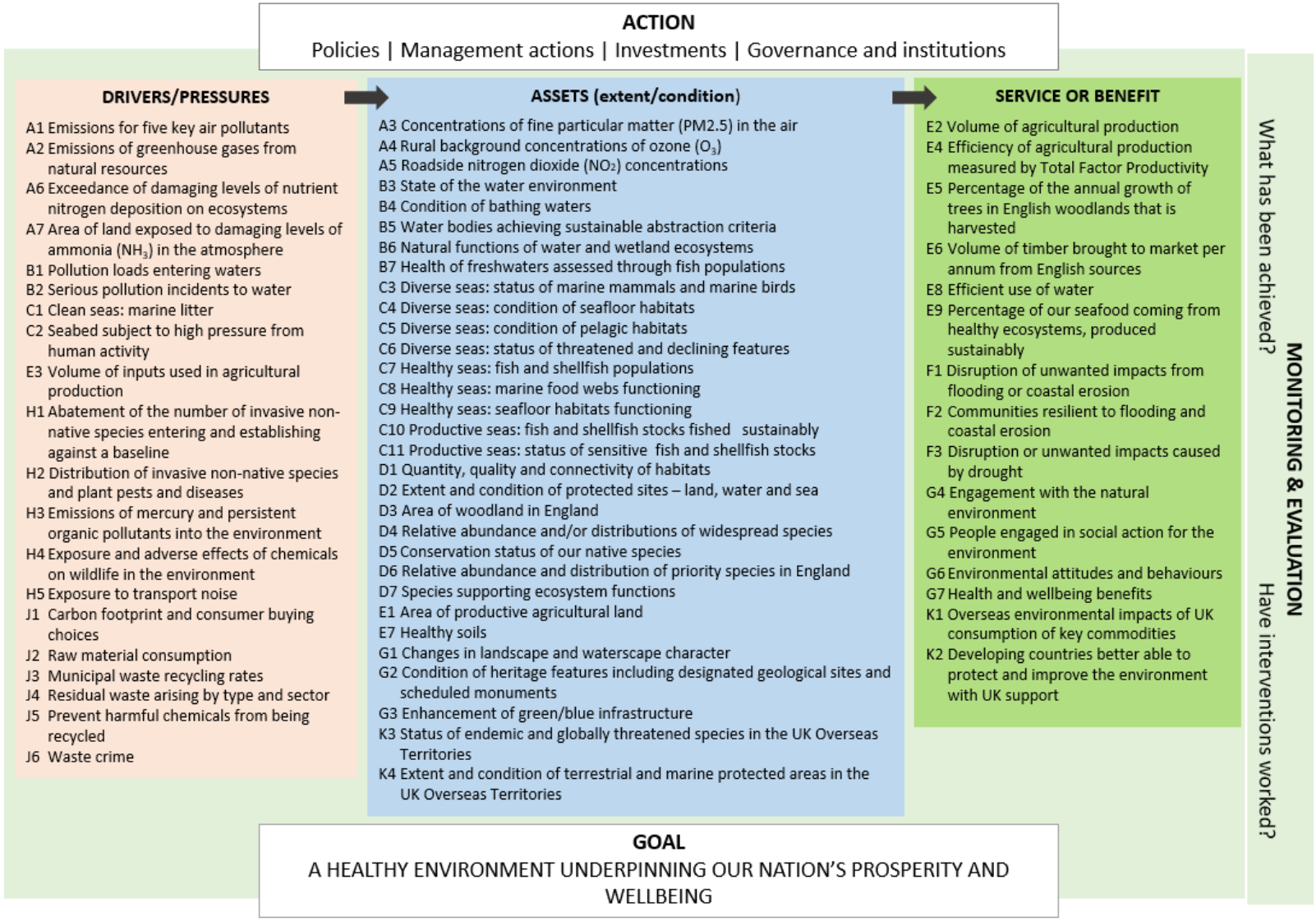
- reduce pressures on natural capital (for example, pollution or plant disease)
- improve the state of natural assets (including air, water, land and seas)
- increase the benefits that we get from those assets

Figure 1 is a visual representation of how the 66 outcome indicators can be considered as either a measure of (a) the drivers or pressures on natural capital assets, (b) the extent or condition of natural capital assets or (c) the services or benefits associated with natural capital assets. This classification is not always straightforward since the condition of one natural capital asset (for example, air quality) may place a pressure on another (for example, wildlife habitat).

It is important to recognise that multiple interactions occur across the indicators and categories. By classifying these indicators in this way, we can also show which direction of change in the indicator reflects an improvement to the environment (that is a downward trend for pressures and an upward trend for the condition of an asset or the provision of a benefit).

This structure is flexible, and indicators can be selected as appropriate to the needs of a particular analysis; several examples of how the indicators may be used to examine specific questions are provided in our 2019 Outcome Indicator Framework report. Monitoring and evaluation of these indicators can inform appropriate actions with an ultimate goal of maximising a healthy environment, economy and society.

Figure 1: A visual representation of the outcome indicators in a natural capital framework



Classification of indicators in Figure 1 in a natural capital framework

The indicators that can be considered drivers or pressures on natural capital assets are:

- A1: Emissions for five key air pollutants
- A2: Emissions of greenhouse gases from natural resources
- A6: Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems
- A7: Area of land exposed to damaging levels of ammonia (NH_3) in the atmosphere
- B1: Pollution loads entering waters
- B2: Serious pollution incidents to water
- C1: Clean seas: marine litter
- C2: Seabed subject to high pressure from human activity
- E3: Volume of inputs used in agricultural production
- H1: Abatement of the number of invasive non-native species entering and establishing against a baseline
- H2: Distribution of invasive non-native species and plant pests and diseases
- H3: Emissions of mercury and persistent organic pollutants to the environment
- H4: Exposure and adverse effects of chemicals on wildlife in the environment
- H5: Exposure to transport noise
- J1: Carbon footprint and consumer buying choices
- J2: Raw material consumption
- J3: Municipal waste recycling rates
- J4: Residual waste arising by type and sector
- J5: Prevent harmful chemical from being recycled
- J6: Waste crime

The indicators that can be considered extent or condition of natural capital assets are:

- A3: Concentrations of fine particulate matter ($PM_{2.5}$) in the air
- A4: Rural background concentrations of ozone ($O_{3)}$
- A5: Roadside nitrogen dioxide (NO_2) concentrations
- B3: State of the water environment
- B4: Condition of bathing water
- B5: Water bodies achieving sustainable abstraction criteria
- B6: Natural functions of water and wetland ecosystems
- B7: Health of freshwater assessed through fish populations
- C3: Diverse seas: status of marine mammals and marine birds
- C4: Diverse seas: condition of seafloor habitats
- C5: Diverse seas: condition of pelagic habitats
- C6: Diverse seas: status of threatened and declining features
- C7: Healthy seas: fish and shellfish populations
- C8: Healthy seas: marine food webs functioning
- C9: Healthy seas: seafloor habitats functioning

- C10: Productive seas: fish and shellfish stocks fished sustainably
- C11 Productive seas: status of sensitive fish and shellfish stocks
- D1: Quantity, quality and connectivity of habitats
- D2: Extent and condition of protected sites – land, water and sea
- D3: Area of woodland in England
- D4: Relative abundance and/or distribution of widespread species
- D5: Conservation status of our native species
- D6: Relative abundance and distribution of priority species in England
- D7: Species supporting ecosystem functions
- E1: Area of productive agricultural land
- E7: Healthy soils
- G1: Changes in landscape and waterscape character
- G2: Condition of heritage features including designated geological sites and scheduled monuments
- G3: Enhancement of green/blue infrastructure
- K3: Status of endemic and globally threatened species in the UK Overseas Territories
- K4: Extent and condition of terrestrial and marine protected areas in the UK Overseas Territories

The indicators that can be considered services or benefits associated with natural capital assets are:

- E2: Volume of agricultural production
- E4: Efficiency of agricultural production measured by Total Factor Productivity
- E5: Percentage of the annual growth of trees in English woodlands that is harvested
- E6: Volume of timber brought to market per annum from English sources
- E8: Efficient use of water
- E9: Percentage of our seafood coming from healthy ecosystems, produced sustainably
- F1: Disruption or unwanted impacts from flooding or coastal erosion
- F2: Communities resilient to flooding and coastal erosion
- F3: Disruption or unwanted impacts caused by drought
- G4: Engagement with the natural environment
- G5: People engaged in social action for the environment
- G6: Environmental attitudes and behaviours
- G7: Health and wellbeing benefits
- K1: Overseas environmental impacts of UK consumption of key commodities
- K2: Developing countries better able to protect and improve the environment with UK support

2022 Update

This 2022 report includes data on environmental trends for 50 of the 66 outcome indicators spanning across 9 of the 10 themes in the Outcome Indicator Framework.

In this report we update trends for 35 of the indicators reported in 2021, reflecting the most recent available data. The remaining 10 indicators presented in 2021 have not been updated as no new data were available for inclusion in the 2022 report at the time of analysis. This year's update report also includes data for 5 additional indicators newly reported with interim status in 2022.

- C11: Productive seas: status of sensitive fish and shellfish stocks
- G3: Enhancement of green/blue infrastructure
- G6: Environmental attitudes and behaviours
- G7: Health and wellbeing benefits
- K1: Overseas environmental Impacts of UK consumption of key commodities

Four of the indicators presented in the 2022 report are classified as 'experimental statistics':

- B3 State of the water environment
- H4 Exposure and adverse effects of chemicals on wildlife in the environment
- K1 Overseas environmental impacts of UK consumption of key commodities
- K4 Extent and condition of terrestrial and marine protected areas in the UK Overseas Territories

These indicators are being published as experimental statistics in order to facilitate user involvement in their development – information on how the data have been obtained and how the indicators have been prepared is available via the links in the individual indicator pages of section B. We would welcome any feedback, particularly on the usefulness and value of these statistics, via 25YEPindicators@defra.gov.uk.

In addition, underpinning data for 'J1 (interim) Carbon footprint and consumer buying choices' are sourced from datasets originally published elsewhere as experimental statistics.

Of the 50 indicators presented, 33 are described as interim indicators. Interim indicators are those where further development is expected to extend or improve the reporting of the indicator. Reporting interim indicators means that we can communicate data where they are available, whilst recognising that further development is necessary for the indicator to be complete. Examples of circumstances under which an indicator is considered to be interim include: data need to be extracted for England from a UK wide dataset, additional data need to be added to the indicator, or the methods used for deriving an indicator are expected to be further developed. The specific reason why an indicator is currently presented as interim is described in the individual indicator description in Section B. Indicators are described as 'final' indicators where no further significant development is immediately expected, notwithstanding the future development of the framework as a whole.

A list of the 50 indicators for which data trends are reported is included in Tables 2a to 2i. Where multiple years or date-ranges for latest data are reported, these reflect individual datapoints associated with separate elements of the associated indicator.

Table 2a: Status of air themed indicators

Indicator title	2022 status	Latest data (years)
A1: Emissions for five key air pollutants	Final	2019
A2: Emissions of greenhouse gases from natural resources	Final	2019
A3: Concentrations of fine particulate matter ($PM_{2.5}$) in the air	Final	2020
A4: Rural background concentrations of ozone (O_3)	Final	2020
A5: Roadside nitrogen dioxide (NO_2) concentrations	Final	2020
A6: Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	Final	2017-2019
A7: Area of land exposed to damaging levels of ammonia (NH_3) in the atmosphere	Final	2016-2018

Table 2b: Status of water themed indicators

Indicator title	2022 status	Latest data (years)
B1: Pollution loads entering waters	Interim (not updated this year)	2019
B2: Serious pollution incidents to water	Final	2020
B3: State of the water environment	Interim (not updated this year)	2019; 2020
B4: Condition of bathing water	Final	2021
B5: Water bodies achieving sustainable abstraction criteria	Final (not updated this year)	2019
B7: Health of freshwater assessed through fish populations	Interim (some elements not updated this year)	2020; 2019

Table 2c: Status of seas and estuaries themed indicators

Indicator title	2022 status	Latest data (years)
C1: Clean seas: marine litter	Interim (some elements not updated this year)	2015; 2015-2019; 2012 to 2015
C2: Seabed subject to high pressure from human activity	Interim (not updated this year)	2010-2015
C3: Diverse seas: status of marine mammals and marine birds	Interim (some elements not updated this year)	2021; 2019; 2015; 2014/2015;

Indicator title	2022 status	Latest data (years)
C4: Diverse seas: condition of seafloor habitats	Interim (not updated this year)	2010-2015
C5: Diverse seas: condition of pelagic habitats	Interim (not updated this year)	2009-2014
C7: Healthy seas: fish and shellfish populations	Interim (not updated this year)	2015 or 2016
C10: Productive seas: fish and shellfish stocks fished sustainably	Interim	2019
C11: Productive seas: status of sensitive fish and shellfish stocks	Interim	2015-2020

Table 2d: Status of wildlife themed indicators

Indicator title	2022 status	Latest data (years)
D2: Extent and condition of protected sites – land, water and sea	Interim	2021
D3: Area of woodland in England	Final	2021
D4: Relative abundance and/or distribution of widespread species	Interim (some elements not updated this year)	2019; 2020
D6: Relative abundance and distribution of priority species in England	Interim (not updated this year)	2016; 2018
D7: Species supporting ecosystem functions	Interim (not updated this year)	2017

Table 2e: Status of natural resources themed indicators

Indicator title	2022 status	Latest data (years)
E1: Area of productive agricultural land	Final	2021
E2: Volume of agricultural production	Interim	2020
E3: Volume of inputs used in agricultural production	Interim	2020
E4: Efficiency of agricultural production measured by Total Factor Productivity	Interim	2020
E5: Percentage of the annual growth of trees in English woodlands that is harvested	Final	2020
E6: Volume of timber brought to market per annum from English sources	Final	2020
E8: Efficient use of water	Final	2018/2019-2020/2021

Table 2f: Status of natural beauty and engagement themed indicators

Indicator title	2022 status	Latest data (years)
G2: Condition of heritage features including designated geological sites and scheduled monuments	Final	2021
G3: Enhancement of green and blue infrastructure	Interim	2021
G4: Engagement with the natural environment	Interim (some elements not updated this year)	2018-2019 and 2020-2021
G5: People engaged in social action for the environment	Interim	2019
G6: Environmental attitudes and behaviours	Interim	2020-2021
G7: Health and wellbeing benefits	Interim	2020-2021

Table 2g: Status of biosecurity, chemical and noise themed indicators

Indicator title	2022 status	Latest data (years)
H1: Abatement of the number of invasive non-native species entering and establishing against a baseline	Interim	2020
H2: Distribution of invasive non-native species and plant pests and diseases	Interim	2011-2020
H3: Emissions of mercury and persistent organic pollutants to the environment	Interim	2019
H4: Exposure and adverse effects of chemicals on wildlife in the environment	Interim (not updated this year)	Various 2014-2019

Table 2h: Status of resource use and waste themed indicators

Indicator title	2022 status	Latest data (years)
J1: Carbon footprint and consume buying choices	Interim	2018
J2: Raw material consumption	Final	2018
J3: Municipal waste recycling rates	Interim	2020/2021
J4: Residual waste arising by type and sector	Interim	2019
J6: Waste crime	Interim	2020/2021

Table 2i: Status of international themed indicators

Indicator title	2022 status	Latest data (years)
K1: Overseas environmental Impacts of UK consumption of key commodities	Interim	2017
K4: Extent and condition of terrestrial and marine protected areas in the UK Overseas Territories	Interim	2021

A limited number of changes have been made to the indicator descriptions over the last year. These reflect feedback as well as further consideration and development of the indicators to ensure the most appropriate data are presented.

There have been some specific changes to individual indicators after further consideration of their intended purpose, in order to better reflect alignment with 25 Year Environment Plan commitments and to deliver the insights required to support associated policy needs.

Extended definition under B6 ‘Natural functions of water and wetland ecosystems’ to include reference to a Natural England report that will form the foundation of the indicator research and development.

The short descriptions of C7 ‘Healthy seas: fish and shellfish populations’ and C8 ‘Healthy seas: marine food webs functioning’ have received minor changes for clarification.

C10 ‘Productive seas: fish and shellfish stocks fished sustainably’ has been revised to include new categories for stocks that have been fished in an acceptable mortality range, as defined by internationally agreed Multi-Annual Plans for fisheries. A reference to the previous location for these data (see E9 ‘Percentage of our seafood coming from healthy ecosystems, produced sustainably’) has also been removed from the short description as this change occurred in the previous (2021) publication.

The short descriptions of indicators D1 ‘Quality, quantity and connectivity of habitats’ and D2 ‘Extent and condition of protected sites’ have received minor changes for clarification. The list of protected areas in D2 has also been corrected, to more accurately reference the inclusion of Marine Conservation Zones.

The short description of G1 ‘Changes in landscape and waterscape character’ has been updated to more accurately capture the information that feeds into the indicator and describe the components that will be included now that development had progressed further. The short description for G3 ‘Enhancement of green and blue infrastructure’ has been altered to update information on Green Infrastructure Standards. The short descriptions for indicators G4 ‘Engagement with the natural environment’, G5 ‘People engaged in social action for the environment’, G6 ‘Environmental attitudes and behaviours’ and G7 ‘Health and wellbeing benefits’ have been updated to better reflect the scope of the datasets informing them, now information from the People and Nature Survey has been, or will soon be, incorporated.

A minor change has been made to the short description of J1 ‘Carbon footprint and consumer buying choices’ to clarify the difference between it and A2 ‘Emissions of greenhouse gases from natural resources’.

The description of K1 ‘Overseas environmental impacts of UK consumption of key commodities’ has been updated to better reflect the indicator now that it is published for the first time this year. This is to provide a more comprehensive insight into the modelling underpinning the indicator.

A minor change has been made to the short description for K2 ‘Developing countries better able to protect and improve the environment with UK support’. This has been to include additional funds that are being analysed as part of the indicator’s development.

A number of indicators remaining in development have recent progress described in respective fiches; see Section B.

Assessment

To date, the Outcome Indicator Framework reports have not included a quantitative assessment of indicators. Reported figures and supporting text have shown how indicator trends change over time but indicators have not stated whether change is in a favourable direction for meeting environmental goals. A new assessment section has been added to this year’s update report, to help with interpreting results and to allow for easier comparison across indicators and to enable the production of additional summary statistics.

Consistent categories of change for different time periods have been assigned to all indicators which are already published in a suitable format and with sufficient historic data to enable analysis. Indicator-specific results with a supporting narrative are provided for each indicator in Section B of this report.

Where data are available for individual indicators, an assessment of environmental change since 2018 has been undertaken, to reflect progress made since the publication of the 25 Year Environment Plan. However, it is important to note that for most indicators, the currently available time series of data points since 2018 does not yet allow for anything more than an early indication of likely change. It is expected that the ongoing annual updates of the Outcome Indicator Framework will in time allow for statistically robust assessment of changes since 2018. This will require more than 5 data points in a given indicator’s time series since 2018 to minimise the impact of year-to-year fluctuations which make it difficult to interpret a clear trend. For this reason, care should be taken to not overinterpret offered assessments for the ‘since 2018’ category, as this is not felt to be as robust an assessment as the other categories which have more datapoints informing their analysis.

There are important considerations to be aware of when interpreting results. These are highlighted in Section C of this report, a new addition to the report which provides more detail on the assessment and methodology employed. Section C also presents summaries

of assessment results by each 25 Year Environment Plan Goal. These summaries help to interpret how much change has been observed across goals and include information on potential links between indicators for different goals to indicate where there may be knock on effects.

Future development

Currently, some indicators are not yet available to report, and further research is required to determine the most suitable data and methods for analysis. We expect additional indicators to be reported in 2023 and subsequent years.

The technologies for monitoring and assessing change in the environment are advancing rapidly and offer new cost-effective methods (for example, Earth Observations, DNA methods, citizen science / mobile apps and new sensor technologies). We will look to update indicators to reflect these developments when appropriate but will ensure the environmental parameters used for reporting indicators are consistent and so retain the trend time-series where possible.

The Outcome Indicator Framework will be kept under regular review so that it continues to be relevant and provide the best and most cost-effective ways of assessing progress. The framework will be reviewed as a minimum every 5 years.

In order to add value to the insights available from the Outcome Indicator Framework data, this year's report includes initial assessment of change analyses, where suitable datasets and methodologies were available for individual indicators.

Further research into potential assessment approaches is ongoing, considering appropriate statistical techniques and timeframes. In future years, this may focus on the indicator headlines and their corresponding indicators (identified in Tables 1a to 1j). Where possible, a baseline near to 2018 (to align with the publication of the 25 Year Environment Plan) will be used as a reference point to assess change. Longer-term (historic) trends will also be presented for comparison where these data are available. Where suitable time-series are available, we will also assess medium-term and short-term trends.

It is important to note that data series of less than 5 years are likely to show year-to-year fluctuations that are difficult to assess and as such, due caution should be taken when inferring meaning from the assessments represented. Further narrative is provided for individual indicator analyses which is important for contextualisation of results.

It is also important to note that time lags exist in the environmental responses to interventions. It is expected that the majority of outcome indicators will require longer-term reporting (greater than 5 years) before they may be considered as showing response to policy and other actions.

Section B: Indicator descriptions and data trends

This section provides a technical summary of each of the indicators. For each indicator the summary includes a short description of the indicator itself, a cross-reference to relevant goals and targets in the 25 Year Environment Plan, the natural capital assets to which it relates and other relevant international reporting commitments.

Aichi targets are still noted under these reporting commitments for many indicators, although these were originally intended to remain in place only up until 2020. Post-2020 Convention on Biological Diversity (CBD) targets are due to be negotiated at the upcoming 15th meeting of the Conference of the Parties (COP15), which has been delayed due to the COVID-19 pandemic. Future updates to this report will continue to refer to Aichi targets until such a time that updated targets are in place.

The readiness of each indicator is also assessed in terms of whether it is already published or whether further development is required. Links are provided to relevant data sources and data trends are presented where data are available in appropriate formats. In some instances, interim indicators are presented pending further development of the indicator; this is clearly identified where relevant.

The geographic scope refers to intended coverage, any interim deviation from this is specified within individual indicator fiches. Where essential, a brief description of the methodology behind an indicator is provided within an indicator summary. Further methodological detail is either available in the source documents or via a link to the relevant point of contact provided in the 'Readiness and links to data' section of an indicator summary. The 25YEPindicators@defra.gov.uk mailbox can be contacted for general enquiries.

In addition to this annual report, an online dashboard version of the Outcome Indicator Framework is available, in an early stage of development. This is intended to enhance data accessibility and transparency, and many charts and underlying datasets are directly downloadable.

Theme A: Air

A1 Emissions for five key air pollutants

Short description

This indicator shows changes in the emissions of the 5 key air pollutants: sulphur dioxide (SO_2), fine particulate matter ($PM_{2.5}$), nitrogen oxides (NO_X), non-methane volatile organic compounds (NMVOC) and ammonia (NH_3). Air pollution has negative impacts on human health and the environment. Long-term exposure to particulate matter contributes to the risk of developing cardiovascular diseases and lung cancer. As well as being emitted

directly, particulate matter can be formed in the atmosphere from reactions between other pollutants, of which SO_2, NO_X, NMVOCs and NH_3 are the most important. NO_X and NH_3 emissions can be deposited in soils or in rivers and lakes, for example, through rain. Resulting nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses and by producing ozone (O_3) which damages crops and leads to impacts on wildlife through enhanced nutrient levels.

This indicator is an assessment of pressures on the atmosphere caused by the emissions of 5 key pollutants, which when concentrated in the air or deposited have impacts on human health and ecosystems.

Relevant goals in the 25 Year Environment Plan

- Clean air
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Meeting legally binding targets to reduce emissions of 5 damaging air pollutants
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- Emissions Reduction Commitments for the UK

Geographical scope

England

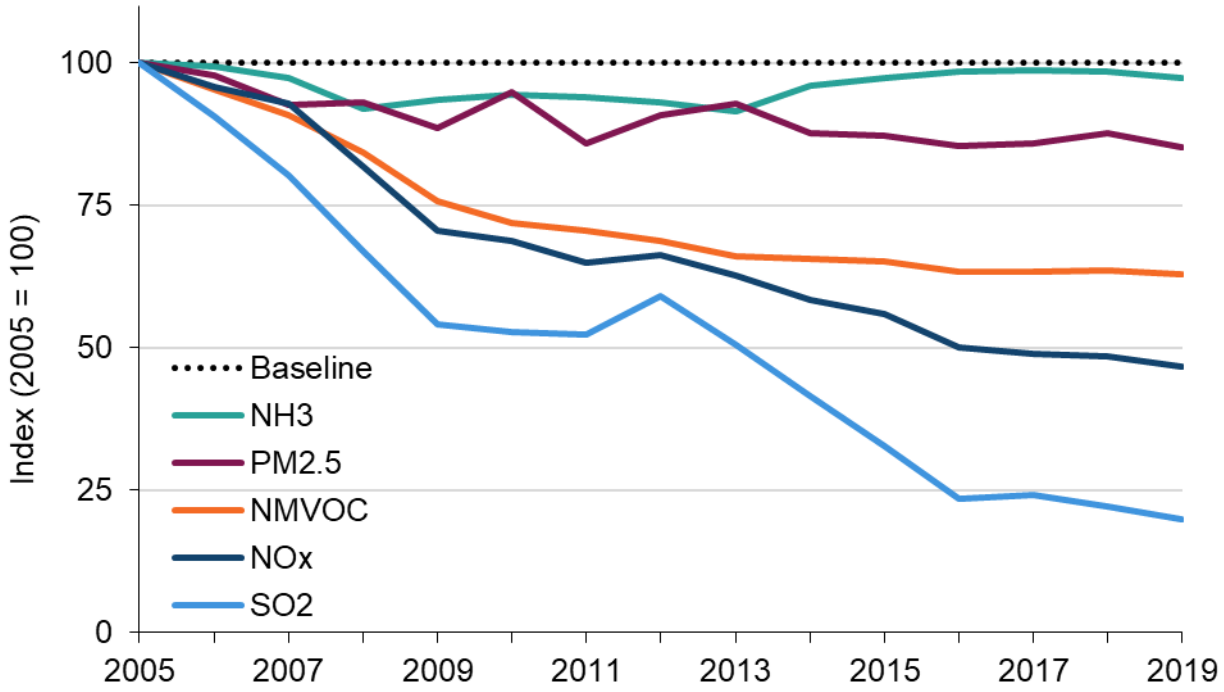
Status of indicator development

Final

Readiness and links to data

Emissions data are published annually in the Air Quality Pollutant Inventories 2005-2019.

Figure A1: Emissions for 5 key air pollutants in England, 2005 to 2019



Source, Ricardo Energy and Environment

Note on Figure A1

The time series of this indicator has changed since our last report in 2021. Previously, we reported data from 1998 onwards. However, this year data are only available from 2005. Consultation with the devolved administrations led to the agreement to limit updates to historic devolved administration air pollutant inventories to 2005 as this is the base year for legally binding emissions reductions commitments. This also allows more resource to be allocated to the development of more recent years of the time series for which there is better access to updated methods and data. A UK-wide historic time series of emissions remains available back to 1970, published as part of Defra's annual emissions reporting each February.

Trend description for Figure A1

Emissions for all 5 key air pollutants (ammonia, fine particulate matter, nitrogen oxides, non-methane volatile organic compounds and sulphur dioxide) in England have fallen over the latest 15 years for which annual, country-level data are available. Emissions of SO_2 have seen the greatest reductions, falling by 80% between 2005 and 2019. Emissions of NOx and NMVOCs and have also fallen considerably, by 53% and 37% respectively; emissions of $PM_{2.5}$ and NH_3 have fallen by 15% and 3% respectively over the same period.

More recently, the trends in annual emissions of $PM_{2.5}$ and NMVOC have levelled off and emissions of NH_3 have increased. For $PM_{2.5}$, decreases in emissions from many sources have been partially offset by increases in emissions from residential burning (domestic combustion); emissions of $PM_{2.5}$ from this source increased by 66% between 2005 and 2019.

Assessment of change

Four of the air pollutants measured by the A1 indicator have shown an improvement in the most recent 5-year period for which trends can be assessed (2013 to 2018), and over the medium and long-term time periods. However, emissions of NH_3 have been increasing over the short and medium term. More detailed reporting mentioned in the 'Readiness and links to data' section for this indicator may provide insights into the factors behind this change in NH_3 emissions. This assessment does not consider whether any improvement is on a sufficient scale for meeting targets. Projections towards air emissions targets set at a UK scale are available to supplement this assessment.

Change since 2018 has also been assessed. SO_2 and NOx emissions showed an improvement in 2019, while NH_3, NMVOC and $PM_{2.5}$ emissions showed little or no change. However, this is based on only 2 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table A1i: Assessment of change in emissions of ammonia (NH_3) in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+4.5 (smoothed Loess)	Deterioration
Medium term	2008-2018	+3.6 (smoothed Loess)	Deterioration
Long term	2005-2018	-2.4 (smoothed Loess)	Little or no change

Table A1ii: Assessment of change in emissions of non-methane volatile organic compounds (NMVOC) in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-5.2 (smoothed Loess)	Improvement
Medium term	2008-2018	-23.8 (smoothed Loess)	Improvement
Long term	2005-2018	-37.8 (smoothed Loess)	Improvement

Table A1iii: Assessment of change in emissions of nitrogen oxides (NOx) in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-22.4 (smoothed Loess)	Improvement
Medium term	2008-2018	-40.7 (smoothed Loess)	Improvement
Long term	2005-2018	-53.4 (smoothed Loess)	Improvement

Table A1iv: Assessment of change in emissions of fine particulate matter ($PM_{2.5}$) in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-4.1 (smoothed Loess)	Improvement
Medium term	2008-2018	-6.7 (smoothed Loess)	Improvement
Long term	2005-2018	-14.0 (smoothed Loess)	Improvement

Table A1v: Assessment of change in emissions of sulphur dioxide (SO_2) in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-56.3 (smoothed Loess)	Improvement
Medium term	2008-2018	-68.3 (smoothed Loess)	Improvement
Long term	2005-2018	-79.4 (smoothed Loess)	Improvement

Note that assessment categories for short, medium and long term were assigned based on smoothed data so percent change figures in Tables A1i to A1v may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

A2 Emissions of greenhouse gases from natural resources

Short description

This indicator tracks the changes in greenhouse gas (GHG) emissions from natural resources as described in the Clean Growth Strategy. GHGs contribute to global climate change which is a pressure on many aspects of our environment. The indicator shows the annual net amount of GHG emissions from land use and land use change, forestry, agriculture, and waste sectors and from the use of fluorinated gases. It measures GHG emissions on a 'territorial' basis, which means that only emissions occurring within England's borders are included.

Relevant goal in the 25 Year Environment Plan

- Mitigating and adapting to climate change

Relevant targets in the 25 Year Environment Plan

- Continuing to cut net greenhouse gas emissions including from land use, land use change, the agriculture and waste sectors and the use of fluorinated gases
- The UK Climate Change Act commits the UK to reducing greenhouse gas emissions by at least 100% of 1990 levels (net zero) by 2050

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- UN Framework Convention on Climate Change (UNFCCC) greenhouse gas emissions inventory data for Agriculture, Land Use, Land Use Change and Forestry (LULUCF), Waste Management and Industrial Processes
- The UK Climate Change Act 2008 requires an annual report by the Committee on Climate Change to parliament on whether the UK is on course to meet its carbon budgets and targets

Geographical scope

England

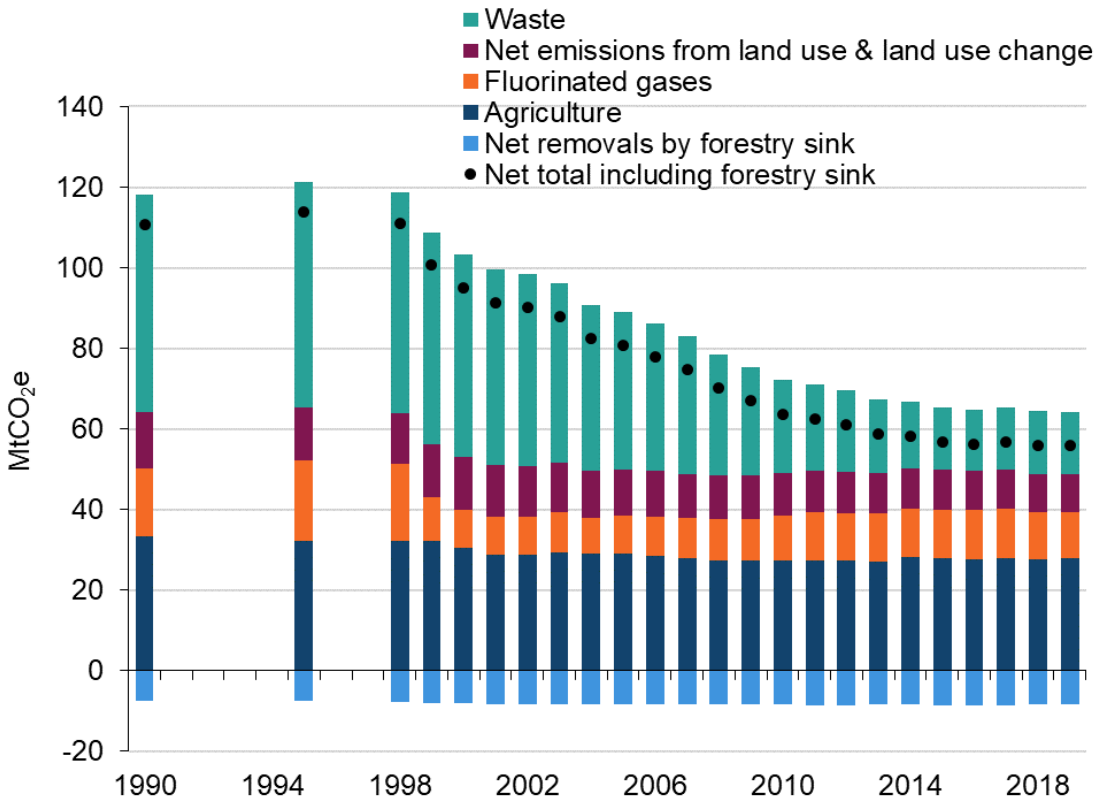
Status of indicator development

Final

Readiness and links to data

Underlying data are published annually in the Greenhouse Gas Inventories 1990 to 2019. Additional information is also published annually in UK Spatial Emissions Methodology 2019 and mapping of the UK Greenhouse Gas Inventory sectors to the sectors used in this indicator is available in the Net Zero Strategy: emissions taxonomy.

Figure A2: Emissions of greenhouse gases from natural resources in England by sector, 1990 to 2019



Source, Department for Business, Energy & Industrial Strategy

Note on Figure A2

The data in this indicator are reflective of the current definition for GHGs from natural resources, they may be subject to change in future updates. No data are available for 1991 to 1994 inclusive, 1996 and 1997.

The whole time series is revised annually to take account of any methodological improvements, reflect the latest data, and follow the latest international guidelines. Two revisions in particular have had a marked impact on the 2022 update of this indicator:

First, methodologies for wetlands from the Intergovernmental Panel on Climate Change (IPCC) report 2013 supplement to the 2006 IPCC guidelines for National Greenhouse Gas Inventories: Wetlands' have been implemented in the 1990 to 2019 Greenhouse Gas Inventory to better represent emissions from drained and rewetted inland organic soils (peatlands). This has increased emissions estimates predominantly in the land use and land use change category. Including the impact of other changes as well, land use and land use change emissions estimates in England have increased overall by around 6 million tonnes of carbon dioxide equivalent (MtCO2e) each year from 1990 to 2018 compared with figures published last year.

Second, a new UK-specific version of ‘HFC Outlook’, a model previously developed to support the UN Environment Programme and European partnership for Energy and

Environment has also been implemented in the 1990 to 2019 Greenhouse Gas Inventory to better represent emissions from Refrigeration, Air Conditioning and Heat Pumps included within the fluorinated gases category.

Further details on both these and other revisions can be found in the 2019 UK greenhouse gas emissions: final figures - statistical release.

Trend description for Figure A2

After a small initial increase, net emissions of GHGs from natural resources in England have fallen by 50%, from 111 $MtCO_2e$ in 1990 to 56 $MtCO_2e$ in 2019. Net GHG emissions have fallen from all sectors included within this indicator; however, the greatest reduction has been achieved in the waste sector (38 $MtCO_2e$ or 71%). While net emissions from land use and land use change, and emissions from fluorinated gases and agriculture have fallen by 33%, 33% and 16% respectively, and net removals by the forestry sector have increased by 14%, the total net improvements in these 4 sectors combined (17 $MtCO_2e$) is less than half of that achieved in the waste sector. More recently, for example, in the latest 10 years, emissions of GHGs from the waste sector and net emissions from land use and land use change have continued to fall, whereas net removals by the forestry sector and emissions from agriculture have fluctuated but show little overall change between 2009 and 2019. Emissions from fluorinated gases have increased by 10% since 2009.

Assessment of change

A decrease (or improvement) in emissions of GHGs from natural resources has been observed over the most recent 5 years for which trends can be assessed (2013 to 2018), as well as in the medium and long term. This assessment does not consider whether any improvement is on a sufficient scale for meeting targets.

Change since 2018 has also been assessed. There has been little or no change in emissions of GHGs from natural resources since 2018. However, this is based on 2 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table A2: Assessment of change in emissions of greenhouse gases from natural resources in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-6.2 (smoothed Loess)	Improvement
Medium term	2008-2018	-20.9 (smoothed Loess)	Improvement
Long term	1990-2018	-50.0 (smoothed Loess)	Improvement

Note that assessment categories for short, medium and long term were assigned based on smoothed data, so percent change figures in Table A2 may differ from unsmoothed

values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

A3 Concentrations of fine particulate matter ($PM_{2.5}$) in the air

Short description

This indicator is a measure of the level of long-term exposure of people to harmful airborne fine particulate matter ($PM_{2.5}$). Long-term exposure to particulate matter contributes to the risk of developing cardiovascular disease and lung cancer. The main sources of $PM_{2.5}$ pollution are industrial processes, combustion in residential, public, commercial, and agricultural sectors and road transport.

This indicator is an assessment of clean air (reporting the condition of the atmosphere as an asset). It can also be considered as pressure on human health. It is determined by calculating the annual population-weighted mean concentration of $PM_{2.5}$ in the air, assessed as background concentrations per 1km square. The population-weighted mean concentration is used as a measure of the impact of $PM_{2.5}$ on the health of the total population. Greater weighting is given to concentrations of $PM_{2.5}$ in urban areas to reflect the higher population density as those concentrations will affect a greater number of people. In addition, people living in urban areas are generally exposed to greater levels of $PM_{2.5}$ than those living in rural areas.

Relevant goal in the 25 Year Environment Plan

- Clean air

Relevant target in the 25 Year Environment Plan

- Meeting legally binding targets to reduce emissions of 5 damaging air pollutants (including primary $PM_{2.5}$ and precursor pollutants that contribute to secondary $PM_{2.5}$ in the atmosphere)

Position in the natural capital framework

Condition of asset – atmosphere

Related reporting commitments

- None

Geographical scope

England; also available at local authority level.

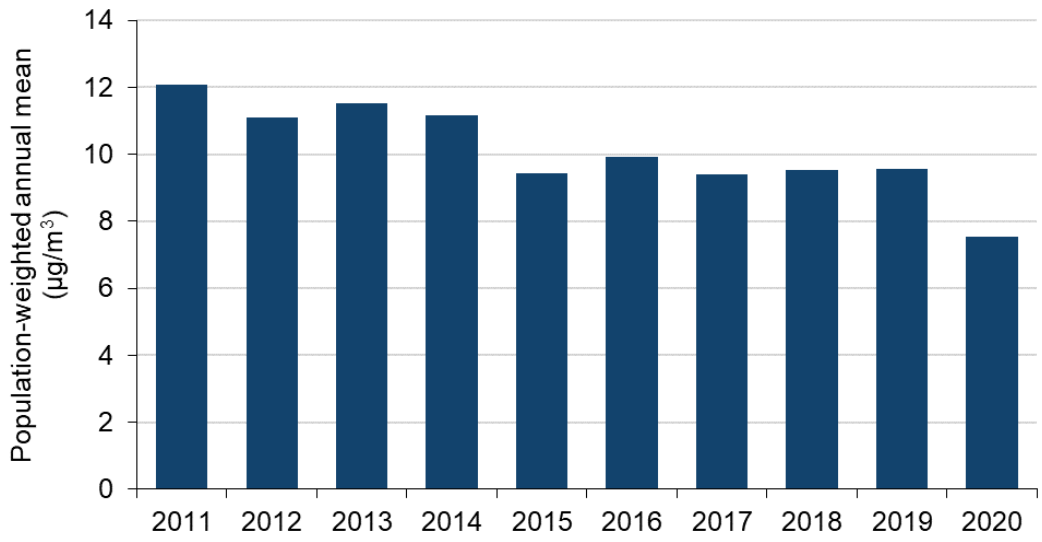
Status of indicator development

Final

Readiness and links to data

Data on fine particulate matter (PM2.5) are published annually at UK Air Information Resource, Modelled background pollution data.

Figure A3: Concentrations of fine particulate matter ($PM_{2.5}$) in England, 2011 to 2020



Source, Defra

Note on Figure A3

$PM_{2.5}$ annual mean concentrations are estimated annually for every square kilometre of the UK through the Pollution Climate Mapping (PCM) model. The geographical distribution of the UK population is then joined to the estimated concentrations to estimate the annual mean concentration of $PM_{2.5}$, weighted on where the population lives. This enables us to account for most of the population living in densely populated urban areas, where concentrations are likely to be greatest.

Trend description for Figure A3

Population-weighted annual mean concentrations of $PM_{2.5}$ in England have declined from 12.1µg per m^3 in 2011 to 7.5µg per m^3 in 2020, a fall of 38% over the latest 9 years for which data are available.

Assessment of change

Concentrations of $PM_{2.5}$ decreased (an improvement) over the most recent 5-year period for which trends can be assessed (2014 to 2019). The time series is not yet long enough to make a trend assessment for the medium and long-term time periods. This assessment does not consider whether improvement is on a sufficient scale for meeting any targets.

Change since 2018 has also been assessed where possible. A decrease in concentrations of fine particulate matter was also observed since 2018. However, this is based on only 3 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table A3: Assessment of change in concentrations of fine particulate matter ($PM_{2.5}$) in the air, England

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	-17.3 (smoothed Loess)	Improvement
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Note: that assessment categories were assigned based on smoothed Loess, so percent change figures in Table A3 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

A4 Rural background concentrations of ozone (O_3)

Short description

This indicator tracks changes in rural background concentration of ozone (O_3). Chemical reactions in the air involving nitrogen oxides (NO_X) and volatile organic compounds (VOCs) produce the toxic gas O_3 which can harm health, damage wild plants, crops, forests, and some materials, and is a greenhouse gas contributing to global warming.

This indicator is an assessment of clean air (reporting the condition of the atmosphere as an asset). It can also be considered as a pressure on human health and thriving plants and wildlife. It is determined by calculating the annual average of the maximum daily 8-hour mean concentrations of O_3 measured at all rural measurement sites on Defra's Automatic Urban and Rural Network (AURN).

Relevant goals in the 25 Year Environment Plan

- Clean air
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Meeting legally binding targets to reduce emissions of 5 damaging air pollutants (some of which are O_3 precursors)
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term

Position in the natural capital framework

Condition of asset – atmosphere

Related reporting commitments

- Air Quality Standards Regulations 2010. Measurements from the UK AURN form part of the annual assessment of air quality against the limit and target values specified by this legislation

Geographical scope

England

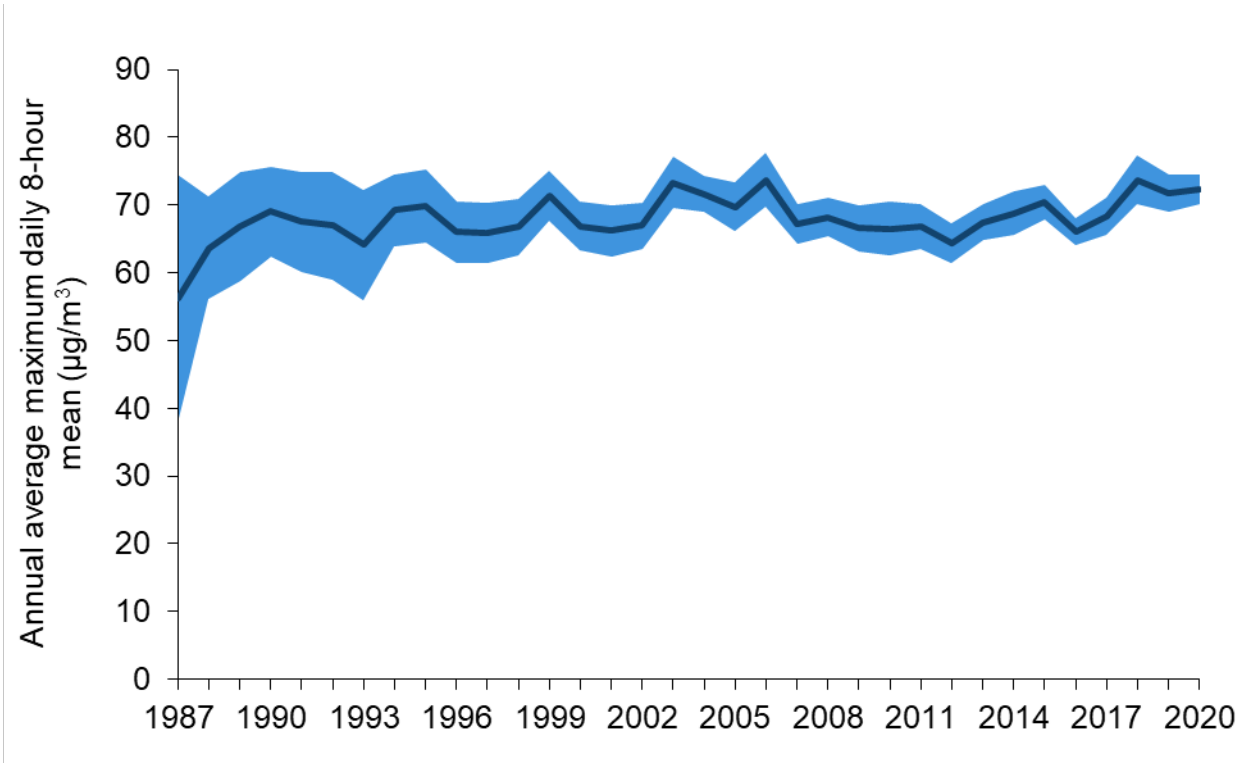
Status of indicator development

Final

Readiness and links to data

Data on concentrations of ozone are published annually as National Statistics, Air Quality Statistics.

Figure A4: Rural background concentrations of ozone (O_3) in England, 1987 to 2020



Source, Defra

Note on Figure A4

The shaded area in the graph represents the 95% confidence interval (measure of uncertainty) for the annual mean concentration of O_3 measured at rural background sites. The interval narrows over time because of an increase in the number of monitoring sites and a reduction in the variation between annual means for O_3.

Trend description for Figure A4

The average daily maximum 8 hour mean concentration of O_3 has fluctuated since the beginning of the time series in 1987. It was 72.3µg per m^3 in 2020; a 29% increase in concentration compared to 1987 but similar to the concentration observed in 2019 (71.8µg per m^3). Some variance from year to year is expected due to fluctuations in the occurrence of hot summer weather conditions which are associated with high O_3 concentrations.

Assessment of change

Rural background concentrations of O_3 increased (a deterioration) over the most recent 5-year period for which trends can be assessed (2014 to 2019), and over the medium and long-term time periods.

Change since 2018 has also been assessed. Little or no change was observed for rural background concentrations of ozone since 2018. However, this is based on only 3 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table A4: Assessment of change in rural background concentrations of ozone (O_3) in England

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	+4.9 (smoothed Loess)	Deterioration
Medium term	2009-2019	+4.9 (smoothed Loess)	Deterioration
Long term	1987-2019	+15.2 (smoothed Loess)	Deterioration

Note that assessment categories for short, medium and long term were assigned based on smoothed data, so percent change figures in Table A4 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

A5 Roadside nitrogen dioxide (NO_2) concentrations

Short description

This indicator tracks changes in average roadside concentration of nitrogen dioxide (NO_2). NO_2 arises predominantly from combustion sources such as traditionally fuelled vehicles and therefore the highest concentrations are often found at roadside locations.

This indicator is an assessment of clean air (reporting the condition of the atmosphere as an asset). It can also be considered as a pressure on human health. It is determined by calculating the average value of the annual mean concentrations measured across Defra's Automatic Urban and Rural Network (AURN) at all roadside locations (with greater than 75% data capture in any one year).

Relevant goals in the 25 Year Environment Plan

- Clean air

Relevant targets in the 25 Year Environment Plan

- Meeting legally binding targets to reduce emissions of 5 damaging air pollutants (including NO_2)

Position in the natural capital framework

Condition of asset – atmosphere

Related reporting commitments

- Air Quality Standards Regulations 2010. Measurements from the UK AURN form part of the annual assessment of air quality against the limit and target values specified by this legislation

Geographical scope

England; data from individual monitoring sites are also available.

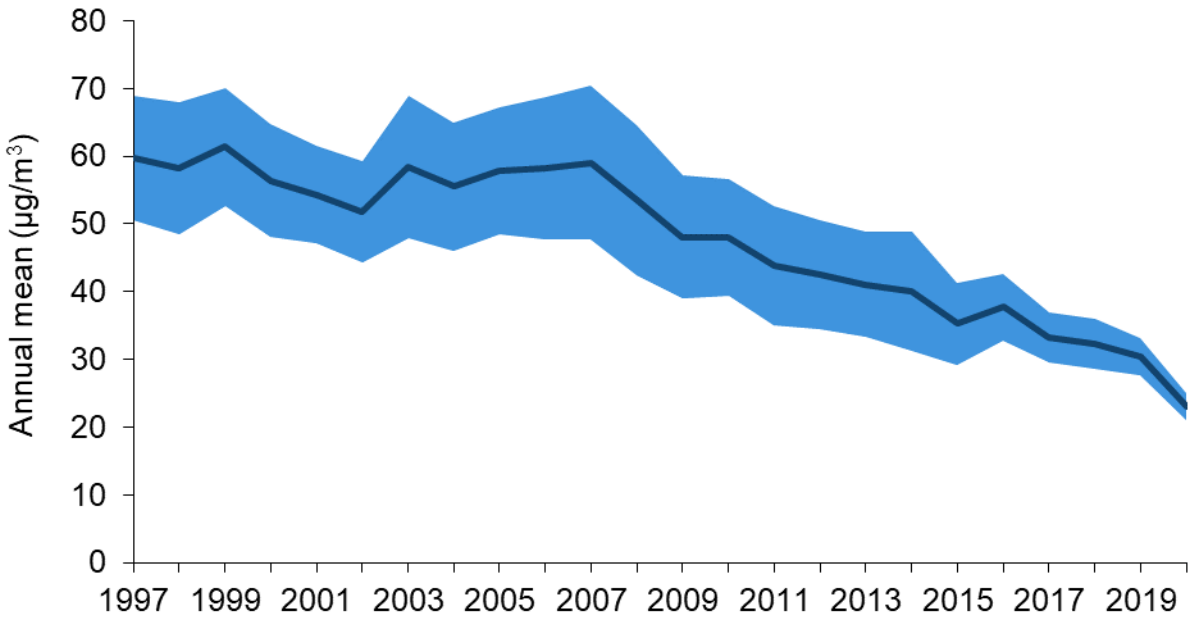
Status of indicator development

Final

Readiness and links to data

Data on concentrations of NO_2 are published annually as National Statistics; Air Quality Statistics.

Figure A5: Roadside nitrogen dioxide (NO_2) concentrations in England, 1997 to 2020



Source, Defra

Note on Figure A5

The shaded area in the graph represents the 95% confidence interval (measure of uncertainty) for the annual mean concentration of NO_2 measured at roadside sites. The interval narrows over time because of an increase in the number of monitoring sites and a reduction in the variation between annual means for NO_2.

Trend description for Figure A5

Concentrations of roadside NO_2 in England have fallen from 59.7µg per m^3 in 1997 to 23.0µg per m^3 in 2020, a drop of 49% over the latest 23 years for which data are available. Although the general trend in measured NO_2 concentrations is decreasing and falls below the NO_2 limit value of 40µg per m^3 in recent years, there are hotspots of NO_2 exceedances which are being addressed through the NO_2 plans.

Assessment of change

Roadside NO_2 concentrations decreased (an improvement) over the most recent 5-year period for which trends can be assessed (2014 to 2019), and over the medium and long-term time periods. Targets for NO_2 are set at a regional scale rather than for the England average recorded by this indicator, so it would not be appropriate to use results to establish whether targets have been met.

You can find more information on trends and monitoring at a regional level can be found in the Air Pollution in the UK report.

Change since 2018 has also been assessed. A decrease in roadside NO_2 concentrations was also observed since 2018. However, this is based on only 3 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table A5: Assessment of change in roadside nitrogen dioxide (NO_2) concentrations in England

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	-27.1 (smoothed Loess)	Improvement
Medium term	2009-2019	-44.1 (smoothed Loess)	Improvement
Long term	1997-2019	-51.4 (smoothed Loess)	Improvement

Note that assessment categories for short, medium and long term were assigned based on smoothed data, so percent change figures in Table A5 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems

Short description

This indicator shows changes in the percentage of sensitive habitats exceeding the internationally agreed threshold for harmful effects (critical load) of nutrient nitrogen deposition. The damaging nutrient nitrogen comes predominantly from ammonia (NH_3) but partly nitrogen oxides (NO_X) and long-range transport of air pollutants.

This indicator is an assessment of clean air (reporting the condition of the atmosphere as an asset). It can also be considered as pressure on thriving plants and wildlife. It is determined by calculating the area of sensitive habitat exceeding the internationally agreed threshold for likely damaging effects from reactive nitrogen deposition in both oxidised and reduced forms, termed the critical load. It uses modelled interpolations of atmospheric concentrations of NO_X and NH_3 and models deposition processes based on internationally agreed methodology.

Relevant goals in the 25 Year Environment Plan

- Clean air
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Meeting legally binding targets to reduce emissions of 5 damaging air pollutants
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- International Collaborative Partnership reporting under United Nations Economic Commission for Europe's Working Group on Effects
- Convention on Biological Diversity Aichi Target 8

Geographical scope

England

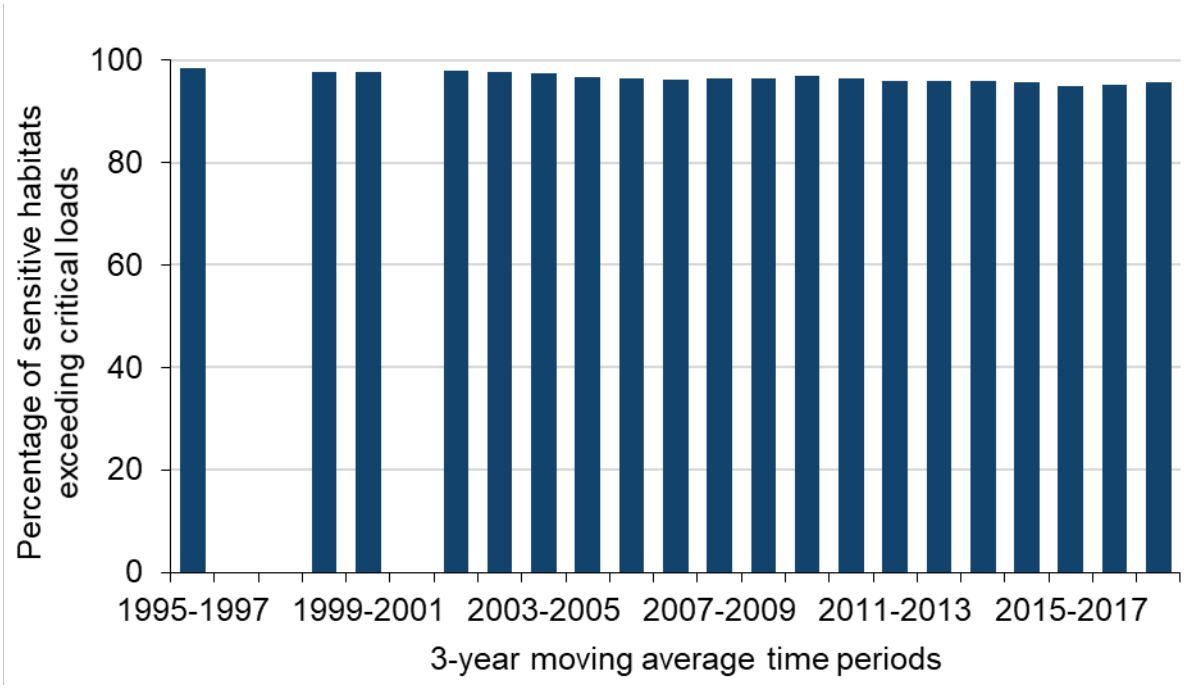
Status of indicator development

Final

Readiness and links to data

Assessments of nutrient nitrogen deposition are undertaken and published annually using 3-year moving average data, at UK Air Information Resource: Trends in critical load and critical level exceedances in the UK.

Figure A6: Exceedance of damaging levels of nutrient nitrogen deposition in England, 1995-1997 to 2017-2019



Source, UK Centre for Ecology & Hydrology

Note on Figure A6

Data are presented as 3-year moving average time periods. A 3-year moving average is used to smooth out inter-annual variability due to the influence of weather on atmospheric chemistry. There have been several minor methodological changes in the time periods 2001 to 2003, 2002 to 2004 and 2004 to 2006 which should be considered when interpreting this trend. No data are available for the periods 1996 to 1998, 1997 to 1999 and 2000 to 2002.

Trend description for Figure A6

The percentage area of sensitive habitats in England where nutrient nitrogen deposition exceeded critical load has fallen over the latest 23 years for which data are available (98.3% in 1995 to 1997 to 95.6% in 2017 to 2019), although it has increased slightly over the last 3 data points (94.8% in 2015 to 2017 to 95.6% in 2017 to 2019).

Assessment of change

There has been little or no change observed in exceedance of damaging levels of nutrient nitrogen deposition on ecosystems over the most recent 5-year period for which trends can be assessed (2012-2014 to 2017-2019), or over the medium and long-term time periods.

Change since 2018 has also been assessed. Little or no change was also observed for exceedance of damaging levels of nutrient nitrogen deposition on ecosystems since 2018.

However, this is based on only 2 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table A6: Assessment of change in exceedance of damaging levels of nutrient nitrogen deposition in England

Period	Date range	Percent change	Assessment of change
Short term	2012-2014 to 2017-2019	-0.3 (moving average data)	Little or no change
Medium term	2007-2009 to 2017-2019	-0.8 (moving average data)	Little or no change
Long term	1995-1997 to 2017-2019	-2.7(moving average data)	Little or no change

Percent change refers to the difference seen from the first to last 3-year moving average in the specified date range.

A7 Area of land exposed to damaging levels of ammonia (NH_3) in the atmosphere

Short description

This indicator tracks changes in the amount of land area affected by damaging levels of ammonia (NH_3) in the air. Excess deposition of NH_3 on natural ecosystems causes nutrient enrichment and changes in vegetation and soils. Agriculture is the main source of NH_3 emissions to the atmosphere.

This indicator is a measure of pressure on ecosystems from air pollution. It shows the percentage of land area where interpolated measurements of ground-level air exceed the lower critical level threshold for NH_3 of 1µg per m^3.

Relevant goals in the 25 Year Environment Plan

- Clean air
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Meeting legally binding targets to reduce emissions of 5 damaging air pollutants (including NH_3)
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- United Nations Economic Commission for Europe National Emissions Ceiling Directive Art.9 and the Convention on Long-range Transboundary Air Pollution
- Convention on Biological Diversity Aichi Target 8

Geographical scope

England

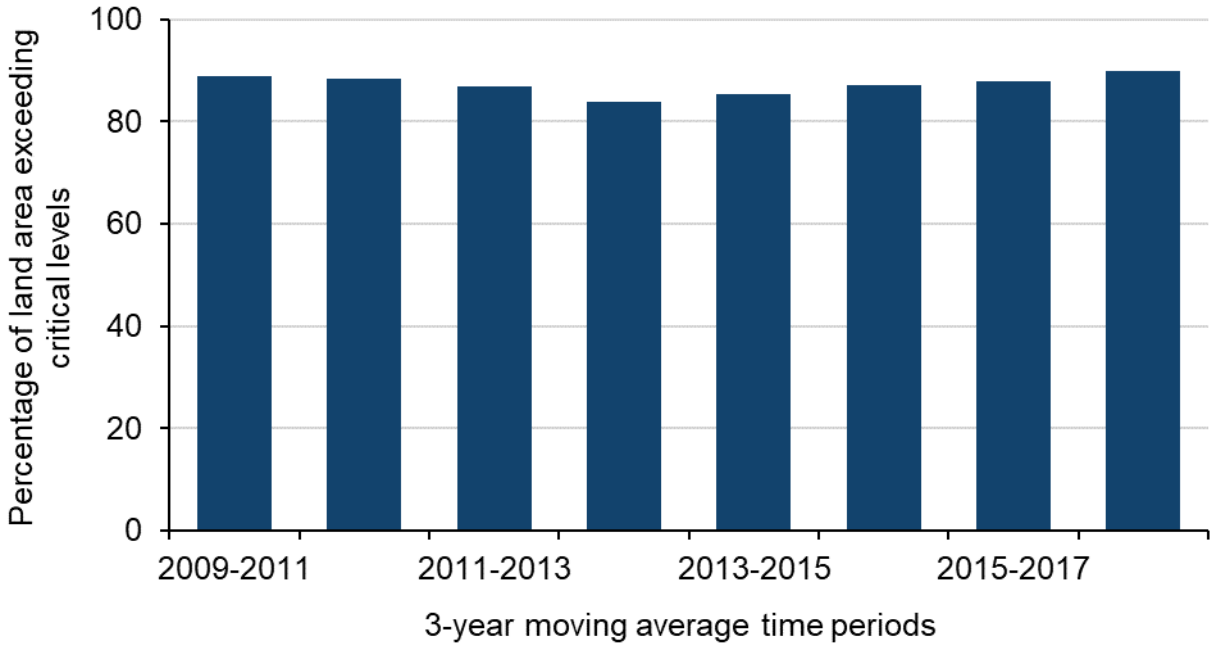
Status of indicator development

Final

Readiness and links to data

Assessments of damaging levels of ammonia in the atmosphere are undertaken and published annually using 3-year moving average data, at UK Air Information Resource: Trends in critical load and critical level exceedances in the UK.

Figure A7: Area of land in England exposed to damaging levels of ammonia (NH_3) in the atmosphere, 2009-2011 to 2016-2018



Source, UK Centre for Ecology & Hydrology

Note on Figure A7

Data are presented as 3-year moving average time periods. A 3-year moving average is used to smooth out inter-annual variability due to the influence of weather on atmospheric chemistry.

Trend description for Figure A7

The percentage of land area exposed to concentrations of NH_3 that exceed critical levels (1µg per m^3) has decreased slightly from 88.9% in 2009 to 2011 to 84.0% in 2012 to 2014 but has since increased again to 90.0% in 2016 to 2018, just over 1% higher than it was in 2009 to 2011.

Assessment of change

Area of land exposed to damaging levels of NH_3 in the atmosphere increased slightly (a deterioration) over the most recent 5-year period for which trends can be assessed (2011-2013 to 2016-2018). The time series was not yet long enough to make an assessment for medium and long-term time periods.

Assessing change since the start of the 25 Year Environment Plan in 2018 will not be possible until future reports, when sufficient datapoints are available in the time series.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table A7: Assessment of change in area of land in England exposed to damaging levels of ammonia (NH_3) in the atmosphere

Period	Date range	Percent change	Assessment of change
Short term	2011-2013 to 2016-2018	+3.6 (moving average data)	Deterioration
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Percent change refers to the difference seen from the first to last 3-year moving average in the specified date range.

Theme B: Water

B1 Pollution loads entering waters

Short description

This indicator will track changes in the inputs and discharges of selected contaminants such as nutrients and some toxic chemicals to rivers or directly to the sea, for example through sewage pipelines or activities such as agriculture inputting substances directly.

It will focus on the discharge and emission of contaminants that adversely affect the quality and uses of receiving waters and potentially increase the costs of water treatment. These also affect the wildlife and ecology of rivers, estuaries and coastal waters.

Data will be derived from the existing Riverine Input and Direct Discharges (RID) data collected under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the Environment Agency's Emissions Inventory.

Relevant goals in the 25 Year Environment Plan

- Clean and plentiful water
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Improving at least three-quarters of our waters to be close to their natural state
- Reaching or exceeding objectives for rivers, lakes, coastal water and ground waters that are specially protected, whether for biodiversity or drinking water as per our River Basin Management Plans
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- UK Marine Strategy Regulations
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

Geographical scope

England; data for individual sites, water bodies and catchments are also available.

Status of indicator development

Interim

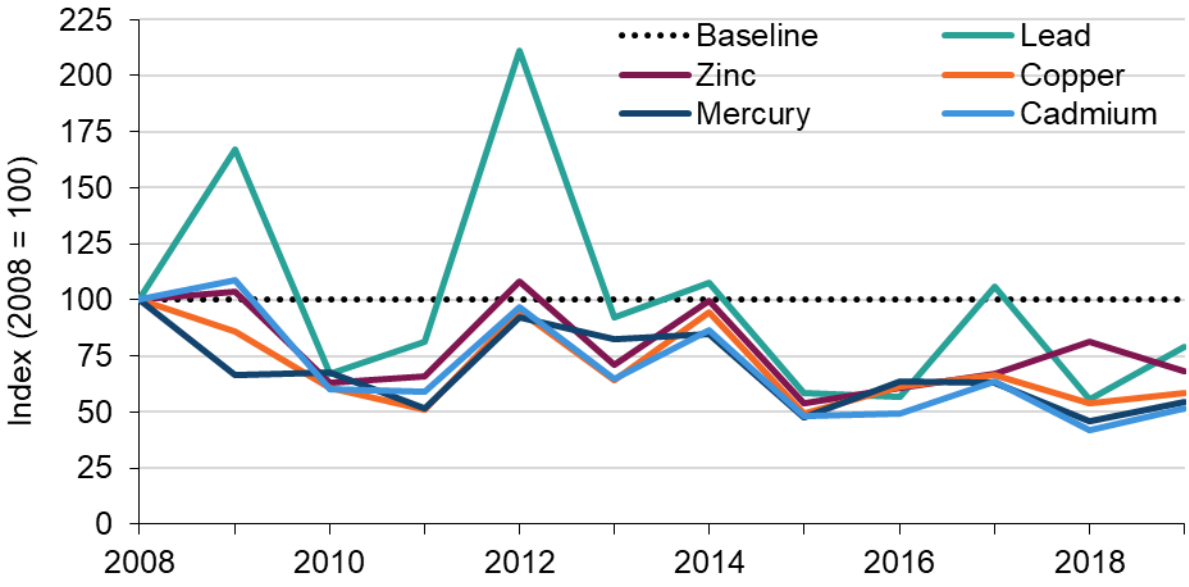
Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows relative changes in measured riverine loads (inputs) of selected metals and nutrients into English tidal waters between 2008 and 2019, covering cadmium, copper, lead, mercury, zinc, nitrogen and ortho-phosphate. Some data for this interim indicator have previously been published as part of the OSPAR assessments (Inputs of Mercury, Cadmium and Lead via Water and Air to the Greater North Sea) although for different time periods and so these data should be compared with caution.

Further development is required to present statistical trends for the selected contaminants in an indicator. These data are taken from the existing OSPAR database. The Environment Agency reports a subset of these data to Defra on an annual basis known as the RIDS dataset, 'Riverine and Industrial Discharges'.

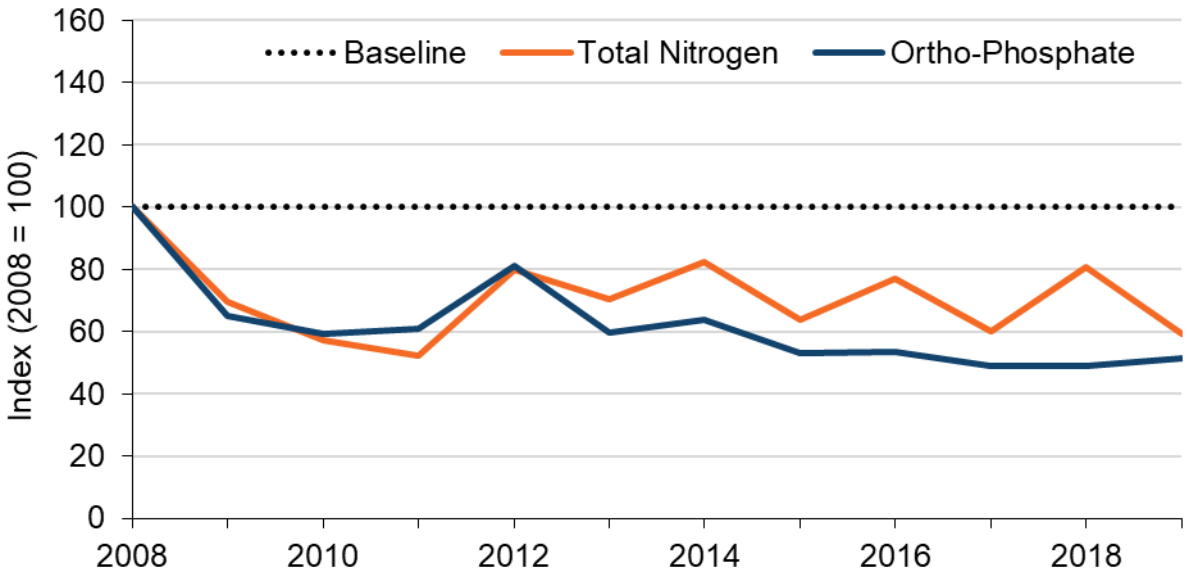
Contact the Environment Agency's National Customer Contact Centre (enquiries@environment-agency.gov.uk) for the OSPAR database extract used for the interim indicator.

Figure B1a (interim): Riverine inputs of selected metals into English tidal waters, 2008 to 2019



Source, Environment Agency

Figure B1b (interim): Riverine inputs of selected nutrients into English tidal waters, 2008 to 2019



Source, Environment Agency

Note on Figures B1a and B1b

Data collection for this interim indicator was heavily impacted by adherence to the government's COVID-19 restrictions during the pandemic. In total, only 357 samples were taken and analysed in 2020 compared with 1,237 samples in 2019. In addition, all the samples for 2020 were taken during wetter months with high flow rates (306 in January to March and 51 in October to December); no samples were collected in the period April to September. Therefore, the summary data for 2020 are unlikely to be representative of the true levels of riverine inputs into English tidal waters and are not reported in this indicator.

Load (input) calculations (kg per day) are the product of the monitored concentration of substance and flow rate. The annual total loads (kg per year) for selected metals (total fraction), total nitrogen and ortho-phosphate are calculated using chemical concentration data reported in the Water quality data Archive and flow data reported in the Environment Agency's core system of hydrometric and hydrological values (Water Information System by Kisters).

Figures B1a and B1b show each annual load relative to the 2008 monitored load (2008 is represented as a baseline index = 100). Observed fluctuations in the data could be influenced by a number of external factors affecting movement and loading within river systems. These factors include flow caused by high or low rainfall in a given year and local impacts of changing industry or land use over time. There appears to be a relationship between high flows and high loads, and it should also be noted that the baseline year of 2008 saw high flows.

Trend description for Figures B1a and B1b

B1a) Riverine inputs of selected metals

Riverine inputs of cadmium, copper, lead, mercury and zinc into English tidal waters have fluctuated considerably between 2008 and 2019, but overall, they have all fallen. Measured loads of cadmium, mercury, copper, zinc and lead were 49%, 45%, 41% 32% and 21% respectively less in 2019 than they were in 2008.

B1b) Riverine inputs of selected nutrients

Riverine inputs of total nitrogen and ortho-phosphate have also fluctuated considerably between 2008 and 2019, but overall, both have fallen, and both have remained below their baseline value with measured loads in 2019 being 41% and 49% respectively less than those measured in 2008.

Assessment of change

No assessment of change was undertaken for this indicator as further development is required to present statistical trends for the selected contaminants in an indicator.

B2 Serious pollution incidents to water

Short description

This indicator shows changes in the number of pollution incidents impacting on water health, including in rivers, lakes, reservoirs, canals, coasts, estuaries and groundwater. Serious pollution incidents are a pressure on the water environment. The Environment Agency uses 4 categories to determine the severity of pollution incidents. The indicator shows the number of events in each year that are in the 2 higher categories (category 1, major and category 2, significant), for example, causing death of fish, potential harm to bathers, or the temporary cessation of abstraction from a river by a drinking water provider.

Relevant goals in the 25 Year Environment Plan

- Clean and plentiful water
- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- No specific target

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- Domestically under the Environment Act 1995
- Relevant under the UN's Sustainable Development Goal 6

Geographical scope

England; data for individual incidents at any geographical scale are also available.

Status of indicator development

Final

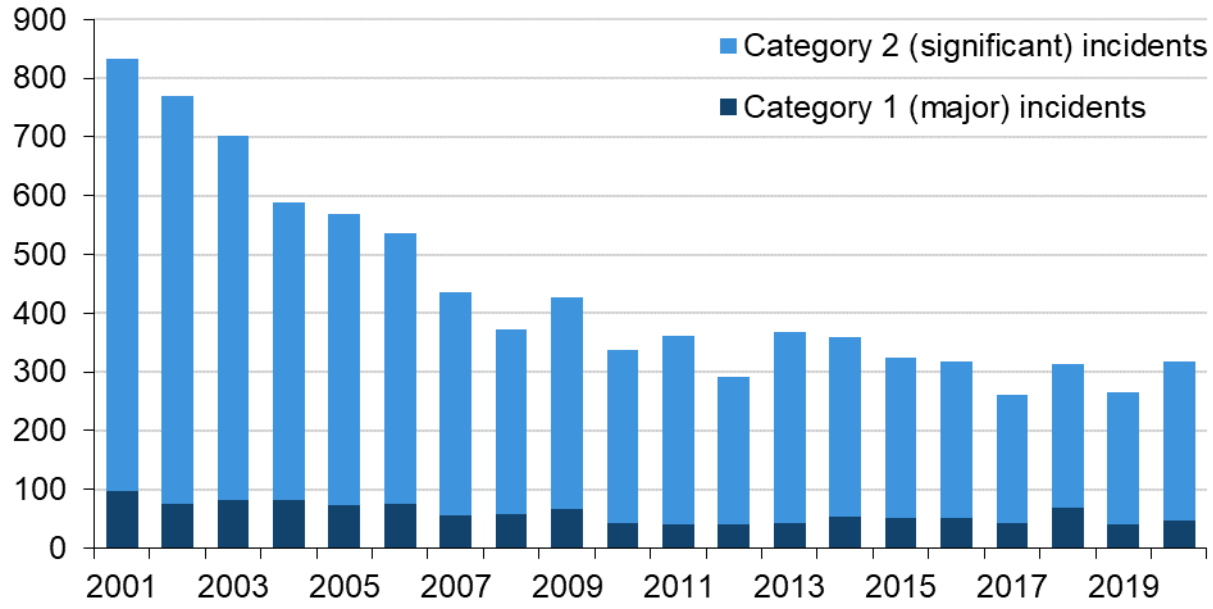
Readiness and links to data

Data are already published annually by the Environment Agency:

- Pollution incidents data
- Section 5 of the Water and Sewerage Companies in England environmental performance report

Longer-term trends are available in the State of the environment: water quality report and the Regulating for people, the environment and growth report.

Figure B2: Number of serious pollution incidents to water in England, 2001 to 2020



Source, Environment Agency

Note on Figure B2

Only includes incidents where investigations and response have been completed by the Environment Agency. Some incidents may take an extended period of months, or exceptionally years, to be completed.

The dataset only includes substantiated incidents and their environmental impact, that is where there is confirmation that the incident took place either by a visit from the Environment Agency or a partner organisation, or it is corroborated by other information.

Results do not include incidents relating to:

- Fisheries incidents – incidents involving illegal fishing and illegal fish movements, fish disease, fishery management activities and fish kills from non-pollution causes, including low flows and low dissolved oxygen
- Water Resources incidents – incidents involving the quantity of a water resource.
- Waterways incidents – incidents on a waterway where the Environment Agency are the competent authority for navigation
- Flood and Coastal Risk Management incidents – for incidents which involve actual or potential flooding and land drainage works

Trend description for Figure B2

The total number of serious pollution incidents to water in England has fallen by almost two-thirds (62%) between 2001 and 2020, with the majority of this fall occurring in the first 10 years (834 in 2001 and 337 in 2010). More recently, while there have been annual fluctuations in the numbers of category 1 (major) and category 2 (significant) pollution

incidents in the last 10 years, the overall trend has plateaued, and in 2020, there were a total of 317 serious pollution incidents to water (47 major and 270 significant).

Assessment of change

A decrease in serious pollution incidents (or improvement) was observed over the most recent 5 years for which trends can be assessed (2013 to 2018), as well as over the medium and long term. However, as noted in the trend description, the percentage change seen over the short and medium term is much reduced compared with the long term and there are fluctuations year on year. This assessment does not consider whether any improvements seen are on a sufficient scale for meeting desired outcomes.

Change since 2018 has also been assessed. There has been little or no change in serious pollution incidents to water since 2018. However, this is based on 3 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table B2: Assessment of change in the total number of serious pollution incidents to water in England

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	-10.2 (smoothed Loess)	Improvement
Medium term	2009-2019	-22.6 (smoothed Loess)	Improvement
Long term	2001-2019	-65.0 (smoothed Loess)	Improvement

Note that assessment categories for the short, medium and long term were assigned based on smoothed data, so percent change figures in Table B2 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

B3 State of the water environment

Short description

This indicator takes a broad overview of the condition of the water environment; it relates to freshwater bodies, wetlands, groundwaters, estuaries and coastal waters. The indicator comprises several metrics including percentage of water tests meeting good (or better) status for ecology and chemistry, percentage of water bodies achieving good ecological status, and compliance of waters specially protected for specific uses such as drinking water abstraction and nature conservation. ‘Status’ refers to quality as measured under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the WFD Regulations). Some of these data relating to protected sites are also included in indicator ‘D2 Extent and condition of protected sites – land, water and sea’. All the Water theme indicators are linked, but 2 indicators that are important to consider as

part of the wider state of the water environment are ‘B4 Condition of bathing waters’ and ‘B6 Natural functions of water and wetland ecosystems’.

Relevant goals in the 25 Year Environment Plan

- Clean and plentiful water
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Improving at least three-quarters of our waters to be close to their natural state
- Reaching or exceeding objectives for rivers, lakes, estuaries, coastal and ground waters that are specially protected, whether for biodiversity or drinking water as per the river basin management plans
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term
- Reversing the loss of marine biodiversity and, where practicable, restoring it.

Position in the natural capital framework

Condition of assets: freshwater; marine; species and ecological communities

Related reporting commitments

- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- Reporting under the Conservation of Habitats and Species Regulations 2017 (as amended) for water dependent sites
- Reporting under the Marine Strategy Regulations 2010 and the assessment of Good Environmental Status in Regional Seas
- Reporting under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) convention 1992 and associated Annexes
- May provide evidence in support of Climate Change Risk Assessment under the Climate Change Act (2008)
- Relevant to the Sustainable Development Goal 6.3.2 – Proportion of bodies of water with good ambient water quality

Geographical Scope

England; data at site, water body, catchment and river basin district level are also available.

Status of indicator development

Interim

Readiness and links to data

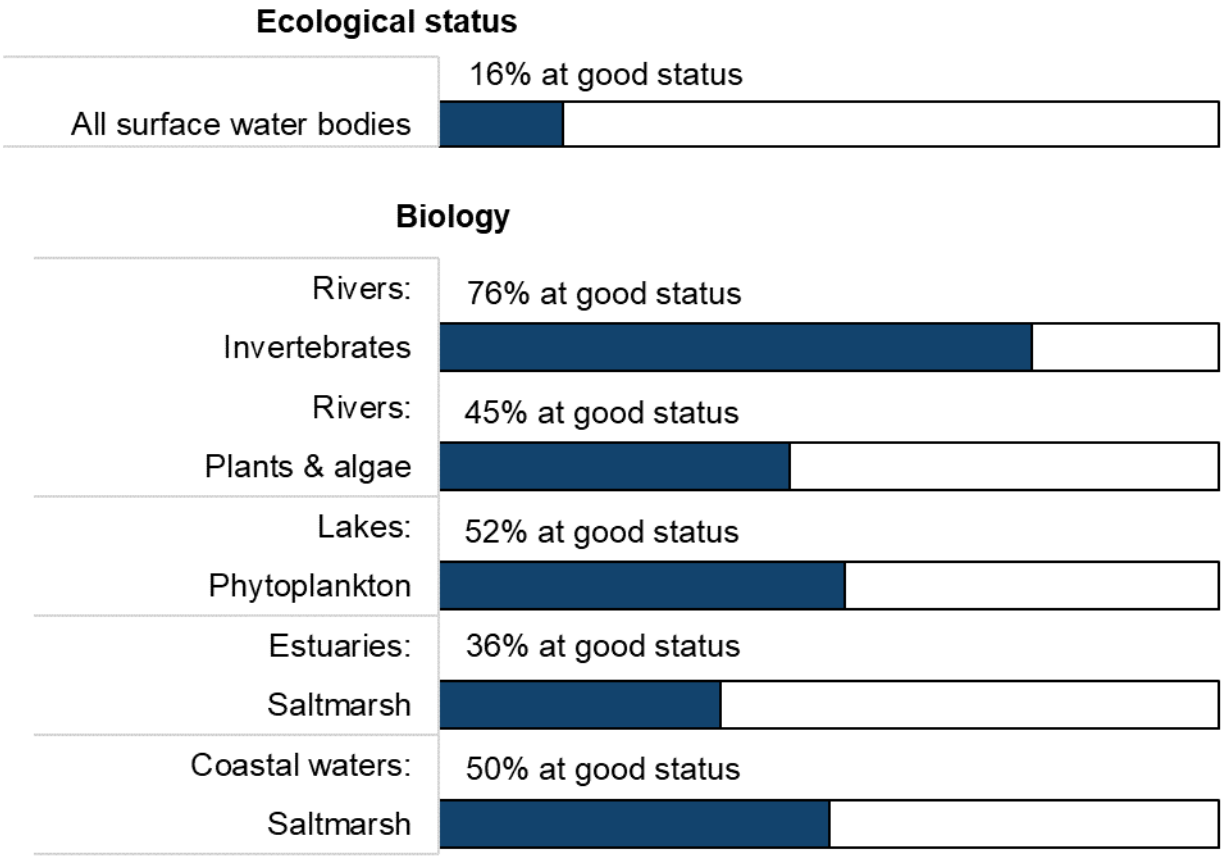
This indicator is not available for reporting in 2022 in a finalised form. A revised interim indicator is presented here as an experimental statistic that was first presented in 2021. It includes metrics from the WFD Regulations status tests for (a) surface water bodies (rivers, lakes, estuaries and coastal waters) and (b) groundwaters; as well as additional metrics for (c) waters protected for a specific reason such as drinking waters and nature sites. For each water type, we include a representative element that is tested to assess the condition of a water body, reflecting water quality and/or hydromorphology (the physical character and water content in water bodies). There are many more elements assessed and tests undertaken; the data represent a snapshot of the complete WFD Regulations dataset. There are no new assessments included in the 2022 report.

Supporting detail for each of the water types and a more detailed dashboard of data are available on the updated B3 Evidence Pages. These data have been published as an experimental statistic to facilitate user involvement in the development of this indicator.

We would therefore welcome any feedback on these statistics, particularly on their usefulness and value, via 25YEPindicators@defra.gov.uk.

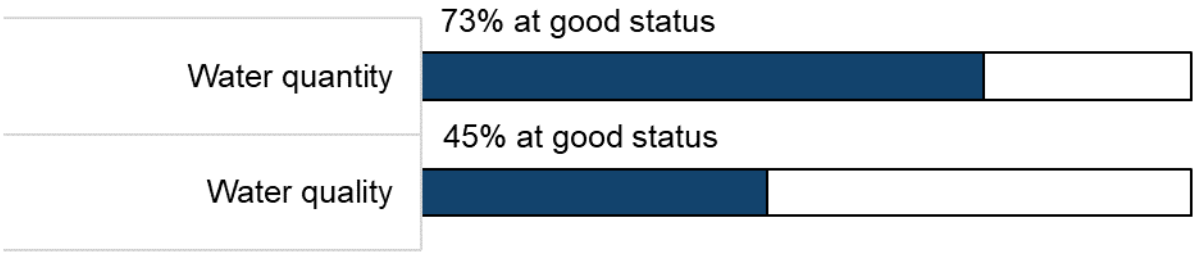
Further work is required to develop the indicator which may, for example, show change over time. We will continue to work with partners to develop our approach for future reporting. Data and evidence will begin to come from different sources as Environment Agency monitoring networks are updated as part of the Natural Capital Ecosystem Assessment development. Piloting and rollout of new networks has begun, and data will start to feed into indicator reporting from 2023. Existing source data are currently published (WFD element status , protected area data, State of the environment and the water quality report).

Figure B3a (interim): Status of surface waters in England, 2019



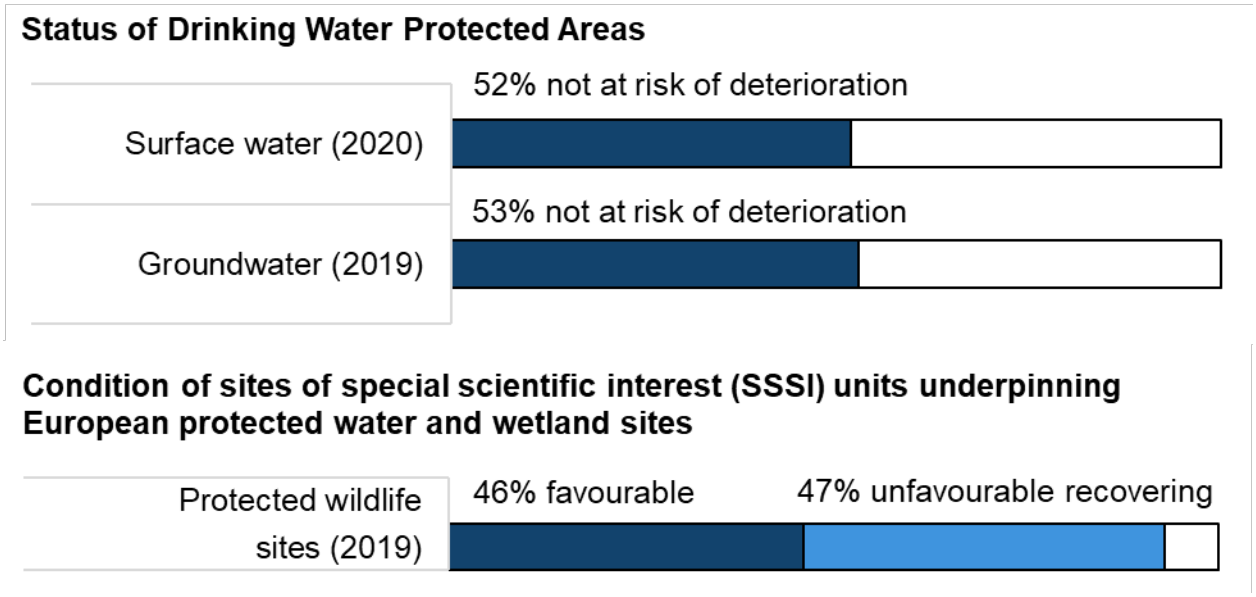
Source, Environment Agency

Figure B3b (interim): Status of groundwaters in England, 2019



Source, Environment Agency

Figure B3c (interim): Status of waters specially protected for specific uses in England, 2019 or 2020



Source, Status of Drinking Water Protected Areas, Environment Agency; Condition of SSSI units underpinning European protected water & wetland sites, Natural England

Note on Figures B3a, B3b and B3c

For B3a and B3b, results for the status of all surface waters and groundwaters are based on the numbers of water bodies assessed and represent the achievement of good or better status. Ecological status is assigned using various water, habitat and biological quality tests. Failure of any one individual test means that the whole water body fails to achieve good or better ecological status.

For B3c, results for the status of Drinking Water Protected Areas are based on the percentage of sites. The B3c indicator for nature conservation includes all water-dependent (river, lake, small waterbody, coastal and wetland) SSSI units underpinning European sites, results are by area. Adverse condition reasons and threats unrelated to Water Framework Directive (water quality, water resources, physical modification) drivers are excluded from the analysis. The European sites series includes Special Areas of Conservation and Special Protection Areas (SPAs). SPAs are designated for bird features only, where favourable condition may not include assessment of water quality elements.

Trend description for Figures B3a, B3b and B3c

B3a) Surface waters (including rivers, lakes, estuaries and coasts)

In total, 16% of surface water bodies met all the relevant criteria of the WFD Regulations in 2019. For rivers, invertebrates and the combined test for macrophytes and phytobenthos (plants and algae) are reported to indicate biological quality, where 76% and 45% of tests carried out passed for the water bodies assessed, respectively. For lakes, the representative biological element shown is phytoplankton with 52% of water bodies assessed passing. For estuaries and coasts saltmarsh is used to reflect the extent and

quality of habitat; results show 36% and 50% of water bodies monitored pass the test, respectively.

B3b) Groundwaters

In 2019, 75% of groundwaters passed quantitative tests and 45% passed chemical (qualitative) tests.

B3c) Sites specially protected for specific uses such as drinking water abstraction and nature conservation.

In 2019 to 2020, 52% of surface water and 53% of groundwater areas (sites) protected for drinking water abstraction were assessed as not being at risk of deterioration. For protected nature sites, 46% were in favourable condition and 47% were in an unfavourable but recovering condition in 2019.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

B4 Condition of bathing waters

Short description

This indicator assesses the condition of bathing waters. It shows the percentage of designated bathing waters meeting conditions sufficient to minimise the risk of harm to bathers from faecal pollution. It is based on a set of microbiological tests (measuring *E.coli* and intestinal enterococci) performed on waters used for bathing. The bacteria, if present, can cause severe stomach upsets and gastro-intestinal illness. Bathing waters are mainly coastal beaches but also include a number of inland freshwater lakes and one area on a river.

Relevant goal in the 25 Year Environment Plan

- Clean and plentiful water

Relevant target in the 25 Year Environment Plan

- Minimising by 2030 the harmful bacteria in our designated bathing waters and continuing to improve the cleanliness of our waters

Position in the natural capital framework

Condition of assets – freshwater; marine

Related reporting commitments

- Statutory duty under the Bathing Water Regulations (2013) to report condition

Geographical scope

England; data for individual designated bathing waters are also available.

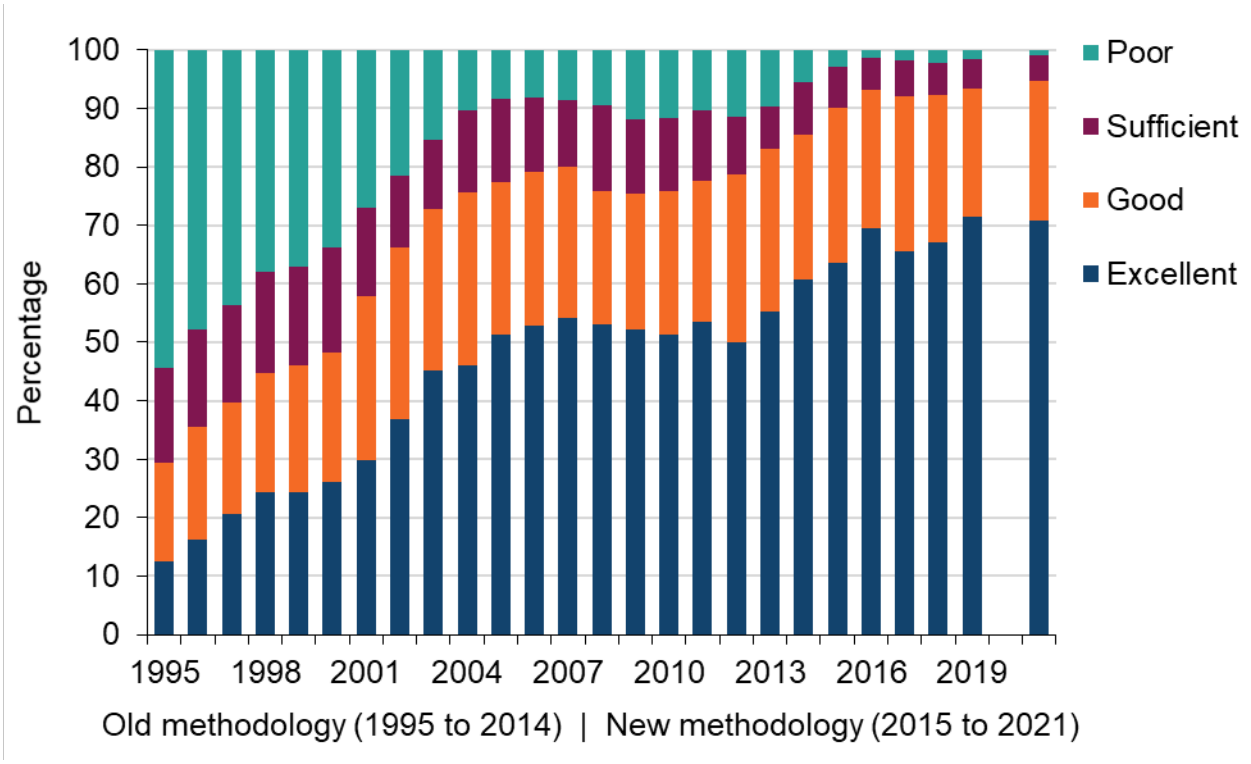
Status of indicator development

Final

Readiness and links to data

Data on Bathing water quality statistics are already published annually; longer-term trends are available in the State of the environment: water quality report.

Figure B4: Condition of designated bathing waters in England, 1995 to 2021



Source, Environment Agency

Note on Figure B4

Any classifications pre 2015 in Figure B4 are projected classifications and were not formally reported. They have been back calculated using historic methods and data collected for the 1976 bathing water directive (76/160/EEC) which was repealed in 2014.

Bathing waters in England were not classified in 2020 due to the severe impacts on bathing water monitoring and analysis caused by the COVID-19 pandemic and the necessary adherence with government guidelines to prevent the spread of the virus.

Trend description for Figure B4

The number of designated bathing waters in England meeting at least the minimum standard (sufficient, good or excellent) has increased considerably from 45.7% in 1995 to 99% in 2021. The majority of this increase occurred in the period to 2015; since then, the number meeting at least the minimum standard has remained relatively stable at between 97.1% and 99%. The number of bathing waters achieving excellent status has also increased considerably since 1995, with 70.7% meeting this standard in 2021. The number of bathing waters rated as poor has remained below 3% since 2015 (1% in 2021).

Assessment of change

An assessment was undertaken using the B4 indicator to look at change in the percent of designated bathing waters meeting minimum standards of at least sufficient condition. A small increase (or improvement) in this metric was observed over the most recent 5 years for which trends can be assessed (2015 to 2020). A new method was introduced in 2015, so only data from that year onwards were included in the assessment. The new method is not directly comparable to the old method, so it is not appropriate to look at trends across both datasets. This meant there was not a sufficiently long time series for a medium or long-term assessment.

Change since 2018 has also been assessed. There has been little or no change in the condition of bathing waters since 2018 with no reported data for 2020 due to the COVID-19 pandemic. The assessment is based on only 3 data points so should be considered as indicative and not evidence of a clear trend. It should also be noted that in 2018 nearly 98% of designated bathing waters were already in at least sufficient condition so there is little scope for further improvement in this indicator.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table B4: Assessment of change in the condition of designated bathing waters in England (meeting at least Sufficient status)

Period	Date range	Percent change	Assessment of change
Short term	2015-2020	+5.5 (smoothed Loess)	Improvement
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Note that assessment categories for the short term were assigned based on smoothed data, so percent change figures in Table B4 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

B5 Water bodies achieving sustainable abstraction criteria

Short description

This indicator shows changes in the percentage of surface waters (rivers, lakes, reservoirs and estuaries) and groundwater (including wetlands fed by groundwater) where sustainable abstraction criteria are met. River flows and groundwater levels are sustainable when they support ecology that is only slightly impacted by human activity. The indicator is affected by changes in water use, both in relation to leakage and personal consumption (see E8 Efficient use of water). This indicator is also sensitive to effects of future climate change on rainfall and consumption and shows the need for adaptation.

Relevant goals in the 25 Year Environment Plan

- Clean and plentiful water
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Reducing the damaging abstraction of water from rivers and groundwater, ensuring that by 2021 the proportion of water bodies with enough water to support environmental standards increases from 82% to 90% for surface water bodies and from 72% to 77% for groundwater bodies
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term

Position in the natural capital framework

Condition of asset – freshwater

Related reporting commitments

- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Relevant to Sustainable Development Goal 6.4.2
- May support Climate Change Risk Assessment and the Adaptation Sub-Committee's assessment of the National Adaptation Programme, under the Climate Change Act (2008)

Geographical scope

England; data for individual water bodies are also available.

Status of indicator development

Final

Readiness and links to data

Data on the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the WFD regulations) Cycle 2 site classifications are available for both surface and ground water bodies on the England Catchment Data Explorer. WFD Cycle 2 site classifications for surface water bodies and WFD Cycle 2 site classifications for ground water bodies are also published as part of the WFD Regulations and the Abstraction Reform Report 2019.

Note on Indicator B5

A graph is not yet presented for this indicator as data are currently only available for 3 years. There are no new data to report for 2020 or 2021 and in future years there will be a change to the data provision for this indicator through the new River Surveillance Network (RSN) and the other surveillance networks as part of the Natural Capital and Ecosystem Assessment Programme.

Trend description for Indicator B5

Latest data (2019), show 85% of surface water bodies supported required flow standards and 73% of groundwater bodies were sustainable. Both results represent a one percentage point increase from the equivalent figures reported in 2018. In 2017, when the timeseries began, 82% of surface water bodies supported required flow standards and 72% of groundwater bodies were sustainable.

Assessment of change

No assessment of change was undertaken for this indicator as there are not yet sufficient data points in the time series.

B6 Natural functions of water and wetland ecosystems

Short description

This indicator will track changes in the naturalness of ecosystem functioning across water and wetland ecosystems in England. Restoring natural functions to these ecosystems is essential for biodiversity recovery and resilience to climate change and contributes to enhancing ecosystem services such as the provision of clean water and flood regulation. Indicator B6 is closely linked with indicator D1 on the quantity, quality and connectivity of habitats as the naturalness of ecosystem function is also being considered within D1. It is anticipated that the development work on D1 and B6 will address different habitat components that are shared between the 2 indicators; B6 will provide the freshwater habitat component and D1 will provide the wetland component.

This indicator builds on the foundation provided by Natural England Report JP016. It will cover rivers, headwater streams, wetlands, lakes and ponds, and consider the naturalness of hydrological, physical, chemical and biological functions. It is also intended to cover transitional and coastal waters, depending on the outcome of an on-going feasibility study.

The indicator will use data from a range of sources, aggregated together in a single hierarchical data framework.

Relevant goals in the 25 Year Environment Plan

- Thriving plants and wildlife
- Clean and plentiful water
- Enhancing biosecurity

Relevant targets in the 25 Year Environment Plan

- Creating or restoring 500,000 hectares of wildlife-rich habitat outside the protected site network, focusing on priority habitats as part of a wider set of land management changes providing extensive benefits
- Achieve clean and plentiful water by improving at least three-quarters of our waters to be close to their natural state as soon as is practicable
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term
- Reaching or exceeding objectives for rivers, lakes, coastal and ground waters that are specially protected, whether for biodiversity or drinking water as per our River Basin Management Plans

Position in the natural capital framework

Condition of assets – freshwater; species and ecological communities

Related reporting commitments

- Conservation of Habitats and Species Regulations 2017 (as amended)
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Domestic biodiversity targets relating to commitments under the Convention on Biological Diversity (including the Environment Act 2021 and the Defra 25 Year Environment Plan)

Geographical scope

England.

Primary output is at England-level but some elements of the indicator will also be able to provide reliable sub-national assessment. National assessments of individual river and lake habitat types included in priority habitat definitions (for example, chalk rivers – rivers that rise from springs in landscapes with chalk bedrock and oligotrophic lakes – lakes that are relatively poor in plant nutrients and that contain abundant oxygen in their deeper parts) will also be possible.

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022 but substantial progress has been made over the past year and a report on the development of indicator B6 was released for targeted consultation in July 2021. The report presented a working model for the rivers and streams components, hierarchical portrayal of data on naturalness attributes from detailed to summary levels, and an outline of parallel work for lakes and ponds.

Work is now progressing on the development of working models for the lakes and ponds components, and a feasibility study is underway on the transitional and coastal waters component. Attention is also turning to the specific links with indicator D1 and the generation of the wetlands component. The precise reporting format for the indicator is being developed to enable clear tracking of change through time.

Alongside completing remaining development work in 2022 to 2023, plans now need to be prepared for operationalising the indicator. This is a significant undertaking because of the variety of data sources and data types used.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

B7 Health of freshwaters assessed through fish populations

Short description

This indicator tracks changes in populations of native freshwater fish in England. Fish are a good indicator of healthy freshwater environments, responding to changes in water quality (including temperature) and quantity, as well as the quality of river habitats, necessary to sustain healthy populations and enable migration throughout rivers to allow fish to complete their life cycles. Fish also provide an important recreational and economic benefit from freshwaters.

Relevant goals in the 25 Year Environment Plan

- Thriving plants and wildlife
- Clean and plentiful water
- Using resources from nature more sustainably and efficiently

Relevant targets in the 25 Year Environment Plan

- Taking action to recover threatened, iconic or economically important species of animals, plants and fungi, and where possible to prevent human induced extinction or loss of known threatened species in England and the Overseas Territories
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term
- Ensuring that all fish stocks are recovered to and maintained at levels that can produce their maximum sustainable yield

Position in the natural capital framework

Condition of assets – freshwater; species and ecological communities

Related reporting commitments

- Aligns with assessment of fish populations in rivers as undertaken and reported through our obligations to the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Assessment of salmon stocks is reported separately to the International Council for the Exploration of the Seas and the North Atlantic Salmon Conservation Organisation
- Relevant to Convention on Biological Diversity Aichi Target 6

Geographical scope

England; data for river basin district are also available.

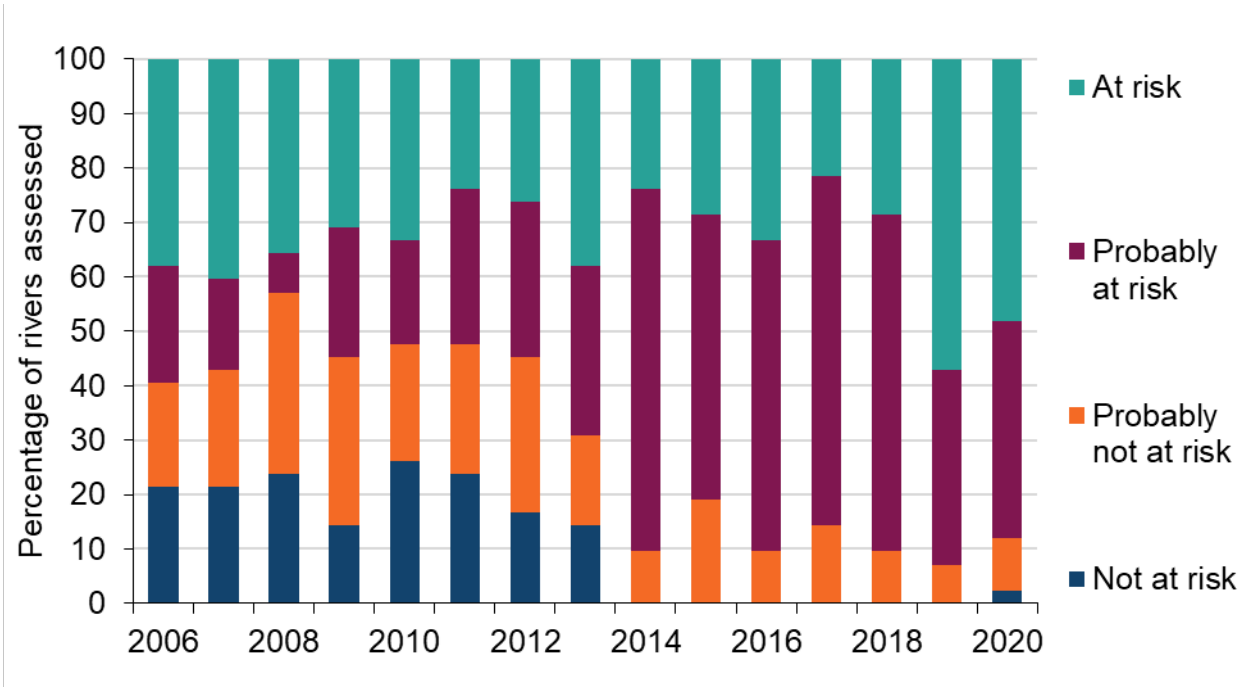
Status of indicator development

Interim

Readiness and links to data

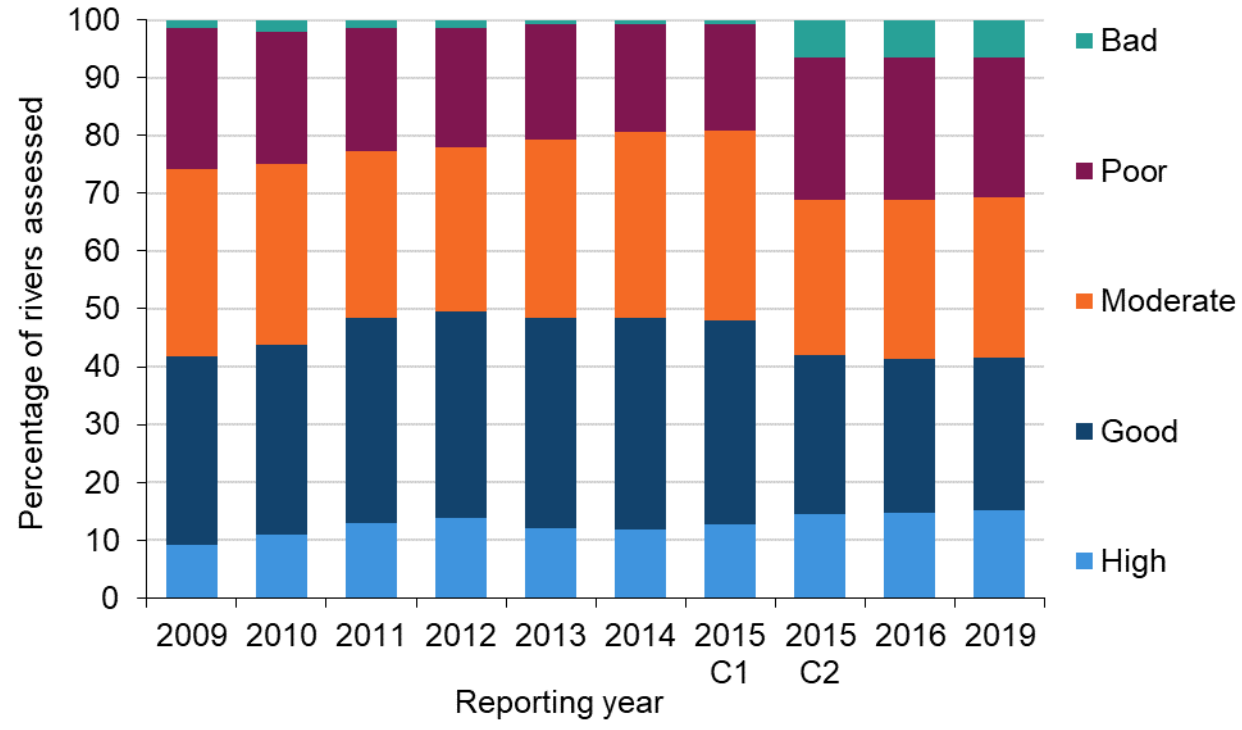
This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows (a) the proportion of principal salmon rivers at risk in England and, additionally, (b) the classification of fish species within English rivers. B7a presents annually published national salmon stock data. For this assessment, each river's salmon stocks are placed into one of 4 categories: at risk; probably at risk; probably not at risk; and not at risk. The results act as a proxy for whether a particular river is at risk or not. In addition, a second measure of freshwater health was included for the first time in 2021. Fish classification data for B7b reflect the status of fish populations within rivers assessed in England. The results show whether the status of a particular river is high; good; moderate; poor or bad for fish. These data contribute to the assessment of ecological status in rivers (B3a). Further work will examine the coverage of the indicator.

Figure B7a (interim): Salmon stock status – principal salmon rivers in England within each risk category, 2006 to 2020



Source, Environment Agency

Figure B7b (interim): Classification of fish in English rivers, 2009 to 2019



Source, Environment Agency

Note on Figures B7a and B7b

In Figure B7a, salmon stock status – principal salmon rivers in England within each risk category data for 2004 and 2005 are no longer included in the source publication.

In Figure B7b, there are 2 data points shown for the classification of fish in English rivers in 2015; these represent a change in assessment methods and a move from cycle 1 to cycle 2 of the Water Framework Directive reporting units. Reporting on fish classifications also moved from annual to triennial in 2016, so the next reporting point was 2019.

Trend description for Figures B7a and B7b

B7a) Salmon stock status

The overall status of salmon stocks across principal salmon rivers continues to show a decline over the period of this assessment. This continues a trend observed before the start of the time series (2006). The percentage of rivers in the 'not at risk' category fell from 21% in 2006 to 0% in 2014 where it remained until there was a slight (2 percentage point) recovery in 2020. The percentage of rivers that are probably not at risk has fallen by 9 percentage points over the 15 years covered by this indicator. The percentage of principal salmon rivers at risk in England has fluctuated considerably from year to year; but overall, the percentage at risk in 2020 (48%) was 10 percentage points higher than the equivalent figure for 2006 (38%). The percentage of rivers in the 'probably at risk' category has also increased over the same time period (by 19 percentage points, from 21% to 40%).

B7b) Classification of fish

The data show a slight but consistent increase in the numbers of rivers classed as high and good ecological status for fish between 2009 and 2015 and a corresponding small decrease in numbers of rivers in the poor and bad categories. Indications are that there was no change in the proportions of rivers in the 5 different categories between 2016 and 2019. From 2015, a revised method for assessing status was introduced and there are not yet sufficient data points to assess a trend. The new method is not directly comparable to the old method, so it is not appropriate to assess trend across both datasets at this time.

Assessment of change

A decrease (or deterioration) for the principal salmon rivers classed as ‘Not at risk’ or ‘Probably at risk’ was observed over the most recent 5 years for which trends can be assessed (2014 to 2019), as well as over the medium and long term. This indicator is derived from highly variable data as fish are susceptible to yearly weather patterns and have natural cycles in abundance. This reduces confidence that shorter-term assessment results reflect real trends rather than natural variation. A more marked deterioration is evident over the medium term, reflecting a steep drop after 2012.

An increase (or improvement) has been observed for the percent of English rivers classified as in high or good status based on fish, over the most recent 5 years for which trends can be assessed (2009 to 2014). From 2015, a new method was introduced for assessing status and there are not yet sufficient data points to assess a trend. The new

method is not directly comparable to the old method, so it is not appropriate to look at trends across both datasets. When a suitable time series is built up with the new method, this more recent data will be assessed. There is not a sufficiently long time series for making an assessment over the medium and long-term periods.

Change since 2018 has also been assessed. Since 2018, there has been an increase (or improvement) for the indicator for principal salmon rivers classed as 'Not at risk' or 'Probably at risk'. However, this improvement is slight and is based on only 3 data points so should be considered as indicative and not evidence of a clear trend. Insufficient data are available to assess change since 2018 for classification of fish in English rivers.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table B7a: Assessment of change in salmon stock status – principal salmon rivers at risk in England (not at risk or probably not at risk)

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	-55.2 (smoothed Loess)	Deterioration
Medium term	2009-2019	-81.5 (smoothed Loess)	Deterioration
Long term	2006-2019	-76.2 (smoothed Loess)	Deterioration

Table B7b: Assessment of change in the classification of fish in English rivers (high or good)

Period	Date range	Percent change	Assessment of change
Short term	2009-2014	+16.1 (smoothed Loess)	Improvement
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Note that assessment categories for the short, medium and long term were assigned based on smoothed data, so percent change figures in Tables B7a and B7b may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

Theme C: Seas and estuaries

C1 Clean seas: marine litter

Short description

This indicator of clean seas shows changes in the amount of litter in the marine environment, including litter on beaches, on the seafloor and floating litter. Beach litter surveys are completed annually or quarterly and cover a representative number of beaches. Data from trawl surveys, typically carried out for fish stock assessments, are

used to monitor the amount of litter on the seafloor. After each tow all litter items are emptied from the net and counted and classified. Beached fulmars or individuals accidently killed are collected as part of a monitoring programme in the Greater North Sea to assess the plastics found in their stomachs. Fulmars forage exclusively at sea, generally at the surface of the water. The amount of plastic they ingest can be used as a proxy for the abundance of floating litter in their environment and how this is changing. Indicators for seafloor litter, beach litter and litter found in Fulmar stomachs have been developed and expert groups are working to improve the data. Additional monitoring programmes are being developed to record the amount of microplastics in sediment and in biota.

Relevant goal in the 25 Year Environment Plan

- Minimising waste

Relevant target in the 25 Year Environment Plan

- Significantly reducing and where possible preventing all kinds of marine plastic pollution – in particular material that came originally from land

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- UK Marine Strategy (Marine Strategy Regulations 2010)
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- Relevant to Sustainable Development Goal 14

Geographical scope

UK (Celtic Seas and Greater North Sea)

Status of indicator development

Interim

Readiness and links to data

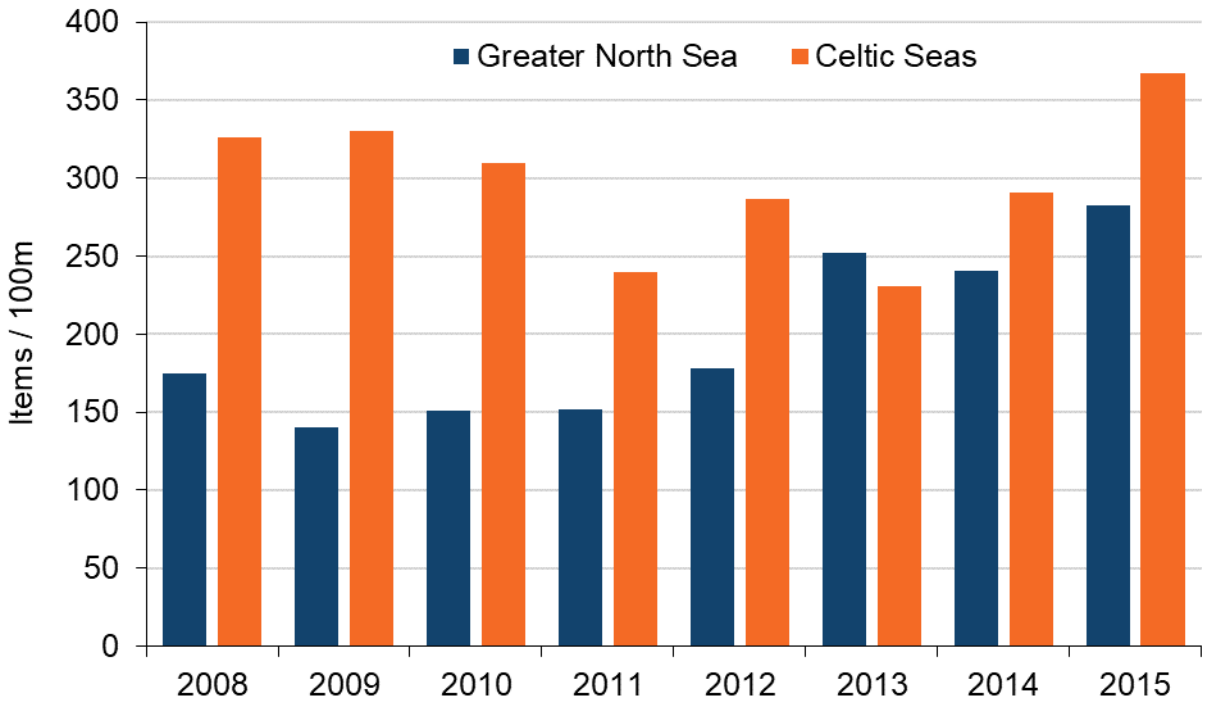
This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows 3 aspects of litter in the marine environment: a) beach litter b) plastic in fulmar stomachs and c) seafloor litter. The assessments used for this interim indicator have been reported under the updated UK Marine Strategy Part One (2019). Data, analytical methods and assessments on Marine litter are available, as are fulmar data from 2011-2015 to 2015-2019.

The litter dashboard also includes some beach litter data beyond 2015 but this is not directly comparable to C1a. Additional commentary on recent trends in the C1b indicator is

published in the latest research report from Wageningen University to Defra (Project code ME5227) which supports reporting commitments under OSPAR.

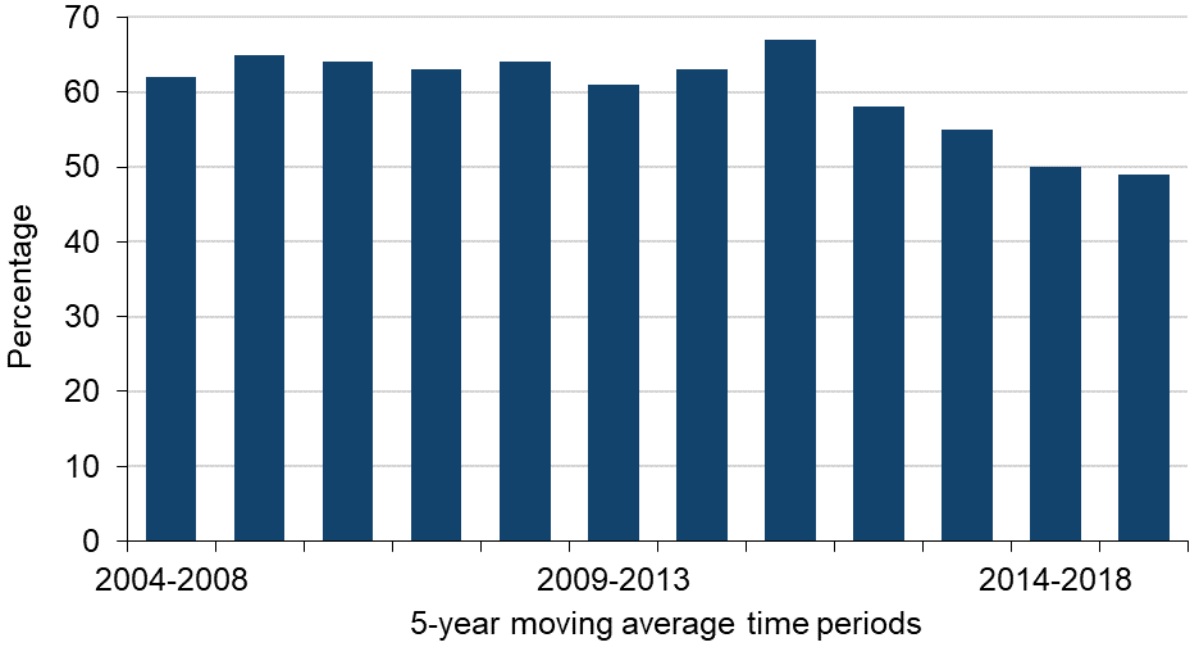
Further development of this indicator is required, and the indicator's format will evolve.

Figure C1a (interim): Items of litter per 100m of beach, UK, 2008 to 2015



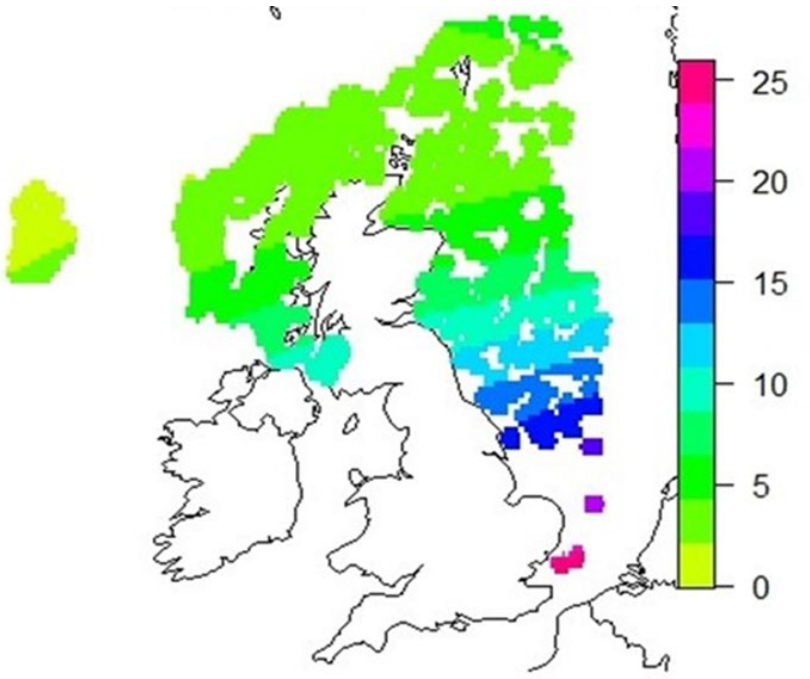
Source, Centre for Environment, Fisheries & Aquaculture Science

Figure C1b (interim): Percentage of sampled fulmars having more than 0.1g of plastic in their stomach, Greater North Sea, 2004-2008 to 2015-2019



Source, Centre for Environment, Fisheries & Aquaculture Science; Wageningen University

Figure C1c (interim): Smoothed median total of seafloor litter items per km^2, UK, 2012 to 2015



Source, Centre for Environment, Fisheries & Aquaculture Science

Note on Figures C1a, C1b and C1c

Data on fulmars are presented as 5-year moving average time periods because annual data may show strong variation due to smaller sample size or other reasons. Trends in UK seafloor litter are represented by spatially smoothed predictions of the median total number of pieces of litter per km, at a grid of points. The colours represent differing relative medians. This is using data combined over the years, although similar patterns are present in the data for the individual years. More data are required to make a full assessment of the trend in the amount of seafloor litter in specific areas of UK waters.

While the currently available data predate the 25 Year Environment Plan, they provide the most recently available assessments of marine litter. They enable an understanding of a baseline from which to measure progress towards the goals of the 25 Year Environment Plan when the indicator is next updated.

Trend description for Figures C1a, C1b and C1c

C1a) Beach litter

The average total abundance of beach litter items per 100m of coast varies considerably around the UK with greater quantities being recorded in the Celtic Seas than in the Greater North Sea. After showing some decrease from 2009 to 2011, beach litter levels in the Celtic Seas, whilst fluctuating, have risen to greater than the 2008 levels. In the Greater North Sea, there has been an increase in beach litter levels. Water currents, weather conditions, and prevailing wind conditions can have an influence on the deposition and retention of beach litter and therefore beach litter abundance. In all beach litter regions, the majority of litter items were made of plastic (including polystyrene). Plastic fragments are the most commonly found type of litter item, followed by food and drinks packaging, sewage related debris and then smaller amounts of fishing-related litter.

C1b) Fulmars

From 2004 to 2014 approximately 60% of surveyed (beached) fulmars in the Greater North Sea region were found to have more than 0.1g of plastic (the threshold level used in the OSPAR target definition) in their stomachs. This reflects the abundance of floating litter in their environment. More recently, the measure appears to show some decline, but not to an extent that is statistically significant.

C1c) Seafloor litter

From sampling UK seafloor litter to date higher amounts of litter and plastic have been found per km^2 of seafloor in the Greater North Sea compared to the Celtic Seas. There were also higher amounts of seafloor litter in the southern parts of the Greater North Sea and Celtic Seas, which could be a result of increasing human pressures.

Assessment of change

The time series for interim C1a indicator Items of litter per 100m of beach runs from 2008 to 2015 which is not yet long enough to produce an assessment for medium and long-term time periods. A decrease in beach litter (or improvement) was observed in the Celtic Seas region over the most recent 5 years for which trends can be assessed (2009 to 2014), but an increase (or deterioration) was observed in the Greater North Sea region.

A decrease (or improvement) in the percentage of sampled fulmars which have more than 0.1g of plastic in their stomach was observed over the short, medium, and long-term time periods. This assessment does not consider whether any improvement is on a sufficient scale for meeting targets.

Change since 2018 has also been assessed for indicator components which had sufficient data. Little or no change in the fulmar indicator was observed since 2018. However, this is based on only 2 data points so should be considered as indicative and not evidence of a clear trend.

The assessment results reported here are not directly comparable with other analyses published elsewhere that use different methodologies to explore these indicators or are based on alternative datasets.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table C1ai: Assessment of change in the number of litter items per 100m of beach, Celtic Seas

Period	Date range	Percent change	Assessment of change
Short term	2009-2014	-9.6 (smoothed Loess)	Improvement
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Table C1aii: Assessment of change in the number of litter items per 100m of beach, Greater North Sea

Period	Date range	Percent change	Assessment of change
Short term	2009-2014	+73.7 (smoothed Loess)	Deterioration
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Table C1b: Assessment of change in the percentage of sampled fulmars having more than 0.1g of plastic in their stomach, Greater North Sea

Period	Date range	Percent change	Assessment of change
Short term	2010-2014 to 2015-2019	-22.2 (moving average data)	Improvement
Medium term	2004-2009 to 2015-2019	-24.6 (moving average data)	Improvement
Long term	2004-2008 to 2015-2019	-21.0 (moving average data)	Improvement

Assessment categories for indicator C1a were assigned based on smoothed data, so percent change figures in Tables C1ai and C1aii may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year or the first to last 5-year moving average in the specified date range.

C2 Seabed subject to high pressure from human activity

Short description

This indicator tracks changes in the distribution and intensity of potential physical disturbance caused by human activities on the seabed. The indicator combines data on the intensity and distribution of pressures from human activities with data on the distribution and sensitivity of seabed habitats. Data from vessel monitoring systems (VMS) showing fishing activity are linked to vessel logbook information and processed to create a layer showing abrasion pressure on the seabed. A second layer is produced by combining data on distribution of seabed habitats with information on resilience and resistance to evaluate their sensitivity to the pressure. The pressure and sensitivity layers are combined using a spatial method to create a single data layer showing the area of seabed subject to high disturbance from human activity. This indicator is linked to the 'Extent of Physical Damage to Predominant and Special Habitats' indicator, developed for the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and used for the UK Marine Strategy Part One (2019) assessment of Good Environmental Status (GES).

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Ensuring seafloor habitats are productive and sufficiently extensive to support healthy, sustainable ecosystems

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- UK Marine Strategy (Marine Strategy Regulations 2010)
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- Relevant to Sustainable Development Goal 14

Geographical scope

UK Continental Shelf

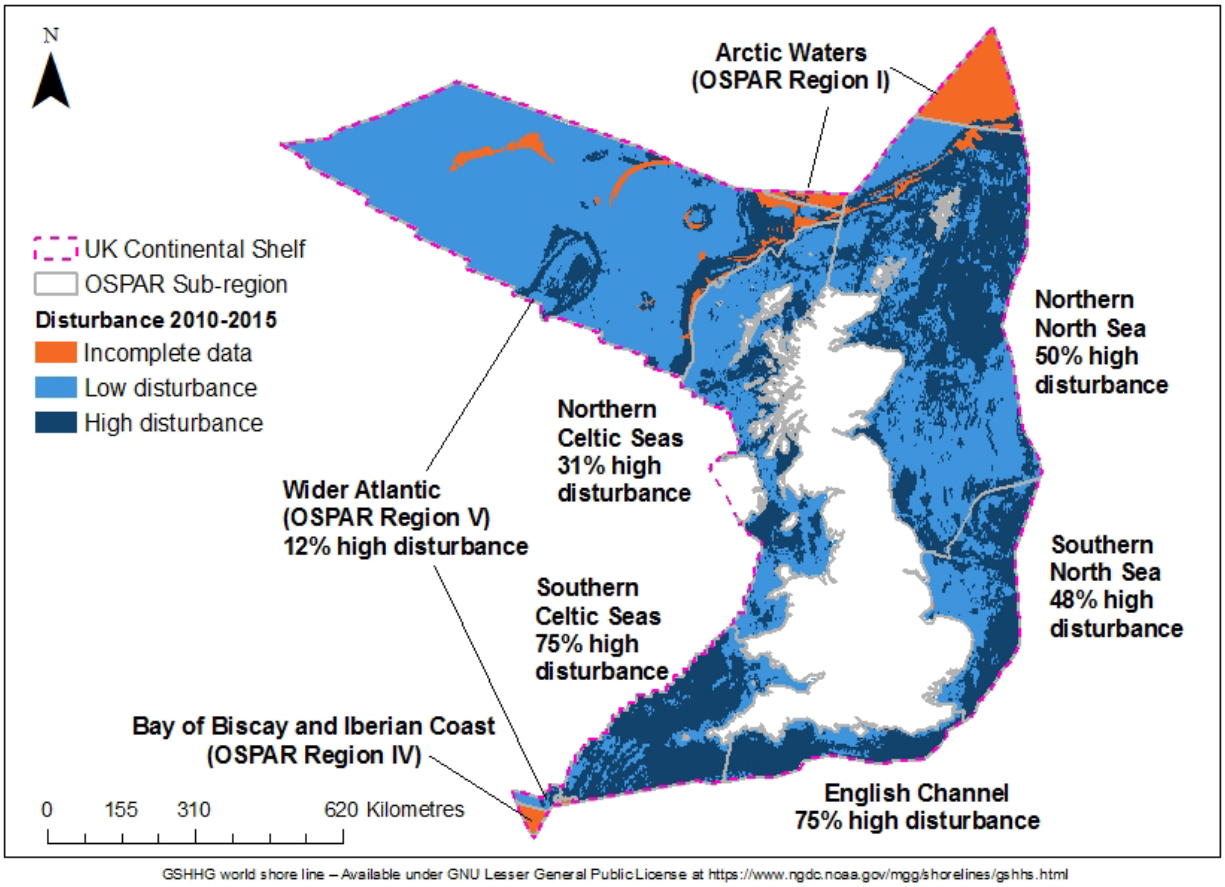
Status of indicator development

Interim

Readiness and links to data

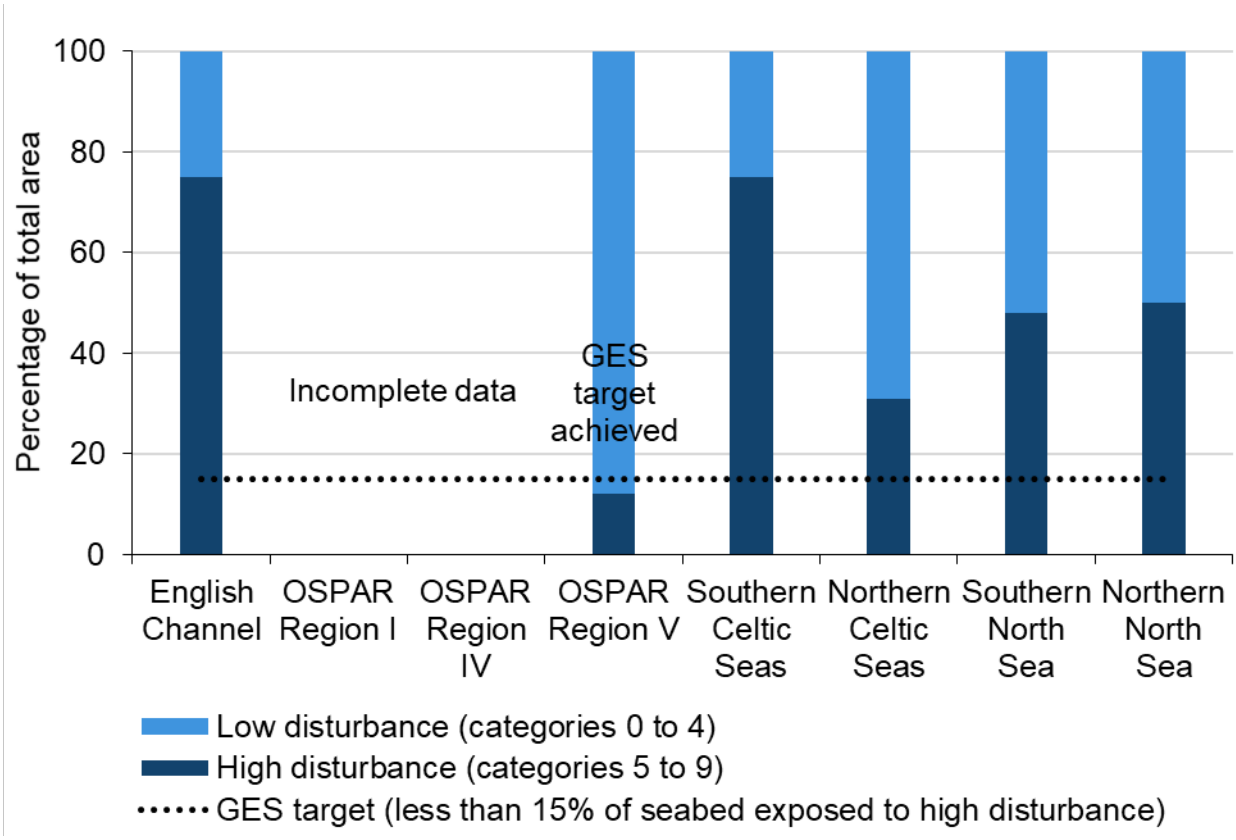
This indicator is not available for reporting in 2022 in a finalised form as some changes to the method are needed to include additional activities and improve habitat sensitivity assessment. An interim indicator is presented here that shows the predicted area of seabed in the UK Continental Shelf exposed to disturbance from bottom contact fishing by vessels over 12m long. The assessments used for this interim indicator, including data and analytical methods, have been reported under the updated UK Marine Strategy Part One (2019). Inclusion of other human activities, specifically commercial aggregate extraction and improved sensitivity information are in development and will be available as part of the OSPAR Quality Status Report in 2023. Further long-term developments to this indicator will include assessments of new activities associated with localised disturbance pressure and higher resolution fishing data, including small fishing vessels under 12m (as data become available).

Figure C2i (interim): Predicted area of seabed in the UK Continental Shelf exposed to disturbance from bottom contact fishing vessels over 12m long, 2010 to 2015



Source, Convention for the Protection of the Marine Environment of the North-East Atlantic

Figure C2ii (interim): Predicted area of seabed in the UK Continental Shelf exposed to disturbance from bottom contact fishing by vessels over 12m long and regional progress towards Good Environmental Status (GES) 2010 to 2015



Source, Convention for the Protection of the Marine Environment of the North-East Atlantic

Note on Figures C2i and C2ii

The degree of disturbance of a habitat is an index based on the predicted spatial and temporal overlap of its sensitivity and exposure to a specific pressure. Sensitivity is assessed using the distribution of habitats and information on species presence collected across the reporting cycle (2010 to 2015). The annual values of the distribution and intensity of pressure are aggregated to give an average pressure intensity for reporting cycle. If the pressure intensity is highly variable across the 6-year period in an area the highest value is taken. Sensitivity and pressure are combined via a matrix, producing 10 categories of disturbance ranging from 0 (no disturbance) to 9 (greatest disturbance possible). Plots show percentage area of OSPAR sub-regions in disturbance categories 0 to 4 (no or low disturbance) and 5 to 9 (high disturbance) across the reporting cycle (2010 to 2015). Incomplete data made it difficult to assess disturbance in the Bay of Biscay and Iberian Coast (OSPAR Region IV) and in Arctic Waters (OSPAR Region I).

While the currently available data predate the 25 Year Environment Plan, they provide the most recently available assessment of the physical damage to benthic (seafloor) habitats. They enable a better understanding of a baseline from which to measure progress towards the goals of the 25 Year Environment Plan when the indicator is next updated.

A lack of data relating to the activities of smaller fishing vessels (less than 12m) exists as they are not currently equipped with a VMS recorder. Consequently, there is an underestimate of disturbance in inshore waters. Due to the analytical methods used in the production of fishing pressure layers, there is a potential overestimate of disturbance as a consequence of assuming an even distribution of fishing pressures.

Trend description for Figures C2i and C2ii

There is currently no trend assessment due to constraints of current data availability. In future updates, changes over time might be identified by comparing results from multiple reporting cycle assessments such those produced by the UK Marine Strategy every 6 years. Future assessments will enable any trends to be identified, for example the number of regions achieving GES.

The results from 2010 to 2015 show pressure and disturbance caused by fishing activities to be widespread, occurring to some degree in 57% of the cells within UK waters. The charts show the aggregated values for seafloor disturbance from bottom fishing for the period 2010 to 2015. The highest level of disturbance is found in the English Channel and Southern Celtic Seas with 75% of both these areas being subject to high disturbance (categories 5 to 9). The extent of disturbance in the Northern North Sea and Southern North Sea is lower, 50% and 48% respectively, but still considerably above the target figure for GES. Within each assessment area there are grid cells showing no disturbance or low disturbance (categories 0 to 4), such as some central areas of the Northern North Sea. The Wider Atlantic (OSPAR Region V) was the only region to achieve GES over the assessment period 2010 to 2015 with 12% of its area subjected to high disturbance from bottom contact fishing.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

C3 Diverse seas: status of marine mammals and marine birds

Short description

This indicator of diverse seas tracks changes in status assessments of marine mammals and marine birds. The assessments of marine mammals will be based on trends in the abundance of harbour seals; Atlantic grey seal pup production; and the abundance of cetaceans (whales and dolphins). The assessments of marine birds will be based on the proportion of breeding seabirds and wintering waterbirds that have met abundance targets, which were set to inform progress towards Good Environmental Status (GES). The GES assessments of marine mammals and birds were used in the updated UK Marine Strategy Part One (2019) and to fulfil reporting commitments under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR).

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Reversing the loss of marine biodiversity and, where practicable, restoring it
- Ensuring seafloor habitats are productive and sufficiently extensive to support healthy, sustainable ecosystems

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- UK Marine Strategy (Marine Strategy Regulations 2010)
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- Berne Convention
- Convention on Biological Diversity Aichi Target 6
- Relevant to Sustainable Development Goal 14

Geographical scope

Seals – England; Marine Birds – OSPAR marine regions (Greater North Sea and Celtic Seas).

Status of indicator development

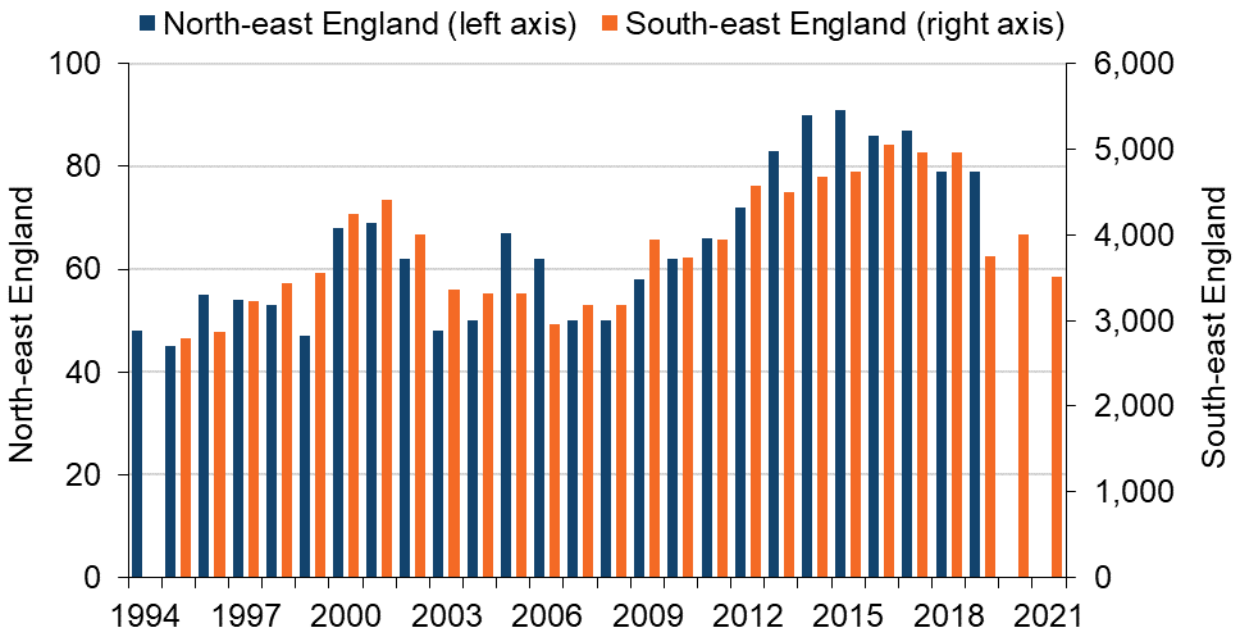
Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form as some further development is being undertaken. An interim indicator is presented here that shows (a) changes in the abundance of harbour seals and the production of Atlantic grey seal pups in the north-east and south-east of England, and (b) changes in the abundance of breeding seabirds and wintering waterbirds in the Greater North Sea and Celtic Seas (OSPAR marine regions including data from neighbouring countries). The assessments of seals and marine birds used for this interim indicator have been reported at a UK scale under the updated UK Marine Strategy Part One (2019). The assessment for seals used data from 1994 to 2014, whereas the most recent data on seals presented in Figures C3ai and C3aii are published by the Special Committee on Seals (SCOS). The indicator will be kept under review during the development of 'D5 Conservation status of our native species' as some elements of this indicator may ultimately be included in D5 instead. Cetaceans are not yet included in this indicator, but they will be once more definitive assessments can be made. Whale and dolphin species were assessed in the UK Marine Strategy Part One (2019) using data on abundance. However, for most species, trends in

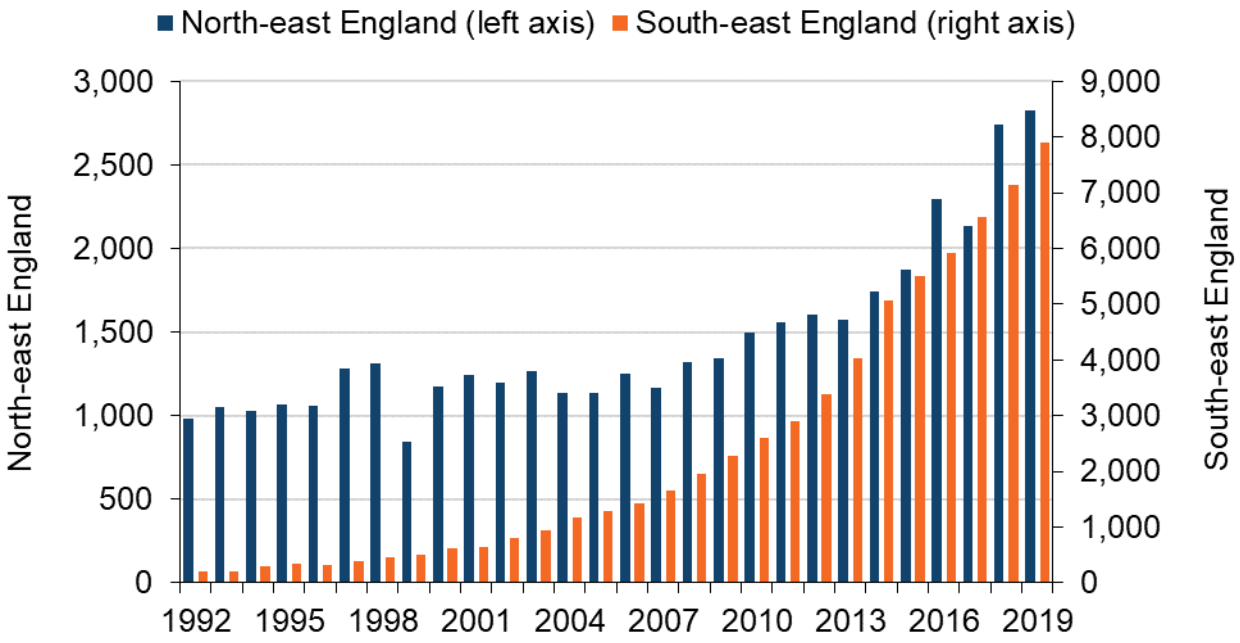
abundance could not be determined because there were an insufficient number of population estimates.

Figure C3ai (interim): Harbour seal abundance, north-east and south-east England, 1994 to 2021



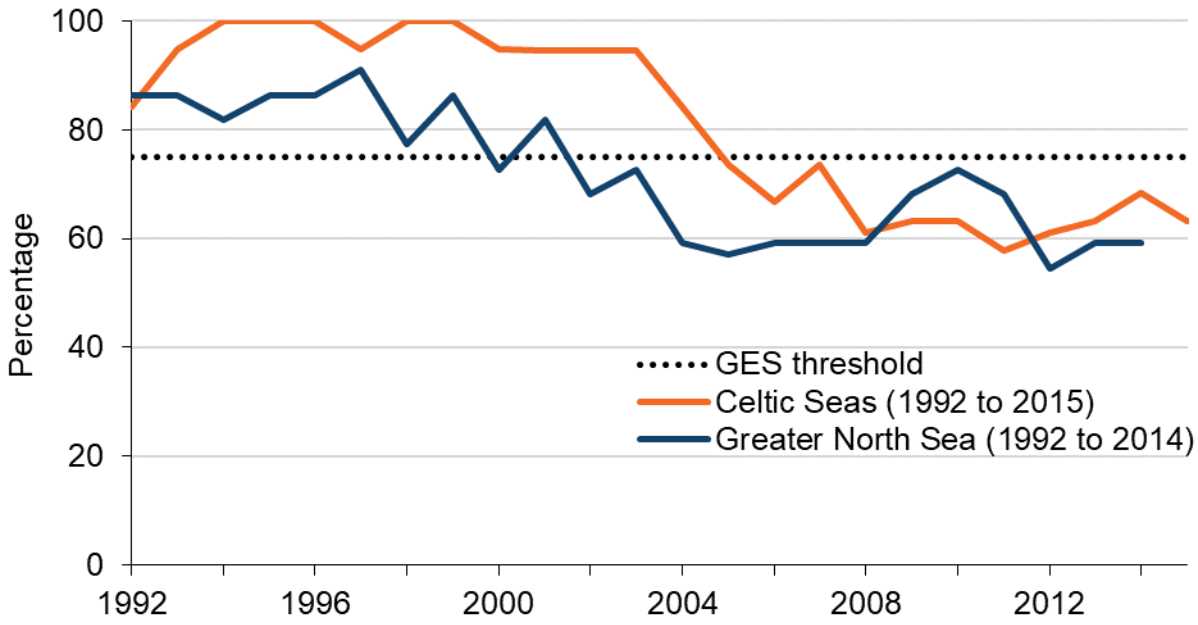
Source, Joint Nature Conservation Committee; Seal Mammal Research Unit

Figure C3aii (interim): Atlantic grey seal pup production, north-east and south-east England, 1992 to 2019



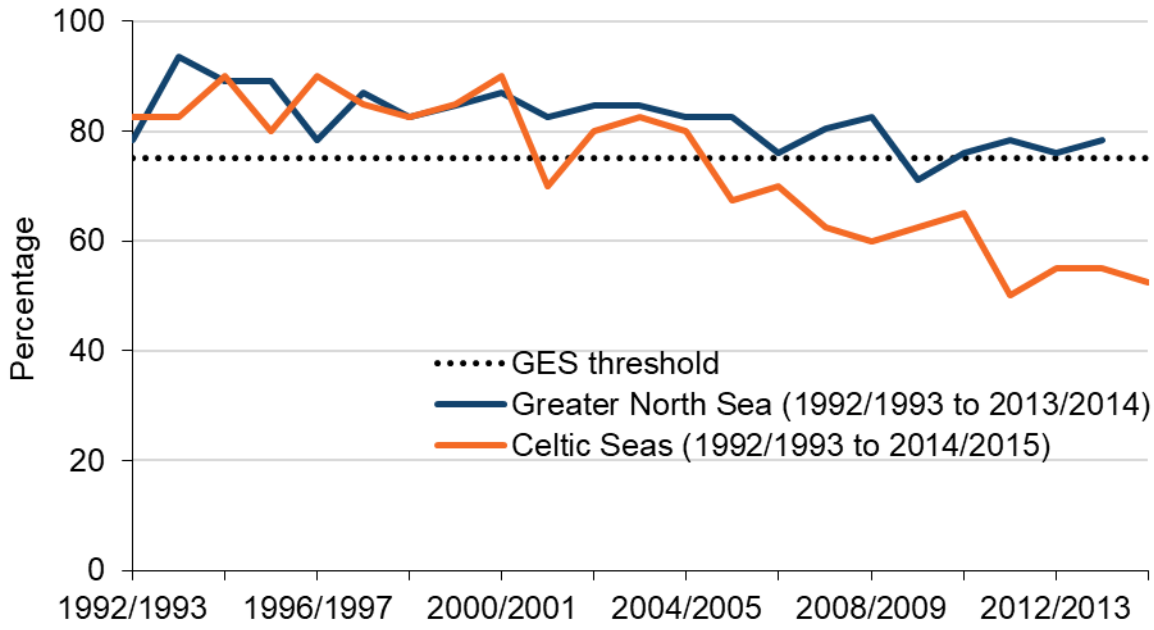
Source, Joint Nature Conservation Committee; Seal Mammal Research Unit

Figure C3bi (interim): Percentage of breeding seabirds meeting abundance targets for Good Environmental Status (GES), Greater North Sea and Celtic Seas, 1992 to 2015



Source, Department of Agriculture, Environment and Rural Affairs; Joint Nature Conservation Committee; Natural England; Natural Resources Wales; Scottish Natural Heritage

Figure C3bii (interim): Percentage of wintering waterbirds meeting abundance targets for Good Environmental Status (GES), Greater North Sea and Celtic Seas, 1992-1993 to 2014-2015



Source, Department of Agriculture, Environment and Rural Affairs; Joint Nature Conservation Committee; Natural England; Natural Resources Wales; Scottish Natural Heritage

Note on Figures C3ai, C3aii, C3bi and C3bii

While the data currently available for breeding seabirds and wintering waterbirds in this interim indicator predate the 25 Year Environment Plan, they provide the most recently available assessment of changes in GES of marine birds. They enable a better understanding of a baseline from which to measure progress towards the goals of the 25 Year Environment Plan when the indicator is next updated.

Figures C3ai and C3aii allow the year-on-year trends in harbour seal abundance and grey seal pup production to be compared between north-east and south-east England but differing scales on the y axes mean that care should be taken when comparing absolute numbers of harbour seals and/or grey seal pups between the 2 regions.

Trends in harbour seal abundance are derived from counts of seals on land in August of each year when they are moulting; Atlantic grey seal status is assessed using counts of pups that estimate pup production at major breading sites. Targets for GES were met if harbour seal abundance and Atlantic grey seal pup production: a) declined by less than an average of 1% per year during 2009 to 2014, or b) decreased by less than 25% since the baseline year (1992 or start of time series, if later). The UK Marine Strategy Part One (2019) GES assessment for seals covered the Celtic Seas and Greater North Sea. No data are available for harbour seal abundance in south-east England for 1994. No data are available for harbour seal abundance in north-east England for the years 2020 and 2021

as COVID-19 related travel and working restrictions prevented aerial surveys of most harbour seal sites in these years.

GES is achieved for breeding seabirds and wintering waterbirds if 75% or more species meet or exceed their thresholds for relative abundance (the dashed horizontal line on Figures C3bi and C3bii). The relative abundance of a species is the annual abundance expressed as a proportion of the baseline, which was taken as the abundance at the start of the timeseries in 1992. Thresholds for relative abundance were set to define GES: greater than 80% of the baseline for species that lay one egg and greater than 70% of the baseline for species that lay more than one egg. Data for wintering waterbirds for the Greater North Sea and Celtic Sea are the means of counts conducted through a one year period (from July in one year to June in the next).

Trend description for Figures C3ai, C3aii, C3bi and C3bii

C3a) Seals

Trends in harbour seal numbers in eastern England had been largely positive since the mid-1990s, although they appear to have levelled off and then fallen between 2015 and 2021. In the south-east, where the majority of the England population are found, numbers have fluctuated showing an increase from 2,793 in 1995 to 4,944 in 2018 followed by a sharp decline to 3,752 in 2019, corresponding to a reduction of 25%. Since 2019, numbers have continued to decline at a slower rate reaching a value of 3,505 in the latest survey conducted in 2021. Numbers are much lower in north-east England; they have shown a steady increase from 45 animals in 1994 to 91 in 2015 before declining to 79 in 2019. The UK Marine Strategy Part One (2019) assessment based on the period 1994 to 2014 concluded that because of declines in Scotland, GES had not been achieved for harbour seal abundance in the UK Greater North Sea sub-region (which includes seal populations in the north-east and south-east of England).

In south-east England annual Atlantic grey seal pup production has risen exponentially from just 200 pups in 1992 to 7,902 pups in 2019. In north-east England the rise in pup production has been steadier, from 985 pups in 1992 to 2,823 in 2019. The UK Marine Strategy Part One (2019) assessment based on the period 1992 to 2014 concluded that GES for Atlantic grey seals has been achieved in the Greater North Sea.

C3b) Marine birds

The proportion of seabird species meeting thresholds for breeding abundance in the Greater North Sea and Celtic Seas has remained stable since 2012 but remains below the 75% target (59% in the Greater North Sea in 2014 and 63% in the Celtic Seas in 2015). The UK Marine Strategy (2019) assessment concluded GES for breeding seabirds has not been achieved in the Greater North Sea or Celtic Seas.

The proportion of wintering waterbird species meeting thresholds for non-breeding abundance in the Greater North Sea has declined sharply but was still on target in 2013 to 2014 (78%); the proportion of wintering waterbird species meeting thresholds in the Celtic Seas has also declined sharply (53% in 2014 to 2015) and has remained below target

since 2006. GES for non-breeding (wintering) waterbirds has been achieved in the Greater North Sea but not in the Celtic Seas.

Assessment of change

An increase (or improvement) in the abundance of harbour seals in both the north-east and south-east of England was observed in the medium and long term. Increases were also found in the north-east over the most recent 5 years for which trends can be assessed (2013 to 2018). A decrease (deterioration) in harbour seal abundance was found in the south-east over most recent 5 years for which trends can be assessed but note the different data range this applies to (2015 to 2020) and that harbour seals are present in much higher numbers in the south-east. An increase (or improvement) in grey seal pup production was found in both regions over most recent 5 years for which trends can be assessed (2013 to 2018), as well as over the medium and long term. These overall trends were assessed using smoothed data do not pick up on small scale patterns in abundance.

In the Greater North Sea, little or no change was observed in the percentage of breeding seabirds or wintering waterbirds meeting abundance targets for GES over the most recent 5 years for which trends can be assessed (2008 to 2013). In the Celtic Seas, there was also little or no change for breeding seabirds over the most recent 5 years for which trends can be assessed (2009 to 2014), but the percentage of wintering waterbirds meeting abundance targets decreased (a deterioration). There has been a decrease in all 4 indicators for breeding seabirds and wintering waterbirds over the medium and long term.

Change since 2018 has also been assessed. Since 2018, there was little or no change in harbour seal abundance in the north-east, and a decrease in the south-east. An increase in grey seal pup production was found in both regions. However, this is based on less than 5 data points (2 for the north-east and 4 for the south-east) so should be considered as indicative and not evidence of a clear trend. No data are available after 2018 for assessing bird indicators.

This assessment does not consider whether any improvements are on a sufficient scale for meeting targets. The assessment results reported here are not directly comparable with other analyses published elsewhere that use different methodologies to explore these indicators or are based on alternative datasets.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table C3aia: Assessment of change in harbour seal abundance, North-east England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+10.0 (smoothed Loess)	Improvement
Medium term	2008-2018	+50.0 (smoothed Loess)	Improvement
Long term	1994-2018	+83.2 (smoothed Loess)	Improvement

Table C3aib: Assessment of change in harbour seal abundance, South-east England

Period	Date range	Percent change	Assessment of change
Short term	2015-2020	-14.8 (smoothed Loess)	Deterioration
Medium term	2010-2020	+3.7 (smoothed Loess)	Improvement
Long term	1995-2020	+38.3 (smoothed Loess)	Improvement

Table C3aiia: Assessment of change in Atlantic grey seal pup production, North-east England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+50.3 (smoothed Loess)	Improvement
Medium term	2008-2018	+97.2 (smoothed Loess)	Improvement
Long term	1990-2018	+169.9 (smoothed Loess)	Improvement

Table C3aiib: Assessment of change in Atlantic grey seal pup production, South-east England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+77.3 (smoothed Loess)	Improvement
Medium term	2008-2018	+274.4 (smoothed Loess)	Improvement
Long term	1990-2018	+3287.9 (smoothed Loess)	Improvement

Table C3bia: Assessment of change in the percentage of breeding seabirds meeting abundance targets for Good Environmental Status (GES), Greater North Sea

Period	Date range	Percent change	Assessment of change
Short term	2008-2013	-0.6 (smoothed Loess)	Little or no change
Medium term	2003-2013	-8.6 (smoothed Loess)	Deterioration
Long term	1992-2013	-28.2 (smoothed Loess)	Deterioration

Table C3bib: Assessment of change in the percentage of breeding seabirds meeting abundance targets for Good Environmental Status (GES), Celtic Seas

Period	Date range	Percent change	Assessment of change
Short term	2009-2014	+1.3 (smoothed Loess)	Little or no change
Medium term	2004-2014	-23.1 (smoothed Loess)	Deterioration
Long term	1992-2014	-27.9 (smoothed Loess)	Deterioration

Table C3biia: Assessment of change in the percentage of wintering waterbirds meeting abundance targets for Good Environmental Status (GES), Greater North Sea

Period	Date range	Percent change	Assessment of change
Short term	2007/2008-2012/2013	-2.6 (smoothed Loess)	Little or no change
Medium term	2002/2003-2012/2013	-8.7 (smoothed Loess)	Deterioration
Long term	1992/1993-2012/2013	-10.2 (smoothed Loess)	Deterioration

Table C3biib: Assessment of change in the percentage of wintering waterbirds meeting abundance targets for Good Environmental Status (GES), Celtic Seas

Period	Date range	Percent change	Assessment of change
Short term	2008/2009-2013/2014	-15.5 (smoothed Loess)	Deterioration
Medium term	2003/2004-2013/2014	-30.9 (smoothed Loess)	Deterioration
Long term	1992/1993-2013/2014	-35.4 (smoothed Loess)	Deterioration

Note that assessment categories for the short, medium and long term were assigned based on smoothed data, so percent change figures in Tables C3ai to C3biib may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

C4 Diverse seas: condition of seafloor habitats

Short description

This indicator of diverse seas evaluates the condition of seafloor habitats. Seafloor habitats assessed include soft sediment invertebrate communities and intertidal communities of seagrass, rocky shore macroalgae and saltmarshes. Once developed the indicator will assess the impact of human activities on seafloor habitats.

Data for the seafloor habitat condition indicators come from surveys undertaken on a 6-yearly cycle using methods developed for Water Framework Directive (WFD) classifications, now transposed to the Water Framework Directive Regulations. These include the intertidal rocky shore macroalgae tool, intertidal seagrass tool, Infaunal Quality Index, and intertidal saltmarsh tool.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Reversing the loss of marine biodiversity and, where practicable, restoring it
- Ensuring seafloor habitats are productive and sufficiently extensive to support healthy, sustainable ecosystems

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- UK Marine Strategy (Marine Strategy Regulations 2010)
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- Relevant to Sustainable Development Goal 14
- Water Framework Directive Regulations – The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017, Water Environment and Water Services (Scotland) Act 2003

Geographical scope

UK

Status of indicator development

Interim

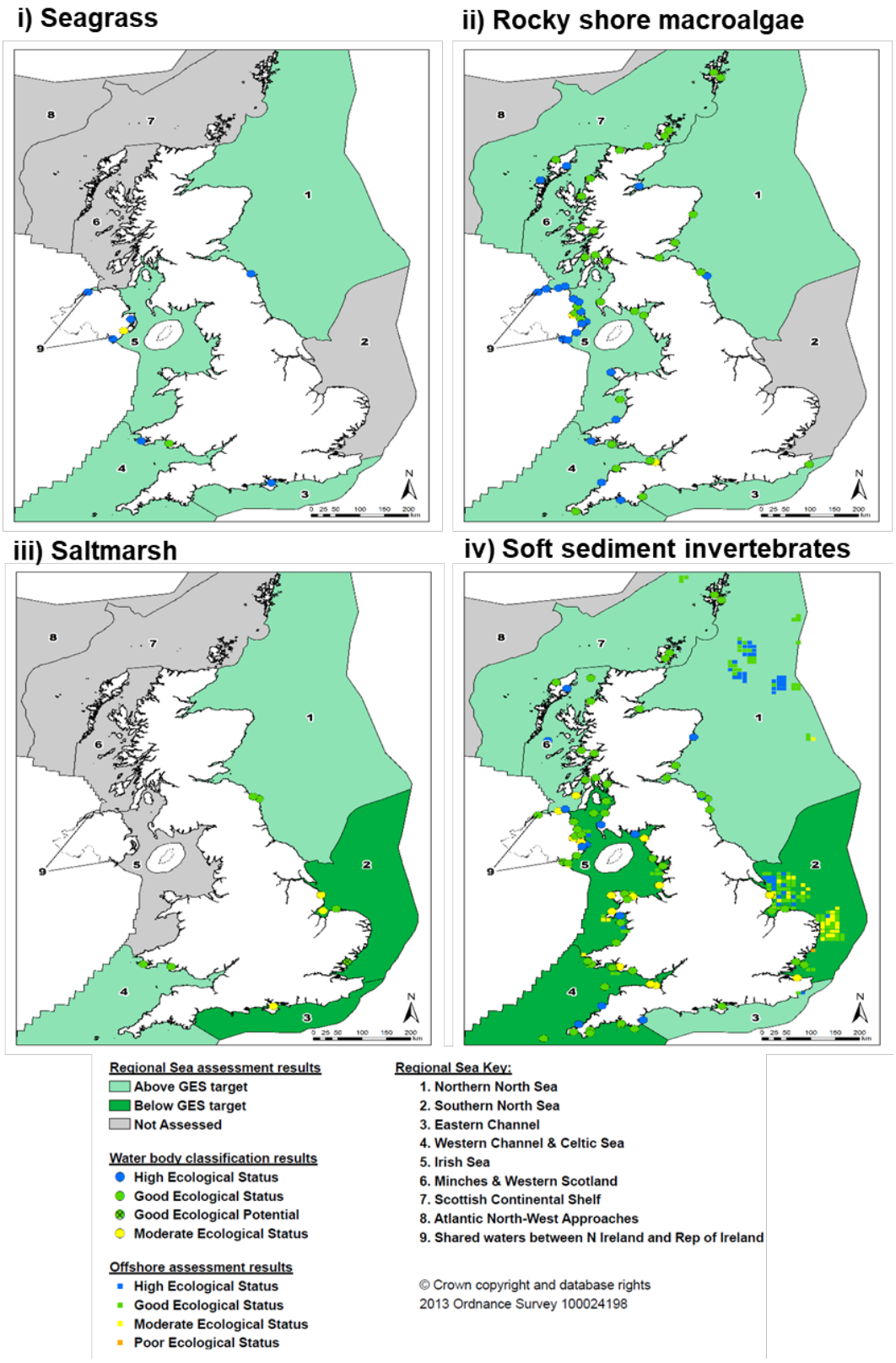
Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows target achievement for regional sea assessment, status of coastal water bodies and offshore unit assessments. The assessments used for this indicator have been reported under the updated UK Marine Strategy Part One (2019) to assess progress towards the UK Marine Strategy target of achieving and maintaining Good Environmental Status (GES) in UK seas.

Data on benthic (sea floor) habitats, analytical methods and assessment are available, including information on the intertidal rocky shore macroalgae tool, intertidal seagrass tool, Infaunal Quality Index, and intertidal saltmarsh tool.

The indicator will be further developed to include data on the condition of benthic communities. When data are available, C4 may also be based upon data on the condition of sublittoral rock communities (those that occur from the lowest point exposed by low tide to the edge of the continental shelf) and the condition of biogenic reefs (formed by horse mussel and Ross worm). A trial assessment on the condition of benthic communities was reported under the updated UK Marine Strategy Part One (2019) to assess progress towards the UK Marine Strategy target of achieving and maintaining Good Environmental Status (GES) in UK seas.

Figure C4 (interim): Regional sea assessments, and the status of coastal water bodies and offshore units for 4 UK seafloor habitats, 2010 to 2015



Source, Defra; Environment Agency; Joint Nature Conservation Committee; Natural Resources Wales; Scottish Environment Protection Agency

Note on Figure C4

Inshore data, predominantly collected between 2010 and 2015, were used to assess seagrass, rocky shore macroalgae and saltmarsh habitats. Soft sediment invertebrates were assessed using inshore and offshore intertidal and subtidal data collected between 2010 and 2015.

While the currently available data predate the 25 Year Environment Plan, they provide the most recently available assessment of the condition of benthic habitats. They enable a better understanding of a baseline from which to measure progress towards the goals of the 25 Year Environment Plan when the indicator is next updated.

Trend description for Figure C4

C4i) Seagrass

The UK Marine Strategy target for intertidal seagrass communities was met for all Regional Seas. Four Regional Seas were not assessed due to either an absence of intertidal habitat which is required by the indicator or an absence of existing WFD classification data. The natural conditions required for seagrass beds to exist limits their occurrence in coastal water bodies. However, for those contributing, the quality threshold of ‘Good’ or ‘High’ Ecological Status was met for the majority of surveyed locations. The Irish Sea had the lowest extent of intertidal seagrass meeting the quality target, although the total remains markedly above the indicator quantity threshold of 85%.

C4ii) Rocky shore macroalgae

The UK Marine Strategy target for the intertidal rocky shore macroalgae was met for all 7 assessed Regional Seas. Two Regional Seas were not assessed due to either an absence of intertidal habitat which is required by the indicator or an absence of existing WFD classification data.

C4iii) Saltmarsh

The UK Marine Strategy target for the saltmarsh communities was largely met for the Celtic Seas and Northern North Sea but was not met for considerable areas of the Southern North Sea and the Eastern English Channel Regional Seas. Five Regional Seas were not assessed due to either an absence of intertidal habitat which is required by the indicator or an absence of existing WFD classification data.

C4iv) Soft sediment invertebrates

The UK Marine Strategy target for soft sediment (benthic) invertebrate communities was largely met for most Regional Seas including the Minches and western Scotland, Scottish Continental Shelf, Shared Waters between Northern Ireland and Republic of Ireland, Northern North Sea and Eastern English Channel. The Western English Channel and Celtic Seas did not reach the target largely due to the inshore classification results, while the failure of the Southern North Sea to meet the target can be attributed to the offshore

results. The Irish Sea did not meet the target due to both inshore and offshore results. The Atlantic North-West Approaches was not assessed due to an absence of data.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

C5 Diverse seas: condition of pelagic habitats

Short description

This indicator of marine biodiversity tracks changes in the Good Environmental Status (GES) of pelagic (water column) habitats. The assessment is based on (a) changes in lifeforms (groups of plankton species that perform the same function in the marine environment) that make up plankton communities, and (b) changes in the biomass of phytoplankton and the abundance of zooplankton. These assessments have been used to inform the assessment of GES for the updated UK Marine Strategy Part One (2019) and to fulfil reporting commitments under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR). The changes experienced by plankton communities could have implications for the health, (functioning, dynamics and structure) of the whole marine ecosystem.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Reversing the loss of marine biodiversity and, where practicable, restoring it
- Ensuring seafloor habitats are productive and sufficiently extensive to support healthy, sustainable ecosystems

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- UK Marine Strategy (Marine Strategy Regulations 2010)
- River Basin Management Plans
- Relevant to Sustainable Development Goal 14

Geographical scope

UK (Celtic Seas and Greater North Sea)

Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form as existing analytical methods are under ongoing development to gain a better understanding of the effects of the key anthropogenic pressures and climatic drivers. Recent progress with this work is presented in a primary research article by Bedford et al. (2020).The effects of these and future developments on this interim indicator will be considered as part of a wider review of the Outcome Indicator Framework. Additional background data on the abundance of plankton in UK waters are also available on the Plankton Lifeform Extraction Tool. The assessments of pelagic habitats used for this interim indicator have been reported under the updated UK Marine Strategy Part One (2019) and to fulfil reporting commitments under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR).

Note on Indicator C5

Spatial representations and charts for the underlying data supporting this interim indicator can be accessed via the Marine Online Assessment Tool. While the currently available data predate the 25 Year Environment Plan, they provide the most recently available assessment of the condition of pelagic habitats. They enable a better understanding of a baseline from which to measure progress towards the goals of the 25 Year Environment Plan when the indicator is next updated.

Trend description for Indicator C5

C5a) Changes in plankton communities, 2004-2008 to 2009-2014

The lifeforms (functional groups of species) that make up the plankton communities in the Celtic Seas and the Greater North Sea changed between the starting conditions period (2004 to 2008) and the current assessment period (2009 to 2014). Prevailing environmental conditions, in particular climate change, are likely to be driving these observed changes, but the potential role of direct human activities such as fishing and nutrient inputs contributing to these changes cannot be ruled out. It is currently uncertain whether GES has been achieved.

C5b) Changes in phytoplankton biomass and zooplankton abundance, 2004-2008 to 2009-2014

In most areas of the Celtic Seas and the Greater North Sea, phytoplankton biomass has increased between the starting conditions period (2004 to 2008) and the current assessment period (2009 to 2014). Changes in zooplankton abundance varied across the 2 sub-regions assessed, with increases in some areas, decreases in others, and no

change in some. This assessment identified, with a medium to high level of confidence, changes in phytoplankton biomass and zooplankton abundance which may have consequences on the functioning, dynamics and structure of the whole marine ecosystem. It is not yet possible to say if GES has been achieved.

Assessment of change

No assessment was undertaken for this indicator as it is not reported as a time series.

C6 Diverse seas: status of threatened and declining features

Short description

This indicator of diverse seas shows changes in the status of vulnerable features flagged for protection, either listed in national legislation or international agreements. These features include the features of conservation interest protected in Marine Protected Areas, Natural Environment and Rural Communities Act Section 41 habitats and species of principle importance for conservation, and under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), amongst others. The overall indicator will be derived from the status of the individual features.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Reversing the loss of marine biodiversity and, where practicable, restoring it

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- UK Marine Strategy (Marine Strategy Regulations 2010)
- Convention on Biological Diversity Aichi Target 12
- Relevant to Sustainable Development Goal 14

Geographical scope

UK

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022 as further development and testing is required. The indicator will show the status of UK-relevant threatened and declining marine features with associated summary statistics, such as:

- Total number of UK-relevant features assessed, including information on the nature and type of assessment.
- Summaries of the overall status of assessed features: for example, the total number of UK-relevant features assessed as having good, poor, or unknown overall status.
- Observed changes or trends from previous assessments and/or known historic baselines, where sufficient data are available.

Initial C6 assessments will be undertaken using UK-relevant information published by OSPAR's Intersessional Correspondence Group on the Protection of Species and Habitats (ICG-POSH).

Existing OSPAR publications will be used, with updates to the indicator when new status assessments become available, following publication of the OSPAR Quality Status Report 2023. The indicator will be flexible, with intended scope for integration with wider datasets, such as Habitats Directive Article 17 Assessments for future publications.

Assessment of change

No assessment was undertaken for this indicator as it is still in development.

C7 Healthy seas: fish and shellfish populations

Short description

This indicator tracks the health of our seas using assessments of fish populations (here separated into demersal communities – fish that live and feed on or near the bottom of seas, and pelagic communities – fish that usually feed in the surface layers of the seas). It consists of 2 metrics. The first metric looks at the size of the fish in a community (Typical Length) and the second looks at the composition of fish communities (Mean Maximum Length). Together these metrics tell us about the health and status of fish communities. A healthy fish community will be made up of species in the expected ratio of numbers of individuals, and with individual species showing the age classes and sizes consistent with a healthy population. Typical Length: a reduction in the proportion of larger, older, fish (as measured by Typical Length) of several species, suggests the top (predator) level of the food web is in poor condition. Mean Maximum Length: if the species that tend towards larger individuals are depleted and smaller-bodied species become more abundant (shown by a reduction in Mean Maximum Length), the species composition of the community can change, suggesting prolonged periods of pressure. When the community is dominated by slow growing species (as expected at low Maximum Mean Length), the size structure is limited in its ability to recover (reduced Typical Length).

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Making sure populations of key species are sustainable with appropriate age structures
- Reversing the loss of marine biodiversity and, where practicable, restoring it
- Ensuring that all fish stocks are recovered to and maintained at levels that can produce their maximum sustainable yield

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- UK Marine Strategy (Marine Strategy Regulations 2010)
- International Council for Exploration of the Seas (ICES)
- Convention on Biological Diversity Aichi Target 6
- Relevant to Sustainable Development Goal 14

Geographical scope

UK (Celtic Seas and Greater North Sea)

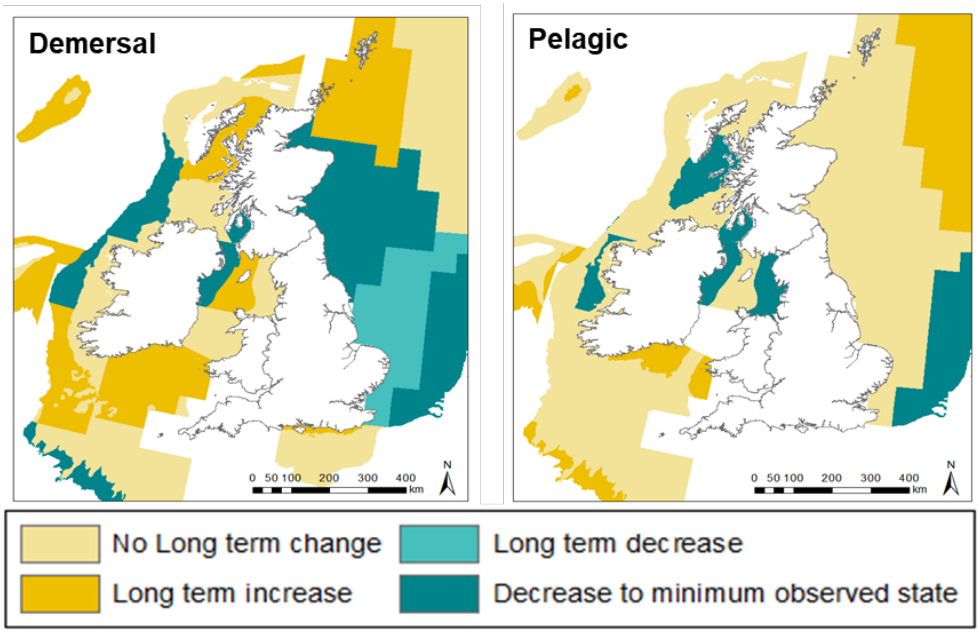
Status of indicator development

Interim

Readiness and links to data

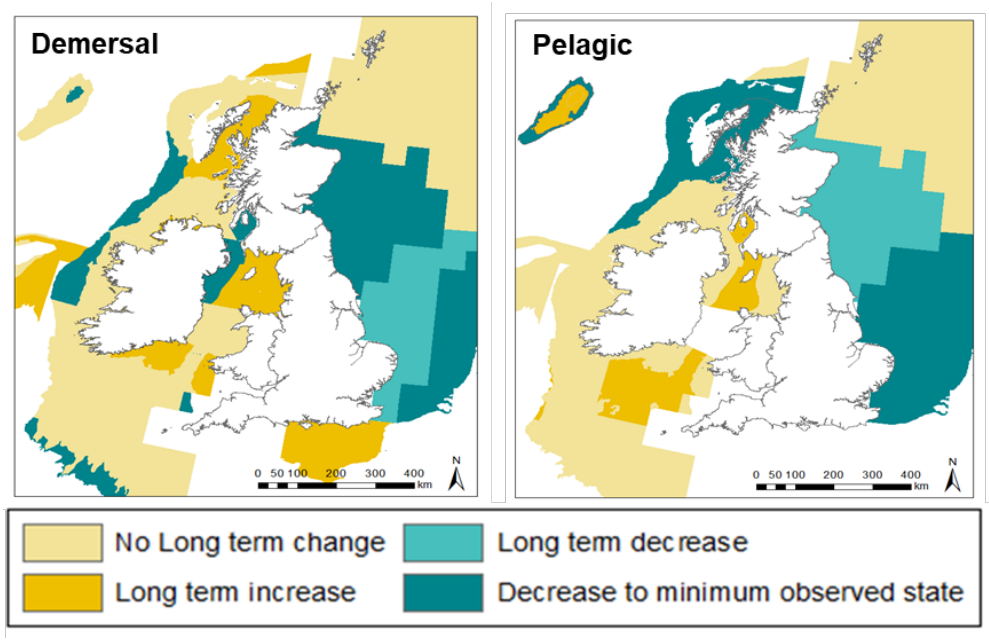
This indicator is not available for reporting in 2022 in a finalised form. Further development of this indicator is required to incorporate the Large Fish Indicator (UK Biodiversity Indicator D1a) and assessment thresholds. An interim indicator is presented here with communities classified as demersal or pelagic. The assessments used for this interim indicator have been reported under the UK Marine Strategy Part One (2019). Data on fish populations, analytical methods and assessment are available and UK Biodiversity Indicator D1a provides additional data on fish sizes in the North Sea.

Figure C7a (interim): Long-term changes in the typical length of demersal and pelagic fish communities in UK waters and surrounding areas, 1980 or 1990 to 2015 or 2016



Source, Centre for Environment, Fisheries & Aquaculture Science; International Council for Exploration of the Sea; Marine Scotland

Figure C7b (interim): Long-term changes in the mean maximum length of demersal and pelagic fish communities in UK waters and surrounding areas, 1980 or 1990 to 2015 or 2016



Source, Centre for Environment, Fisheries & Aquaculture Science; International Council for Exploration of the Sea; Marine Scotland

Note on Figures C7a and C7b

Assessment period starts in the 1980s or 1990s and ends in 2015 or 2016 depending on the survey.

For the Typical Length maps (C7a):

- Long-term increase: an increase in the size of fish within the community over the period
- No long-term change: no change in the size of fish
- Long-term decrease: the size of fish in the community has decreased from an earlier period but has increased from a more recent period
- Decrease to minimum observed state: the fish in the community are currently at the lowest size recorded

For the Mean Maximum Length maps (C7b):

- Long-term increase: the fish are shifting back towards larger species
- No long-term change: no change in the composition of fish communities
- Long-term decrease: more smaller species than in an earlier period but less than in a more recent one
- Decrease to minimum observed state: the community has the highest proportion of small species recorded

While the currently available data predate the 25 Year Environment Plan, they provide the most recently available assessment of fish and shellfish populations. They enable a better understanding of a baseline from which to measure progress towards the goals of the 25 Year Environment Plan when the indicator is next updated.

Trend description for Figures C7a and C7b

C7a) Typical Length of demersal and pelagic fish communities

In the English Channel, northern North Sea and the eastern Irish Sea, the health of the demersal fish community has improved since the 1990s, with an increasing contribution of large individuals (increasing Typical Length). In the central and southern North Sea and on the shelf edge to the west of Scotland, the proportion of individuals within demersal communities, relative to the early 1980s, has shifted towards smaller fish (low Typical Length) indicating this community is in poorer health. In the northern North Sea, no change in the Typical Length in the pelagic fish community is evident. The Typical Length of pelagic fish generally shows no long-term change at the sub-regional level in the Celtic Seas.

C7b) Mean Maximum Length of demersal and pelagic fish communities

In the central and southern North Sea and on the shelf edge to the west of Scotland, the balance of species within demersal communities, relative to the early 1980s, has shifted towards smaller species (low Mean Maximum Length), indicating this community is in poorer health. There has been no long-term change in Mean Maximum Length of demersal fish communities in the northern North Sea. Within the southern and central

North Sea, the Mean Maximum Length of pelagic fish communities is declining suggesting the proportion of larger species is declining. There is no long-term change in the Mean Maximum Length in the northern North Sea.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

C8 Healthy seas: marine food webs functioning

Short description

This indicator will track the health of our seas using metrics based on the size, structure and function of different feeding (trophic) levels in marine food webs. The indicator will focus on pelagic (water column) habitats and populations of key species groups within the food web. The indicator will also link to and complement C9 'Healthy seas: Seafloor habitats functioning'. These show whether ecosystems are healthy and are being used sustainably. Currently, the metrics within this indicator are being developed for the UK Marine Strategy Descriptors 1 (biodiversity), 4 (food webs) and 6 (seafloor integrity) and the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR).

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Making sure populations of key species are sustainable with appropriate age structures
- Reversing the loss of marine biodiversity and, where practicable, restoring it
- Ensuring that all fish stocks are recovered to and maintained at levels that can produce their maximum sustainable yield

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- UK Marine Strategy (Marine Strategy Regulations 2010)
- International Council for Exploration of the Seas (ICES)
- Convention on Biological Diversity Aichi Target 6
- Relevant to Sustainable Development Goal 14

Geographical scope

UK

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022 as significant development is required. Research is underway to further develop the food web metrics that constitute this indicator. Analytical methods and some data on food webs are available.

Functional 'feeding guilds' based on diet and life stage have been defined for fish using a recently collated dataset of stomach contents for the North East Atlantic and its marginal seas (Thompson et al., 2020). These feeding guilds were applied to assess change in fisheries-independent survey data, revealing spatial aggregations of feeding guilds, and regions of change over time indicative of change in ecosystem structure and function. Ongoing developments include the collation of more stomach content data to further resolve predator diets. Stomach content data are publicly available from International Council for the Exploration of the Seas (ICES) Fish-stomach data portal (Fish stomach (ices.dk)) and the Cefas Integrated Database and Portal for Fish Stomach Records. Fisheries-independent survey data are also available from ICES Database of Trawl Surveys (DATRAS).

Assessment of change

No assessment was undertaken for this indicator as it is still in development.

C9 Healthy seas: seafloor habitats functioning

Short description

This indicator will show changes in the natural functionality and extent of seafloor habitats able to support a healthy and productive ecosystem. The indicator is linked to the UK Marine Strategy Descriptor 6 (Seafloor Integrity). The indicator will be derived from the integration of metrics of individual broad habitat types and selected vulnerable habitats. Well-functioning seafloor habitats (physically and structurally) are both productive and sufficiently extensive, to carry out natural functionality, including the necessary ecological processes which underpin ecosystem goods and services, and are capable of supporting a healthy and sustainable ecosystem for the long term.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Ensuring seafloor habitats are productive and sufficiently extensive to support healthy, sustainable ecosystems

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- UK Marine Strategy (Marine Strategy Regulations 2010)
- Water Framework Directive Regulations – The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017, Water Environment and Water Services (Scotland) Act 2003
- Relevant to Sustainable Development Goal 14

Geographical scope

UK

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022 as further development and testing is required. The C9 indicator is planned to draw upon models of habitat suitability and spatially overlaid activities understood to cause irreversible loss of the habitat area. Potential habitat loss of seagrass and horse mussels has already been reported under the updated UK Marine Strategy Part One (2019) to assess progress towards the UK Marine Strategy target of achieving and maintaining Good Environmental Status (GES) in UK seas. Further work is required before this data is incorporated into C9, and it may also be expanded to include additional habitats in the future.

Assessment of change

No assessment was undertaken for this indicator as it is still in development.

C10 Productive seas: fish and shellfish stocks fished sustainably

Short description

This indicator shows changes in the proportion of commercial fish and shellfish stocks that are within safe biological limits and fished sustainably. The indicator is derived from

assessments of individual stocks. Where available, the assessment of stocks against their Maximum Sustainable Yield (MSY) will be incorporated into the overall indicator. The indicator is linked to UK Marine Strategy Descriptor 3 (Commercial Fish and Shellfish) and the Convention on Biological Diversity sustainable fisheries indicators and is derived from International Council for the Exploration of the Sea (ICES) and national stock assessments.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Ensuring that all fish stocks are recovered to and maintained at levels that can produce their maximum sustainable yield

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- UK Marine Strategy (Marine Strategy Regulations 2010)
- Convention on Biological Diversity Aichi Target 6
- Relevant to Sustainable Development Goals 12 and 14

Geographical scope

UK

Status of indicator development

Interim

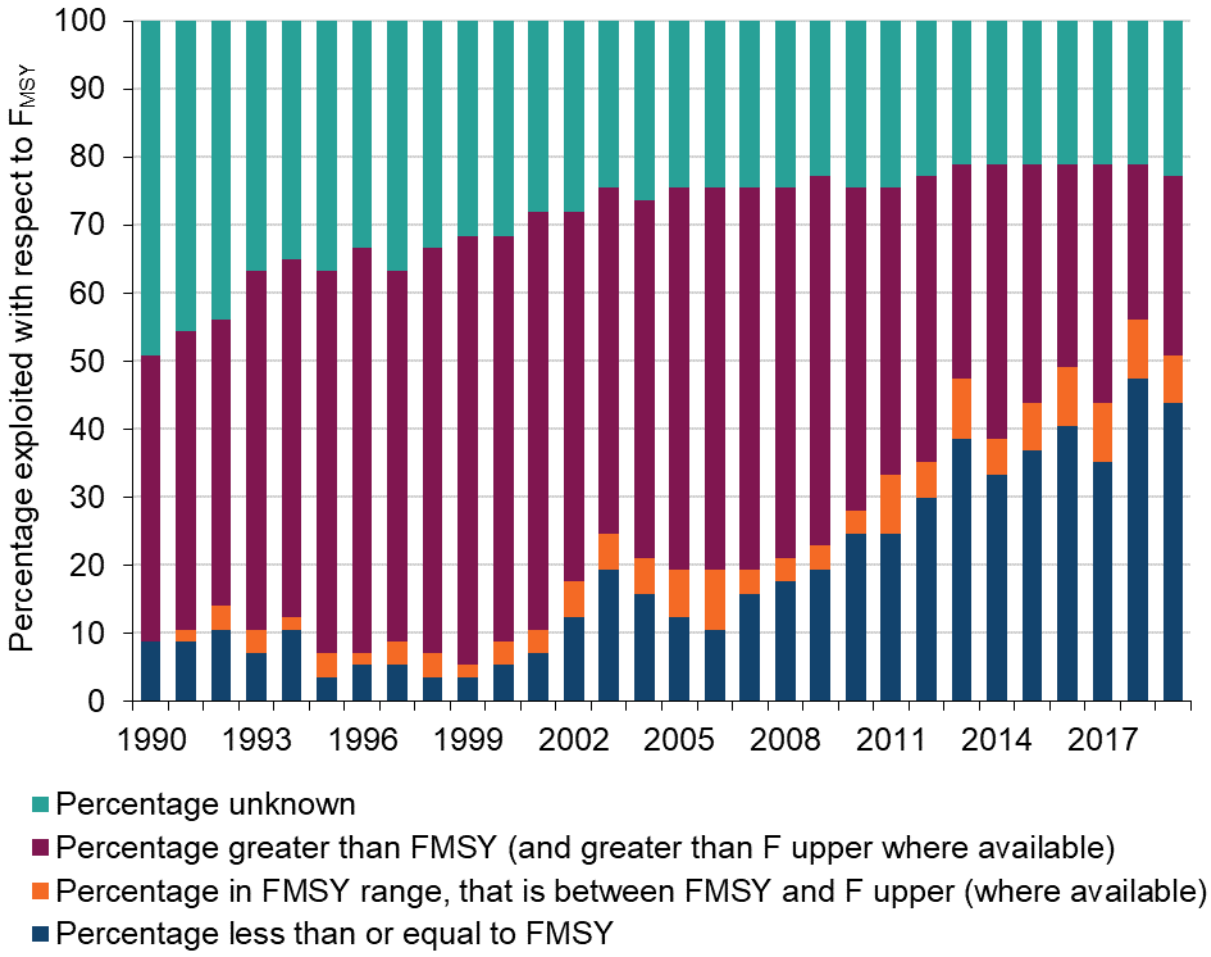
Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. A revised interim indicator is presented here that shows: the percentage of stocks of UK interest fished at or below the level capable of producing MSY (F_{MSY}); and the percentage of stocks with spawning stock biomass (SSB) above the level capable of producing MSY (MSY $B_{trigger}$). The revised indicator also introduces a new upper limit (F_{upper}, where available) for a number of stocks that are fished above F_{MSY}, but within an acceptable mortality range (in F_{MSY} range) as defined by internationally agreed Multi-Annual Plans (MAPs) for fisheries. In addition, a lower limit reference point (B_{lim}) is included for SSB to distinguish a number of stocks that are at a higher risk of reproductive impairment, from those that are at lower risk (that is, above B_{lim} but below MSY $B_{trigger}$).

The assessments used for this interim indicator have been reported under the UK Marine Strategy Part One (2019) using data from 1990 to 2015 for F_{MSY} and from 1990 to 2016 for MSY $B_{trigger}$. Data on commercially exploited fish and shellfish, analytical methods and

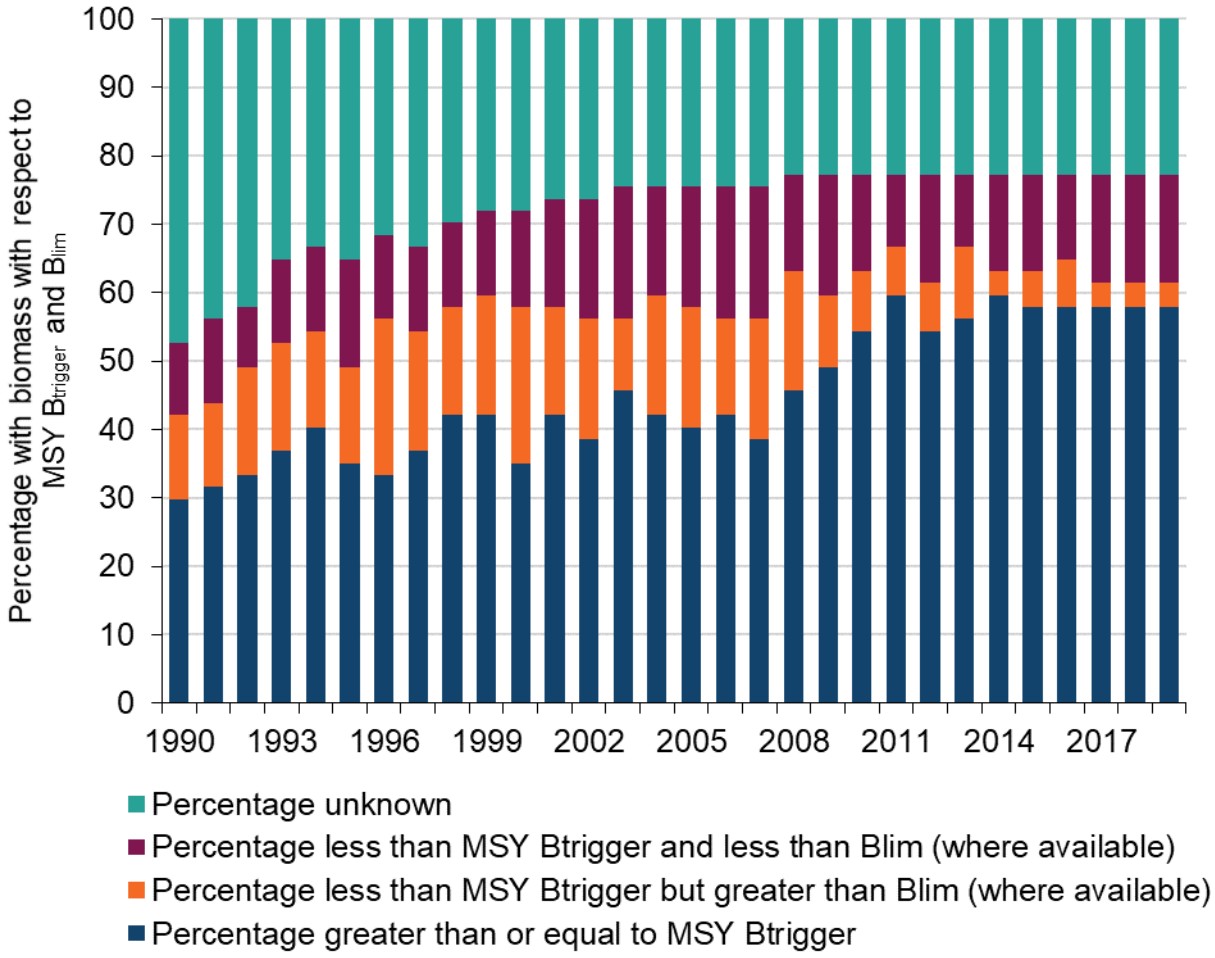
assessment are available. Data are also published annually in the UK Biodiversity Indicator B2 – Sustainable fisheries. National shellfish stocks assessments are updated on a 3-year cycle. These data are not included in the interim indicator but were published as part of the UK Marine Strategy Part One (2019) and will be included in the final indicator. Once population age and size distribution assessments are developed, they will be included to provide further detail for this indicator.

Figure C10a (interim): Marine fish (quota) stocks of UK interest harvested sustainably, 1990 to 2019



Source, Defra

Figure C10b (interim): Marine fish (quota) stocks of UK interest with biomass at levels capable of maintaining full reproductive capacity, 1990 to 2019



Source, Defra

Note on Figures C10a and C10b

Figures C10a and C10b are based on 57 stocks of interest to the UK, derived from ICES and national stock assessment reports**.** When new stock assessment data are incorporated into the model that compiles this time series, all data are subject to minor revisions.

Changes made to this indicator since the previous publication to bring it in line with the MAPs for fisheries mean the current interim version of C10 is not directly comparable to the version appearing in the Outcome Indicator Framework prior to 2022.

Trend description for Figures C10a and C10b

Overall, there is evidence of a positive trend towards a greater proportion of stocks fished sustainably in both the long term and in recent years. There is also a positive trend for fish stocks remaining within safe biological limits in the long term, but a negative trend in recent years. For both measures, there is a decreasing percentage of stocks with unknown status, from almost 50% in 1990 to 23% in 2019.

C10a) Marine fish (quota) stocks of UK interest harvested sustainably

The percentage of fish stocks (including Norway lobster, *Nephrops norvegicus*) fished at or below F_{MSY}, and/or within acceptable mortality range levels, has increased from 9% in 1990 to 51% in 2019. The percentage fished above F_{MSY} has decreased over the same time period, from 42% of UK quota-fish stocks assessed being fished at levels of fishing pressure above F_{MSY} in 1990 to 26% in 2019.

C10b) Marine fish (quota) stocks of UK interest with biomass at levels capable of maintaining full reproductive capacity

To maintain the reproductive capacity of stocks, each stock's spawning biomass (SSB) should be at or above the level capable of producing maximum sustainable yield (that is, MSY $B_{trigger}$). The percentage of stocks subject to quota management and achieving this goal has increased from 30% in 1990 to 58% in 2019. A further 4% of stocks were at low risk of reproductive impairment (that is, with a SSB below MSY $B_{trigger}$ but above B_{lim}) in 2019 and 16% more were at high risk of reproductive impairment (that is, with SSB below MSY $B_{trigger}$ and B_{lim}).

Assessment of change
Two indicator components are assessed here: 'marine fish (quota) stocks of UK interest harvested sustainably' and 'marine fish (quota) stocks of UK interest with biomass at levels capable of maintaining full reproductive capacity'. Assessments of change are made for the most recent 5 years for which trends can be assessed (2012 to 2017), as well as medium and long-term periods. In every case there has been an improvement recorded.

Change since 2018 has also been assessed. Marine fish harvested sustainably decreased (a deterioration) in 2019 while there was little or no change in marine fish stocks with biomass at levels capable of maintaining full reproductive capacity. However, this is based on two data points so should be considered as indicative and not evidence of a clear trend.

The assessment results reported here are not directly comparable with other analyses published elsewhere that use different methodologies to explore these indicator components.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table C10a: Assessment of change in marine fish (quota) stocks of UK interest harvested sustainably, (below F_{MSY} or in F_{MSY} range, if available)

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+39.3 (smoothed data)	Improvement
Medium term	2008-2018	+113.7 (smoothed data)	Improvement
Long term	1990-2018	+327.0 (smoothed data)	Improvement

Table C10b: Assessment of change in marine fish (quota) stocks of UK interest with biomass at levels capable of maintaining full reproductive capacity (above MSY $B_{trigger}$)

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+5.6 (smoothed data)	Improvement
Medium term	2008-2018	+24.4 (smoothed data)	Improvement
Long term	1990-2018	+89.1 (smoothed data)	Improvement

Note that assessment categories for the short, medium and long term were assigned based on smoothed data, so percent change figures in Tables C10a and C10b may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

C11 Productive seas: status of sensitive fish and shellfish stocks

Short description

This indicator tracks changes in the population status (occurrence, abundance and condition) of fish and shellfish species at risk of depletion. The indicator is derived from individual species assessments based on scientific survey data; note that a subset of species may also be included in indicator 'C6 Diverse seas: status of threatened and declining features'. Species considered at risk will be assessed to account for the impact of change in environmental conditions and human activities to identify if species are adversely impacted by human activities. The indicator is linked to the UK Marine Strategy Descriptor 1 (biodiversity) and the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR).

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Ensuring that all fish stocks are recovered to and maintained at levels that can produce their maximum sustainable yield

Position in the natural capital framework

Condition of asset – seas

Related reporting commitments

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- UK Marine Strategy (Marine Strategy Regulations 2010)
- Convention on Biological Diversity Aichi Target 6
- Relevant to Sustainable Development Goals 12 and 14

Geographical scope

UK. The interim indicator is currently only available for the Greater North Sea.

Status of indicator development

Interim

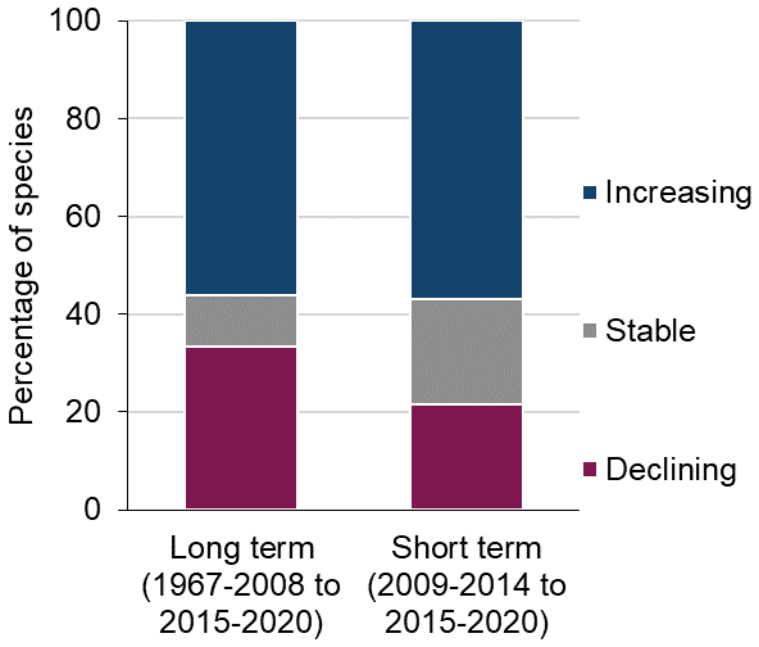
Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows assessments of change in occurrence of 55 sensitive fish species in international scientific surveys of the Greater North Sea. Species are assessed for evidence of a significant increase or decrease in frequency of occurrence in the assessment period (2015 to 2020) compared to a reference period. There is an aspiration to reverse any long-term depletion of species populations, so the basis of the assessment is a long-term reference period inclusive of all years prior to the assessment period (that is 1967 to 2014). To identify whether depletion is ongoing or if signs of recovery are evident, a secondary short-term reference period is also defined (here, 2009 to 2014).

Further work to standardise the dataset is ongoing due to a change in the types of fishing equipment used to conduct the surveys over time.

The indicator provides an assessment of change in the occurrence of species identified as sensitive to fishing. Where data allow, those species that fail this occurrence assessment will be analysed further to identify any change in abundance and condition (population age and size structure) (see Bluemel et al., 2021 for a comprehensive example using this methodology).

Figure C11 (interim): Long-term and short-term changes in the occurrence of sensitive fish species, Greater North Sea, 1967 to 2020



Source, International Council for the Exploration of the Sea

Note on Figure C11

Figure C11 is based on the assessment results for 55 sensitive fish species found in fisheries surveys of the Greater North Sea. In the long-term reference period (1967 to 2008), 48 of the 55 species (87%) could be assessed and in the short-term reference period (2009 to 2014), 51 of the 55 species (93%) could be assessed.

These results were produced as part of the worked example of a sensitive fish species presence-absence analysis, as conducted by the International Council for the Exploration of the Sea workshop on the abundance estimates for sensitive species (WKABSENS).

The inclusion of incomplete survey data from the 1960s to 1980s can be important to track the true status of rare species, despite several limitations, which are detailed in the WKABSENS Report.

Trend description for Figure C11

Over the long term, 16 (33%) of the 48 species assessed show a significant decline in occurrence in the assessment period (2015 to 2020) compared to the long-term reference period (1967 to 2008), whereas in the short term, only 11 (22%) of the 51 species assessed show a significant decline in the assessment period compared to the short-term reference period (2009 to 2014).

A further 27 (56%) of the species assessed show a significant increase in occurrence in the assessment period compared to the long-term reference period, very similar to the

number of species (29 or 57% of those assessed) that show a significant increase in the assessment period compared to the short-term reference period.

The suite of sensitive fish species assessed by this indicator for the Greater North Sea (OSPAR region II) would not achieve an aggregated assessment result consistent with Good Environmental Status because the total number of decreasing species (16) over the long term is significantly high (and above the number expected by chance at the 5% significance level).

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

Theme D: Wildlife

D1 Quantity, quality and connectivity of habitats

Short description

This indicator will assess the function of terrestrial and freshwater habitats in England by measuring their extent, condition, and connectivity. In the 25 Year Environment Plan, government committed to establishing a Nature Recovery Network: an increasingly connected network of places that are richer in wildlife and more resilient to climate change. The network will build on the recommendations from 'Making space for nature', led by Professor Sir John Lawton, and will provide wider environmental benefits, including carbon capture and opportunities for recreation.

Data are available to measure some aspects of this indicator such as extent and condition of some habitats, but further work is required to assess habitats beyond protected sites, and reliable methods for measuring ecological connectivity need to be further tested. Some indicators of aspects of ecosystem functions and processes are available to assess condition, but these are not comprehensive. New methods of Earth Observation together with development of measures of favourable conservation status and long-term site-based monitoring offer good opportunities to develop this indicator.

Relevant goals in the 25 Year Environment Plan

- Thriving plants and wildlife
- Mitigating and adapting to climate change

Relevant targets in the 25 Year Environment Plan

- Creating or restoring 500,000 hectares of wildlife-rich habitat outside the protected area network
- Implementing a sustainable and effective second National Adaptation Programme

Position in the natural capital framework

Condition of asset – species and ecological communities

Related reporting commitments

- Conservation of Habitats and Species Regulations 2017 (as amended)
- May provide evidence in support of Climate Change Risk Assessment and the Adaptation Sub Committee's assessment of the National Adaptation Programme, under the Climate Change Act (2008)
- Convention on Biological Diversity Aichi Targets 5 and 15

Geographical scope

England. Some data, for example, Earth Observation data or site assessments may be disaggregated to local sites.

Status of indicator development

In development.

Readiness and links to data

This indicator is not available for reporting in 2022. Several elements of this indicator are published as England Biodiversity Indicators (for example, 2a – Extent and condition of priority habitats and 3 – Habitat connectivity in the wider countryside) but substantial further work is required to bring these elements together with new data to assess overall resilience. Ongoing work to progress this indicator includes the development of an earth observation approach (via the Living England project) for habitat quantity, statistical analysis of attributes to assess habitat quality and testing of different approaches to measure habitat connectivity.

The Living England project, led by Natural England, is a multi-year programme delivering a satellite-derived national habitat map. Improvements in 2021 have resulted in an increased level of confidence in habitat assignment in the map. Work to finalise the methodology to allow the assessment of habitat quantity on a national scale is ongoing.

The development of the quality and connectivity elements of the indicator is also ongoing. During 2021 to 2022 a final list of habitat quality attributes has been produced, together with identification of datasets which can be used to measure them. Future work will determine benchmarks for defining poor, moderate and good status for each attribute in each habitat type.

Assessment of change

No assessment was undertaken for this indicator as it is still in development.

D2 Extent and condition of protected sites – land, water, and sea

Short description

Protected sites are areas of land, inland water and the sea that have special legal protection to conserve important habitats and species in England. These include our Sites

of Special Scientific Interest (SSSIs), Marine Conservation Zones (MCZs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites. These area designations have been included as they focus on the protection of biodiversity and provide legal mechanisms for this protection. This indicator currently has 2 components: (a) extent of protected sites on land, freshwater and at sea and (b) condition of terrestrial SSSIs on land and water. Condition for terrestrial sites is assessed against relevant common standards agreed by the UK conservation agencies. Condition methodology for marine sites is currently under development.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Increasing the proportion of protected and well-managed seas, and better managing existing protected sites
- Restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term

Position in the natural capital framework

Condition of asset – species and ecological communities

Related reporting commitments

- The Conservation of Habitats and Species Regulations 2017 (as amended)
- The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention)
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- Convention on Biological Diversity Aichi Target 11

Geographical scope

England. Data may be disaggregated to individual sites and features.

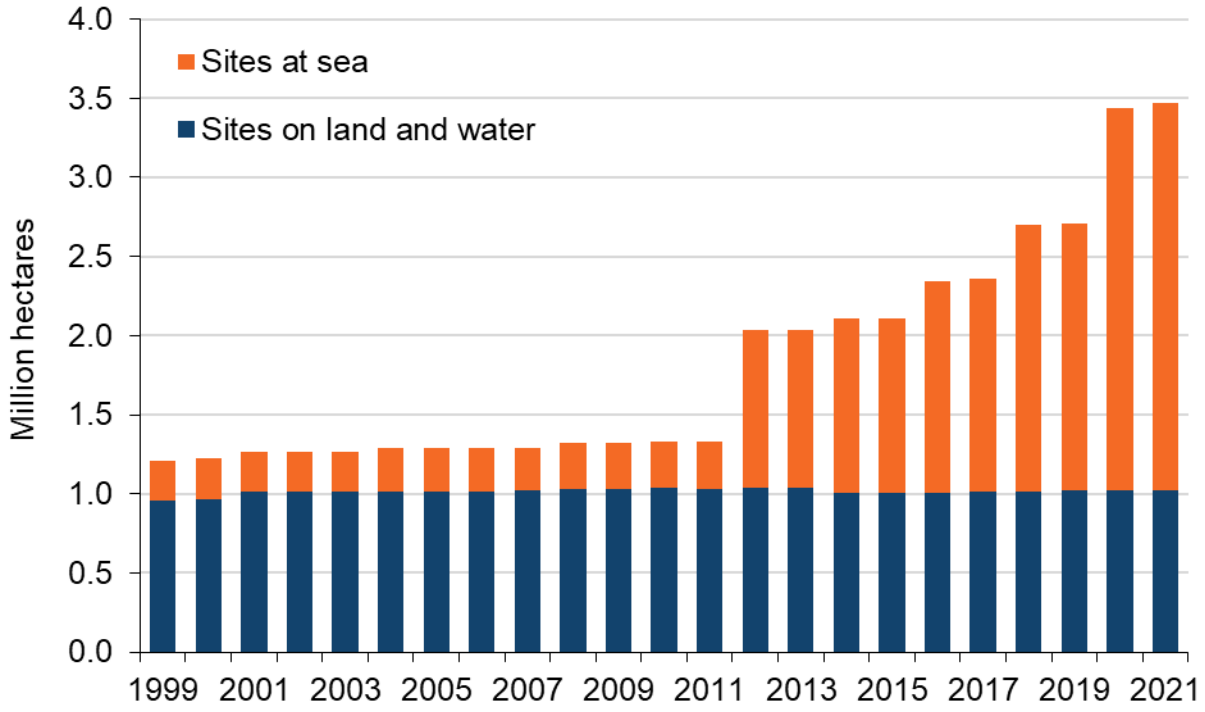
Status of indicator development

Interim

Readiness and links to data

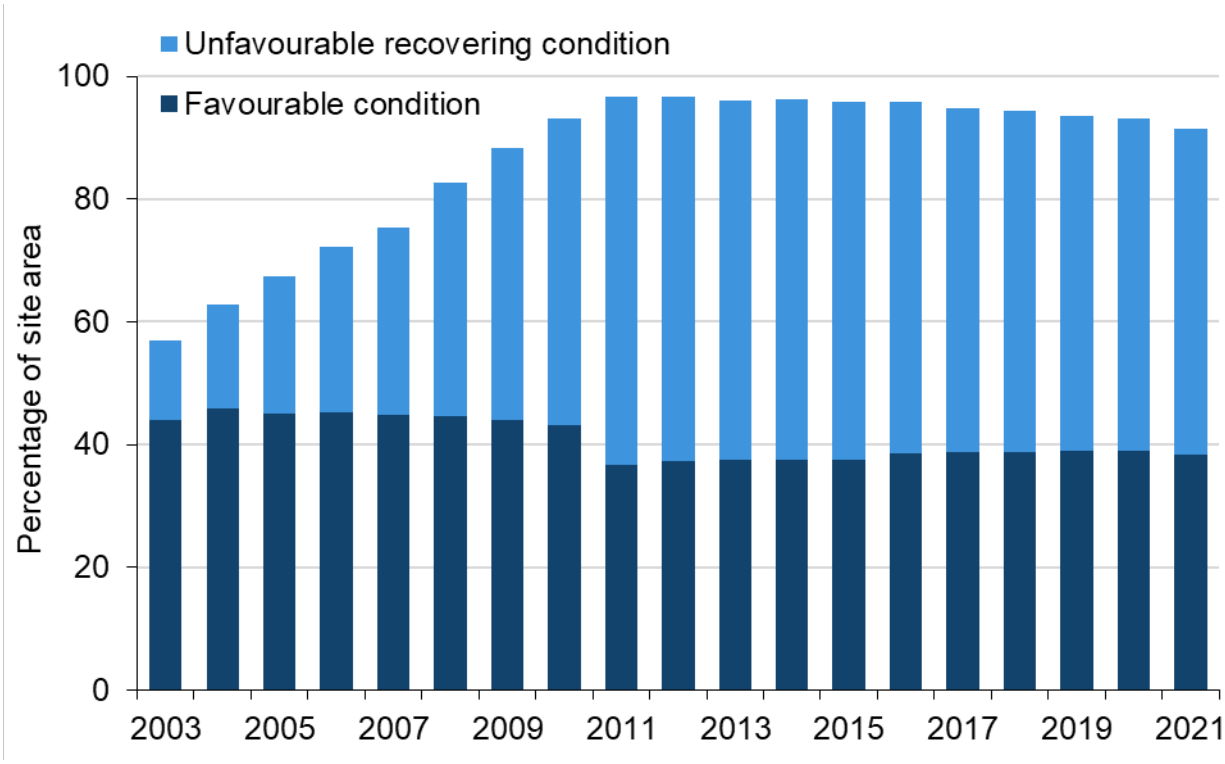
This indicator is not available for publishing in 2022 in a finalised form. An interim indicator is presented here that shows the extent of protected areas (D2a) and condition of SSSIs (D2b) in England. Data for this interim indicator are published annually as England Biodiversity Indicator 1 – Extent and condition of protected areas. Work is underway to review reporting for terrestrial and freshwater sites. Further work is required to implement a methodology for assessing the condition of marine sites.

Figure D2a (interim): Extent of protected sites in England, 1999 to 2021



Source, Natural England

Figure D2b (interim): Condition of Sites of Special Scientific Interest in England, 2003 to 2021



Source, Natural England

Note on Figures D2a and D2b

The extent of protected sites is the cumulative area assessed by March of each year shown. It is based on the following designations: Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Nature Reserves (NNRs), Ramsar sites and Marine Conservation Zones (MCZs). For sites that span English borders, only the area within England is included. Sites between mean low water and the 12 nautical mile limit are included in the 'marine' measure.

Site condition is the cumulative area assessed by 31 March of each year shown. As new assessments are completed, they replace the previous ones, so Figure D2b is a snapshot of the condition of the site network at a given point in time.

The figures presented in this indicator differ from the England element of the UK Biodiversity Indicator C1 – Protected Areas, which includes additional area designations (Areas of Outstanding Natural Beauty and National Parks) that are not included here.

Trend description for Figures D2a and D2b

D2a) Extent of Protected sites

The total extent of land, water and sea protected in England through national and international protected areas increased from 1.2 million hectares in 1999 to 3.5 million hectares in 2021. The area of sites at sea has increased substantially, by more than 8 times since the time series began in 1999 although the majority of this increase took place between 2011 and 2020. The area of sites on land and water has remained relatively stable over time, increasing by 7% between 1999 and 2021.

D2b) Condition of Sites of Special Scientific Interest

There has been a net decrease in the area of SSSIs in favourable condition; down from 44% in 2003 to 38.4% in 2021. The sudden drop in the area of SSSIs in favourable condition from 43.2% in 2010 to 36.6% in 2011 was largely due to a more rigorous application of the 'Common Standard for Monitoring' protocols in assessing unit condition. While there has been a small increase in the area in favourable condition over the last 10 years (from 36.6% in 2011 to 38.4% in 2021), the figure has fallen slightly in the latest year. The area of SSSIs in unfavourable recovering condition has increased substantially from 13% in 2003 to 53% in 2021.

Assessment of change

Little or no change was observed for the extent of protected sites on land and water in England over the most recent 5 years for which trends can be assessed (2016 to 2021), or the medium term. An increase (or improvement) was observed over the long-term time period. The has been an increase in the extent of protected sites at sea in England over the short, medium and long term. This assessment does not consider whether any improvements seen are on a sufficient scale for meeting targets.

There has been little or no change in the percentage of SSSIs in England achieving favourable condition over the most recent 5 years for which trends can be assessed (2016 to 2021). An increase (or improvement) was observed over the medium term, while there has been a long-term decrease (deterioration).

Change since 2018 has also been assessed. Since 2018, there has been little or no change in extent of protected sites on land and water or the percent of SSSIs achieving favourable status. However, extent of protected sites at sea has increased. This is based on 4 years of data. We set a minimum of 5 data points for the production of a robust trend for this assessment so this result should be treated with caution until the next iteration is available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table D2ai: Assessment of change in the extent of protected sites in England – on land and water

Period	Date range	Percent change	Assessment of change
Short term	2016-2021	+1.8 (unsmoothed)	Little or no change
Medium term	2011-2021	-0.8 (unsmoothed)	Little or no change
Long term	1999-2021	+6.7 (unsmoothed)	Improvement

Table D2aii: Assessment of change in the extent of protected sites in England – at sea

Period	Date range	Percent change	Assessment of change
Short term	2016-2021	+82.7 (unsmoothed)	Improvement
Medium term	2011-2021	+730.9 (unsmoothed)	Improvement
Long term	1999-2021	+877.6 (unsmoothed)	Improvement

Table D2b: Assessment of change in the condition of Sites of Special Scientific Interest in England (in favourable condition)

Period	Date range	Percent change	Assessment of change
Short term	2016-2021	-0.5 (unsmoothed)	Little or no change
Medium term	2011-2021	+4.9 (unsmoothed)	Improvement
Long term	2003-2021	-12.8 (unsmoothed)	Deterioration

Percent change in Tables D2ai, D2aii and D2b refers to the difference seen between the first and last years in the specified date range.

D3 Area of woodland in England

Short description

This indicator shows change in the area of broadleaved and conifer woodland in England. Woodland as defined for the National Forest Inventory is land under stands of trees with a minimum area of 0.5 hectares, a width of at least 20 metres, and a canopy cover of at least 20% or having the potential to achieve this. The definition relates to land use, rather than land cover, so integral open space and areas of felled trees that are awaiting restocking (replanting) are included as woodland. Woodland is a key natural capital asset that provides many natural capital benefits, such as the provision of timber and other wood products, carbon storage, habitats for wildlife, and opportunities for exercise and recreation.

Relevant goals in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently
- Thriving plants and wildlife
- Enhanced beauty, heritage and engagement with the natural environment

Relevant targets in the 25 Year Environment Plan

- Creating or restoring 500,000 hectares of wildlife-rich habitat outside the protected sites network
- Increasing woodland in England in line with our aspiration of 12% cover by 2060

Position in the natural capital framework

Condition of assets – land; species and ecological communities

Related reporting commitments

- Equivalent data at UK level are reported to the United Nations Food and Agriculture Organisation for its regular Forest Resources Assessment, and to Forest Europe for publication in the State of Europe's Forests

Geographical scope

England. The related National Forest Inventory woodland map geospatial Open Data can be disaggregated to any sub-national geography required.

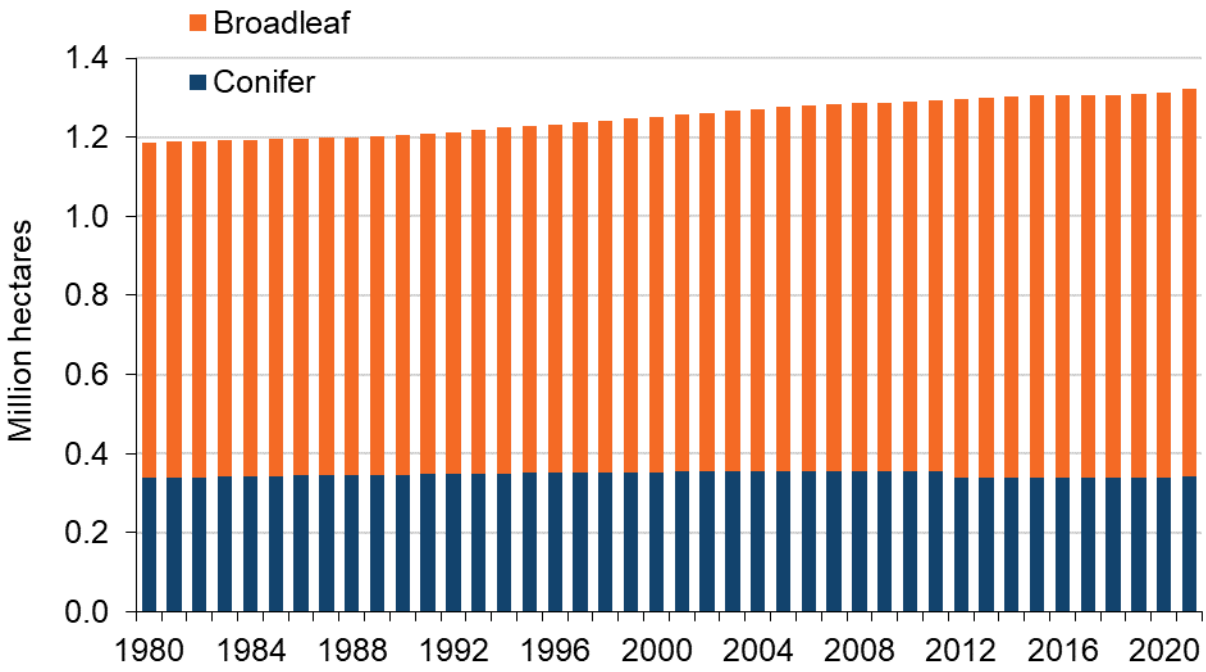
Status of indicator development

Final

Readiness and links to data

Data on the area of woodland are published annually in Forest Research's Forestry Statistics along with information on the data sources and methodology. Additional commentary on recent trends and new planting of woodland and trees in England is provided in the Forestry Commission's quarterly Key Performance Indicators.

Figure D3: Area of woodland in England, 1980 to 2021



Source, Forestry Commission; Forest Research

Trend description for Figure D3

The total area of woodland in England has increased from 1.19 million hectares in 1980 to 1.32 million hectares in 2021, equating to an increase from 9.1% to 10.1% of the land area of England. This growth has been driven by an increase in broadleaf woodland. The area of conifer woodland in England has remained relatively static over the last 40 years.

Assessment of change

Over the most recent 5 years for which trends can be assessed (2016 to 2021) and in the medium term (2011 to 2021), the observed increases in the area of woodland in England count as ‘little or no change’. This is because it would take a large area of additional woodland cover to reach the +3% change needed to for the ‘improvement’ category to be assigned. There has been an increase (improvement) over the long term. This assessment does not consider whether any improvement is on a sufficient scale for meeting targets. Change since 2018 has also been assessed. There has been ‘little or no change’ in woodland cover since 2018.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table D3: Assessment of change in the area of Woodland in England

Period	Date range	Percent change	Assessment of change
Short term	2016-2021	+1.1 (unsmoothed data)	Little or no change
Medium term	2011-2021	+2.1 (unsmoothed data)	Little or no change
Long term	1980-2021	+11.2 (unsmoothed data)	Improvement

Percent change refers to the difference seen from the first to last year in the specified date range.

D4 Relative abundance and/or distribution of widespread species

Short description

This indicator will use regularly collected data to track changes in relative abundance and/or distribution of species which are widespread and characteristic of different broad habitats in England including birds, bats, butterflies, moths, other invertebrates, and plants. The indicator will have 2 components: (a) changes in the relative abundance of those widespread species for which relevant data are available; and (b) changes in the distribution (the number of 1km grid squares in which species are recorded in any given year) of widespread species for which relevant data are available.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Taking action to recover threatened, iconic or economically important species of animals, plants and fungi, and where possible to prevent human-induced extinction or loss of known threatened species in England and the Overseas Territories

Position in the natural capital framework

Condition of asset – species and ecological communities

Related reporting commitments

- Sustainable Development Goal 15 Life on Land
- Convention on Biological Diversity Aichi Targets 7, 8 and 12

Geographical scope

England

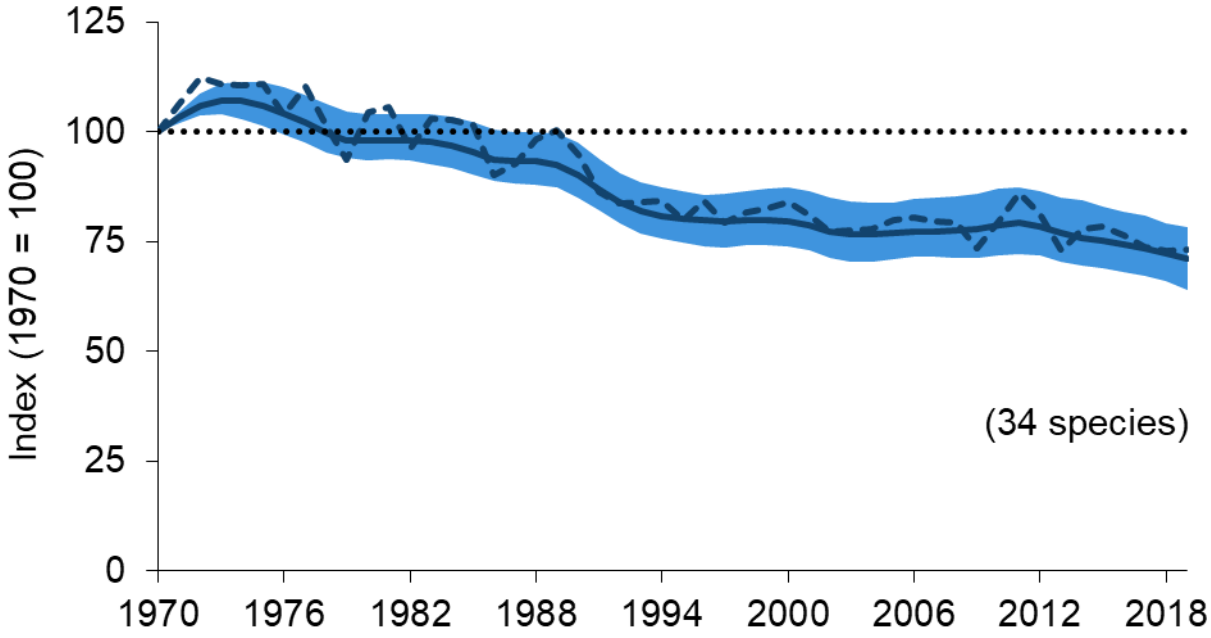
Status of indicator development

Interim

Readiness and links to data

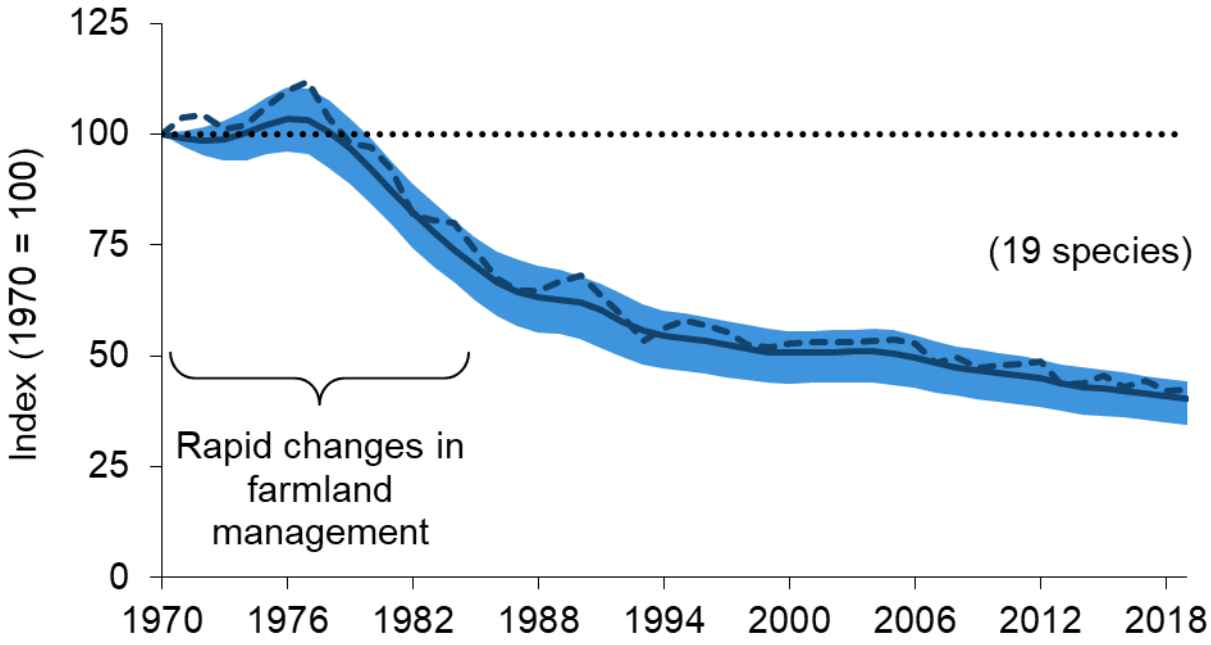
This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows trends in the abundance of (a) breeding wild birds, (b) widespread butterflies and (c) widespread bats in England. The expectation is that this indicator will be expanded to include more species groups and habitat types in the future. Some data are already published annually elsewhere (wild birds, butterflies on farmland and in woodland, and bats), and methods for analysing trends in plants are being developed. Further work is required to combine and present trends for different species groups and habitat types within the abundance and distribution measures in this indicator.

Figure D4ai (interim): Trends in abundance of breeding wild birds in woodland in England, 1970 to 2019



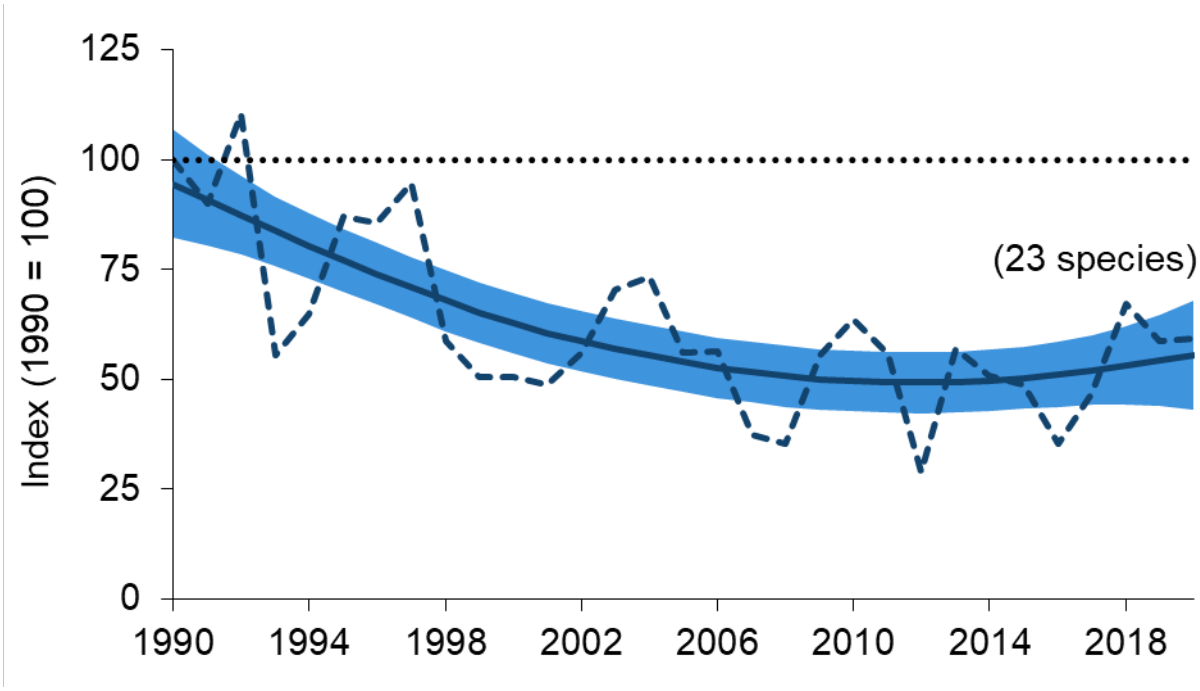
Source, Defra

Figure D4aii (interim): Trends in abundance of breeding wild birds on farmland in England, 1970 to 2019



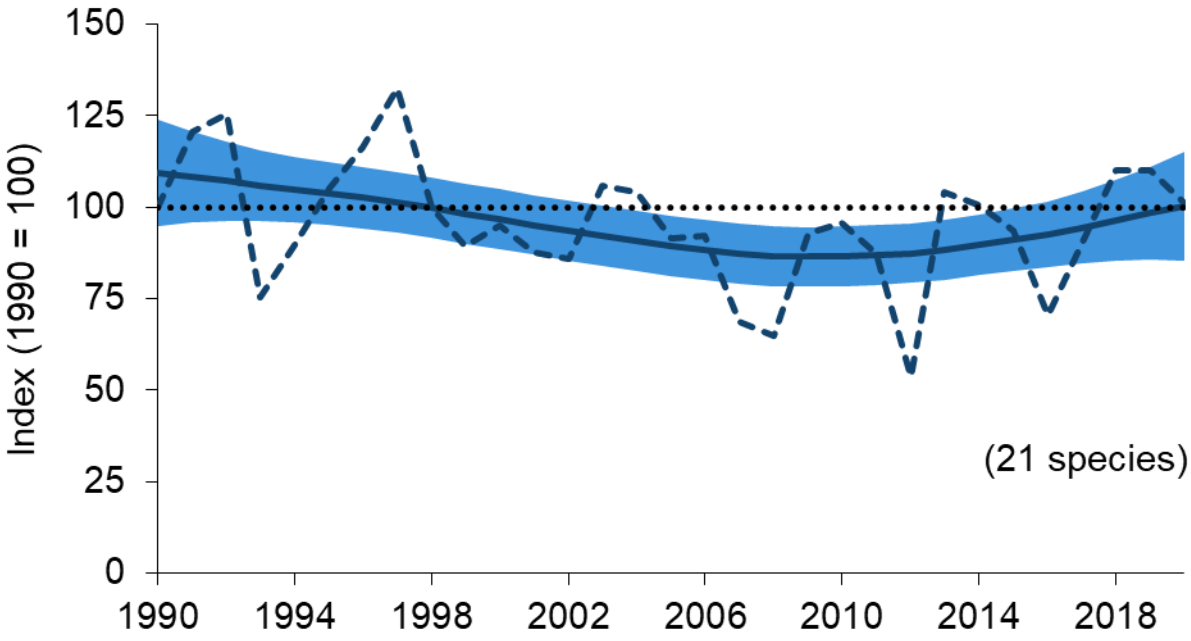
Source, Defra

Figure D4bi (interim): Trends in abundance of widespread butterflies in woodland in England, 1990 to 2020



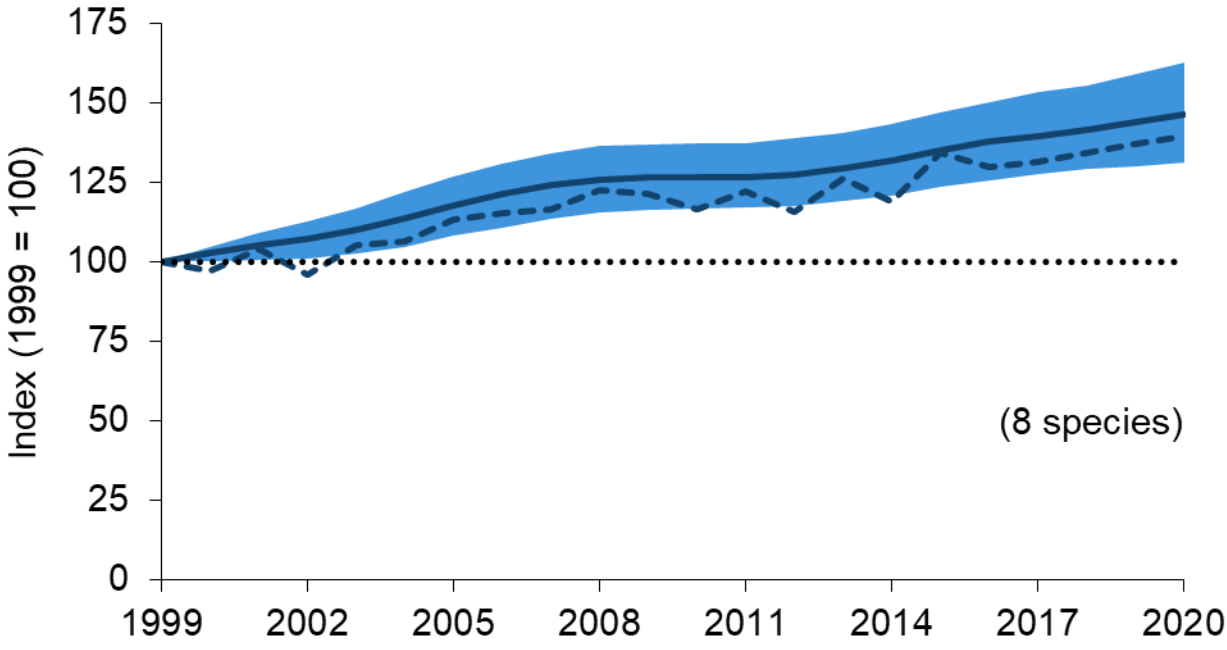
Source, Defra

Figure D4bii (interim): Trends in abundance of widespread butterflies on farmland in England, 1990 to 2020



Source, Defra

Figure D4c (interim): Trends in abundance of bats in England, 1999 to 2020



Source, Defra

Note on Figures D4ai, D4aii, D4bi, D4bii and D4c

Figures D4ai, D4aii, D4bi, D4bii and D4c show the unsmoothed (dashed lines) and smoothed (solid lines) trends for each of the species indices. The shaded areas represent

the 95% confidence intervals (measures of uncertainty) for the smoothed trends and the figures in brackets show the number of species included within each composite index.

Due to COVID-19 restrictions in England, the latest Breeding Bird Survey report prepared by the British Trust for Ornithology, the RSPB and the Joint Nature Conservation Committee collected limited data in 2020 and therefore it was not possible to update the indicators for breeding wild birds in woodland and on farmland in England either here or in the source publication.

Trend description for Figures D4ai, D4aii, D4bi, D4bii and D4c

Whilst the following overall trends are clear from the charts, they mask the trends for individual species within each index – some farmland and woodland species trends have increased whereas others have either remained the same or decreased over time. Further details on these individual species trends are available in the source publications.

D4a) Breeding wild birds

The indicators for breeding wild birds in woodland and on farmland in England have both declined between 1970 and 2019; the former by almost 30%, the latter by 60%. Farmland birds experienced steeper declines during the late 1970's and early 1980's because of rapid changes in farmland management.

D4b) Widespread butterflies

The indicators for widespread butterflies in woodland and on farmland in England also declined between 1990 and 2010, the former more steeply than the latter. However, in recent years, the woodland butterfly indicator has shown little change while the farmland butterfly indicator has increased to a figure similar to its 1990 baseline value.

D4c) Widespread bats

The indicator for widespread bats in England has increased by approximately 40% since the turn of the century. The bat species within this index vary in their habitat requirements, but all occur in farmland and woodland landscapes.

Assessment of change

Indicators for breeding wild birds, widespread butterflies and widespread bats in England are also reported in the England Biodiversity Indicators, which presents a short and long-term assessment for the same time periods used in this Outcome Indicator Framework assessment. These assessment results were reused as the England Biodiversity Indicators method is tailored to the datasets of the specific taxonomic groups (birds, butterflies and bats) and factors-in information on confidence. The assessment found a decrease (or deterioration) in both breeding wild birds on farmland and woodland in England over the short term (the most recent 5 years for which data were available). There was little or no change in widespread butterflies in woodland and on farmland over this period, and an increase (or improvement) in widespread bats. Over the long term, decreases in breeding wild birds in woodland and on farmland, and widespread butterflies

in woodland, were recorded. Widespread butterflies on farmland showed little or no change in the long term, while widespread bats increased.

Change since 2018 has also been assessed. An assessment using the England Biodiversity Indicators methodology was only available for butterflies for this time period. Little or no change was seen since 2018 for both widespread woodland and farmland butterflies. However, this is based on 3 data points so should be considered as indicative and not evidence of a clear trend.

Details on the England Biodiversity Indicators assessment method can be found in sections 5 and 6 of the latest England Biodiversity Indicators report. Further assessment summaries by 25 Year Environment Plan goal and information on indicator links are additionally presented in Section C.

Table D4ai: Assessment of change in the abundance of breeding wild birds in woodland in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-6.0 (smoothed data)	Deterioration
Medium term	N/A	N/A	Not assessed
Long term	1970-2018	-27.6 (smoothed data)	Deterioration

Table D4aii: Assessment of change in the abundance of breeding wild birds on farmland in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-6.4 (smoothed data)	Deterioration
Medium term	N/A	N/A	Not assessed
Long term	1970-2018	-59.0 (smoothed data)	Deterioration

Table D4bi: Assessment of change in the abundance of widespread butterflies in woodland in England

Period	Date range	Percent change	Assessment of change
Short term	2015-2020	+ 10.4 (smoothed data)	Little or no change
Medium term	2010-2020	+12.0 (smoothed data)	Little or no change
Long term	1990-2020	- 41.1 (smoothed data)	Deterioration

Table D4bii: Assessment of change in the abundance of widespread butterflies on farmland in England

Period	Date range	Percent change	Assessment of change
Short term	2015-2020	+10.2 (smoothed data)	Little or no change
Medium term	2010-2020	+16.0 (smoothed data)	Little or no change
Long term	1990-2020	-8.3 (smoothed data)	Little or no change

Table D4c: Assessment of change in the abundance of widespread bats in England

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	+9.1 (smoothed data)	Improvement
Medium term	N/A	N/A	Not assessed
Long term	1999-2019	+43.9 (smoothed data)	Improvement

Note that smoothed data presented in Figures D4ai to D4c were used for percent change calculations. The smoothing method is specific to this indicator and differs from the default Loess smoothing approach adopted for most indicators for the Outcome Indicator Framework assessment. Percent change figures in Tables D4ai to D4c may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen between the first and last years in the specified date range.

D5 Conservation status of our native species

Short description

This indicator will track changes in the national (Great Britain) extinction risk faced by terrestrial, freshwater and marine species using the International Union for Conservation of Nature's (IUCN) Red List categories and criteria. The Red-listing process classifies each species into one of 10 categories including Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered and Regionally Extinct. A simple Red List index will be constructed to summarise the changes in numbers of species between each category over time.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Taking action to recover threatened, iconic or economically important species of animals, plants and fungi, and where possible to prevent human-induced extinction or loss of known threatened species in England and the Overseas Territories

Position in the natural capital framework

Condition of asset – species and ecological communities

Related reporting commitments

- Contributes to reporting under the Habitats and Species Conservation Regulation 2017, which meets our commitments under the Convention on Biological Diversity Aichi Targets 12 and 13
- Relevant to Sustainable Development Goal 15 (Life on land)
- May provide evidence in support of Climate Change Risk Assessment under the Climate Change Act (2008)

Geographical scope

Great Britain

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022. However, baseline assessment data for approximately 10,000 species are already available, including those for Mammals, Birds, many Invertebrate groups, Vascular Plants, Lichens, Bryophytes, and some Fungi. Assessments for several thousand more species are currently underway to increase the diversity of species in the baseline and the indicator. Further development work is also underway, exploring the sensitivity of the index to such factors as the real rates of change across categories under various policy scenarios and the frequency with which assessments are repeated and/or updated. Data on the extinction risk faced by individual species in Great Britain are published by the JNCC as Conservation Designations for UK taxa, whilst information on the derivation of a Red List Index is available on the IUCN website.

Available data on changes in abundance and distribution of native species are presented in indicators ‘D4 Relative abundance and/or distribution of widespread species’, ‘D6 Relative abundance and/or distribution of priority species’ and ‘D7 Species supporting ecosystem functions’.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

D6 Relative abundance and distribution of priority species in England

Short description

Priority Species are those identified as the most threatened or declining species in the UK. They were identified to support UK conservation planning and are published and maintained by the Joint Nature Conservation Committee. Priority species are used as the reference source to produce statutory species lists of principal conservation importance. Such lists are published by the Secretary of State under Section 41 of the Natural Environment and Rural Communities Act 2006. There are over 940 priority species recognised in England.

This indicator has 2 components: (a) changes in the relative abundance of those priority species for which suitable abundance data are available; and (b) changes in distribution (the number of 1km grid squares in which species are recorded in any given year) of those priority species for which distribution data are available. The relative abundance of a species will increase when the population of the species grows; it will decrease when the

population of the species declines. The occupancy index will increase when a species becomes more widespread; it will decrease when a species becomes less widespread.

The taxonomic coverage of this indicator is limited at present. The relative abundance measure includes priority birds, butterflies, some mammals (one hare and 5 bats) and moths but does not currently include plants, fungi, amphibians, reptiles, fish or invertebrates other than butterflies and moths; the distribution measure includes priority species of bryophytes, lichens, insects and other invertebrates but does not currently include amphibians, reptiles, birds, fish or mammals.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Taking action to recover threatened, iconic or economically important species of animals, plants and fungi, and where possible to prevent human-induced extinction or loss of known threatened species in England and the Overseas Territories

Position in the natural capital framework

Condition of asset – species and ecological communities

Related reporting commitments

- Sustainable Development Goal 15 Life on Land
- Convention on Biological Diversity Aichi Target 12

Geographical scope

England

Status of indicator development

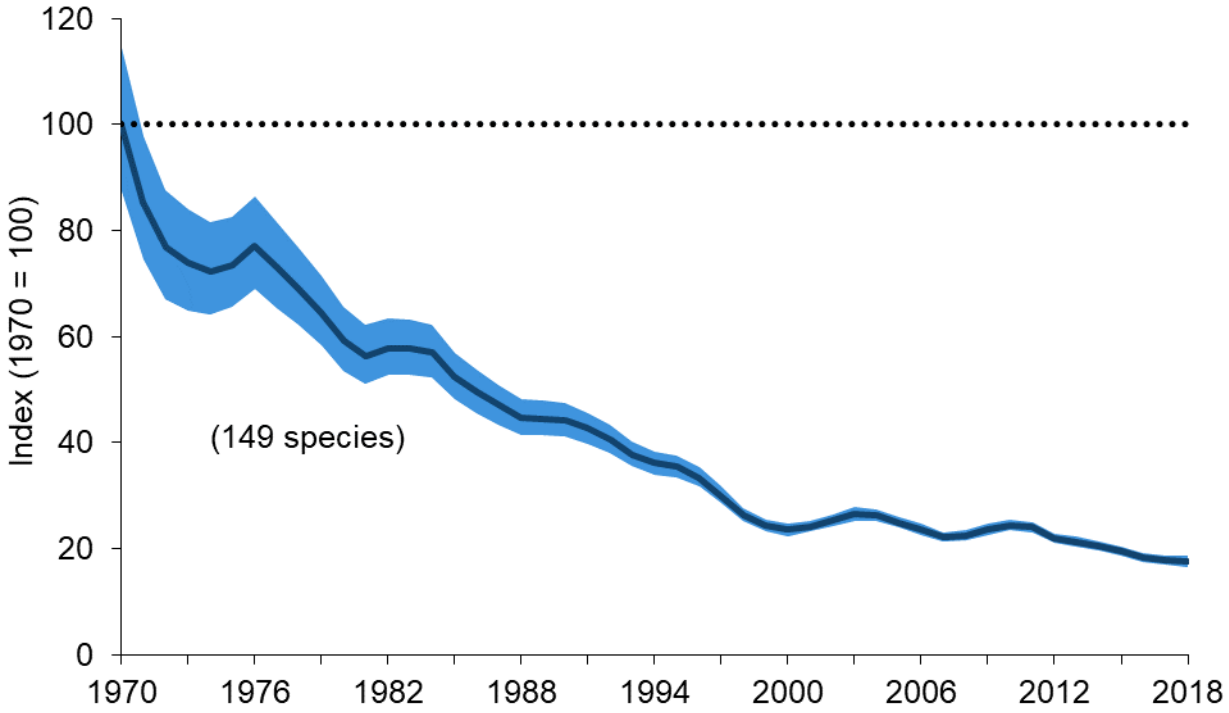
Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. Trends for the relative abundance and distribution of priority species at an England-level were presented here for the first time in 2021 as a revised interim indicator, but there are no new data available to update this indicator in 2022. Further details about this indicator, including a technical background document that describes the data sources and methods in detail, and spreadsheets that contain a list of species within each index together with the data behind the indices are published annually as England Biodiversity Indicators 4a and 4b – Status of priority species: relative abundance and distribution. Methods are being developed to refine the future reporting of this indicator and to expand the taxonomic coverage.

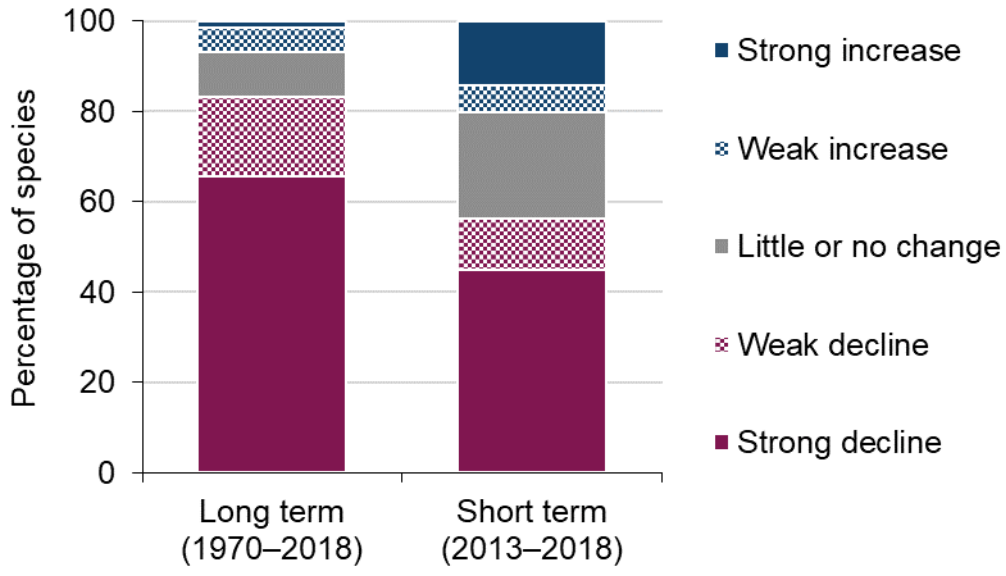
These methods are still undergoing peer review and user feedback is invited via 25YEPindicators@defra.gov.uk.

Figure D6ai (interim): Relative abundance of priority species in England, 1970 to 2018



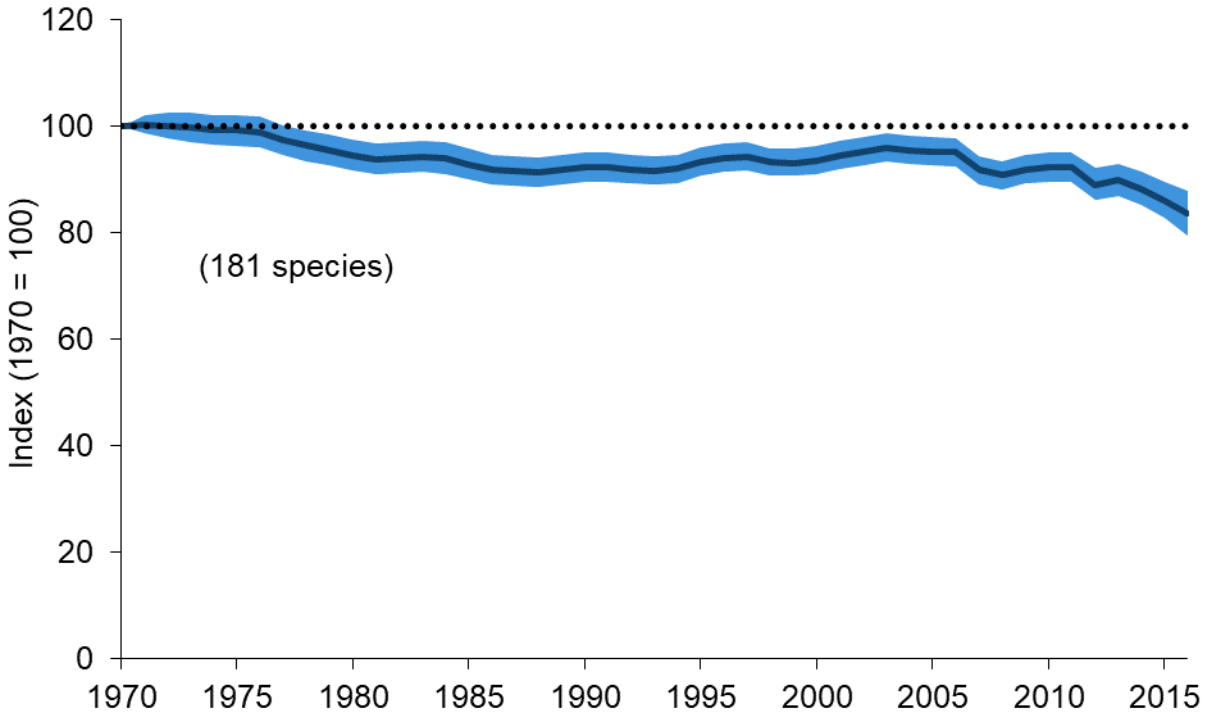
Source, Defra

Figure D6aii (interim): Long-term and short-term changes in the relative abundance of individual priority species in England, 1970 to 2018



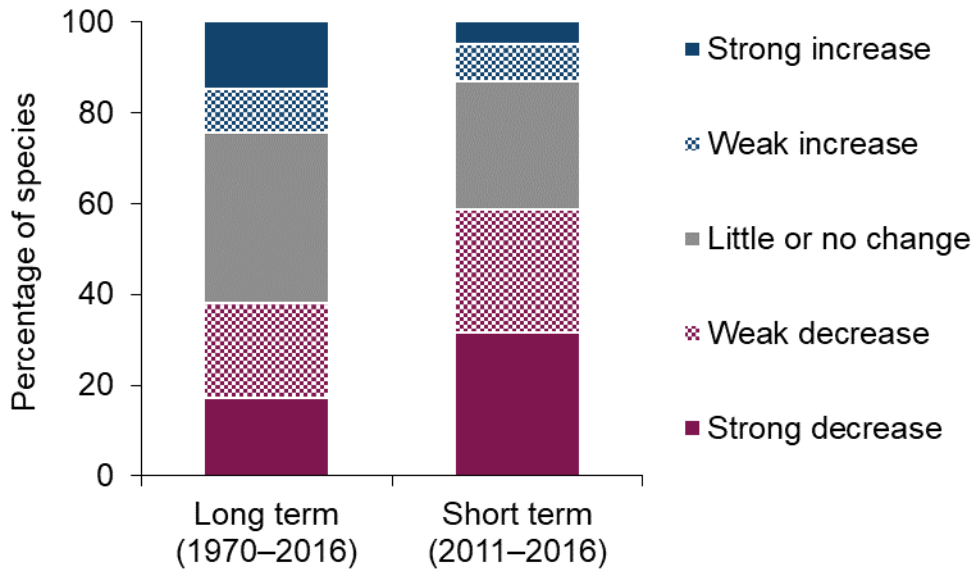
Source, Defra

Figure D6bi (interim): Distribution of priority species in England, 1970 to 2016



Source, Defra

Figure D6bii (interim): Long-term and short-term changes in the distribution of individual priority species in England, 1970 to 2016



Source, Defra

Note on Figures D6ai, D6aii, D6bi and D6bii

The shaded areas on the line graphs represent the 95% credible intervals (measures of uncertainty) for the smoothed relative abundance and distribution indices. The width of the

credible interval (CI) is in part determined by the proportion of species in the indicator for which data are available; for the relative abundance data, the CI narrows as data become available for groups such as bats in the 1990s and widens as datasets such as the Rothamsted Insect Survey drop out before the final indicator year. The numbers in brackets show the number of species included within each composite measure.

Of the more than 940 species in the priority species list for England, 149 have robust quantitative time-series data on relative abundance and 181 have suitable distribution data. The relative abundance measure comprises Birds (44), Butterflies (21), Mammals (6) and Moths (78); the distribution measure comprises Bees (13), Bryophytes (9), Lichens (16), Moths (93), Spiders (9), Wasps (7), and 34 species representing other taxonomic groups. Approximately 60 species of moths appear in both the relative abundance and distribution measures; the remaining species within this indicator are unique to one or other of the measures because they are drawn from different data sources. The abundance datasets are generated largely from data collected by national monitoring schemes, whereas the distribution data are collated through the Biological Records Centre and include contributions from a wide range of national recording schemes (see the technical background document referenced in the 'Readiness and links to data' section for further detail).

Composite indices mask individual species trends. Therefore, the bar charts are included to show the number of priority species included within each measure that have increased, decreased or displayed little or no overall change in their relative abundance and/or distribution over 2 time periods, (i) long term (since the time series began in 1970) and (ii) short term (latest 5 years of the time series).

Trend description for Figures D6ai, D6aii, D6bi and D6bii

D6a) Changes in abundance of priority species

By 2018, the index of relative abundance of priority species in England had declined to 17.7% of its base-line value in 1970, a statistically significant decrease. Over this long-term period, 7% of species showed a strong or weak increase and 83% showed a strong or weak decline. More recently, between 2013 and 2018, the relative abundance index declined from 21.3 to 17.7 (17% of the 2013 value), again a statistically significant decrease. Over this short-term period, 20% of species showed a strong or weak increase and 56% showed a strong or weak decline.

D6b) Changes in distribution of priority species

By 2016, the index of distribution of priority species in England decreased to 84, a statistically significant decrease of 16% of the 1970 value. Over this long-term period, 24% of species showed a strong or weak increase and 38% showed a strong or weak decline. More recently, between 2011 and 2016, the distribution index declined from 92.3 to 83.7 (9% of the 2011 value), again a statistically significant decrease. Over this short-term period, 13% of species showed a strong or weak increase and 59% showed a strong or weak decline.

Assessment of change

Indicators for relative abundance and distribution of priority species in England are also reported in the England Biodiversity Indicators, which presents a short and long-term assessment for the same time periods used in this Outcome Indicator Framework assessment. These assessment results were reused as the England Biodiversity Indicators method is more tailored to the specific dataset and factors-in information on confidence. No results were available for the medium-term period using the England Biodiversity Indicators methodology, although this will be considered for the next publication. The assessment found a decrease (or deterioration) in both the relative abundance and distribution of priority species in England over the short term (the most recent 5 years for which data were available). There were also decreases recorded over the long term.

Change since 2018 has not been assessed for this indicator as sufficient data are not yet available.

Details on the England Biodiversity Indicators assessment method can be found in sections 4a and b of the latest England Biodiversity Indicators report. Further assessment summaries by 25 Year Environment Plan goal and information on indicator links are additionally presented in Section C.

Table D6a: Assessment of change in the relative abundance of priority species in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-17.2 (smoothed data)	Deterioration
Medium term	N/A	N/A	Not assessed
Long term	1970-2018	-82.3 (smoothed data)	Deterioration

Table D6b: Assessment of change in the distribution of priority species in England

Period	Date range	Percent change	Assessment of change
Short term	2011-2016	-9.3 (smoothed data)	Deterioration
Medium term	N/A	N/A	Not assessed
Long term	1970-2016	-16.3 (smoothed data)	Deterioration

Note that smoothed data presented in the indicator charts were used for percent change calculations. The smoothing method is specific to this indicator and differs from the default Loess smoothing approach adopted for most indicators for the Outcome Indicator Framework assessment. Percent change figures in Tables D6a and D6b may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen between the first and last years in the specified date range.

D7 Species supporting ecosystem functions

Short description

All species have a functional role within ecosystems such as photosynthesis, respiration, decomposition, nutrient cycling, predator-prey and symbiotic relationships such as pollination. Plants, fungi, algae, invertebrates and soil micro-organisms are particularly important. The presence, abundance and diversity of species are key factors in determining the resilience of ecosystems to environmental changes, including climate change and disease, and the maintenance of ecosystem services. Further research is required to develop this indicator, building on the existing UK pollinator indicator and defining species groups and functions for inclusion.

Relevant goal in the 25 Year Environment Plan

- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Taking action to recover threatened, iconic or economically important species of animals, plants and fungi, and where possible to prevent human-induced extinction or loss of known threatened species in England and the Overseas Territories

Position in the natural capital framework

Condition of asset – species and ecological communities

Related reporting commitments

- May provide evidence in support of Climate Change Risk Assessment under the Climate Change Act (2008)
- Convention on Biological Diversity Aichi Targets 7 and 8

Geographical scope

England. The interim indicator is only available for the UK.

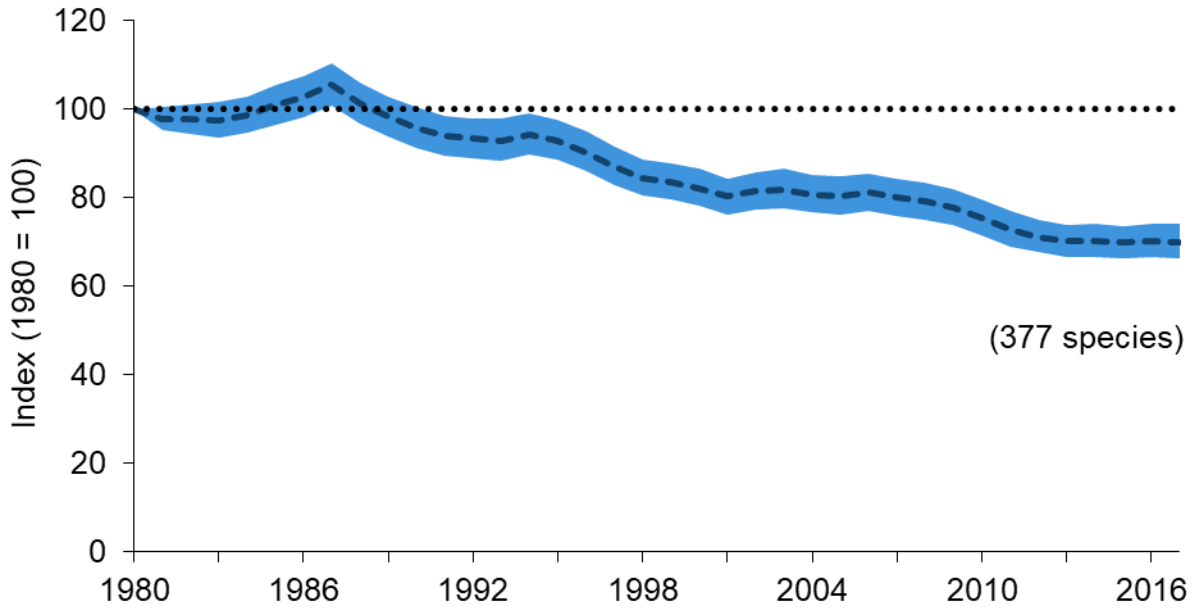
Status of indicator development

Interim

Readiness and links to data

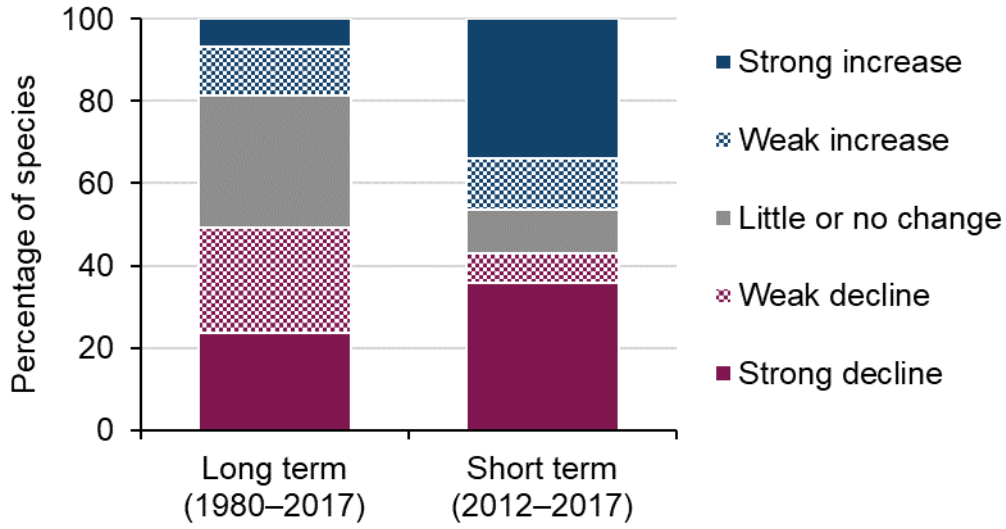
This indicator is not available for reporting in 2022 in a finalised form, and there were no new data available to update this interim form of the indicator this year. This interim indicator shows trends in the distribution (occupancy of 1km grid squares) of pollinators (bees and hoverflies) in the UK. These data are published annually as UK Biodiversity Indicator D1c – Status of pollinating insects. Significant further research and development is required to include a range of species groups important for supporting ecosystem functions in England.

Figure D7i (interim): Change in the distribution of pollinators in the UK, 1980 to 2017



Source, Defra

Figure D7ii (interim): Long-term and short-term changes in the distribution of individual pollinator species in the UK, 1980 to 2017



Source, Defra

Note on Figures D7i and D7ii

The line graph shows the unsmoothed composite indicator trend (dashed line) and the shaded area represents the 90% credible interval (measure of uncertainty) for this trend. The figure in brackets shows the total number of species included in the index (148 wild bee and 229 hoverfly species); the number of species can vary between years and hence this indicator may not be directly comparable to those appearing in previous publications.

Composite indices mask individual species trends therefore the bar chart shows the percentage of species within the indicator that have increased, decreased or shown little or no change in occupancy, based on set thresholds of change over the long term (since the time series began in 1980) and short term (latest 5 years).

Trend description for Figures D7i and D7ii

There was an overall decrease in the UK pollinators index from 1987 onwards. In 2017, the index had declined by 30% compared to its value in 1980. More recently however, this downward trend has slowed, with the indicator decreasing by less than 2% between 2012 and 2017. These overall declines mask the trends of the individual species within the index, 49% of which have become less widespread, 19% of which have become more widespread and 32% of which have shown little or no change since the index began in 1980. By contrast, over the short term (between 2012 and 2017), a slightly greater proportion of species have become more widespread (46%) than have become less widespread (43%).

Assessment of change

The indicator 'Change in the distribution of pollinators in the UK' is also reported in the England Biodiversity Indicators, which presents a short and long-term assessment for the same time periods used in this Outcome Indicator Framework assessment. These assessment results were reused as the England Biodiversity Indicators method is more tailored to the specific dataset and factors-in information on confidence. No results were available for the medium-term period using the England Biodiversity Indicators methodology, although this will be considered for the next publication. The assessment found little or no change in the distribution of pollinators in the UK in the short term (the most recent 5 years for which data were available). There was a long-term decrease (or deterioration).

Change since 2018 has not been assessed for this indicator as sufficient data are not yet available.

Details on the England Biodiversity Indicators assessment method can be found in section 10 of the latest England Biodiversity Indicators report. Further assessment summaries by 25 Year Environment Plan goal and information on indicator links are additionally presented in Section C.

Table D7i: Assessment of change in the distribution of pollinators in the UK

Period	Date range	Percent change	Assessment of change
Short term	2012-2017	-1.7 (unsmoothed data)	Little or no change
Medium term	N/A	N/A	Not assessed
Long term	1980-2017	-30.1 (unsmoothed data)	Deterioration

Note that smoothed data presented in the indicator charts were used for percent change calculations. The smoothing method is specific to this indicator and differs from the default Loess smoothing approach adopted for most indicators for the Outcome Indicator

Framework assessment. Percent change figures in Table D7 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen between the first and last years in the specified date range.

Theme E: Natural Resources

E1 Area of productive agricultural land

Short description

Agriculture provides around 75% of the indigenous food we eat (food which can be produced in the climatic conditions of the UK) and accounts for around 70% of land use. As well as being vital for food production, agriculture helps to shape the landscape, providing important recreational, spiritual and other cultural benefits. This indicator shows annual changes in land used for agriculture in 3 categories: grassland (including sole rough grazing); crops (including horticulture and perennial crops); and uncropped arable (land left fallow or under environmental management). Agricultural production and the associated land use and management are key drivers of the environmental impacts from the sector. A key policy challenge is to de-couple production from environmental impact. The indicator may be considered a measure of pressure on the environment, a measure of condition of the land asset, or a measure of service/benefit we derive from the land. The indicator is included in the framework to provide contextual information.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Ensuring that food is produced sustainably and profitably

Position in the natural capital framework

Condition of asset – land

Related reporting commitments

- None

Geographical scope

England

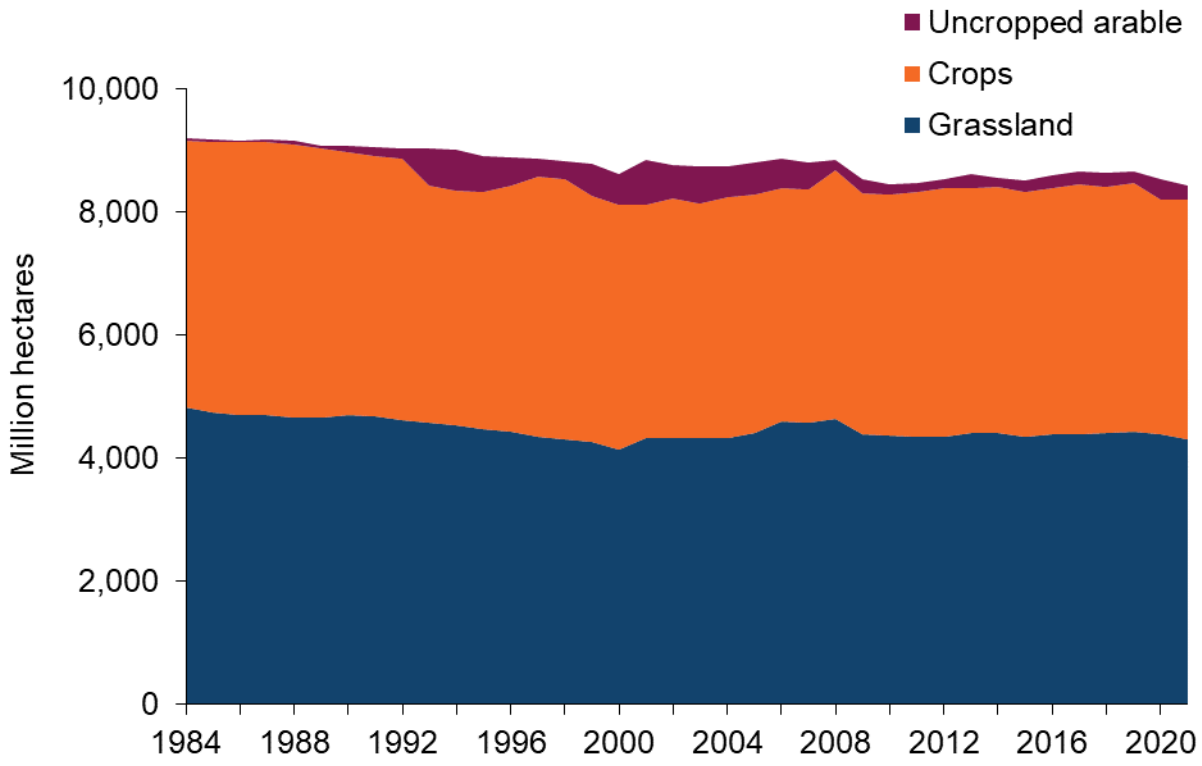
Status of indicator development

Final

Readiness and links to data

Data on the structure of the agricultural industry in England are already published annually as National Statistics.

Figure E1: Area of productive agricultural land in England, 1984 to 2021



Source, Defra

Trend description for Figure E1

After a period of decline in the late 1980s, land use by agriculture has remained relatively stable. Similarly, the split between crops and grazing has remained relatively constant over this time, with grassland accounting for around half of agricultural land (51% in 2021) and crops a little under half (46% in 2021).

Assessment of change

Little or no change was observed for area of agricultural land over the most recent 5 years for which trends can be assessed (2015 to 2020) and in the medium term. There has been a decrease in the long term since 1984. It is not possible to categorise this decrease as either an ‘improvement’ or ‘deterioration’. Whether a change away from agricultural land is positive for the environment will depend on numerous factors such as the farming practices that were employed and what the new land use is.

Change since the start of the 25 Year Environment Plan has also been assessed. There has been little or no change in area of agricultural land since 2018, based on 4 years of

data. We set a minimum of 5 data points for the production of a robust trend for this assessment so this result should be treated with caution until the next iteration is available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table E1: Assessment of change in the area of productive agricultural land in England

Period	Date range	Percent change	Assessment of change
Short term	2015-2020	-0.3 (smoothed Loess)	Little or no change
Medium term	2010-2020	-1 (smoothed Loess)	Little or no change
Long term	1984-2020	-7.4 (smoothed Loess)	Change (decreasing)

Note that assessment categories were assigned based on smoothed data, so percent change figures in Table E1 may differ from unsmoothed values quoted elsewhere. It is not possible to define a simplistic desired direction of change for this indicator so cannot assign ‘improvement’ or ‘deterioration’.

E2 Volume of agricultural production

Short description

Farming produces a range of food, feed and fibre commodities. This represents a valuable output from the land and other resources used. Volume of agricultural production is considered to be a provisioning service provided by a range of natural capital assets (land, water, air, species and ecological communities). This indicator shows annual changes in the index of output volume which provides an overall measure of total production across the wide range of agricultural commodities. The index is calculated using agreed international standards. Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats and impact on air, water and soils. This indicator should therefore be viewed alongside indicator ‘E3 Volume of inputs used in agricultural production’ and other indicators in the framework relating to the condition of natural capital assets.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Ensuring that food is produced sustainably and profitably

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- None

Geographical scope

England. The interim indicator is only available for the UK.

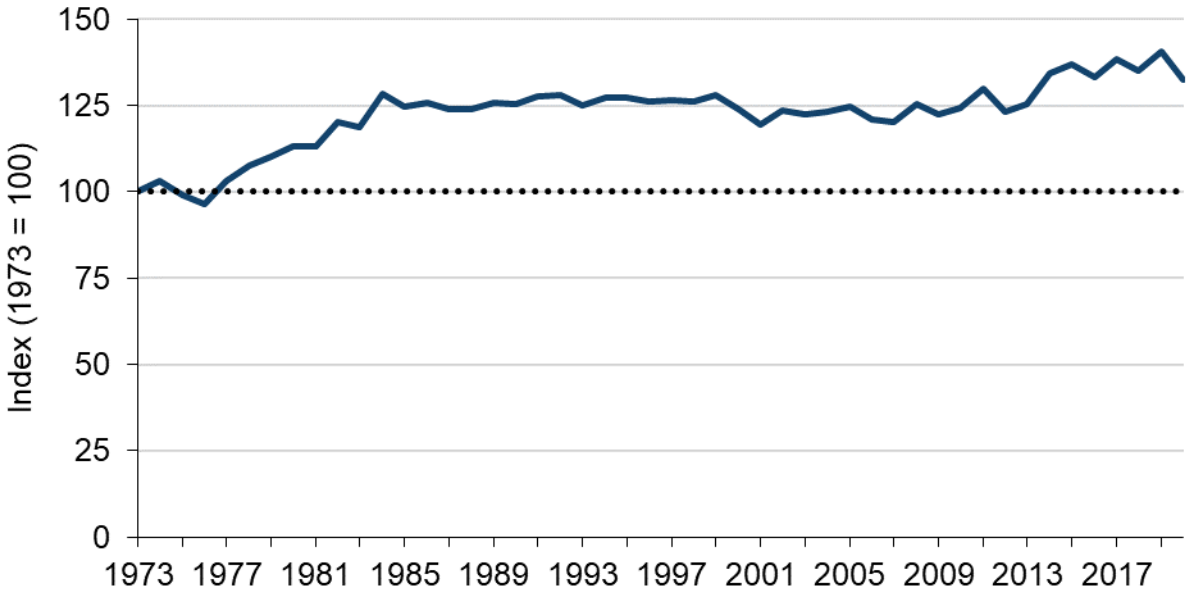
Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows the volume of agricultural production in the UK. Data on total factor productivity for England by farm type are published as experimental statistics, but the National Statistics publication on total factor productivity of the agricultural industry in the UK is considered to be a more reliable source for this indicator until the England-level data receive accreditation as National Statistics.

Figure E2 (interim): Volume of agricultural production in the UK, 1973 to 2020



Source, Defra

Trend description for Figure E2

After a period of sustained increase from the late 1970s to the mid-1980s the overall volume of agricultural production (outputs) in the UK has remained relatively stable, with some variation from year to year. Annual variations are generally driven by external factors, in particular weather, affecting growing and harvest and the variation in cropping driven by prices. Over the most recent year (2020), the overall volume of agricultural production in the UK fell by 5.7%; this was driven by a 14.1% decrease in total volume of

crop output, a 0.8% decrease in the output volume of livestock for meat, and a 0.5% decrease in the output volume of livestock products.

Assessment of change

An increase in volume of agricultural production has been observed over the most recent 5 years for which trends can be assessed (2014 to 2019), and in the medium and long term. It is not possible to categorise this increase as either a simplistic 'improvement' or 'deterioration' as this will depend on numerous factors around farming practices. This indicator is included in the Outcome Indicator Framework to help interpret the reasons behind changes in 'E4 Efficiency of agricultural production measured by Total Factor Productivity', rather than to assess progress for a policy driver in the 25 Year Environment Plan.

Change since 2018 has also been assessed. There has been little or no change in volume of agricultural production since 2018, based on 3 years of data. We set a minimum of 5 data points for the production of a robust trend for this assessment so this result should be treated with caution until the next iteration is available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table E2: Assessment of change in the volume of agricultural production in the UK

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	+5.8 (smoothed Loess)	Change (increasing)
Medium term	2009-2019	+9.9 (smoothed Loess)	Change (increasing)
Long term	1973-2019	+44.6 (smoothed Loess)	Change (increasing)

Note that assessment categories were assigned based on smoothed data, so percent change figures in Table E2 may differ from unsmoothed values quoted elsewhere. It is not possible to define a simplistic desired direction of change for this indicator so cannot assign 'improvement' or 'deterioration'.

E3 Volume of inputs used in agricultural production

Short description

To produce food and feed, farming uses a range of inputs including fertilisers, pesticides, energy and animal feed. In addition, labour and land is required as well as depreciation of capital. Minimising the use of these inputs is an important policy driver to improve productivity and hence improve profitability whilst reducing the environmental impacts of farming. Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats and impact on air, water and soils. Volume of

inputs may therefore be considered an indirect measure of pressure on a range of natural capital assets.

This indicator should be viewed alongside indicator ‘E2 Volume of agricultural production’ and other indicators in the framework relating to the condition of natural capital assets. The index of the volume of inputs is an overall measure of the total inputs used with price effects removed. This includes all inputs including intermediate consumption, land, labour and depreciation of capital.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Ensuring that food is produced sustainably and profitably

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- None

Geographical scope

England - The interim indicator is only available for the UK.

Status of indicator development

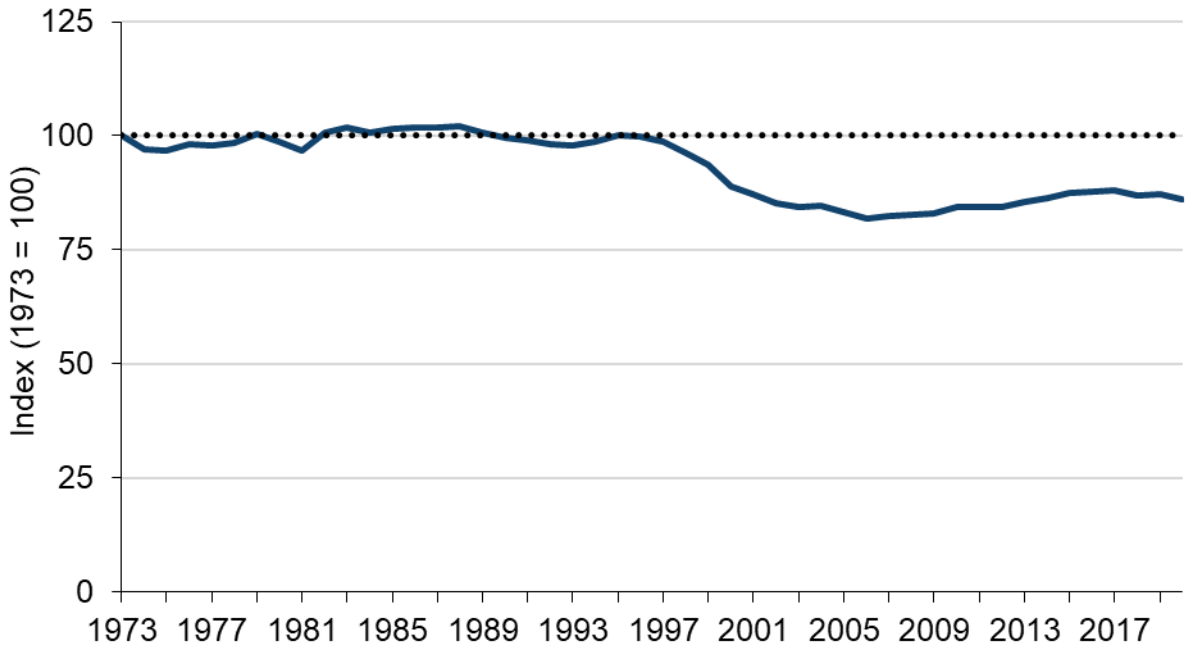
Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows the volume of inputs used in agricultural production in the UK.

Data on total factor productivity for England by farm type are published as experimental statistics, but the National Statistics publication on total factor productivity of the agricultural industry in the UK is considered to be a more reliable source for this indicator until the England-level data receive accreditation as National Statistics.

Figure E3 (interim): Volume of inputs used in agricultural production in the UK, 1973 to 2020



Source, Defra

Trend description for Figure E3

The volume of inputs used in agricultural production in the UK has shown an overall decline since 1973. Most of this decline took place between the late 1990s and 2006; since then, there has been a slight increase in the volume of inputs used in agricultural production, but the volume remains below historical levels. Over the most recent year (2020), the volume of inputs used in agricultural production in the UK fell slightly (by 1.2%).

Assessment of change

An increase in volume of inputs used in agricultural production has been observed over the most recent 5 years for which trends can be assessed (2014 to 2019), and in the medium term. This is in contrast to long-term decreasing trends. It is not possible to simplistically categorise these changes as either an ‘improvement’ or ‘deterioration’ for the environment as this will depend on the types of input driving change. An increase in inputs of pesticide and fertiliser would likely have a negative effect, but this indicator also includes other inputs such as labour. This indicator is included in the Outcome Indicator Framework to help interpret the reasons behind changes in ‘E4 Efficiency of agricultural production measured by Total Factor Productivity’.

Change since 2018 has also been assessed. There has been little or no change in volume of inputs used in agricultural production since 2018, based on 3 years of data. We set a minimum of 5 data points for the production of a robust trend for this assessment so this result should be treated with caution until the next iteration is available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table E3: Assessment of change in the volume of inputs used in agricultural production in the UK

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	+4.3 (smoothed Loess)	Change (increasing)
Medium term	2009-2019	+5.2 (smoothed Loess)	Change (increasing)
Long term	1973-2019	-8.5 (smoothed Loess)	Change (decreasing)

Note that assessment categories were assigned based on smoothed data, so percent change figures in Table E3 may differ from unsmoothed values quoted elsewhere. It is not possible to define a simplistic desired direction of change for this indicator so cannot assign ‘improvement’ or ‘deterioration’.

E4 Efficiency of agricultural production measured by Total Factor Productivity

Short description

Total factor productivity is a well-established index of how efficiently farming inputs (such as fertilisers, labour) are converted into outputs (such as wheat, milk) giving an indication of changes in the efficiency and competitiveness of the agriculture industry. It is based on the ratio of inputs (indicator ‘E3 Volume of inputs used in agricultural production’) to outputs (indicator ‘E2 Volume of agricultural production’) such that the higher the value, the more efficiently inputs are converted into outputs. Data are based on volumes rather than values so that price effects are removed. The measure is known as Total Factor Productivity as it takes into account all output and input factors, including land, labour, intermediate consumption and depreciation of capital.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Ensuring that food is produced sustainably and profitably

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- None

Geographical scope

England. The interim indicator is only available for the UK.

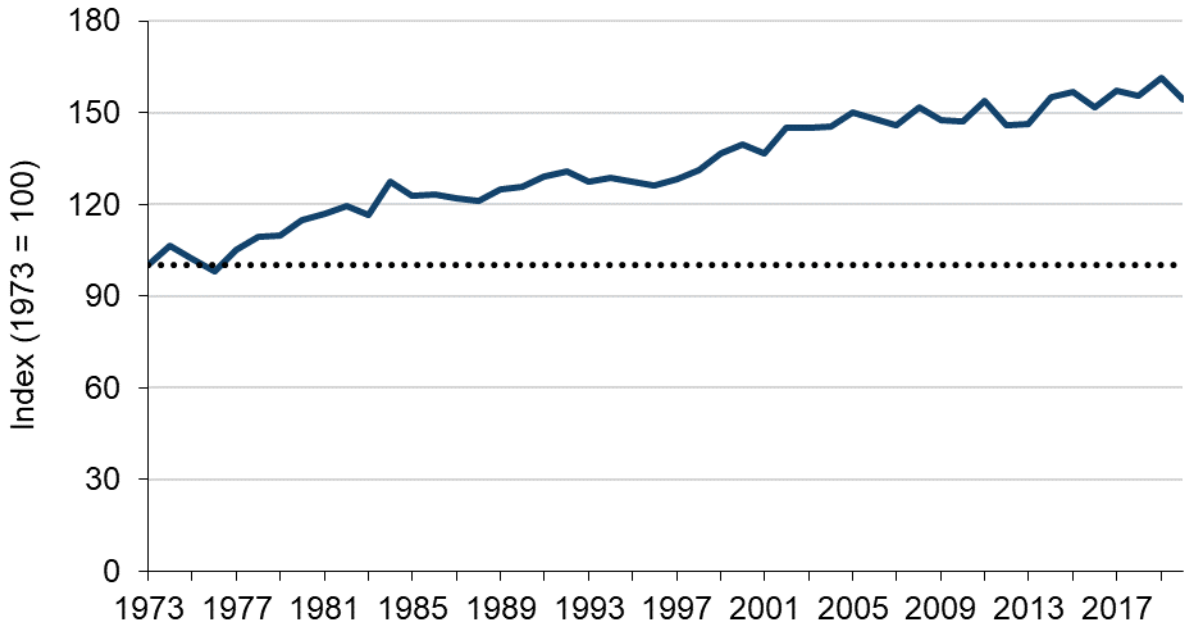
Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows the total factor productivity for the UK. Data on total factor productivity for England by farm type are published as experimental statistics, but the National Statistics publication on total factor productivity of the agricultural industry in the UK is considered to be a more reliable source for this indicator until the England-level data receive accreditation as National Statistics.

Figure E4 (interim): Efficiency of agricultural production in the UK measured by Total Factor Productivity, 1973 to 2020



Source, Defra

Trend description for Figure E4

Overall productivity is driven by both the output and input components. Total factor productivity of the agricultural industry in the UK was 54% higher in 2020 than it was in 1973. There has been an overall long-term increase driven by both increased outputs and a fall in inputs, although the separate trends (see indicators E2 and E3) have followed different patterns. There is considerable annual variation, this variation being mainly driven by variation in output volumes, and over the most recent year (2020), total factor productivity of the agricultural industry in the UK fell by 4.5%.

Assessment of change

Little or no change in efficiency of agricultural production measured by Total Factor Productivity has been observed over the most recent 5 years for which trends can be assessed (2014 to 2019). This is in contrast to increasing trends in the medium and long term. It is not possible to simplistically categorise any change as either an 'improvement' or 'deterioration' for the environment as this will depend on the farming practices driving change.

Change since 2018 has also been assessed. There has been little or no change in efficiency of agricultural production measured by Total Factor Productivity since 2018, based on 3 years of data. We set a minimum of 5 data points for the production of a robust trend for this assessment so this result should be treated with caution until the next iteration is available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table E4: Assessment of change in the efficiency of agricultural production in the UK measured by Total Factor Productivity

Period	Date range	Percent change	Assessment of change
Short term	2014-2019	+1.9 (smoothed Loess)	Little or no change
Medium term	2009-2019	+4.8 (smoothed Loess)	Change (increasing)
Long term	1973-2019	+57.2 (smoothed Loess)	Change (increasing)

Note that assessment categories were assigned based on smoothed data, so percent change figures in Table E4 may differ from unsmoothed values quoted elsewhere. It is not possible to define a simplistic desired direction of change for this indicator so cannot assign 'improvement' or 'deterioration'.

E5 Percentage of the annual growth of trees in English woodlands that is harvested

Short description

This indicator shows changes in the percentage of annual softwood and hardwood growth in England that is harvested annually. Separate statistics are available for softwood, hardwood, and both in total. This indicator helps us to better understand the levels of, and trends in, the economic productive utilisation of English timber resources as a part of sustainable forest management policies and practices.

The underlying data sources are National Statistics from Forest Research on UK Wood Production and Trade and National Forest Inventory forecasts of increase (increment) in the volume of wood that grows in England.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Increasing timber supplies

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- The component statistics that make up this indicator are provided, at UK level, to Forest Europe for publication in the State of Europe's Forests

Geographical scope

England

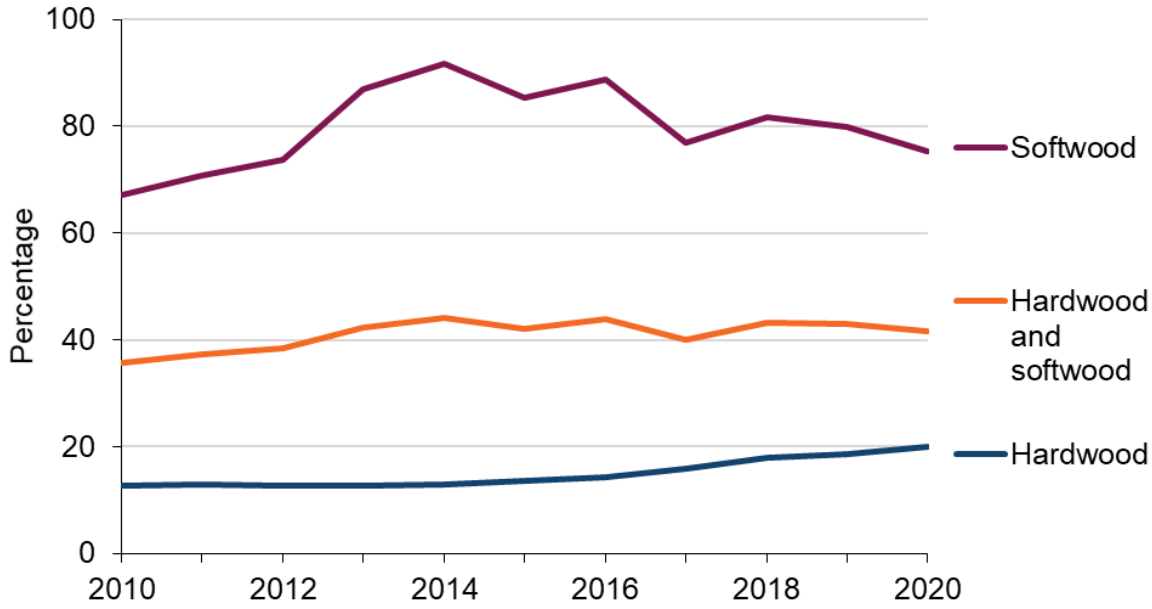
Status of indicator development

Final

Readiness and links to data

Data on the percentage of the annual growth of trees in English woodlands that is harvested are published in the Forestry Commission's Key Performance Indicators Reports.

Figure E5: Percentage of the annual growth of trees in English woodlands that is harvested, 2010 to 2020



Source, Forestry Commission; Forest Research

Trend description for Figure E5

The percentage of softwood growth in England which is harvested has fluctuated between 67% and 92% over the 11 years for which these data are reported, reflecting sustained active management of softwood resources. The percentage of hardwood growth which is harvested has increased slightly, although it remains much lower (between 13% and 20% over the same 11-year period), reflecting a lower level of active management of broadleaved woodland for timber supplies.

Assessment of change

Little or no change was observed for the percentage of the total annual growth of trees in English woodlands that is harvested (hardwood and softwood combined) over the most recent 5 years for which trends can be assessed (2015 to 2020). There has been an increase (or improvement) over the medium term (2010 to 2020). The time series is not yet sufficient to make an assessment for a long-term period.

Change since 2018 has also been assessed. There has been a decrease (or deterioration) in the percentage of annual growth harvested since 2018. However, this is based on only 3 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table E5: Assessment of change in the percentage of annual growth of trees in English woodlands that is harvested

Period	Date range	Percent change	Assessment of change
Short term	2015-2020	-0.7 (unsmoothed data)	Little or no change
Medium term	2010-2020	+17.1 (unsmoothed data)	Improvement
Long term	N/A	N/A	Not assessed

Percent change refers to the difference seen from the first to last year in the specified date range.

E6 Volume of timber brought to market per annum from English sources

Short description

This indicator shows changes in the volume of commercial timber brought to market from woodlands in England by Forestry England from the nation's forests, and by other owners of woodland. It is a measure of the level of active management of woodland assets for economic productive purposes. The data are National Statistics from Forest Research on UK Wood Production and Trade.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Increasing timber supplies

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- Related statistics on total UK fellings are provided to Forest Europe for publication in the State of Europe's Forests

Geographical scope

England

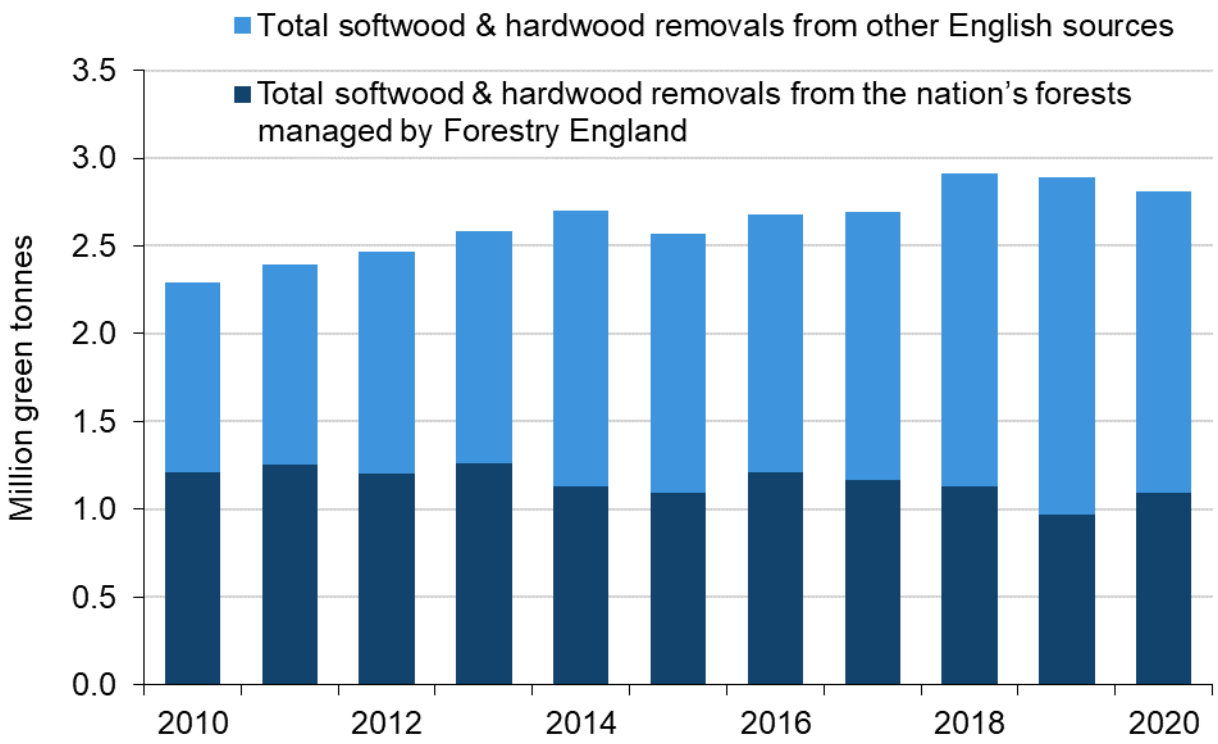
Status of indicator development

Final

Readiness and links to data

Data on the volume of timber brought to market from English sources are published annually in the Forestry Commission's Key Performance Indicators Reports.

Figure E6: Volume of timber brought to market from English sources, 2010 to 2020



Source, Forestry Commission; Forest Research

Trend description for Figure E6

The total annual volume of softwood and hardwood timber brought to market in England has increased from 2.3 million green tonnes in 2010 to 2.8 million green tonnes in 2020. Total removals from the nation's forests managed by Forestry England have fallen by 9% over this period, whereas removals from other English sources have increased by 59%.

Assessment of change

Little or no change was observed for the total volume of timber brought to market per annum from English sources (softwood and hardwood combined) over the most recent 5 years for which trends can be assessed (2015 to 2020). There has been a decrease (or deterioration) over the medium term (2010 to 2020). The time series is not yet sufficient to make an assessment for a long-term period.

Change since 2018 has also been assessed. There has been a decrease (or deterioration) in percentage of the annual growth harvested since 2018. However, this is based on only 3 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table E6: Assessment of change in the volume of timber brought to market from English sources

Period	Date range	Percent change	Assessment of change
Short term	2015-2020	+9.4 (unsmoothed data)	Improvement
Medium term	2010-2020	+22.8 (unsmoothed data)	Improvement
Long term	N/A	N/A	Not assessed

Percent change refers to the difference seen from the first to last year in the specified date range.

E7 Healthy soils

Short description

Healthy soils underpin the multiple functions of soils in food production, supporting wildlife, regulating water and regulating climate. More work is being done to define exactly what the indicator will include but it could include physical properties (such as a measure of soil structure), chemical properties (such as soil carbon, nutrients and pH), bare ground (soil) and a measure of soil biological activity. This indicator is not limited to agricultural soils. Further development of statistically and scientifically robust national monitoring programmes may be needed to provide data for this indicator.

Relevant goal in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently

Relevant target in the 25 Year Environment Plan

- Improving our approach to soil management: by 2030 we want all of England's soils to be managed sustainably, and we will use natural capital thinking to develop appropriate soil metrics and management approaches.

Position in the natural capital framework

Condition of asset – land

Related reporting commitments

- May provide evidence in support of Climate Change Risk Assessment under the Climate Change Act (2008)

Geographical scope

England

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022 as further development work is required. Some data on aspects of soil health are already published in the Countryside Survey reports but they do not provide a full baseline.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

E8 Efficient use of water

Short description

Climate change and a growing population will put increasing pressure on our water supplies. Ambitious reductions in water consumption and leakage have a significant role in maintaining secure supplies and protecting the environment. This indicator shows changes in the efficient use of water, focussing on (a) leakage and (b) per capita consumption. Leakage and per capita household consumption of water in England are existing metrics reported to The Water Services Regulation Authority (Ofwat) and the Environment Agency.

Relevant goals in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently
- Clean and plentiful water

Relevant targets in the 25 Year Environment Plan

- Supporting Ofwat's ambitions on leakage, minimising the amount of water lost through leakage year on year, with water companies expected to reduce leakage by at least an average of 15% by 2025
- Work with the water industry to set a personal consumption target and agree cost-effective measures to meet it

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- Leakage and per capita consumption figures are reported annually as part of a water company's statutory annual review of its water resources management plan
- Relevant to Sustainable Development Goals 11 and 13

Geographical scope

England, and by water company area for those with customers wholly or mainly in England.

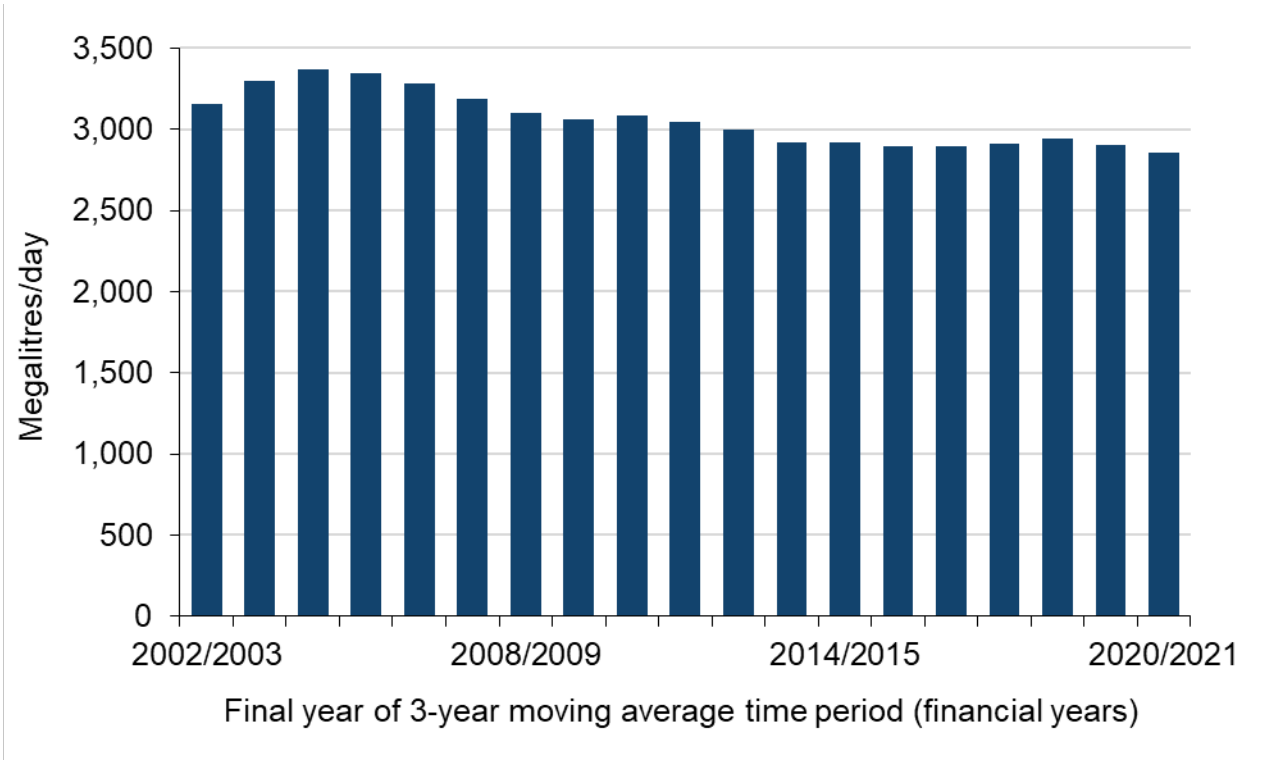
Status of indicator development

Final

Readiness and links to data

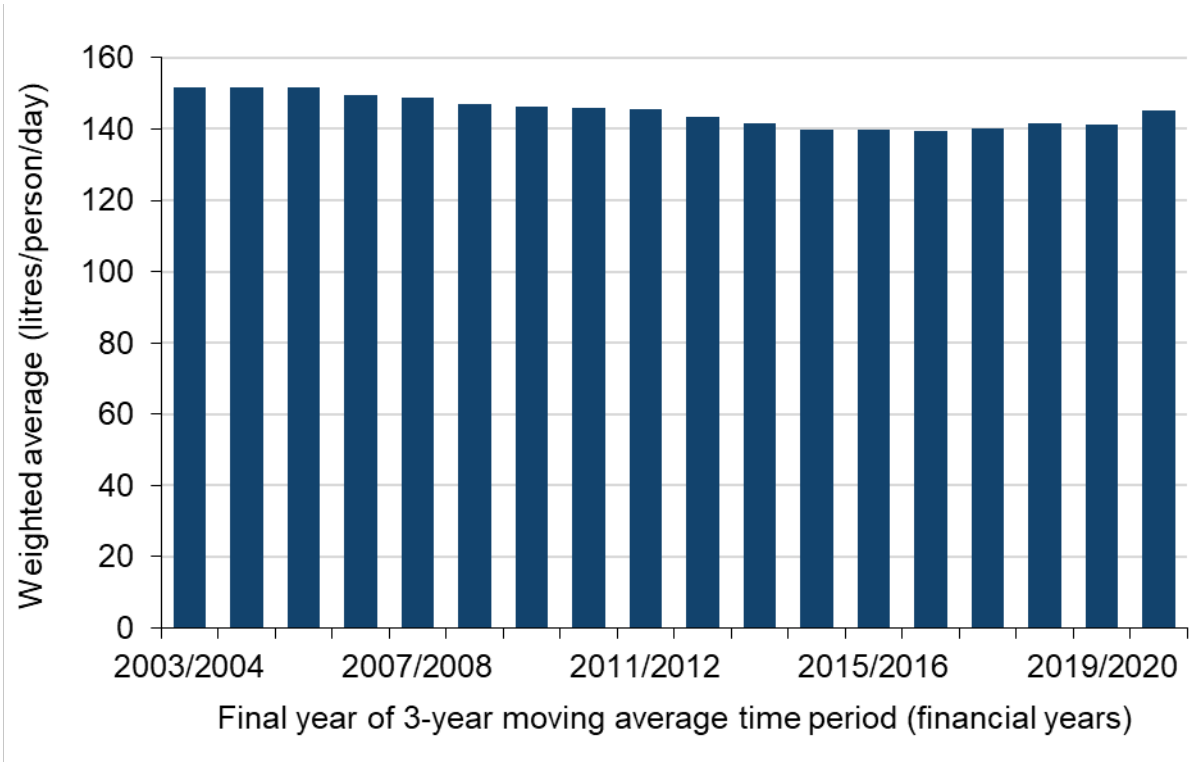
Water companies in England and Wales report total leakage and per capita household consumption figures annually as 3-year moving averages, but it should be noted that these totals differ from the England-only data presented in this indicator due to the inclusion of results for Wales. From 2020, water companies report their leakage performance against Ofwat's 2025 target, this is a 3-year average with 2017 to 2018 as a start point for the 3-year average.

Figure E8a: Water leakage in England, 2000/2001-2002/2003 to 2018/2019-2020/2021



Source, The Water Services Regulation Authority

Figure E8b: Per capita household water consumption in England, 2001/2002-2003/2004 to 2018/2019-2020/2021



Source, The Water Services Regulation Authority

Note on Figures E8a and E8b

Data represent figures for April to March (financial years) and are presented as 3-year moving averages. This aligns with Ofwat targets and reporting and helps to reduce sensitivity to anomalous events such as weather conditions; dates given in the charts indicate the final year of each time period.

Trend description for Figures E8a and E8b

E8a) Water leakage

Between 2018 to 2019 and 2020 to 2021, total water leakage in England averaged 2,857 megalitres per day, 9% lower than the daily average for the 3 years from 2000-2001 to 2002-2003.

E8b) Per capita water consumption

Per capita household water consumption has also fallen during the time period covered by this indicator, from an average of 152 litres per person per day in the 3 years to 2003/2004 to an average of 145 litres per person per day in the most recent 3-year time period (2018/2019 to 2020/2021).

Assessment of change

Little or no change was observed for water leakage in England (E8a) over the most recent 5 years for which trends can be assessed (3-year moving average time periods ending 2015/2016 to 2020/2021). This is in contrast to historic improvements seen in the medium and long term. Per capita water consumption in England (E8b) increased (a deterioration) over the most recent 5 years for which trends can be assessed (3-year moving average time periods ending 2015/2016 to 2020/2021), showed little or no change in the medium term and decreased (an improvement) over the long term. This assessment does not consider whether any improvements seen in the medium or long term would be on a sufficient scale for meeting targets. See 'Readiness and links to data' section for this indicator for reference to water companies' reporting against targets.

Change since 2018 has also been assessed. There has been little or no change in water leakage since 2018 while per capita water consumption has increased (a deterioration). This is based on 4 years of data. We set a minimum of 5 data points for the production of a robust trend for this assessment so this result should be treated with caution until the next iteration is available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table E8a: Assessment of change in water leakage in England

Period	Date range	Percent change	Assessment of change
Short term	2015/2016-2020/2021	-1.6 (moving average data)	Little or no change
Medium term	2010/2011-2020/2021	-7.7 (moving average data)	Improvement
Long term	2002/2003-2020/2021	-9.6 (moving average data)	Improvement

Table E8b: Assessment of change in per capita water consumption in England

Period	Date range	Percent change	Assessment of change
Short term	2015/2016-2020/2021	+3.7 (moving average data)	Deterioration
Medium term	2010/2011-2020/2021	-0.6 (moving average data)	Little or no change
Long term	2003/2004-2020/2021	-4.4 (moving average data)	Improvement

Percent change in Tables E8a and E8b refers to the difference seen between the first and last 3-year moving average in the specified date range; the dates in the Tables E8a and E8b refer to the final year of the 3-year period, for example 2020/2021 refers to the period 2018/2019 to 2020/2021.

E9 Percentage of our seafood coming from healthy ecosystems, produced sustainably

Short description

This is a composite indicator that tracks the sustainability of seafood, fish and aquaculture products. It will combine metrics on production (covering harvesting and subsequent preparation), management and impact on the environment. The indicator will use the data collected for the management of fish stocks to assess whether harvesting rates remain within sustainable limits. It will use equivalent data for aquaculture production. These data on harvesting and production will then be integrated with data on the impact of these activities on the wider environment together with social and economic data to provide an assessment of the sustainability of our seafood.

The data for the proportion of marine fish quota stocks of UK interest exploited above or below maximum sustainable yield that were presented in this indicator in 2019 are now presented as part of indicator C10 ‘Productive seas: fish and shellfish stocks fished sustainably’. This revision took place because the data are specific to fish and shellfish rather than reflecting the health of the marine ecosystem as a whole.

Relevant goals in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently
- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- Ensuring that all fish stocks are recovered to and maintained at levels that can produce their maximum sustainable yield

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- International Council for Exploration of the Seas (ICES)
- Convention on Biological Diversity Aichi Targets 4 and 6
- Relevant to Sustainable Development Goals 12 and 14

Geographical scope

UK

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022. Data on sustainably harvested fish stocks are already published annually. However, further work is required to incorporate these data and others into this broader indicator.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

Theme F: Resilience

F1 Disruption or unwanted impacts from flooding or coastal erosion

Short description

This indicator will track changes in the impacts of flooding and coastal erosion on people's lives. We continue to refine the approach to the finalisation of this indicator to ensure it aligns with the government's recent policy statement on Flood and Coastal Erosion Risk Management, which sets out government's commitment to develop a relevant national set of flood indicators by spring 2022, and the Environment Agency's recently updated National Flood and Coastal Erosion Risk Management (FCERM) Strategy for England.

Relevant goal in the 25 Year Environment Plan

- Reducing the risks of harm from environmental hazards

Relevant target in the 25 Year Environment Plan

- Boosting the long-term resilience of our homes, businesses and infrastructure

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- May provide evidence in support of Climate Change Risk Assessment under the Climate Change Act (2008)
- Relevant to Sustainable Development Goals 11 and 13

Geographical scope

England

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022 as further development is required. The government set out its policies to tackle flood and coastal erosion risk in the long term in the Flood and Coastal Erosion Risk Management Policy Statement in July 2020. These policies include a commitment to develop a national set of indicators by spring 2022 which will allow us to monitor trends over time to better understand the impact of our flood and coastal erosion risk management policies. As part of this work, we are reviewing the indicators proposed for the 25 Year Environment Plan to ensure they align with the outcomes of the Policy Statement and the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy for England.

Although the Environment Agency does not routinely carry out economic cost analysis of all floods, it has published cost of flooding reports following the winter 2013 to 2014 and winter 2015 to 2016 floods. The flood and coastal erosion risk management annual reports (from 1 April 2011) provide further context and statistics about the impacts of recent major flood events.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

F2 Communities resilient to flooding and coastal erosion

Short description

This indicator will allow us to monitor trends over time to better understand the impact of our policies and take action to protect and benefit our communities to build resilience everywhere.

We continue to refine the approach being taken in the finalisation of this indicator to ensure it aligns with the government's recent Policy Statement on Flood and Coastal Erosion Risk Management, which sets out government's commitment to develop a relevant national set of flood indicators by spring 2022, and the Environment Agency's recently published the updated National Flood and Coastal Erosion Risk Management (FCERM) Strategy for England.

Relevant goal in the 25 Year Environment Plan

- Reducing the risks of harm from environmental hazards

Relevant target in the 25 Year Environment Plan

- Boosting the long-term resilience of our homes, businesses and infrastructure

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- May provide evidence in support of Climate Change Risk Assessments and the ASC's assessment of the National Adaptation Programme, under the Climate Change Act (2008)
- Relevant to Sustainable Development Goals 11 and 13

Geographical scope

England

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022. The government's policy statement on flood and coastal erosion risk management sets out our commitment to develop a national set of indicators by spring 2022 which will allow us to monitor trends over time to better understand the impact of our flood and coastal erosion risk management policies. As part of this work, we are reviewing the indicators proposed for the 25 Year Environment Plan to ensure they align with the outcomes of the Policy Statement and the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy for England.

Good progress has been made through a research project commissioned to investigate ways of measuring resilience to flooding and coastal erosion. Recommendations from this work will inform further development of a resilience indicator. The flood and coastal erosion risk management annual reports (from 1 April 2011) provide further context and statistics about the impacts of recent major flood events. The National Flood and Coastal Erosion Risk Management Strategy for England sets out measures and actions to achieve a nation resilient to climate change.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

F3 Disruption or unwanted impacts caused by drought

Short description

This indicator will focus on disruption to public water supply due to drought.

Water companies have a statutory duty to produce a water resources management plan (WRMP) and drought plan. The WRMPs, prepared, published and maintained in accordance with provisions of the Water Industry Act 1991 and regulations and directions made under it, must set out how a company intends to maintain the balance between supply and demand for water over at least the next 25 years. This includes how it will manage the increasing pressures on our water supplies from a growing population and

climate change, whilst protecting the environment. Water company drought plans, also prepared, published and maintained under Water Industry Act 1991, set out the operational actions the water companies will take before, during and after a drought to maintain a secure supply of water.

This indicator will track changes in a Supply Demand Balance Index (SDBI), which will be reported by all water and sewerage companies from Summer 2022 as part of the Environment Agency's Environmental Performance Assessment (EPA) report.

Relevant goal in the 25 Year Environment Plan

- Reducing the risks of harm from environmental hazards

Relevant targets in the 25 Year Environment Plan

- Ensuring interruptions to water supplies are minimised during prolonged dry weather and drought
- Boosting the long-term resilience of our homes, businesses and infrastructure

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- Relevant to Sustainable Development Goals 11 and 13
- Water and sewerage companies currently provide Security of Supply Index (SoSi) data to the Environment Agency annually. This is published as part of the Environment Agency's EPA report and is part of the water companies' annual review of WRMPs

Geographical scope

England, and by water company area for those with customers wholly or mainly in England.

Status of indicator development

In development

Readiness and links to data

This indicator is not ready for reporting in 2022.

Existing SoSi data identifies whether water companies have a greater than planned risk of interruptions to public water supply during drought events. It illustrates those that need to take immediate action to increase resilience to the environmental hazard of drought. SoSi data are reported annually in the Environment Agency's annual EPA report.

We do not report on the SoSi metric here as it contains elements of prediction and from 2022, all water and sewerage companies will report a new, improved index (SDBI)

annually which will be based more firmly on actual figures. We will therefore use the SDBI as the metric for this indicator and report on it from 2023.

The SDBI measures how a company is actually able to meet water demand compared to the design drought event that is set out in the company's Water Resources Management Plan (WRMP). It will therefore be testing the theoretical risk that customers could be facing if there was a drought.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

Theme G: Natural Beauty and Engagement

G1 Changes in landscape and waterscape character

Short description

This is a composite indicator of changes in landscape and waterscape character in England. It will combine findings from 3 developing strands of landscape monitoring work. Firstly, a statistical database and spatially mapped monitoring of changes in landscape and waterscape character in National Character Areas (NCA) and protected landscapes across all of England. Secondly, monitoring at an England scale of the public's perceptions of landscape character and how those perceptions relate to the landscape change trends being identified. Thirdly, findings will be informed by on-going monitoring (since 2013) of environmental outcomes in our protected landscapes (National Parks and Areas of Outstanding Natural Beauty). The composite indicator will build on an approach that has been developed to assess the impacts of agri-environment schemes on landscape in 159 NCAs and will be structured by landscape change themes such as field patterns and boundaries, waterscapes historic features, semi-natural habitats, agricultural land use, settlement patterns and development, and woodland or tree cover. The NCA profiles (currently being refreshed and placed on a digital platform) include Statements of Environmental Opportunity, which are being utilised to evaluate changes detected in landscape and waterscape character.

Relevant goal in the 25 Year Environment Plan

- Enhancing beauty, heritage and engagement with the natural environment

Relevant target in the 25 Year Environment Plan

- Safeguarding and enhancing the beauty of our natural scenery and improving its environmental value while being sensitive to considerations of its heritage

Position in the natural capital framework

Condition of assets – land; freshwater; marine

Related reporting commitments

- Reporting under the European Landscape Convention

Geographical scope

England

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022. Substantial further development work is required to build on existing methods and information sources to assess changes in landscape and waterscape character.

Progress has been made towards an indicator that will be made available in 2023, including establishment of a set of indicators and metrics for the suite of landscape change themes associated with the NCA change database. A change atlas and dashboard are currently under development to allow interactive access to detailed findings for a range of audiences. A baseline analysis and evaluation of the NCA and protected landscape change data is also under way from which headline findings will inform the composite indicator. In addition, progress has been made in assessing how the People and Nature Survey (PANS) results can be used to develop a metric for public perception of landscape character. Opportunities have been identified to enhance and capture additional information in future PANS surveys relating more specifically to people's perceptions and preferences about landscape that can inform landscape change monitoring.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

G2 Condition of heritage features including designated geological sites and scheduled monuments

Short description

This indicator consists of 2 measures that describe (a) the condition of geological and geomorphological (landforms and the processes which create them) heritage features of Sites of Special Scientific Interest (SSSIs) and (b) the condition of Scheduled Monuments. Heritage features enable us to understand how our landscapes have been formed and are an important aspect of landscape character that significantly contribute to our enjoyment and appreciation of the natural beauty. We have a particular responsibility to conserve heritage features of designated sites. The indicator uses information from SSSI condition assessments and information which supports the production of Historic England's annual Heritage at Risk Register.

All geological (including geomorphological) features designated as SSSIs have first been subject to rigorous and systematic scientific assessment leading to their selection as nationally important Geological Conservation Review (GCR) sites. As of December 2021, there were 1,150 SSSIs in England designated wholly, or in part, for their geology, encompassing 1,679 features identified through the GCR. Many SSSIs contain more than one geological heritage feature.

Monuments designated as Scheduled Monuments have been recognised by the Secretary of State as being nationally important. For a monument to be considered of national importance its surviving features, above and/or below the surface of the land or seabed, must have a particular significance that relates to its historic, traditional, architectural, artistic and/or archaeological interest. As of August 2021, there were 19,921 Scheduled Monuments in England.

Relevant goal in the 25 Year Environment Plan

- Enhancing beauty, heritage and engagement with the natural environment

Relevant target in the 25 Year Environment Plan

- Safeguarding and enhancing the beauty of our natural scenery and improving its environmental value while being sensitive to considerations of its heritage

Position in the natural capital framework

Condition of assets – land; freshwater; marine

Related reporting commitments

- Reporting under the European Landscape Convention

Geographical scope

England, data for individual sites which may be presented at various geographical scales, including National Character Areas are also available.

Status of indicator development

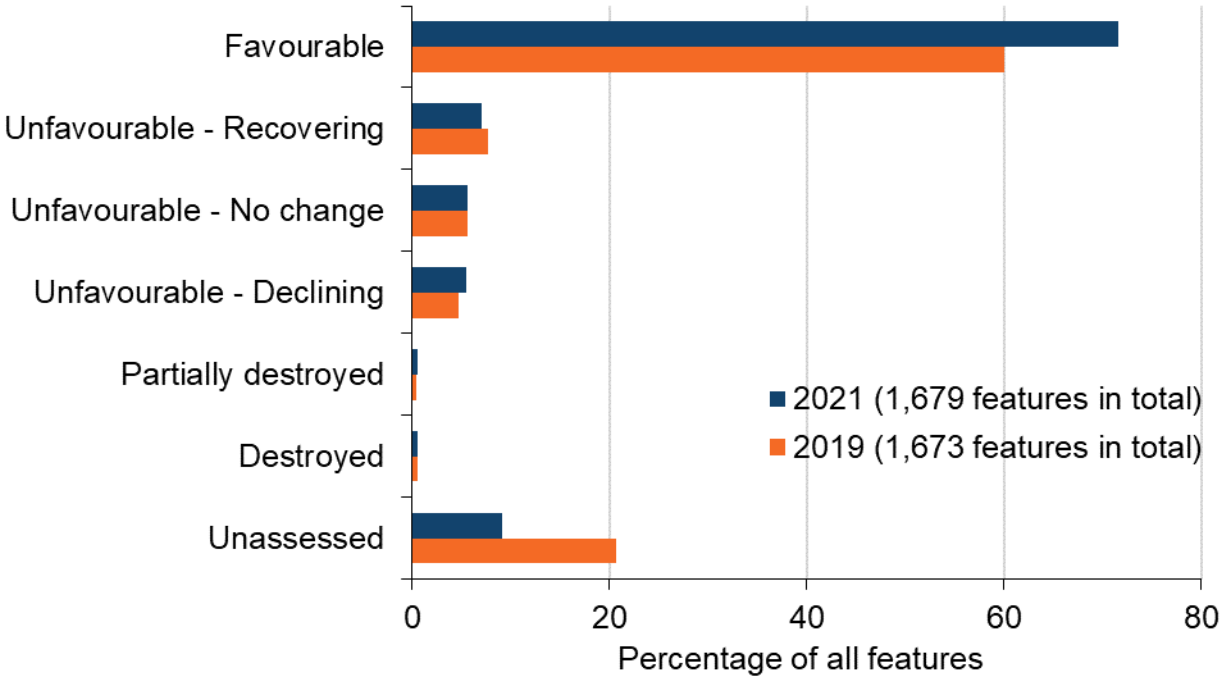
Final

Readiness and links to data

Data are available on SSSI condition assessments (as a searchable database), and as a data download of SSSI Monitored features. A programme of work was initiated in 2020, aimed at assessing the condition of previously unassessed geological features and reassessing the condition of features which have not been assessed for more than 6 years.

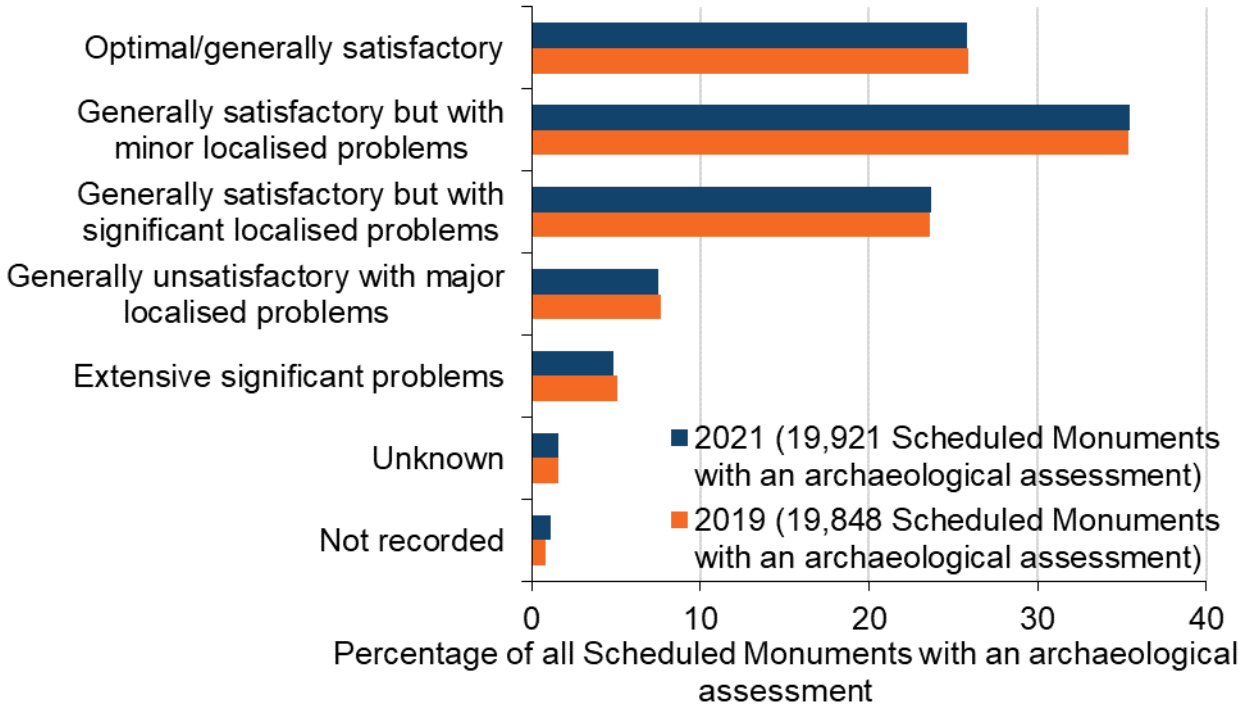
Data on Scheduled Monuments at risk are also available. These data have been collated over an extended time period as it is not currently possible to update them in full on a regular basis. It should be noted that during 2020 and 2021, the COVID-19 pandemic impacted upon data collection and collation, and depending on the region, site visits for assessment purposes were either not possible or very limited. Although the usual level of on-site checking of entries on, additions to and removals from the Heritage at Risk Register was not possible, desk-based assessments and updates were carried out.

Figure G2a: Condition of geological and geomorphological heritage features of Sites of Special Scientific Interest in England, 2019 to 2021



Source, Natural England

Figure G2b: Condition of Scheduled Monuments in England (based on entries with archaeological assessments), 2019 to 2021



Source, Historic England

Note on Figures G2a and G2b

Figure G2a is based on the condition of 1,526 geological and geomorphological heritage features that had been assessed by December 2021, with 30% of those assessments being carried out since 2015 and 60% being carried out since 2011. A further 9% of all 1,679 features are still to be assessed. As of December 2019, 1,326 geological and geomorphological heritage features had been assessed.

The observed increase in the percentage of geological and geomorphological heritage features in favourable condition from 2019 to 2021 and the absence of any major changes to the percentage of features in the unfavourable assessment categories over the same period is largely due to the timing of data inputted since the last update of this indicator. Most new assessments in favourable condition have been included in the 2021 results, whereas most unfavourable assessments are still being finalised and have therefore not been included yet. The resulting skew towards the percentage of heritage features in favourable condition relative to those in unfavourable condition should be resolved during the next scheduled update of this indicator in 2024, and current results for the unfavourable condition categories should be treated with caution.

Summarised condition data in Figure G2b are based on the archaeological assessments of the 19,921 Scheduled Monuments that had been assessed by August 2021. Of these, 16.0% have been subject to new or updated condition assessments since 2015 and 29.7% have been assessed since 2011. A further 1.1% of all features are still to be assessed. As of August 2019, 19,848 Scheduled Monuments had archaeological assessments in place.

Data on the condition of Scheduled Monuments in this indicator are based on archaeology assessments only. As of August 2021, 842 Scheduled Monuments have additional condition assessments based on their built or structural remains; these have been omitted from this indicator.

Trend description for Figures G2a and G2b

G2a) Condition of geological and geomorphological heritage features of Sites of Special Scientific Interest

In total, 72% of all designated geological features have been assessed as in favourable condition as of December 2021 (a 12 percentage point increase in the equivalent figure for 2019) and a further 7% have been assessed as unfavourable but recovering. Approximately 1% have been destroyed or partially destroyed.

G2b) Condition of Scheduled Monuments

In total, 84.9% of all Scheduled Monuments with archaeological assessments are considered as being in optimal or generally satisfactory condition, whereas 12.4% are considered as either being in a generally unsatisfactory condition or having extensive significant problems. This represents no significant change from data first published in 2020.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

G3 Enhancement of green and blue infrastructure

Short description

This indicator will show changes in the quantity, quality, accessibility and, ultimately, multiple functions of green and blue infrastructure. Green and blue spaces and other natural features in and around our built environment, including within Green Belts, are part of networks of multi-functional green infrastructure, which are capable of delivering a wide range of benefits that are essential to health and wellbeing, nature, climate, water and prosperity. Green and blue infrastructure includes land, freshwater and coastal spaces.

This indicator will be developed from work led by Natural England, with Defra and an advisory group, on a new Green Infrastructure Framework – Principles and Standards for England which will cover both green and blue infrastructure. These standards aim to green our towns and cities, by improving existing green infrastructure provision and encouraging more investment. Green and blue infrastructure can also make an important contribution towards adaptation to climate change.

Relevant goals in the 25 Year Environment Plan

- Enhancing beauty, heritage and engagement with the natural environment
- Thriving plants and wildlife

Relevant targets in the 25 Year Environment Plan

- Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas
- Creating or restoring 500,000 hectares of wildlife-rich habitat outside the protected area network

Position in the natural capital framework

Condition of assets – land; freshwater; seas; species and ecological communities

Related reporting commitments

- Reporting under European Landscape Convention
- Reporting on the United Nation's Sustainable Development Goals, for example Goal 11: 'Make cities and human settlements inclusive, safe, resilient and sustainable'
- May provide evidence in support of assessment against the Convention for Biological Diversity regarding the contribution of biodiversity and green/blue spaces to human health and wellbeing
- May provide evidence in support of Climate Change Risk Assessment and the Adaption Sub-Committee's assessment of the National Adaptation Programme, under the Climate Change Act (2008)

Geographical scope

England

Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. However, an interim indicator is presented here, which is based on Natural England's updated Accessible Natural Greenspace Standards (ANGSt). These standards will inform the development of indicators for accessible greenspace quantity and proximity, at different scales.

Natural England and Defra have also developed initial baseline maps of Green and Blue Infrastructure across England (version 1.1), for analysis using the updated ANGSt and other standards and indicators in development. The England Green Infrastructure Mapping Database Report provides details of the Green Infrastructure Mapping datasets and

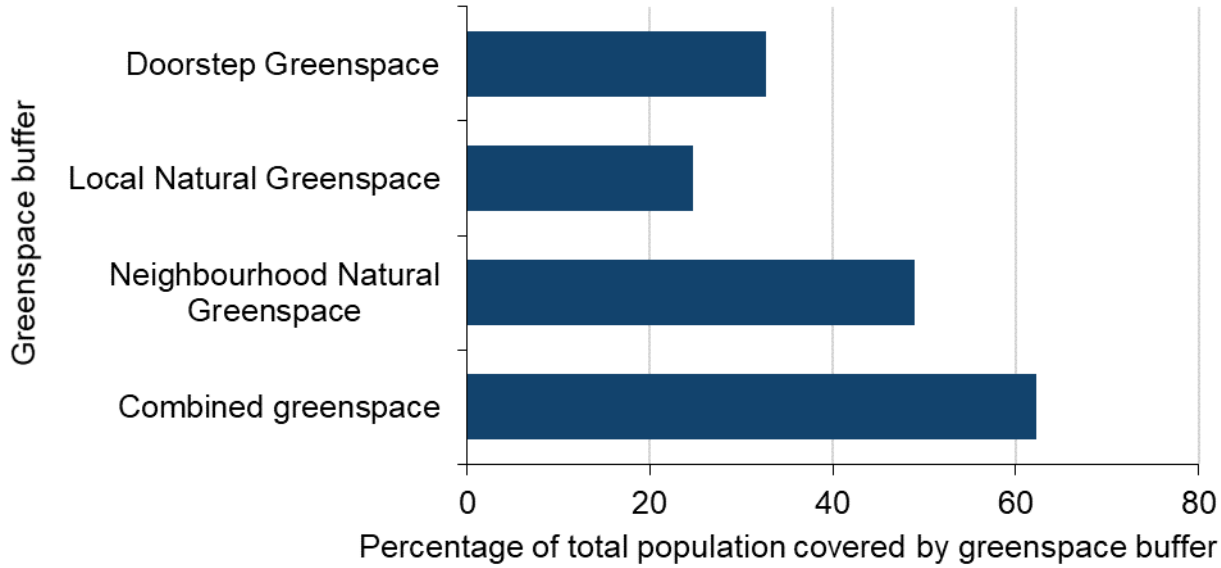
analysis (and of the updated ANGSt). Initial findings are published on the Green Infrastructure Mapping Database and Analyses webpage.

The ANGSt include a measure of hectares of Local Nature Reserve (LNR) per 1,000 population, and this analysis will be undertaken using data on LNRs held in Designated Sites View to report in 2023.

Outputs of further analysis of the Green Infrastructure Mapping will be considered for providing additional information in the final indicator, including more detailed statistical analysis of population shares within ANGSt buffers by index of deprivation, population density and green space per 1,000 population, and also access to waterside and linear access such as Public Rights of Way.

Information on changes in the public's perceptions of green and blue space quality and access to green and blue spaces is now gathered by Natural England using the People and Nature Survey (PANS) for England. A new indicator, derived from the PANS results, is in development.

Figure G3 (interim): Percentage of the total population in England with access to nearby green space (defined by ANGSt buffers), as of October 2021



Source, Natural England

Note on Figure G3

Figure G3 covers both urban and rural areas. Doorstep Greenspace is accessible greenspace of at least 0.5 hectares in size within a 200m straight-line distance from home; Local Greenspace is accessible natural greenspace of at least 2 hectares in size within a 300m straight-line distance from home; and Neighbourhood Greenspace is accessible natural greenspace of at least 10 hectares within a 1km straight-line distance from home. The combined greenspace category, while not a standard in itself, includes the percentage

of the population with access to any one or more of the doorstep greenspace, and local and neighbourhood natural greenspace standards.

The ‘percentage of total population covered by greenspace buffer’ is based on an assumption that the population within each lower layer super output area (LSOA) is evenly distributed.

Trend description for Figure G3

This is the baseline year of data; we aim to build a time series that is updated at the frequency new mapping is undertaken. As of October 2021, the proportions of the total population in England living within ANGSt ‘buffers’ (straight line distances from the boundary of the greenspaces) are:

- 1 in 3 people live within 200m of a doorstep greenspace of at least 0.5 hectares
- 1 in 4 people live within 300m of a local natural greenspace of at least 2 hectares, and
- 1 in 2 people live within 1km of a neighbourhood natural greenspace of at least 10 hectares

When considered together, these 3 most local ANGSt buffers allow us to form a composite picture of accessible greenspace. Initial findings suggest that, as of October 2021, almost 2 in 3 people (62.2%) have access to greenspace as defined by one or more of the doorstep greenspace, local natural greenspace and neighbourhood natural greenspace standards included within this indicator, and hence within a maximum 1km radius of home.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

G4 Engagement with the natural environment

Short description

This indicator will track changes in people’s engagement with the natural environment. It is our objective that, alongside improvements in natural environments, people are also engaging more with them. Spending time in the natural environment is important for both human health and wellbeing, and increasing pro-environmental behaviours to support nature recovery.

A range of measurements may be indicative of engagement with the natural environment, but for the purposes of this indicator, data covering the broadest possible aspects of nature and engagement are considered. In addition, other measures of engagement relating to people’s care and concern for the environment are measured as part of indicators ‘G5 People engaged in social action for the environment’ and ‘G6 Environmental attitudes and behaviours’.

Relevant goal in the 25 Year Environment Plan

- Enhancing beauty, heritage and engagement with the natural environment

Relevant target in the 25 Year Environment Plan

- Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- Relevant to Convention on Biological Diversity Aichi Target 1

Geographical scope

England

Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. A revised interim indicator is provided here that presents data from 2 of Natural England's nationally representative surveys on time spent in natural spaces (spanning a wide set of green and blue spaces, both urban and rural):

1) Historic data (2009/2010 to 2018/2019) for adults from the Monitor of Engagement with the Natural Environment (MENE) survey.

2) Baseline data for adults from the People and Nature Survey (PANS). PANS began collecting data on an on-going basis from 2 April 2020 and can now report on engagement after a year of data collection (up to 31 March 2021). Further information on PANS survey methods, outputs and the full questionnaires, are available on the PANS homepage. The PANS team welcomes collaboration and feedback via the PANS user hub.

Further work is underway to be able to finalise measures used for this indicator taken from MENE and/or PANS, including:

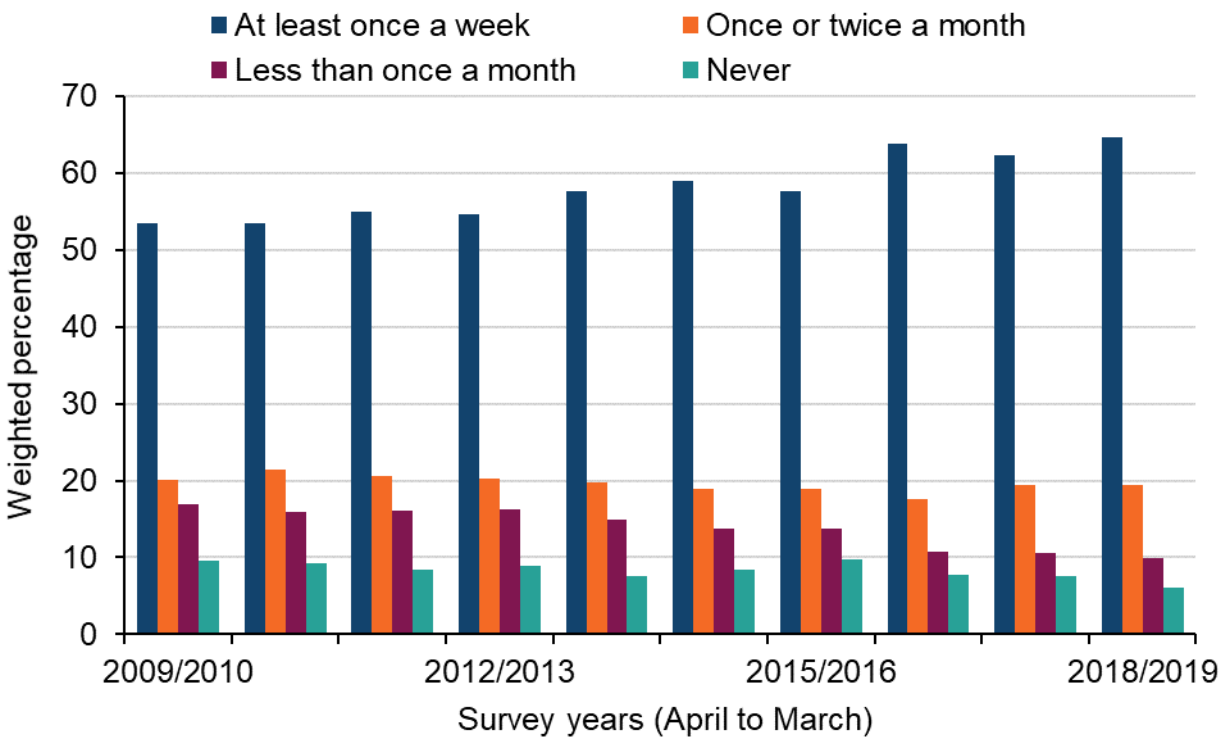
1) On-going collection of data past year 1 of PANS to allow for examination of trends over time.
2) Work to test and progress the harmonisation of PANS data with the 10 years' of MENE data which at present are not comparable. More information on methodological differences between the surveys and the work underway to understand, and potentially

harmonise datasets is available on Natural England's methods and limitations webpage.

3) Work to understand the impacts of COVID-19 on the trends for this indicator.

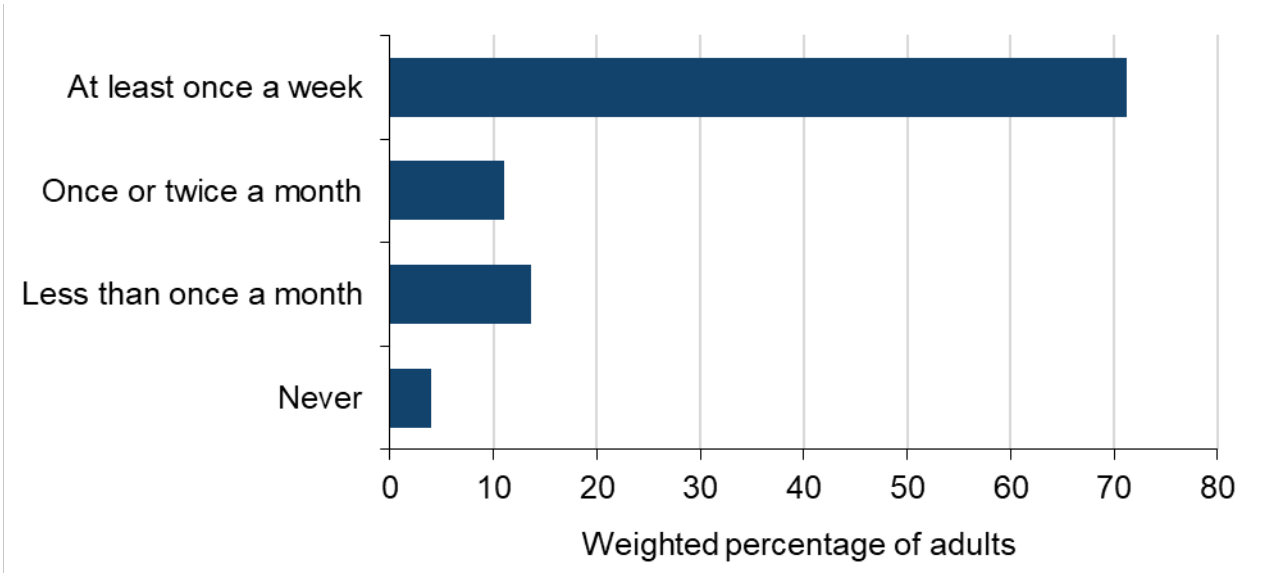
Similar data for children from the Children's People and Nature Survey (C-PANS) which measures the engagement of children with nature during school holiday-time and term-time will be included in the 2023 Outcome Indicator Framework report.

Figure G4a (interim): Frequency of visits to the natural environment in the past 12 months, percentage of adults in England, survey years 2009/2010 to 2018/2019



Source, Natural England

Figure G4b (interim): Frequency of visits to green and natural spaces in the past 12 months, percentage of adults in England, survey year 2020/2021



Source, Natural England

Note on Figures G4a and G4b

Figure G4a is based on MENE survey data collected between 2009 and 2019 (inclusive). Base: All respondents. Question [17]: 'Now thinking about the last 12 months, how often, on average, have you spent your leisure time out of doors, away from your home? Again, by out of doors we mean open spaces in and around towns and cities, the coast and the countryside.' Some response options in the MENE survey have been combined for the purposes of this indicator.

Figure G4b is based on PANS data collected between 2 April 2020 and 31 March 2021 (inclusive). Base: All respondents. Question [M1_Q1]: In the last 12 months, how often, on average have you spent free time outside in green and natural spaces? Some response options in PANS have been combined for the purposes of this indicator.

Trend description for Figures G4a and G4b

G4a) Visits to the natural environment

The MENE survey showed an increase in the proportion of adults visiting the natural environment at least once a week, from 54% in 2009/2010 to 65% in 2018/2019.

G4b) Visits to green and natural spaces

The PANS survey cannot yet show yearly trends or be compared to the earlier MENE data. However, data from 2020/2021 show that 71% of adults said they had visited green and natural spaces at least once a week (11% once or twice a month, 14% less than once a month, and 4% never did this).

Assessment of change

This year's Outcome Indicator Framework report presents a baseline year of data on frequency of visits to the natural environment from PANS. When a sufficient time series is available, we will use this new indicator for the assessment of change. In the meantime, trends in the historic data from the MENE survey have been assessed. The time series for the MENE indicator on frequency of visits to the natural environment is not long enough to produce an assessment for medium and long-term time periods. An increase (or improvement) was observed over the most recent 5 years for which trends can be assessed (2013 to 2018).

Change since 2018 has also been assessed. An increase (or improvement) in frequency of visits to the natural environment was observed since 2018 (up to 2019). However, this is based on 2 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table G4a: Assessment of change in the frequency of visits to the natural environment in the past 12 months by adults in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+13.9 (smoothed Loess)	Improvement
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Note that assessment categories for the short term were assigned based on smoothed data, so percent change figures in Table G4a may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

G5 People engaged in social action for the environment

Short description

Social action is about people coming together to help improve their lives and solve the problems that are important in their communities. It can broadly be defined as practical action in the service of others, which is (i) carried out by individuals or groups of people working together, (ii) not mandated and not for profit, (iii) done for the good of others – individuals, communities and/or society, and (iv) bringing about social change and or value.

Multiple measurements will be used within this indicator as indicative of social actions which people can take to care for and restore the environment.

Relevant goal in the 25 Year Environment Plan

- Enhancing beauty, heritage and engagement with the natural environment.

Relevant target in the 25 Year Environment Plan

- Focusing on increasing action to improve the environment from all sectors of society.

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- None

Geographical scope

England

Status of indicator development

Interim

Readiness and links to data

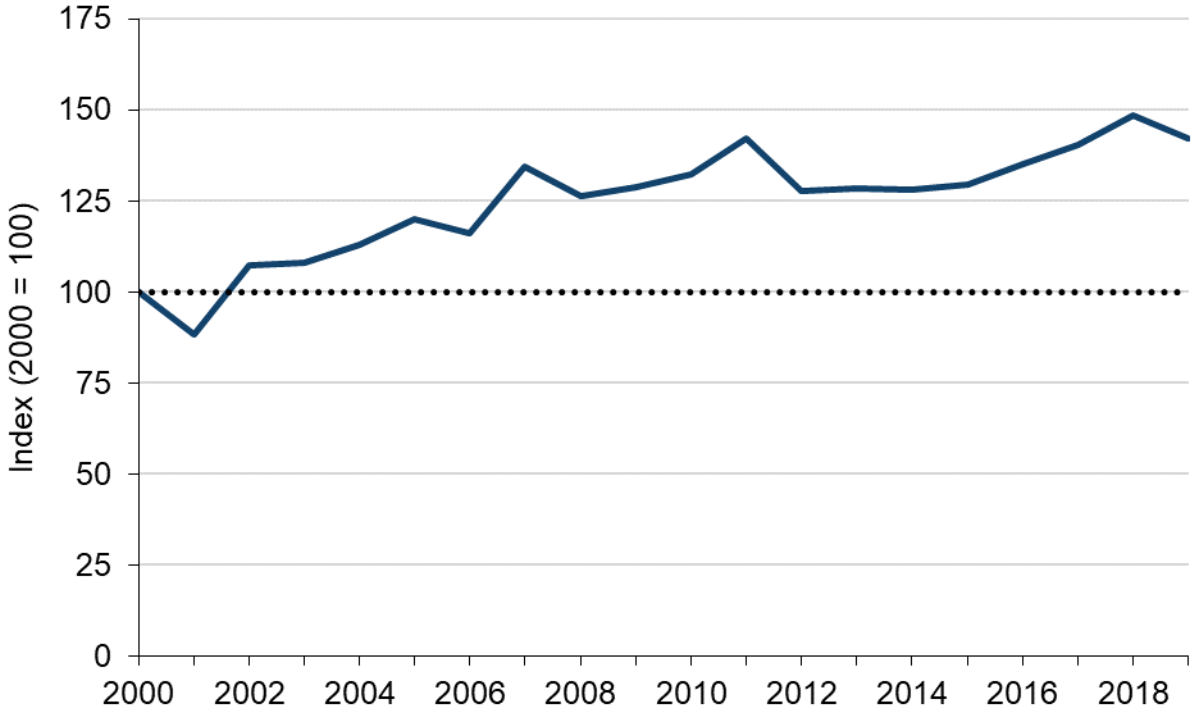
This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is provided here that presents data from England biodiversity indicator 14 – Taking action for the environment. These data show volunteer time spent on activities of benefit to the natural environment in England. While the impacts of COVID-19 on the volunteering sector are likely to be considerable, they are not reflected in the results of this interim indicator because the most recently available data from the England biodiversity indicators (to 31 March 2020) mostly predate the onset of the COVID-19 pandemic.

Information on social action for the environment is now also collected through Natural England's nationally representative People and Nature Survey (PANS) and the Children's People and Nature Survey (C-PANS). PANS began collecting data on an ongoing basis from 2 April 2020 and C-PANS has measured social action for the environment during school holiday-time (10 to 31 August) and is due to release data from a 2021 term-time survey. Further information on the survey methods, outputs and the full questionnaires, are available on the PANS homepage. The PANS team welcomes collaboration and feedback via the PANS user hub.

Further work is underway to be able to finalise measures used for this indicator taken from PANS and C-PANS, including:

1) Scrutiny of the multiple questions relating to social action for the environment to assess how they should be used and whether a composite score can be used for the purposes of this indicator.
2) On-going collection of data past year 1 to allow for examination of trends over time.
3) Work to understand the impacts of COVID-19 on the trends for this indicator.

Figure G5 (interim): Volunteer time spent on the natural environment in England, 2000 to 2019



Source, Defra

Note on Figure G5

Some data have been imputed to fill gaps in the time series where contributing organisations were unable to provide figures for a particular year.

Data provided by 6 organisations (The Conservation Volunteers, Canal and River Trust (formerly British Waterways), National Parks England, Natural England, RSPB and The Wildlife Trusts) were for financial years rather than calendar years. Financial year data have been assigned to the first calendar year (for example, 2019/2020 data were allocated to 2019).

Data provided by one organisation (the Canal and River Trust) include volunteering carried out in England and Wales as no England-only data are available.

Trend description for Figure G5

Between 2000 and 2019, the index of the amount of time contributed by environmental volunteers in England has fluctuated, but, overall, it has increased by 42%.

Assessment of change

Future Outcome Indicator Framework reports will present data from PANS on people engaged in social action for the environment. When a sufficient time series is available, we will make an assessment using this new indicator. In the meantime, only the interim indicator on volunteer time spent on the natural environment has been assessed. An increase (or improvement) was observed over the most recent 5 years for which trends can be assessed (2013 to 2018), as well as over the medium and long term.

Change since 2018 has also been assessed. A decrease (or deterioration) in volunteer time spent on the natural environment was observed since 2018 (up to 2019). However, this is based on 2 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table G5: Assessment of change in volunteer time spent on the natural environment in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+8.3 (smoothed data)	Improvement
Medium term	2008-2018	+9.8 (smoothed data)	Improvement
Long term	2000-2018	+52.2 (smoothed data)	Improvement

Note that assessment categories for the short, medium and long term were assigned based on smoothed data, so percent change figures in Table G5 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

G6 Environmental attitudes and behaviours

Short description

This indicator will track changes in people's attitudes and behaviours relating to the environment, covering different sectors of the population. It will track attitudes such as willingness to change lifestyle and behaviours in key policy areas relating to sustainable use of natural resources, such as waste, water and energy. The indicator will include information on:

- Environmental attitudes including personal importance of environmental issues, ranking when compared to wider issues facing society and relative importance of

environmental issues (such as climate change, litter, plastics, wildlife decline, and water and air pollution)
- Pro-nature conservation behaviours
- Wildlife gardening behaviours
- At home environmental behaviours, including water and energy efficiency, waste and diet
- Active travel behaviours
- Behavioural intentions

Relevant goal in the 25 Year Environment Plan

- Enhancing beauty, heritage and engagement with the natural environment.

Relevant target in the 25 Year Environment Plan

- Focusing on increasing action to improve the environment from all sectors of society.

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- Relevant to Convention on Biological Diversity Aichi Target 1

Geographical scope

England

Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is provided here that presents baseline data from Natural England's nationally representative People and Nature Survey (PANS) for adults. PANS began collecting data on an on-going basis from 2 April 2020 and can now report on attitudes after one year of data collection (up to 31 March 2021). Further information on PANS survey methods, outputs and the full questionnaires, are available on the PANS homepage. The PANS team welcome collaboration and feedback via their PANS user hub.

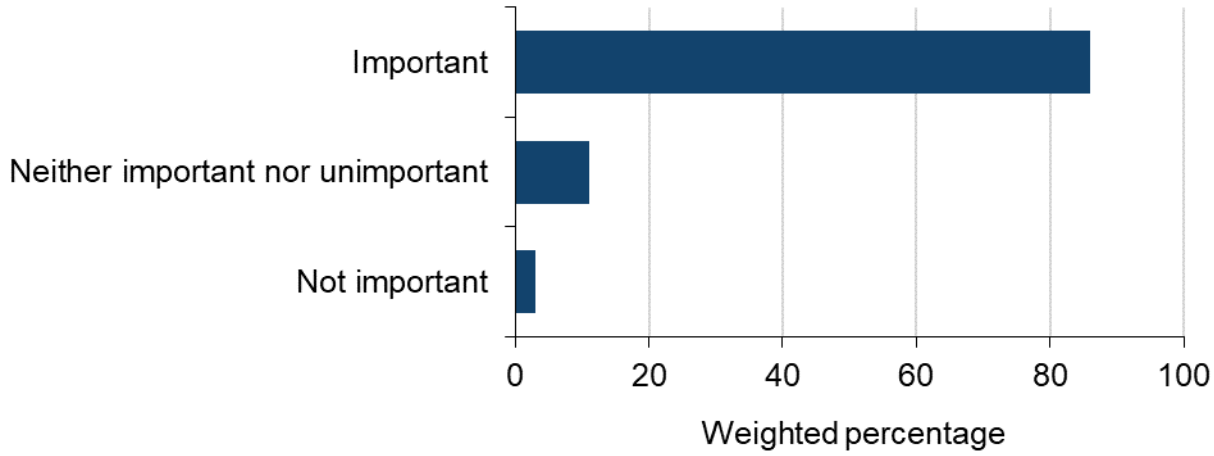
Further work is underway to be able to finalise measures used for this indicator taken from PANS, including:

1) Scrutiny of several other questions relating to environmental attitudes and behaviours, to assess whether they should be used and whether a composite score can be used for the purposes of this indicator.
2) On-going collection of data past year 1 to allow for examination of trends over time.

3) Work to understand the impacts of COVID-19 on the trends for this indicator.

Similar data for children from the Children's People and Nature Survey (C-PANS) will be included in the 2023 Outcome Indicator Framework report.

Figure G6 (interim): Percentage of adults in England reporting that protecting the environment is important to them, survey year 2020/2021



Source, Natural England

Note on Figure G6
Figure G6 is based on data collected between 2 April 2020 and 31 March 2021 (inclusive). Base: All asked M4. Question [M4_Q2]: 'How important is protecting the environment to you personally?'. Some response options in PANS have been combined for the purposes of this indicator.

Trend description for Figure G6

The PANS survey cannot yet show yearly trends. However, data from 2020/2021 show that the proportion of adults reporting that protecting the environment is important to them personally was 86% (3% reporting it was not important, and 11% that it was neither important nor unimportant).

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

G7 Health and wellbeing benefits

Short description

A growing body of research is evidencing how improved quality, access to and engagement with nature can impact on health and well-being, showing the interconnection between our own and our planet's health. This indicator will therefore aim to show the benefits to human health and well-being that can be gained through England's natural

environments. This includes benefits gained from more people engaging with nature, but also more passive benefits through improvements in natural environments that may impact on human health and well-being (for example, improvements in air quality, climate regulation, and noise mitigation). The indicator will aim to track changes for people in disadvantaged groups and others who may benefit the most.

Relevant goal in the 25 Year Environment Plan

- Enhancing beauty, heritage and engagement with the natural environment

Relevant target in the 25 Year Environment Plan

- Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing.

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- May provide evidence in support of Climate Change Risk Assessment and the Adaptation Sub-Committee's assessment of the National Adaptation Programme, under the Climate Change Act (2008)

Geographical scope

England

Status of indicator development

Interim

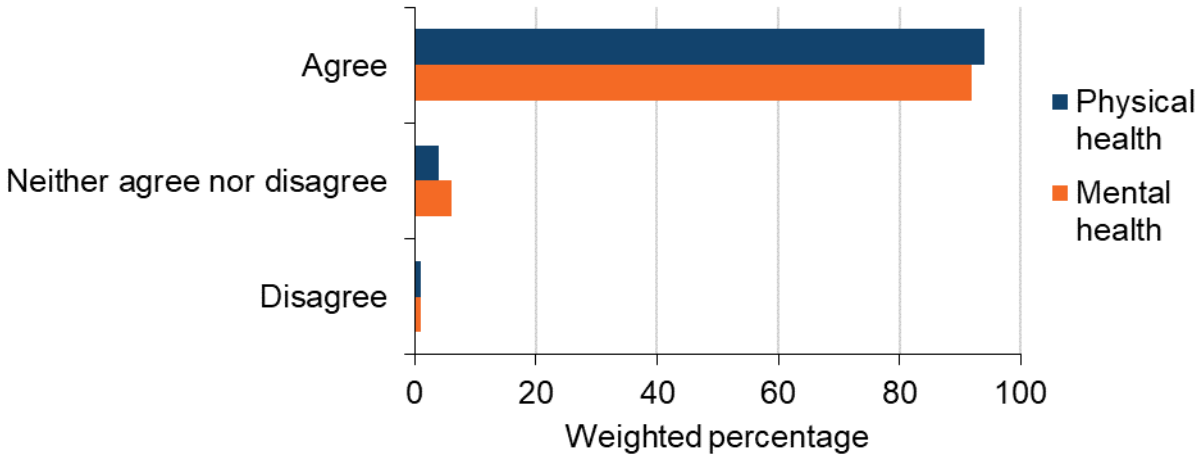
Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that presents baseline data on self-reported mental and physical health benefits of nature from Natural England's nationally representative People and Nature Survey (PANS) for adults. PANS began collecting data on an on-going basis from 2 April 2020 and can now report on this interim indicator after one year of data collection (up to 31 March 2021). Further information on PANS survey methods, outputs and the full questionnaires, are available on the PANS homepage. The PANS team welcome collaboration and feedback via the PANS user hub.

Similar data for children from the Children's People and Nature Survey (C-PANS) will be included in the 2023 Outcome Indicator Framework report.

This interim indicator may be superseded following an assessment of more appropriate national data to evidence the health and well-being implications of improvements in quality, access to and engagement with England's natural environments.

Figure G7 (interim): Percentage of adults in England reporting that time spent outdoors was good for their physical and mental health, survey year 2020/2021



Source, Natural England

Note on Figure G7
Figure G7 is based on data collected between 2 April 2020 and 31 March 2021 (inclusive). Base: Respondents who had visited a green space in the last 14 days. Question [M2A_Q9]: 'To what extent do you agree or disagree with the following statements about this time spent outdoors…1) It was good for my physical health, 2) It was good for my mental health'. Some response options in PANS have been combined for the purposes of this indicator.

Trend description for Figure G7

The PANS survey cannot yet show yearly trends. However, data from 2020/2021 show that, the majority (94%) of adults who had visited green and natural spaces in the last 14 days felt that spending time outdoors was good for their physical health, and 92% thought it was good for their mental health.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

Theme H: Biosecurity, Chemical and Noise

H1 Abatement of the number of invasive non-native species entering and establishing against a baseline

Short description

Biosecurity measures to prevent the establishment of invasive non-native species are a key element of protecting against their significant economic, environmental and social impacts. This indicator will show how the number of invasive non-native species entering

Great Britain has been abated (reduced) by comparing a predicted trend for establishment of invasive non-native species against actual establishment. Establishment of invasive species depends on factors such as trade and climate change. The difference to the trend in actual establishment then provides a measure of the success of biosecurity measures.

The indicator will draw on data from the Non-Native Species Information Portal, overseen by the 'Great Britain Non-Native Species Secretariat', which maintains an early detection, surveillance and monitoring mechanism that facilitates management, including rapid response. This indicator requires significant development, including deciding on which species to include and establishing a baseline for the predicted and established trend.

Relevant goal in the 25 Year Environment Plan

- Enhancing biosecurity

Relevant target in the 25 Year Environment Plan

- Managing and reducing the impact of existing plant and animal diseases; lowering the risk of new ones and tackling invasive non-native species

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- May provide evidence in support of Climate Change Risk Assessments under the Climate Change Act (2008)
- Convention on Biological Diversity Aichi Target 9

Geographical scope

Great Britain

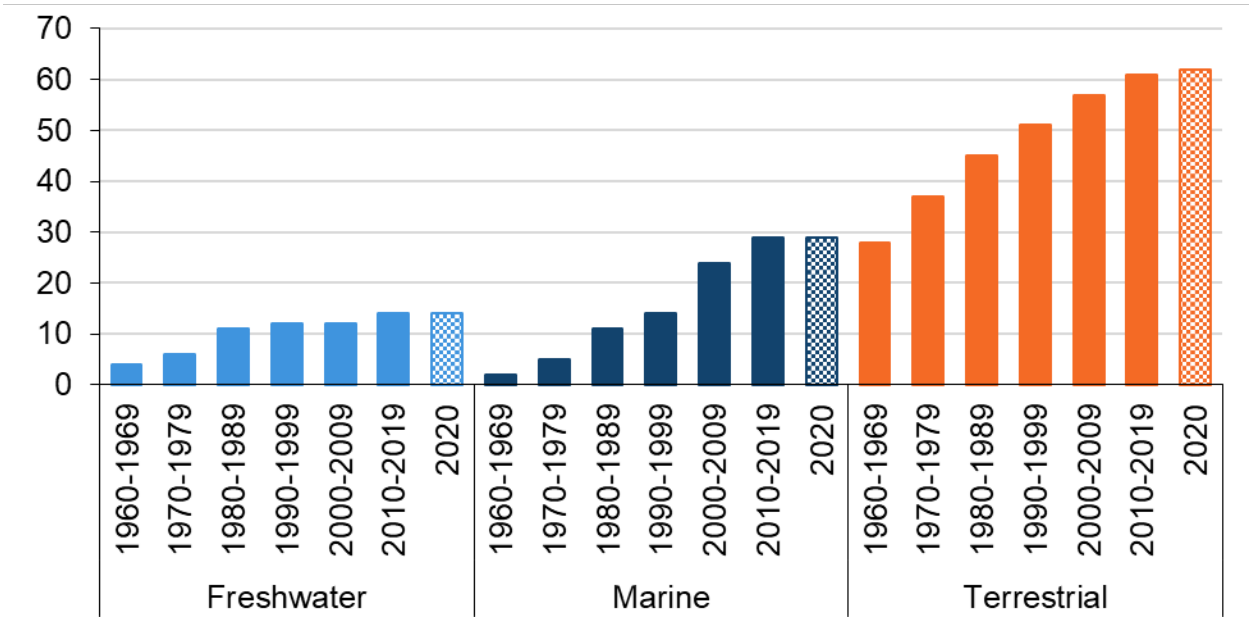
Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows trends in the number of established non-native species in Great Britain. These data are published annually as UK Biodiversity Indicator B6 – Pressure from invasive species. Further development is required to compare these data against a predicted trend.

Figure H1 (interim): Number of invasive non-native species established across or along 10% or more of the land area or coastline of Great Britain, 1960 to 2020



Source, Defra

Note on Figure H1

There are 3,248 non-native species in Great Britain, 2,016 of which are classified as established (reproducing in the wild). This indicator contains 194 non-native species that are considered to be exerting a negative impact on native biodiversity (47 freshwater species, 39 marine species and 108 terrestrial species). The majority (187) of these species are established; 6 are long-term residents but not known to breed in the wild.

The most recent time period covers a shorter period than the other bars (currently one year, 2020).

Trend description for Figure H1

Between the period 1960 to 1969 and the year 2020, the number of invasive non-native species established in or along 10% or more of Great Britain's land area or coastline has increased in the freshwater, terrestrial and marine (coastal) environments, with the greatest increases in numbers having been observed in the marine and terrestrial environments.

Assessment of change

The H1 indicator 'Abatement of the number of invasive non-native species entering and establishing against a baseline' reports one cumulative data point for each 10-year period included within the indicator, unlike the majority of other indicators that report annually. Therefore, it is only possible to assess long-term trends as there are insufficient data points to establish trends over shorter time periods. An increase (or deterioration) was observed over the long term for freshwater, marine and terrestrial non-native species.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table H1i: Assessment of change in the number of invasive non-native species established across or along 10% or more of the land area or coastline of Great Britain – Freshwater

Period	Date range	Percent change	Assessment of change
Short term	N/A	N/A	Not assessed
Medium term	N/A	N/A	Not assessed
Long term	1960-1969 to 2010-2019	+250.0 (unsmoothed)	Deterioration

Table H1ii: Assessment of change in the number of invasive non-native species established across or along 10% or more of the land area or coastline of Great Britain – Marine

Period	Date range	Percent change	Assessment of change
Short term	N/A	N/A	Not assessed
Medium term	N/A	N/A	Not assessed
Long term	1960-1969 to 2010-2019	+1350.0 (unsmoothed)	Deterioration

Table H1iii: Assessment of change in the number of invasive non-native species established across or along 10% or more of the land area or coastline of Great Britain – Terrestrial

Period	Date range	Percent change	Assessment of change
Short term	N/A	N/A	Not assessed
Medium term	N/A	N/A	Not assessed
Long term	1960-1969 to 2010-2019	+117.9 (unsmoothed)	Deterioration

Note that each data point reported for this indicator represents the total over a 10-year period rather than annual data. Percent change in Tables H1i to H1iii refers to the difference seen between the first and last multi-year periods in the specified date range.

H2 Distribution of invasive non-native species and plant pests and diseases

Short description

This indicator will show changes in the distribution of non-native invasive species and plant pests that have already established in England. Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems and cause economic damage.

Plant pests and diseases cause significant negative impacts and it is often more difficult to prevent their entry and establishment, therefore limiting spread is critical in preventing negative impact on native species and ecosystems. This indicator will utilise distribution data for a reference subset of priority invasive species and plant pests and diseases as an indication of the success of biosecurity measures in controlling their spread.

Relevant goal in the 25 Year Environment Plan

- Enhancing biosecurity

Relevant targets in the 25 Year Environment Plan

- Managing and reducing the impact of existing plant and animal diseases; lowering the risk of new ones and tackling invasive non-native species
- Reaching the detailed goals set out in the Tree Health Resilience Strategy

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- May provide evidence in support of Climate Change Risk Assessments under the Climate Change Act (2008)
- Convention on Biological Diversity Aichi Target 9

Geographical scope

England

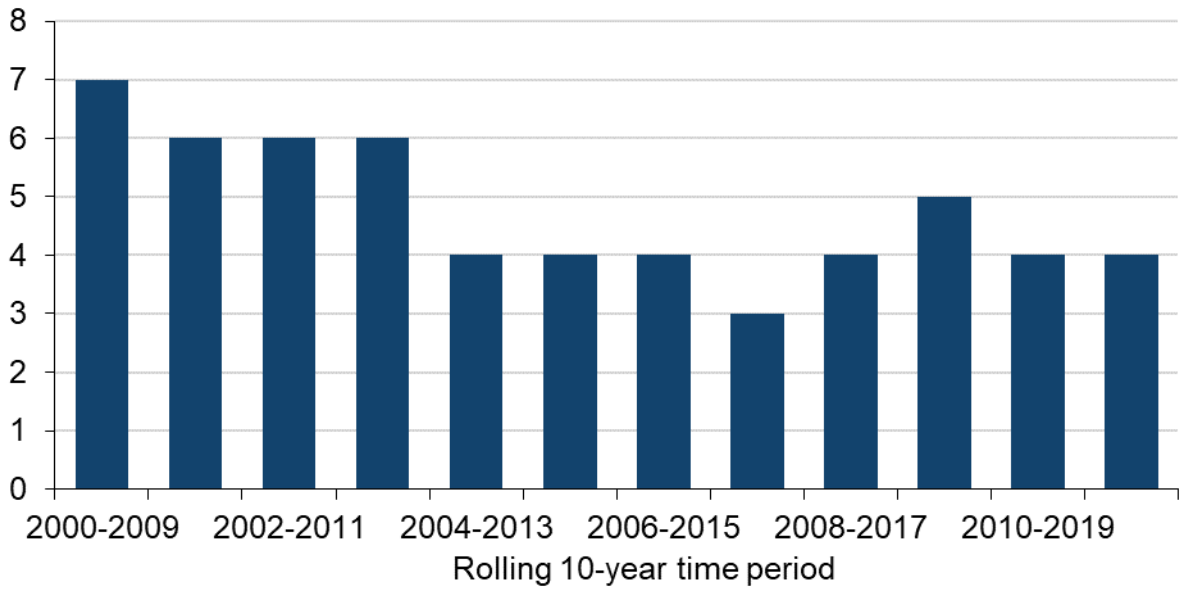
Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows trends in the number of additional tree pests and diseases becoming established in England since the year 2000. These data are published in the Forestry Commission's Key Performance Indicators Reports. Further development is required to identify species for inclusion and develop the indicator drawing on existing data.

Figure H2 (interim): Number of additional tree pests and diseases becoming established in England, 2000-2009 to 2011-2020



Source, Forestry Commission

Note on Figure H2

This indicator enumerates those additional tree pests and diseases formally considered as becoming 'established' by the UK Plant Health Risk Group within a rolling 10-year period. Establishment is defined as 'perpetuation, for the foreseeable future, of a pest within an area after entry'. This is the definition produced by the Secretariat of the International Plant Protection Convention.

It is not possible to sum the number of additional tree pests and diseases becoming established within each 10-year period to calculate the total number becoming established since 2000. This is because each tree pest or disease is included in up to 10 rolling 10-year time periods; adding them together would result in a greatly inflated total for the time period covered by this indicator.

Trend description for Figure H2

The number of additional tree pests and diseases becoming established in England within a rolling 10-year period fell from a peak of 7 in 2000-2009 to a low of 3 in 2007-2016. It subsequently increased again to 5 in 2009-2018 before falling to 4 in 2010-2019 and 2011-2020 (the 2 most recent 10-year periods for which data are available). In total, 11 tree pests and diseases became established in England in the 20 years from 2000 to 2020 and of these, the 4 'established' between 2011 and 2020 are:

1. Chalara dieback of Ash (*Hymenoscyphus fraxineus*), considered established in 2012.
2. Oriental chestnut gall wasp (*Dryocosmus kuriphilus*), considered established in 2016.

3. Sweet chestnut blight caused by the fungus *Cryphonectria parasitica*, considered established in 2017.
4. The Elm zigzag sawfly *(Aproceros leucopoda*), considered established in 2018, following a rapid expansion across Europe from eastern Asia

Assessment of change

Little or no change was observed for the interim indicator for H2 Number of additional tree pests and diseases becoming established in England over the most recent 5 years for which trends can be assessed (10-year rolling time periods ending 2015 and 2020). However, there has been a decrease (improvement) over the medium and long term.

Change since 2018 has also been assessed. There has been a decrease in number of additional tree pests and diseases becoming established since 2018. However, this is based on only 3 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table H2: Assessment of change in the number of additional tree pests and diseases becoming established in England

Period	Date range	Percent change	Assessment of change
Short term	2006-2015 to 2011-2020	0 (unsmoothed data)	Little or no change
Medium term	2001-2010 to 2011-2020	-33.3 (unsmoothed data)	Improvement
Long term	2000-2009 to 2011-2020	-42.9 (unsmoothed data)	Improvement

Percent change refers to the difference seen from the first to last year in the specified date range.

H3 Emissions of mercury and persistent organic pollutants to the environment

Short description

This indicator shows changes in emissions of mercury and persistent organic pollutants (POPs) to air, land, and water from measured, calculated, and modelled sources.

Mercury is toxic, causes damage to human health and accumulates in the environment and the food chain. For mercury, which is covered by the Minamata Convention, combustion sources are particularly significant, and information on emissions is provided annually by larger industrial sites. Other major sources of mercury to air will be gathered from different data sources.

POPs are chemicals that are extremely persistent in the environment, become widely distributed geographically, are able to accumulate in the tissues of humans and wildlife, and have harmful impacts on human health and the environment. POPs within this indicator refers to pollutants listed under Annex C (unintentional produced) of the Stockholm Convention. The Convention covers a range of substances spanning industrial uses, pesticides, and unintentionally produced substances.

Relevant goal in the 25 Year Environment Plan

- Managing exposure to chemicals

Relevant targets in the 25 Year Environment Plan

- Seeking in particular to eliminate the use of Polychlorinated Biphenyls (PCBs) by 2025, in line with our commitments under the Stockholm Convention
- Reducing land-based emissions of mercury to air and water by 50% by 2030
- Substantially increasing the amount of Persistent Organic Pollutants (POPs) material being destroyed or irreversibly transformed by 2030, to make sure there are negligible emissions to the environment
- Fulfilling our commitments under the Stockholm Convention as outlined in the UK's most recent National Implementation Plan

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- UNEP Stockholm Convention
- UNECE Convention on Long-Range Transboundary Air Pollution (CLR-TAP) via the European Monitoring and Evaluation Programme (EMEP)
- National Emission Ceilings Regulations
- UK Regulation on Pollutant Release and Transfer Registry
- The Persistent Organic Pollutants (Amendment) (EU Exit) Regulations 2020
- UNEP Minamata Convention on Mercury

Geographical scope

England

Status of indicator development

Interim

Readiness and links to data

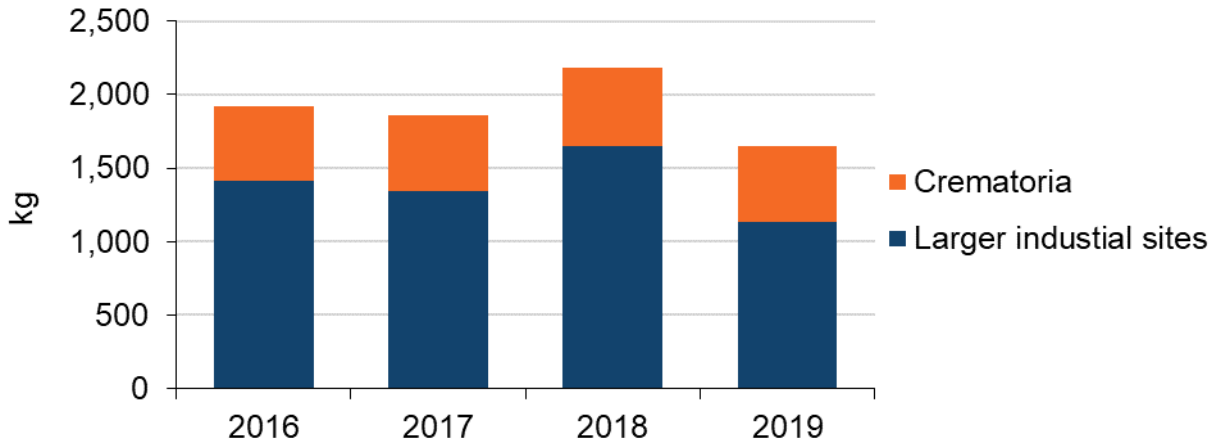
This indicator is not available for reporting in a final format in 2022 as further development is required to bring data together from a number of different sources. A revised interim indicator is presented here that shows annual England-level emissions of (a) mercury from larger industrial sites and crematoria, and (b) 7 unintentionally produced POP substances

(as listed in the Stockholm Convention Annex C): polychlorinated biphenyls; dioxin-like polychlorinated biphenyls; dioxins and furans; hexachlorobenzene; polychlorinated naphthalenes; pentachlorophenol; and pentachlorobenzene from a wide range of sources to air, land, and water. These POPs data are a disaggregation of the annual UK-level data previously presented in this indicator.

Some information is already published: Pollution Inventory, National Atmospheric Emissions Inventory, Persistent Organic Pollutants Multimedia Emissions Inventory, and National Reports for the Stockholm Convention. Population estimates used to apportion some UK emissions of POPs at an England level are also published annually.

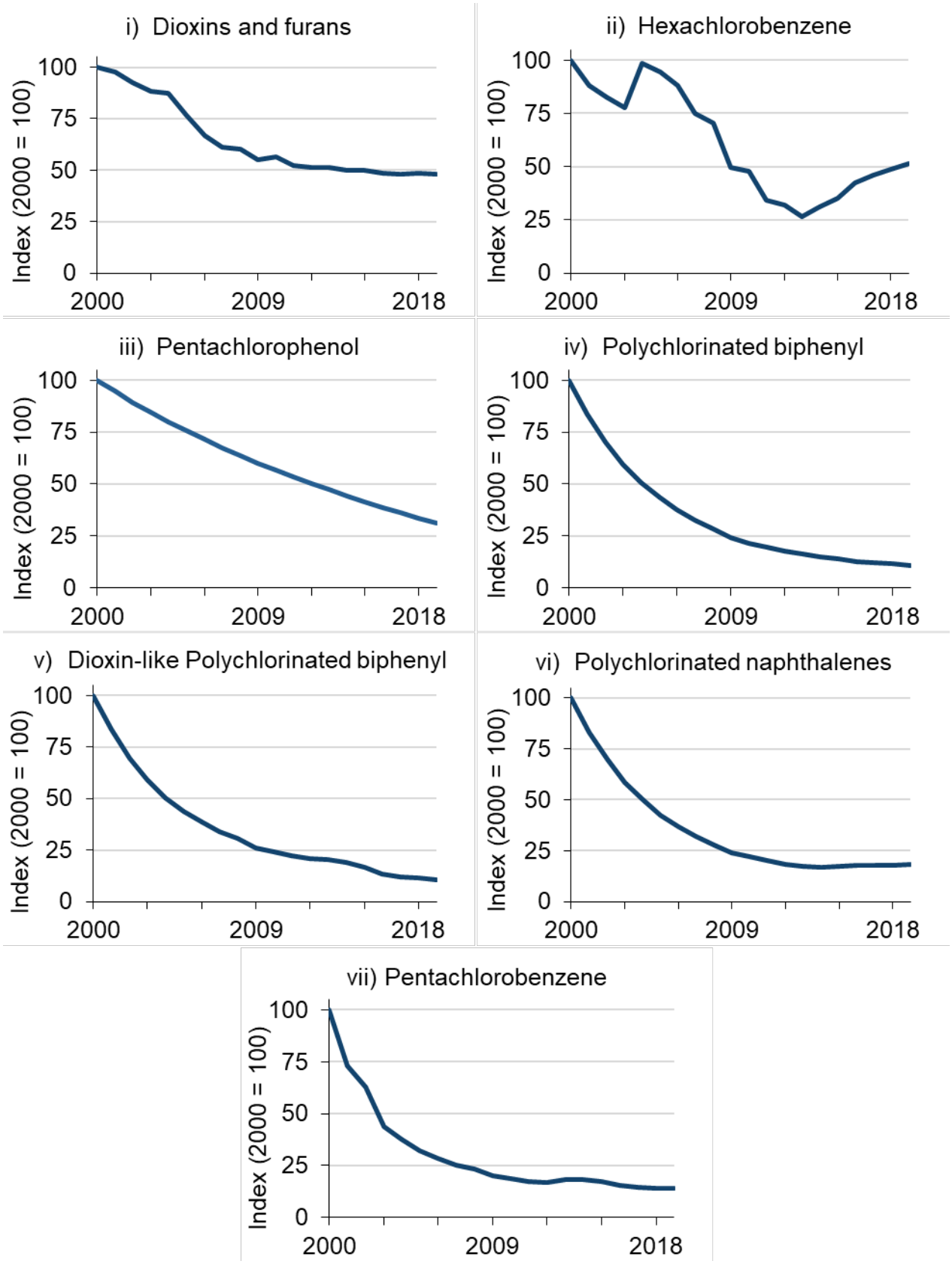
For further information on the methodology used to produce this indicator email chemicalrestrictions@environment-agency.gov.uk.

Figure H3a (interim): Emissions of mercury to air, land and water, England, 2016 to 2019



Source, Larger industrial sites data, UK pollutant release and transfer register; Crematoria data, National Atmospheric Emissions Inventory

Figure H3b (interim): Emissions of persistent organic pollutants to air, land and water, England, 2000 to 2019



Source, Persistent Organic Pollutants Multimedia Emissions Inventory

Note for Figures H3a and H3b

Emissions of mercury from larger industrial sites (including primary ferrous and non-ferrous metal production, cement production, oil refining and combustion activities over 50 megawatts [coal-fired power stations]) are to air, land and water; emissions from crematoria are to air only. At a UK level, these sources together account for approximately 85% of total mercury emissions. The balance of emissions come from consumer product waste and contaminated sites; these are not currently included in this indicator.

Emissions of POPs are to air, land and water. POPs are also present in landfill and other waste streams, which are not currently included in these data. Historical data are available which show significantly reduced emissions prior to 2000; data are presented here from 2000 onwards to focus upon recent trends.

The England-level POPs emissions presented in Figure H3b have been calculated from UK data by attributing emissions from larger industrial sources to their country of origin; emissions from other sources have been attributed on a population basis. This approach is considered to give the best available figures for England within the UK context.

Trend description for Figures H3a and H3b

H3a) Emissions of mercury to air, land and water

In 2019, emissions of mercury from larger industrial sites and crematoria in England totalled 1,652 kg, with larger industrial sites accounting for 68% of this figure.

H3b) Emissions of persistent organic pollutants to air, land and water

Emissions attributed to England for all 7 POPs included within this indicator have fallen between 2000 and 2019.

Dioxins and furans are a family of chemicals strongly associated with thermal processes linked to combustion (particularly of waste) and manufacture of metals. Their emissions were already reduced by over 60% between 1990 and 2000, with improvements in technology and tighter environmental regulations contributing to this fall. Between 2000 and 2010, emissions of dioxins and furans fell by a further 43% but have since levelled out, with emissions post-2010 largely linked to more diffuse sources such as domestic combustion of solid fossil fuels, accidental fire, and illegal burning of waste.

By 2013, emissions of hexachlorobenzene had fallen to 27% of their 2000 baseline figure but they have risen annually since then to reach 52% of emissions in 2000. This is linked to waste incineration and the increasing use of a specific pesticide (chlorothalonil) for which it is a by-product. Emissions of pentachlorophenol have fallen consistently since 2000 to reach 31% of their baseline figure in 2019. Emissions of the remaining 4 POPs have followed a very similar pattern to each other, falling sharply in the first 10 years and then levelling out to between 11% and 18% of their baseline figures in 2019. In particular for polychlorinated biphenyls and dioxin-like polychlorinated biphenyls, this relates to remaining final in-use stocks of heat-transfer fluids in di-electric equipment in the energy transmission networks.

Assessment of change

A decrease (or improvement) was observed for all emissions of persistent organic pollutants (POPs) to air land and water covered by the interim H3 indicator, over the medium and long term. Most POPs also decrease over the most recent 5 years for which trends can be assessed (2013 to 2018); however, little or no change was seen in emission of polychlorinated naphthalenes during this period, and there was an increase (deterioration) in hexachlorobenzene.

Change since 2018 has also been assessed. Since 2018, there has been a mixed picture with 3 POPs decreasing, 3 showing little or no change, and hexachlorobenzene increasing. However, this is based on only 2 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table H3bi: Assessment of change in the emissions of dioxins and furans to air, land and water, England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-5 (smoothed Loess)	Improvement
Medium term	2008-2018	-19.2 (smoothed Loess)	Improvement
Long term	2000-2018	-53.1 (smoothed Loess)	Improvement

Table H3bii: Assessment of change in the emissions of hexachlorobenzene to air, land and water, England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+57.2 (smoothed Loess)	Deterioration
Medium term	2008-2018	-27.9 (smoothed Loess)	Improvement
Long term	2000-2018	-46.4 (smoothed Loess)	Improvement

Table H3biii: Assessment of change in the emissions of pentachlorophenol to air, land and water, England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-28.6 (smoothed Loess)	Improvement
Medium term	2008-2018	-47.1 (smoothed Loess)	Improvement
Long term	2000-2018	-66.3 (smoothed Loess)	Improvement

Table H3biv: Assessment of change in the emissions of polychlorinated biphenyl to air, land and water, England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-28.3 (smoothed Loess)	Improvement
Medium term	2008-2018	-59.1 (smoothed Loess)	Improvement
Long term	2000-2018	-88.3 (smoothed Loess)	Improvement

Table H3bv: Assessment of change in the emissions of dioxin-like polychlorinated biphenyl to air, land and water, England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-40.3 (smoothed Loess)	Improvement
Medium term	2008-2018	-61.4 (smoothed Loess)	Improvement
Long term	2000-2018	-88.2 (smoothed Loess)	Improvement

Table H3bvi: Assessment of change in the emissions of polychlorinated naphthalenes to air, land and water, England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+2.7 (smoothed Loess)	Little or no change
Medium term	2008-2018	-34.9 (smoothed Loess)	Improvement
Long term	2000-2018	-81.7 (smoothed Loess)	Improvement

Table H3bvii: Assessment of change in the emissions of pentachlorobenzine to air, land and water, England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-15.5 (smoothed Loess)	Improvement
Medium term	2008-2018	-34.2 (smoothed Loess)	Improvement
Long term	2000-2018	-84.6 (smoothed Loess)	Improvement

Note that assessment categories for the short, medium and long term were assigned based on smoothed data, so percent change figures in Tables H3bi to H3bvii may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

H4 Exposure and adverse effects of chemicals on wildlife in the environment

Short description

This indicator tracks changes in the exposure of wildlife to chemicals in the environment over time and considers the potential risks to wildlife from chemicals in terrestrial, freshwater, and marine ecosystems. Data are currently available for representative chemicals in water and in certain species of birds of prey, fish, mammals, and mussels.

Other relevant exposure data will be incorporated in the future. Further work is ongoing to improve reporting for exposure metrics and to understand better the effects of chemicals on wildlife populations and individuals.

This indicator is complementary to other indicators within the framework that give data on environmental pressures from chemicals, for example, ‘B1 Pollution loads entering waters’ and ‘H3 Emissions of mercury and persistent organic pollutants to the environment’.

Relevant goals in the 25 Year Environment Plan

- Managing exposure to chemicals
- Thriving plants and wildlife

Relevant target in the 25 Year Environment Plan

- None

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- Marine Strategy Regulations 2010 and the assessment of Good Environmental Status in Regional Seas
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)
- Water Environment (Water Framework Directive) Regulations 2017
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

Geographical scope

England and UK for some marine components.

Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. The interim indicator presented here is consistent with that published in 2021 as an experimental statistic. It covers the exposure of wildlife to chemicals in the environment and, where feasible, the risk from different types of chemicals to wildlife on land and in water. The indicator is based on chemical concentrations found in water and in different organisms – sparrowhawk/red kite, red fox (data extraction under development), freshwater fish, otter, blue mussel, dab, and harbour porpoise. It covers 3 environmental compartments: terrestrial, freshwater and marine (estuarine, coastal and offshore).

The chemicals are representative of 3 groups highlighted for attention under the 25 Year Environment Plan: persistent, bioaccumulative (the accumulation of a substance over time in a living organism) and toxic (PBT) substances, heavy metals, and pesticides and biocides. There are no new assessments to report in 2022, but we aim to update the indicator in 2024 as further data become available.

These data are being published as an experimental statistic to facilitate user involvement in the development of this indicator.

We would therefore welcome any feedback on these statistics, particularly on their usefulness and value, via 25YEPindicators@defra.gov.uk.

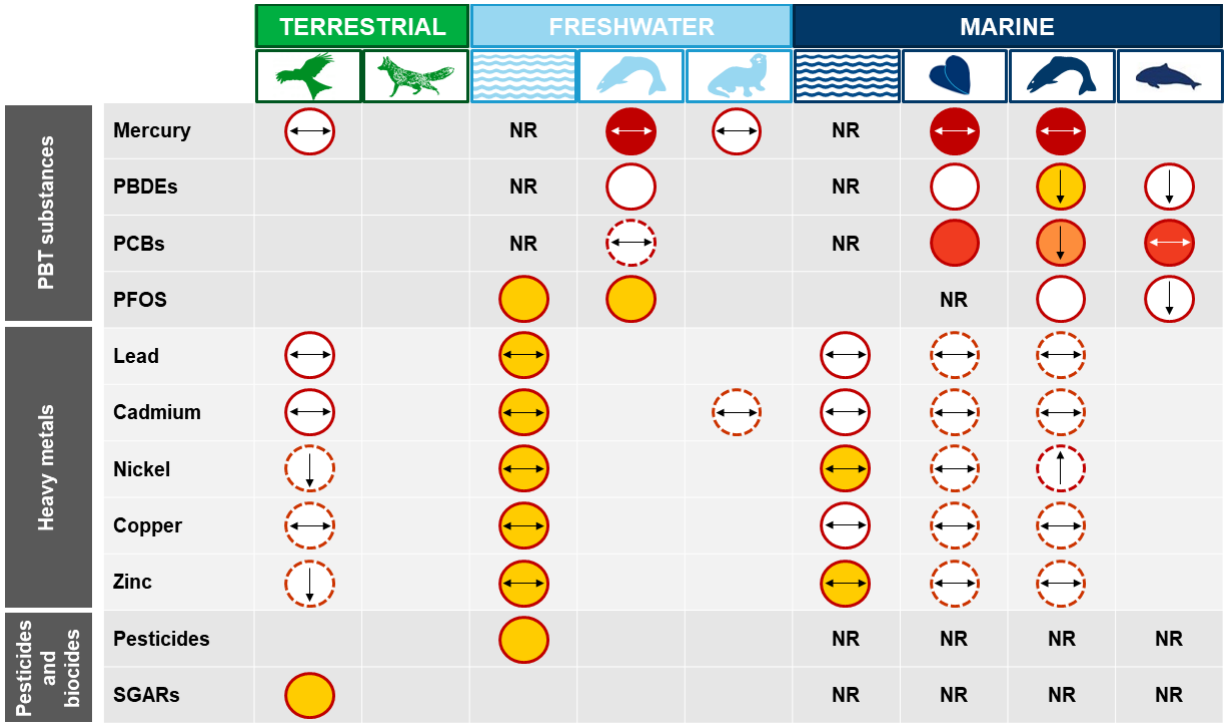
Further details on the data analysis used for the presented indicator are given in the supporting H4 indicator report. Some data relevant to this indicator are published: Predatory Bird Monitoring Scheme – contaminant exposure, Water Quality Data Archive, Water quality monitoring gas chromatography–mass spectrometry and liquid chromatography–mass spectrometry semi-quantitative screening data, British Oceanographic Data Centre - Monitoring and Assessment National Database (MERMAN).

Since the publication of the H4 indicator report, we have been working to improve our understanding of exposure of wildlife to the chemical contaminants presented, including by analysis of archived samples to address data gaps and get a picture across environmental compartments. This will enhance our ability to report exposure trends. We are exploring methods for assessing chemical contaminant effects on wildlife to improve our understanding of environmental impacts and the potential to report these under the indicator.

In addition, we are initiating the development of metrics for emerging chemical risks. This includes integrating results from the Prioritisation and Early Warning System (PEWS) for chemicals of emerging concern, which was developed in response to the 25 Year Environment Plan to consolidate work on monitoring and horizon scanning. PEWS includes consideration of the risks posed by emerging contaminants to surface and groundwaters, biota, soils and sediments. The approach taken on emerging risks will also seek to incorporate the consideration of broader chemical topics which extend beyond PEWS.

Figure H4 (interim): Exposure of wildlife to chemicals in the environment in England and, for some marine components the UK; up to 2019 where available

This image is a visual representation of the exposure of wildlife to chemicals in the environment and, where feasible, the risk from different types of chemicals to wildlife on land and in water. The information is also described in the trend description for Figure H4.



Key

Data sources

Sparrowhawk / red kite; Red fox; Freshwater; Roach / chub / brown trout; Otter; Estuarine / coastal waters; Blue mussels; Dab; Harbour porpoise

Acronyms PBT: persistent, bioaccumulative and toxic; PBDEs: polybrominated diphenyl ethers; PCBs: polychlorinated biphenyls; PFOS: perfluorooctanesulfonic acid; SGARs: second-generation anticoagulant rodenticides; NR: not relevant – unlikely to be an exposure route for that substance

Trend

Increasing concentrations; No observed change in concentrations; Decreasing concentrations

Only statistically significant trends in environmental concentrations are shown for upward and downward arrows; no arrow indicates minimum requirements for trend assessment are not met. Available year ranges for assessing trends vary and trends are only assessed for data sources with at least 5 full years of change (6 independent sampling years).

Risk

More than 75% sites/samples above threshold; 50 to 74% sites/samples above threshold; 25 to 49% sites/samples above threshold; 1 to 24% sites/samples above threshold; All sites/individuals or population average below threshold; No threshold available; not currently able to assess risk

Assessment is based on comparison of concentration data for the most-recent year, 2 years for dab and 3 years for PFOS and heavy metals in water.

Notes

1. Blank spaces indicate there are currently insufficient or no comparable data available to allow trend or risk reporting.
2. Data cover up to and including 2019 where available; exceptions are mercury (2013) and heavy metals (2014) in sparrowhawk, mercury and cadmium in otter (2016), and PBT substances in harbour porpoise (2018).

Source, Environment Agency

Note on Figure H4

Available thresholds for wildlife have been used to provide context to the most-recent national concentrations. Their use to indicate risk does not represent a compliance assessment and should not be compared with other regulatory reporting regimes which may use values with different protection goals. The approach for selecting thresholds is specific to the wildlife or environmental medium being considered because of the data available and the purpose for which it was gathered. Monitoring networks and thresholds can change over time.

The freshwater assessment for pesticides is currently based on a threshold for short-term toxic effects. In the future, the approach will be adapted to reflect risks from chronic exposure.

Additional data are available for otter, freshwater fish and red fox which cannot be incorporated into the dashboard at present, but are provided in the supporting report to this indicator. The report also contains information on spatial variation in results for freshwater metals sites and for marine fish.

Trend description for Figure H4

i) PBT substances

Downward trends are observed for polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs) in marine fish (dab) and for PBDEs and perfluorooctanesulfonic acid in harbour porpoise. These trends are particularly evident for PBDEs.

Exceedance of thresholds is most significant for mercury in the freshwater and marine environments, followed by PCBs in the marine environment. The result for mercury in dab may be over-precautionary for reasons given in supporting report.

ii) Heavy metals

For heavy metals, downward trends are observed for nickel and zinc in sparrowhawks, although the data are only available up to 2014. There is an upward trend for nickel in dab, which is driven by eastern and southern coastal marine sites.

The exceedance of the nickel threshold in estuarine and coastal waters is only driven by one site. Zinc shows the highest rate of threshold exceedance of the metals in both freshwater and estuarine and coastal waters.

While the freshwater data for heavy metals show no change in concentrations from 2014 to 2019, these results can be split into 2 types: those for sites where the waters are affected by abandoned metal mines and those for sites in other locations. Cadmium and copper exhibit downward trends for the ‘other’ sites over the assessed time period. Lead, nickel and zinc concentrations show no statistically significant change over time at such sites. For waters affected by abandoned metal mines, none of the metals included within this indicator show any statistically significant change in concentrations over time.

However, their elevated levels of cadmium, copper, lead, and zinc mean that they comprise a high proportion of those overall sites above available thresholds. The exception is for nickel, where sites in ‘other’ locations comprise the majority of those at risk.

iii) Pesticides and biocides

It is not possible to assess trends currently for pesticides and second-generation anticoagulant rodenticides (SGARs). Risk is indicated for less than a quarter of sites or individuals considered for pesticides in water and SGARs in red kite.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

H5 Exposure to transport noise

Short description

This indicator will track changes in the exposure of people to noise from transportation sources. It does not include neighbour and neighbourhood noise. The indicator will show the estimated number of people exposed to noise levels (in 5 decibel bands) from the most significant road, rail and air sources. Health costs (and hence burden to the economy) of noise can be estimated from health outcomes associated with noise exposure (such as annoyance, sleep disturbance, and cardiovascular effects). The available data being explored for this indicator’s development are currently derived through strategic noise mapping undertaken at 5-year intervals.

Relevant goal in the 25 Year Environment Plan

- Enhanced beauty, heritage and engagement with the natural environment

Relevant target in the 25 Year Environment Plan

- None

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- Environmental Noise (England) Regulations (as amended) 2006

Geographical scope

England, potential to disaggregate the data regionally.

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022 as the model for producing this data is in development. Prototype development began in 2021, focussing initially on a small-scale geographical pilot to refine technical approach before subsequent expansion to full-scale national level modelling. Data for noise exposure is published.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

Theme J: Resource Use and Waste

J1 Carbon footprint and consumer buying choices

Short description

This indicator tracks the carbon footprint of England's residents, by showing changes in the greenhouse gas (GHG) emissions associated with final demand for goods and services in England. Unlike indicator A2 which measures emissions on a territorial basis, this indicator includes GHG emissions embedded within goods and services consumed in England wherever these emissions arise across the globe. The indicator will show how consumer preferences and behaviour are impacting on the overall national carbon footprint.

Relevant goals in the 25 Year Environment Plan

- Minimising waste
- Mitigating and adapting to climate change

Relevant targets in the 25 Year Environment Plan

- Working towards our ambition of zero avoidable waste by 2050
- Making sure that all policies, programmes and investment decisions take into account the possible extent of climate change this century

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- None

Geographical scope

England

Status of indicator development

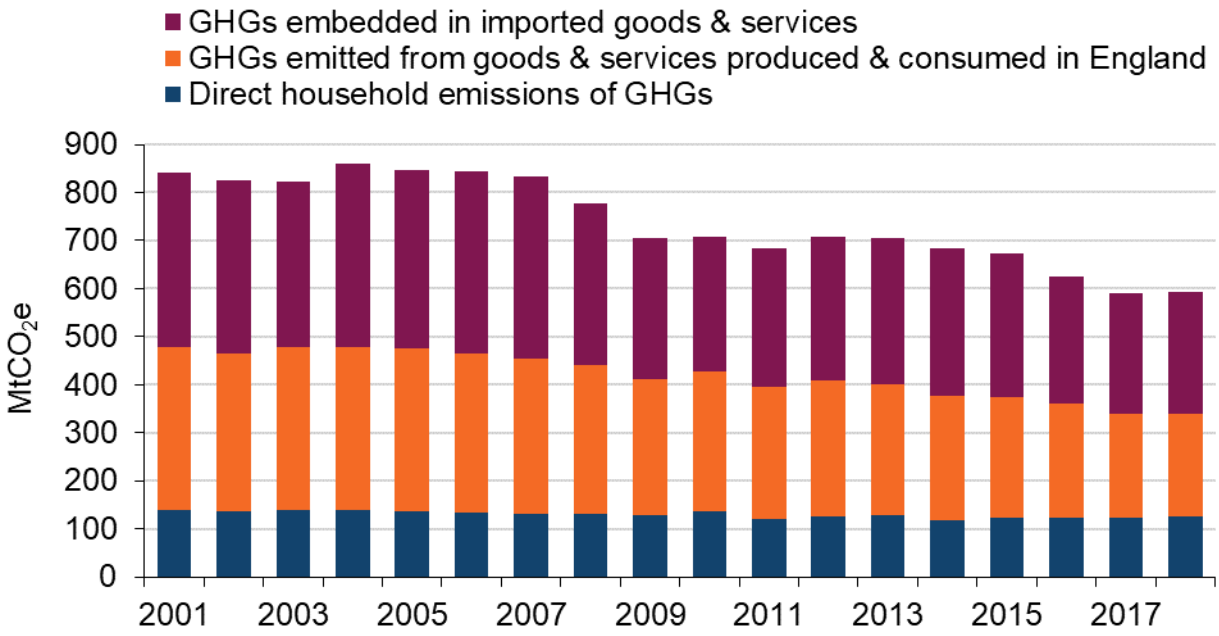
Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows consumption-based GHG emissions in England. Data underpinning this metric are available in the England Carbon Footprint Data Release. These source data are currently published as experimental statistics whilst there are ongoing refinements to the methodology.

Methodology and accompanying data at a UK level are available in the UK's carbon footprint release. These UK data are again published as experimental statistics whilst there are ongoing refinements to the methodology. This interim indicator, together with additional supporting methodology is also included within the Resources and waste strategy for England. Further data may be available in the future tracking an index of carbon emissions impacts due to consumer buying choices.

Figure J1 (interim): Consumption-based greenhouse gas emissions in England, 2001 to 2018



Source, Defra

Note on Figure J1

These data have been revised since the previous publication due to ongoing refinements to the methodology of the experimental statistics underpinning this indicator.

Trend description for Figure J1

England's carbon footprint (carbon dioxide, methane and nitrous oxides) was estimated to be equivalent to 593.6 million tonnes of carbon dioxide ($MtCO_2e$) in 2018, a 29.5% reduction on levels in 2001 (841.7 $MtCO_2e$). GHGs emitted directly by households (making up 21.0% of the footprint in 2018) were 9.6% lower in 2018 than in 2001 as a result of reductions in emissions associated with household-related heating. Total consumption-based emissions have been on a downward trajectory since 2004: the greatest contribution to this trend has come from the goods and services produced in England and consumed here; but emissions embedded in imports have also reduced substantially (36.3% and 33.7% respectively from the 2004 peak overall). As a proportion of total emissions in 2018, GHGs emitted overseas in the production of goods and services consumed in England made up 42.7% of the total footprint.

Assessment of change

The interim indicator for J1 'Consumption based greenhouse gas emissions in England' was assessed. This showed an improvement in the most recent 5-year period for which trends can be assessed (2013 to 2018), and over the medium and long-term time periods. This assessment does not consider whether any improvement is on a sufficient scale for meeting targets.

Change since 2018 has not been assessed for this indicator as sufficient data are not yet available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table J1: Assessment of change in consumption-based greenhouse gas emissions in England

Period	Date range	Percent change	Assessment of change
Short term	2012-2017	-12.4 (smoothed Loess)	Improvement
Medium term	2007-2017	-24.7 (smoothed Loess)	Improvement
Long term	2001-2017	-25.9 (smoothed Loess)	Improvement

Note that assessment categories were assigned based on smoothed data, so percent change figures in Table J1 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen between the first and last years in the specified date range.

J2 Raw material consumption

Short description

This indicator shows trends in the amount of (a) raw material consumption (RMC) per capita and (b) the amount of gross value added (GVA) per unit of raw material

consumption. These measures give a proxy for the scale of our environmental impact associated with our material consumption, while helping identify how efficiently natural resources are being used and the extent to which economic output is being decoupled from consumption of materials.

Relevant goals in the 25 Year Environment Plan

- Using resources from nature more sustainably and efficiently
- Mitigating and adapting to climate change

Relevant target in the 25 Year Environment Plan

- Maximising the value and benefits we get from our resources, doubling resource productivity by 2050

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- Links to the UN Sustainable Development Goals 8 and 12

Geographical scope

England

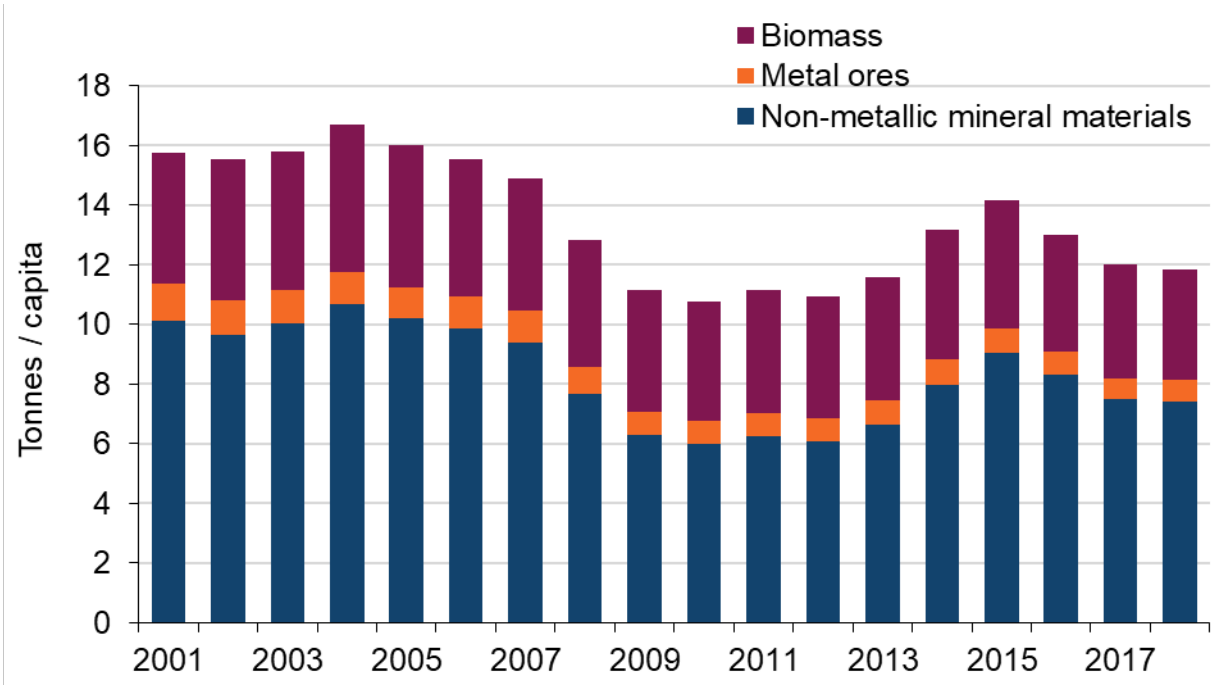
Status of indicator development

Final

Readiness and links to data

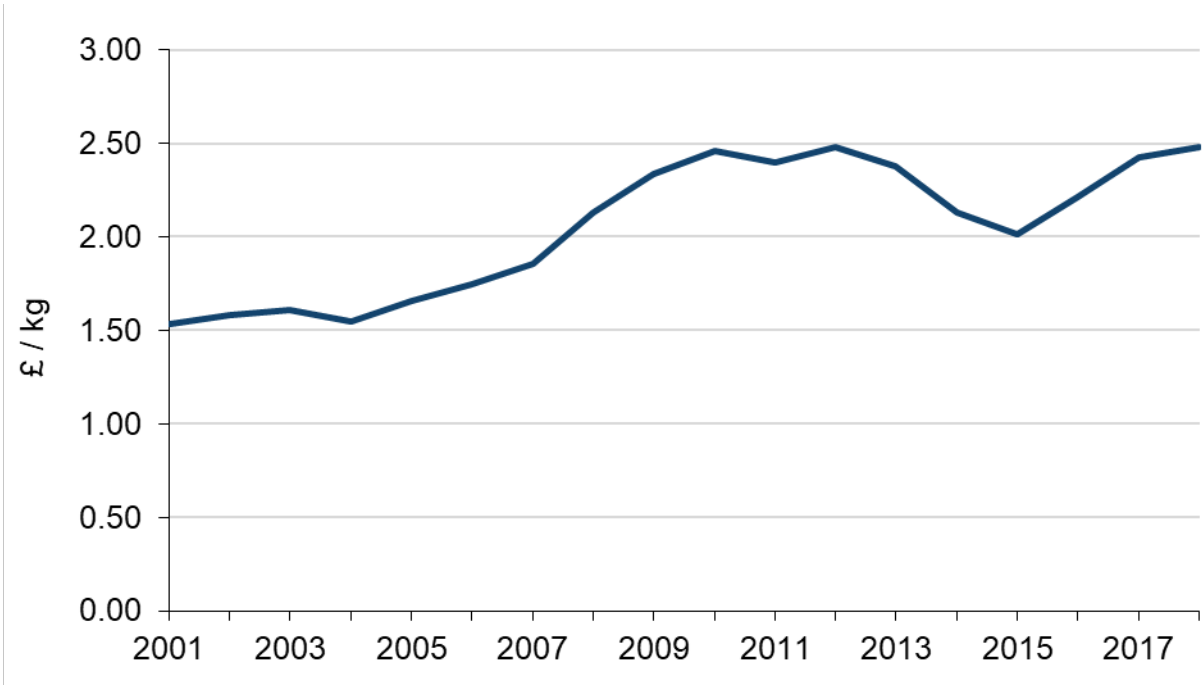
Data on RMC underpinning each metric are available in the England's material footprint release. Data on Nominal and real regional gross value added (balance) by industry and Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland are published by the Office for National Statistics. This indicator, together with additional supporting methodology is also included within the Resources and waste strategy for England.

Figure J2a: Raw material consumption (excluding fossil fuels) per capita in England, 2001 to 2018



Source, Defra; Office for National Statistics

Figure J2b: Gross value added per kg of raw material consumption (excluding fossil fuels) in England, 2001 to 2018



Source, Defra; Office for National Statistics

Note on Figures J2a and J2b

These data have been revised since the previous publication due to refinements to the methodology as the source publication underpinning this indicator progressed from experimental to official statistics.

Trend description for Figures J2a and J2b

J2a) Raw material consumption per capita

The average raw material footprint per capita in England (excluding fossil fuels) fell by 25.0% between 2001 and 2018. It peaked in 2004, decreased steadily until 2007 and then fell sharply during the 2008 to 2009 recession. It rose again until 2015 but has fallen over the latest 3 years for which data are available (2016 to 2018) to 11.8 tonnes per capita. Within the overall total, per capita consumption of non-metallic mineral materials, metal ores and biomass have all decreased between 2001 and 2018 (by 27%, 40% and 17% respectively).

J2b) Gross value added per kg of raw material consumption

In 2018, England generated approximately 62.0% more economic value than in 2001 (measured by GVA per unit of RMC (excluding fossil fuels), also described as resource productivity). Resource productivity measured on this basis, rose from £1.53 of GVA per kg of RMC in 2001 to a peak of £2.48 in 2012 before declining until 2015, and then regaining its 2012 peak in 2018.

Assessment of change

There has been an improvement recorded over the medium and long term for both interim indicators for J2: J2a Raw material consumption (excluding fossil fuels) per capita in England and J2b Gross value added per kg of raw material consumption (excluding fossil fuels) in England. However, in the most recent 5 years for which trends can be assessed (2012 to 2017), RMC has begun to increase again (meaning a deterioration for the indicator) and progress has stalled for GVA per kg of RMC with an assessment of ‘little or no change’.

Change since 2018 has not been assessed for this indicator as sufficient data are not yet available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table J2a: Assessment of change in raw material consumption (excluding fossil fuels) per capita in England

Period	Date range	Percent change	Assessment of change
Short term	2012-2017	+10.3 (smoothed Loess)	Deterioration
Medium term	2007-2017	-12.5 (smoothed Loess)	Improvement
Long term	2001-2017	-19.6 (smoothed Loess)	Improvement

Table J2b: Assessment of change in gross value added per kg of raw material consumption (excluding fossil fuels) in England

Period	Date range	Percent change	Assessment of change
Short term	2012-2017	-2.3 (smoothed Loess)	Little or no change
Medium term	2007-2017	+21.4 (smoothed Loess)	Improvement
Long term	2001-2017	+50.2 (smoothed Loess)	Improvement

Note that assessment categories were assigned based on smoothed data, so percent change figures in Tables J2a and J2b may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen between the first and last years in the specified date range.

J3 Municipal waste recycling rates

Short description

This indicator shows changes in municipal waste recycling rates in England. The municipal waste recycling rate is the fraction of household waste and waste similar in nature and composition to household waste, which is recycled. The indicator reflects levels of everyday waste that is recycled and not sent for final disposal. Development of the Defra 'waste tracking' tool and further integration with data collected by local authorities will close some of the data gaps and enable collection of more comprehensive data.

Relevant goal in the 25 Year Environment Plan

- Minimising waste

Relevant target in the 25 Year Environment Plan

- Working towards our ambition of zero avoidable waste by 2050

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- None

Geographical scope

England; some data are available for local authorities.

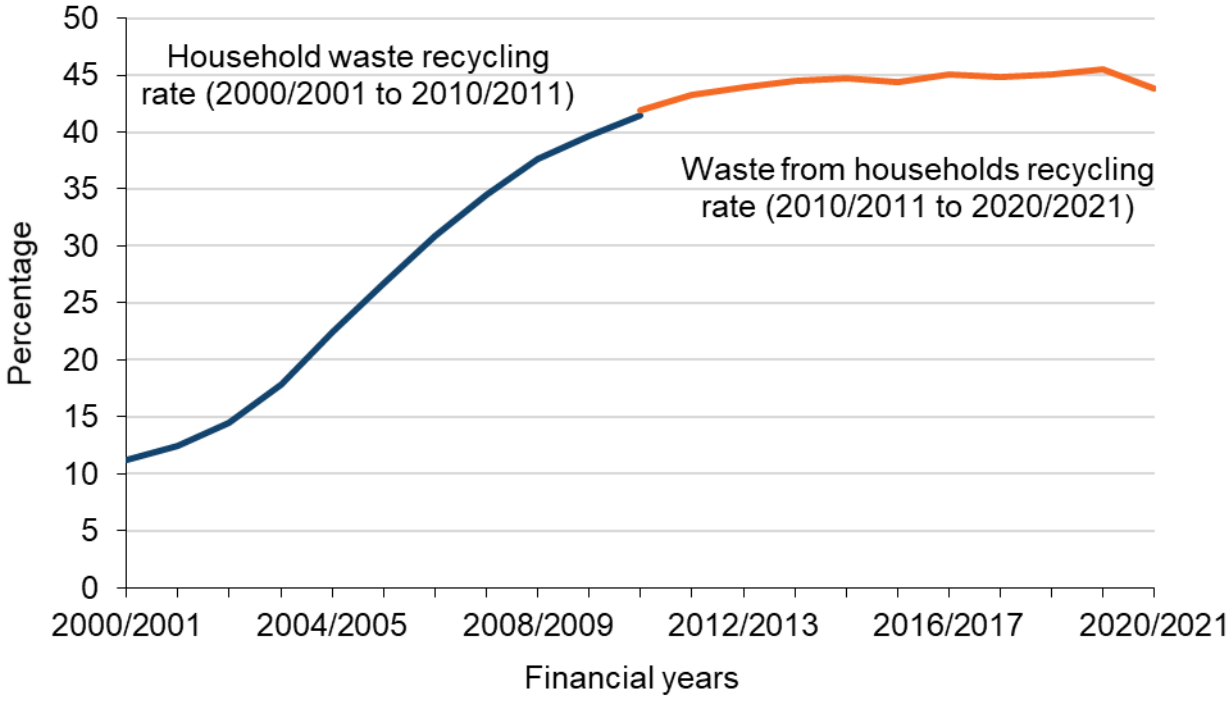
Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows trends in 'household waste' and 'waste from households' recycling rates. These waste data are already published annually as National Statistics. Further development is required to include waste that is similar in nature and composition to household waste such as non-household municipal waste. Information is available about the development of Defra's 'waste tracking' tool.

Figure J3 (interim): 'Household waste' and 'waste from households' recycling rates in England, 2000/2001 to 2020/2021



Source, Defra

Note on Figure J3

The recycling measure reported in this indicator changed from 'household waste' to 'waste from households' in 2010/2011. The earlier 'household waste' recycling measure was based on a slightly broader definition of waste than the 'waste from households' measure and results from the 2 measures are therefore not directly comparable (see 'glossary'

section of the source statistical publication on Local authority collected waste management for further details). Data for both measures are for April to March (financial years).

Trend description for Figure J3

In the 2020/2021 financial year, the recycling rate for 'waste from households' was 43.8%, up 1.9 percentage points on the equivalent figure for 2010/2011 (when the measure was first reported), but down 1.7 percentage points since 2019/2020.

Assessment of change

In 2011, there was a change in the methodology used to produce for the Municipal waste recycling rates indicator. As this was not directly comparable to the previous method, we have only assessed trends using data following the new method. This limits the length of time series available, so no assessment is provided for medium and long-term time periods.

Little or no change was observed over the most recent 5 years for which trends can be assessed (2015 to 2020). This is in contrast to historic improvements recorded using the old method.

Change since 2018 has also been assessed. There has been little or no change in municipal recycling rates since 2018, based on 4 years of data. We set a minimum of 5 data points for the production of a robust trend for this assessment so this result should be treated with caution until the next iteration is available.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table J3: Assessment of change in 'household waste' and 'waste from households' recycling rates in England

Period	Date range	Percent change	Assessment of change
Short term	2014/2015-2019/2020	+0.5 (smoothed Loess)	Little or no change
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Note that assessment categories were assigned based on smoothed data, so percent change figures in Table J3 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen between the first and last years in the specified date range.

J4 Residual waste arising by type and sector

Short description

This indicator shows how much waste is incinerated and landfilled in England rather than recycled, reused or treated further up the waste hierarchy. Data presented are captured through the Environment Agency's permitted site data and annual monitoring reports. There are still gaps in the data and these will need to be addressed in order to provide reporting by source sector.

Relevant goal in the 25 Year Environment Plan

- Minimising waste

Relevant targets in the 25 Year Environment Plan

- Working towards our ambition of zero avoidable waste by 2050
- Working to a target of eliminating avoidable plastic waste by end of 2042
- Meeting all existing waste targets – including those on landfill, reuse and recycling – and developing ambitious new future targets and milestones

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- None

Geographical scope

England

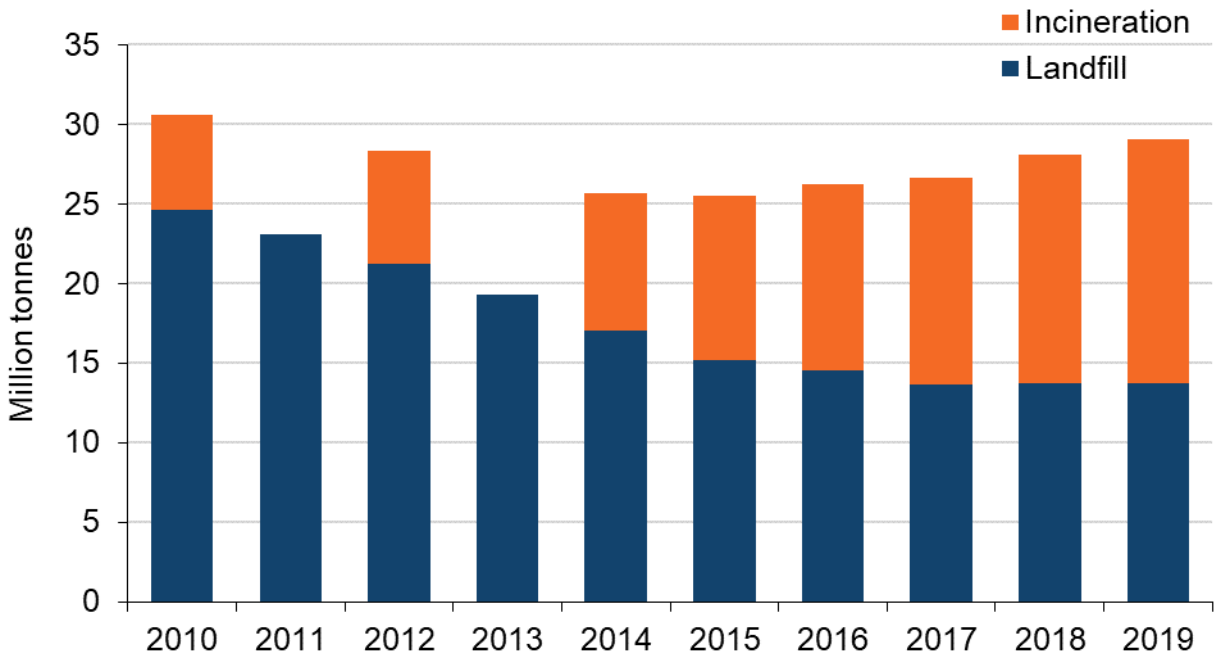
Status of indicator development

Interim

Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows trends in waste landfilled or incinerated (with and without energy recovery) in England, excluding major minerals. Some data are available via the Environment Agency's Waste data interrogator and incineration monitoring reports, but further work is required to split these data by source sector. This interim indicator, together with additional supporting methodology is also included within Defra's Resources and waste strategy for England.

Figure J4 (interim): Residual waste (excluding major mineral wastes) in England, 2010 to 2019



Source, Defra, Environment Agency

Note on Figure J4

For the purposes of this indicator, residual waste refers to waste sent to landfill or incineration in England. There are no incineration data available for 2011 and 2013.

These data do not include exported waste figures. However, it is intended for these to be incorporated in the future.

Trend description for Figure J4

In 2019, the total quantity of waste (excluding major mineral wastes) landfilled or incinerated in England was 29.1 million tonnes, a 5.0% reduction against levels in 2010 (30.6 million tonnes). This reduction was due to less waste being landfilled (falling by 44.1% over the period 2010 to 2019), and more waste being sent to incineration (increasing by 156.3% over the same period).

Assessment of change

The time series for interim J4 indicator Residual waste (excluding major mineral wastes) in England begins in 2010 which is not yet long enough to produce an assessment for medium and long-term time periods. The assessment shows trends for the total of both landfill and incineration waste. Missing data points for incineration waste were extrapolated to produce a continuous time series. A small increase in residual waste (or deterioration) was observed over the most recent 5 years for which trends can be assessed (2013 to 2018). This assessment does not consider whether this improvement is on a sufficient scale to meet any targets.

Change since 2018 has also been assessed. An increase in residual waste has been observed since 2018. However, this is based on only 2 data points so should be considered as indicative only and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table J4: Assessment of change in residual waste (excluding major mineral wastes) in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+3.6 (smoothed Loess)	Deterioration
Medium term	N/A	N/A	Not assessed
Long term	N/A	N/A	Not assessed

Note that assessment categories were assigned based on smoothed data, so percent change figures in Table J4 may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen between the first and last years in the specified date range.

J5 Prevent harmful chemicals from being recycled

Short description

This indicator will track the amount of banned or restricted chemicals in waste which is being destroyed. The removal and proper destruction of such chemicals is necessary to prevent them contaminating recycled products or being released into the environment.

Initially the indicator will use data on the amount of persistent organic pollutants (POPs) being sent for destruction. This is in line with the goal to substantially increase the amount of POPs material being destroyed or irreversibly transformed by 2030. Similar data on elimination of the use of polychlorinated biphenyls (PCBs) will be included once those data become available.

Where possible, these chemicals should be removed prior to disposal, minimising the amount of waste being sent for destruction. Data may soon become available for some of these waste types, enabling assessment of improvements in the quantity and quality of waste material available for recycling.

Relevant goals in the 25 Year Environment Plan

- Managing exposure to chemicals
- Minimising waste

Relevant targets in the 25 Year Environment Plan

- Fulfilling our commitments under the Stockholm Convention as outlined in the UK's most recent National Implementation Plan
- Substantially increasing the amount POPs material being destroyed or irreversibly transformed by 2030, to make sure there are negligible emissions to the environment
- Seeking in particular to eliminate the use of PCBs by 2025, in line with our commitments under the Stockholm Convention
- Working towards our ambition of zero avoidable waste by 2050

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- Persistent Organic Pollutants Regulation (Article 13)
- UN Stockholm Convention on Persistent Organic Pollutants (Article 15)

Geographical scope

UK; data are also available at regional level, and by local and waste planning authority.

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022. Some data are already published via the hazardous waste interrogator. Further work is required to develop and improve confidence in the data for the indicator for POPs, due to the nature of the available data, there is greater certainty in the data for PCBs. Further work is planned to improve the existing data, and to further expand the indicator to include more POPs.

The UK is currently consulting on introducing a mandatory digital waste tracking system. If implemented this system could further add to the body of data for this indicator.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

J6 Waste crime

Short description

This indicator tracks changes in the scale of key aspects of waste crime. Waste crime is a broad term encompassing fly-tipping, illegal waste sites, illegal waste exports, the misdescription of waste and illegal waste dumping, among other illegal waste-related activities. If not handled properly, waste can cause serious pollution of the environment –

air, land and water, which can also be harmful to health. It further reduces the availability of resources from waste. Current data reported include illegal waste sites and fly-tipping. The underpinning data can be used to establish the level of criminal activity for some aspects of waste crime and geographic distribution. Options for further development will be considered, including the impacts and behavioural aspects of waste crime, the amount and types of potential resources lost through waste crime, and to reflect the need for targeting and effective enforcement to deliver reductions in the level of criminal activities.

Relevant goal in the 25 Year Environment Plan

- Minimising waste

Relevant target in the 25 Year Environment Plan

- Seeking to eliminate waste crime and illegal waste sites over the lifetime of this Plan, prioritising those of highest risk

Position in the natural capital framework

Pressure on natural capital assets

Related reporting commitments

- None

Geographical scope

England and at individual site or facility level.

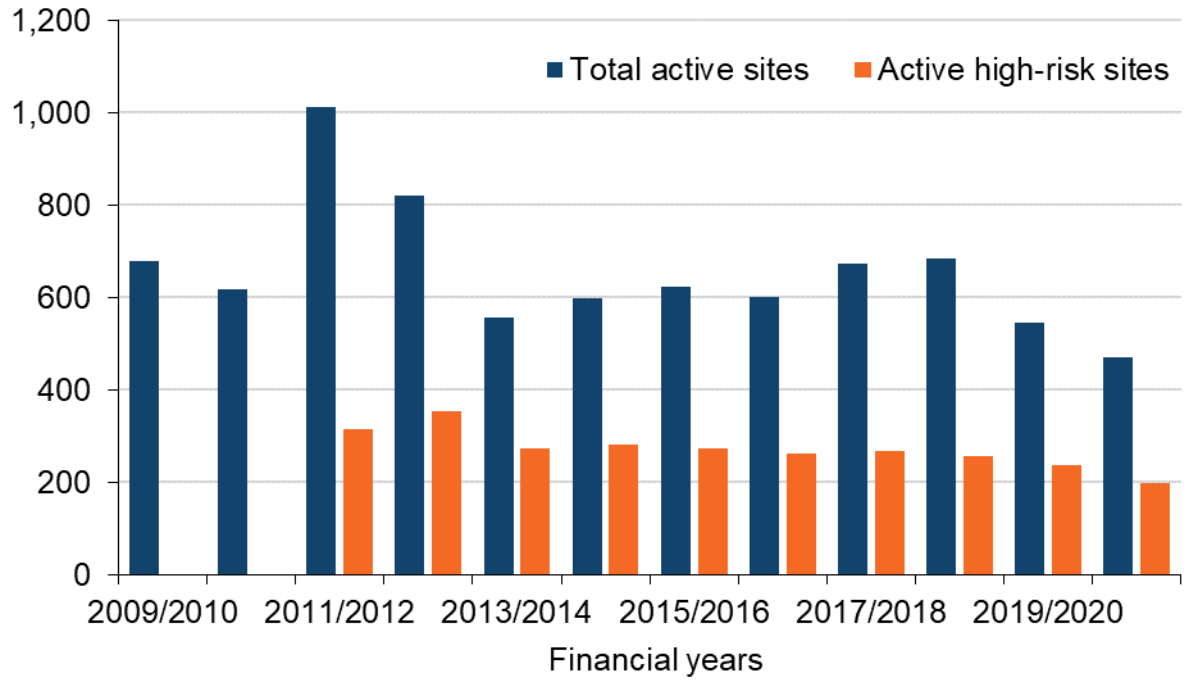
Status of indicator development

Interim

Readiness and links to data

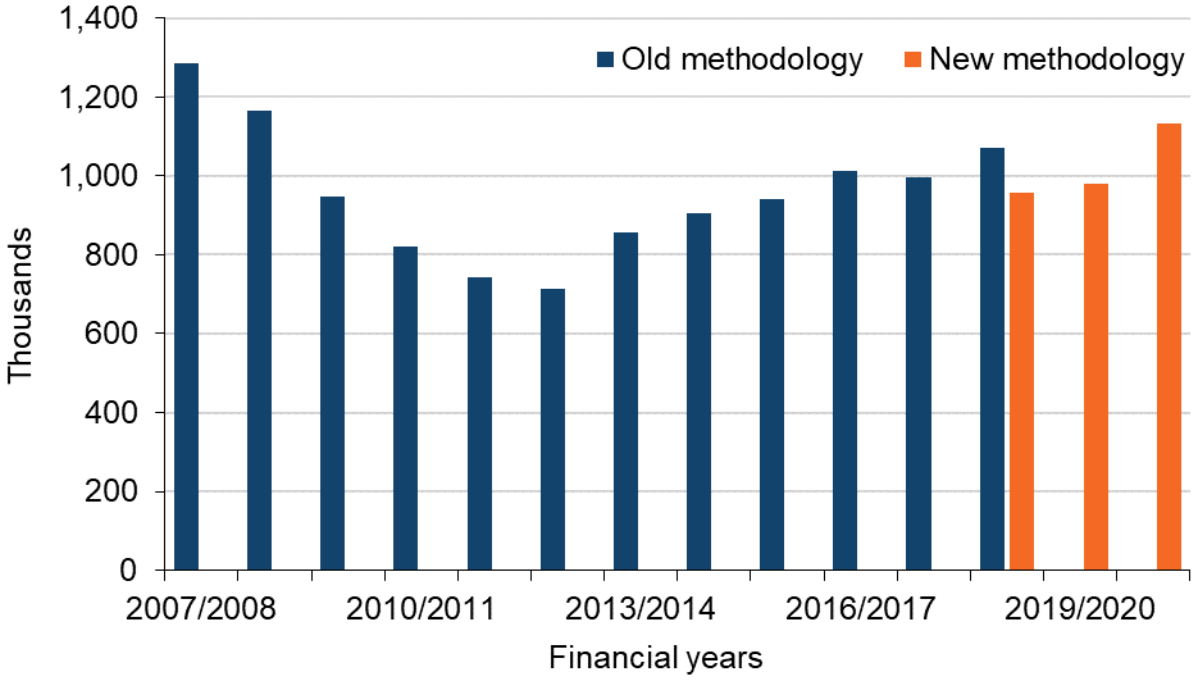
This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows the number of: (a) illegal waste sites and (b) fly-tipping incidents in England. Some data on illegal waste sites (waste crime) and fly-tipping are already published, but further work is required to develop the final indicator.

Figure J6a (interim): Number of illegal waste sites in England, 2009/2010 to 2020/2021



Source, Environment Agency

Figure J6b (interim): Fly-tipping incidents in England, 2007/2008 to 2020/2021



Source, Defra

Note on Figures J6a and J6b

Illegal waste site and fly-tipping data are for April to March (financial years).

Illegal waste site data for 2009/2010 and 2010/2011 are for the total number of active waste sites; a breakdown of these data into active sites and active high-risk sites is not available. Concerted sampling efforts from the Environment Agency to identify and investigate illegal waste sites resulted in a peak number being observed in 2011/2012. In subsequent years, activity focused on interventions to disrupt and deal with offenders and close down illegal waste sites. There is a low level of confidence in the 2020/2021 data, as the COVID-19 pandemic impeded the Environment Agency's ability to identify illegal waste sites.

The methodology used to calculate the total number of fly-tipping incidents in England was changed in 2019/2020 and results derived by using the new methodology are not comparable to those derived from the old methodology. These methodological changes have also been applied to the 2018/2019 results in order to show the effects of adopting the new methodology. Detailed information on these changes can be found in the reporting basis section of the source Fly-tipping statistics publication. For years 2007/2008 to 2017/2018 there is some level of estimation in the fly-tipping data, where returns for certain local authorities were missing or incomplete.

Trend description for Figures J6a and J6b

J6a) Illegal waste sites

The total number of illegal waste sites in England fell from a peak of 1,011 active sites in the financial year 2011/2012 to 556 active sites in 2013/2014. Since then, the number increased gradually, reaching 685 sites in 2018/2019, before falling again to 470 sites in 2020/2021. Within this total, the number of active high-risk illegal waste sites fell by 44% from a peak of 353 sites in 2012/2013 to 197 sites in 2020/2021.

J6b) Fly-tipping incidents

The total number of fly-tipping incidents reported in England fell from 1.28 million incidents in the financial year 2007/2008 to 715,000 incidents in 2012/2013. Since these initial reductions, the number of incidents reported under the old methodology increased to over 1 million (1.07 million) between 2012/2013 and 2018/2019. The total number of fly-tipping incidents reported in 2018/2019 under the new methodology was 957,000. In the 2 years to 2020/2021, this total increased by 18.5% to 1.13 million incidents.

Assessment of change

There has been an improvement recorded over the medium term for both interim indicators for J6: J6a Illegal waste sites in England and J6b Fly-tipping incidents in England. However, in the most recent 5 years for which trends can be assessed (2012 to 2017), fly tipping incidents have begun to increase again (meaning a deterioration for the indicator) and progress has stalled for illegal waste sites with an assessment of 'little or no change'.

The time series for both J6 indicator component's are not yet long enough for a long-term assessment. A new methodology was introduced in 2018 for J6b but, as this was not directly comparable to the previous method and only 3 data points are so far available, just data based on the old method were included in the assessment.

Change since 2018 has also been assessed. Illegal waste sites decreased in 2019 (an improvement) while fly tipping incident increased (a deterioration). However, this is based on only 2 data points so should be considered as indicative and not evidence of a clear trend.

Further background on this assessment, along with details on the method, is provided in Section C of the report. Summaries by 25 Year Environment Plan goal and information on indicator links are also presented there.

Table J6a: Assessment of change in the total number of active illegal waste sites in England

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	-1.4 (smoothed Loess)	Little or no change
Medium term	2008-2018	-14.7 (smoothed Loess)	Improvement
Long term	N/A	N/A	Not assessed

Table J6b: Assessment of change in the number of fly-tipping incidents in England (using old methodology)

Period	Date range	Percent change	Assessment of change
Short term	2013-2018	+36.0 (smoothed Loess)	Deterioration
Medium term	2008-2018	-22.0 (smoothed Loess)	Improvement
Long term	N/A	N/A	Not assessed

Note that assessment categories were assigned based on smoothed data, so percent change figures in Tables J6a and J6b may differ from unsmoothed values quoted elsewhere. Percent change refers to the difference seen from the first to last year in the specified date range.

Theme K: International

K1 Overseas environmental impacts of UK consumption of key commodities

Short description

This indicator tracks the impact on the environment overseas resulting from our domestic consumption, linked to the sustainability of the products we import. The indicator is based on multi regional input-output (MRIO) modelling, which is used to model global trade flows representing the monetary inputs and outputs across different countries and their

commercial sectors. While the indicator is also based on a similar concept and approach to ‘J1 Carbon footprint and consumer buying choices’ and ‘J2 Raw material consumption,’ the detail of the methodologies does not align and therefore the results are not directly comparable.

Relevant goal in the 25 Year Environment Plan

- There are no specific goals in the 25 Year Environment Plan for this indicator, however the Plan commits us to leaving a lighter footprint on the global environment by enhancing sustainability and supporting zero deforestation supply chains.

Relevant target in the 25 Year Environment Plan

- None

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- Convention on Biological Diversity Aichi Target 4
- Sustainable Development Goals 12, 14 and 15

Geographical scope

International

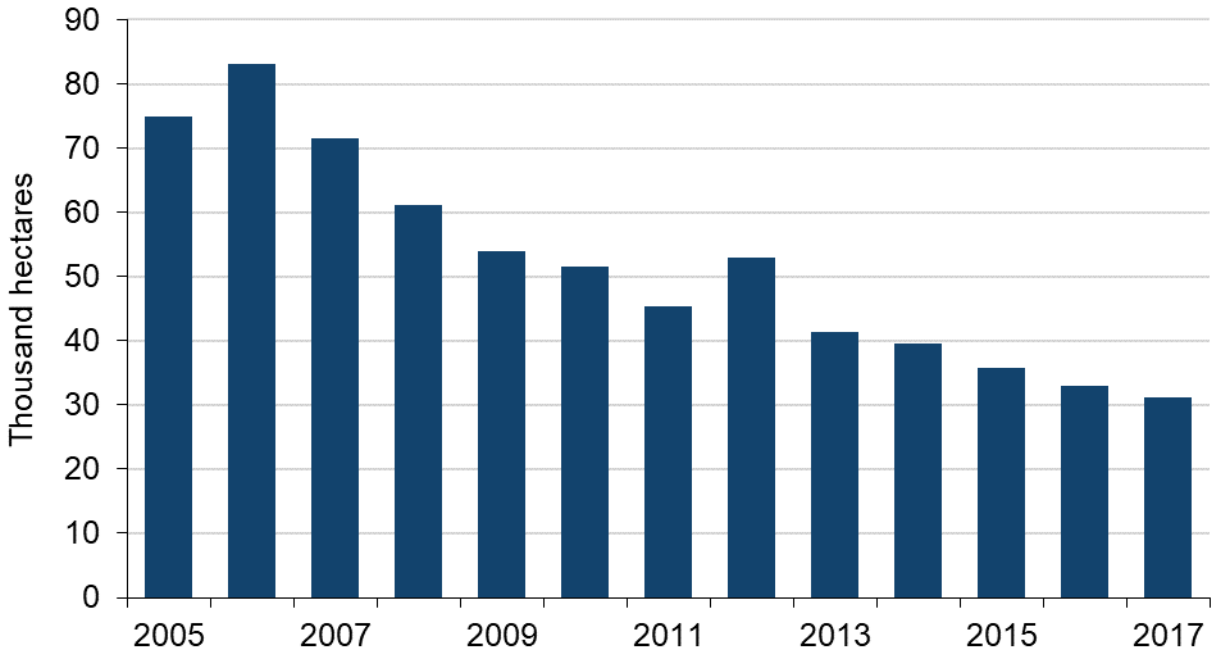
Status of indicator development

Interim

Readiness and links to data

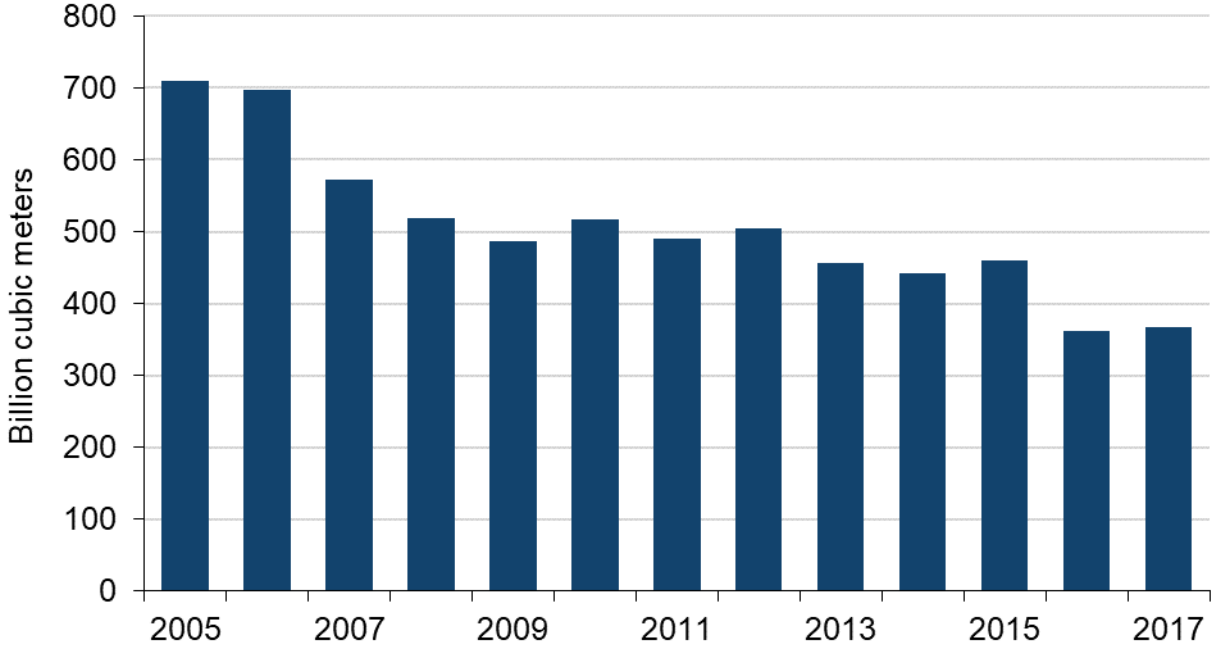
This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows (i) the global deforestation risk and (ii) the global ‘scarcity-weighted blue water use’ from UK consumption of imported commodities; a further metric to measure biodiversity loss is currently being developed. The figures are calculated using the Input-Output Trade Analysis (IOTA) framework and the results are reported for the first time in 2022 as an experimental statistic; information on how the data have been obtained and how the statistics have been calculated is available in UK Biodiversity Indicator A4 – Global biodiversity impacts of UK economic activity and sustainable consumption. The data are being published as experimental statistics, both here and within the source publication, to gather feedback and facilitate user involvement in the development of this indicator. An early metric for measuring biodiversity loss is included within UK Biodiversity Indicator A4 publication but is undergoing refinement before publication as part of the Outcome Indicator Framework.

Figure K1i (interim): Area of tropical deforestation associated with UK consumption, 2005 to 2017



Source, Joint Nature Conservation Committee

Figure K1ii (interim): Global scarcity-weighted blue water use associated with UK consumption, 2005 to 2017



Source, Joint Nature Conservation Committee

Note on Figures K1i and K1ii

Estimates of the global deforestation risk in Figure K1i refer to tropical and subtropical deforestation from UK consumption of crop, cattle related and timber commodities only.

Scarcity-weighted blue water use scales the blue water footprint (surface and groundwater consumed as a result of production) according to water availability in a region after human and aquatic ecosystem demands have been met. Estimates of the global scarcity-weighted blue water use in Figure K1ii refer to the UK consumption of crop commodities only.

Data that trace all commodities back to their exact countries of origin are not publicly available. This information is necessary in order to accurately link production to deforestation and water use. Therefore, the outputs produced by this indicator are derived from modelling these trade flows, and so (whilst based on empirical statistics) they should be considered as best estimates rather than exact figures. Additional caveats and limitations are outlined in the source publication – the Global biodiversity impacts of UK economic activity and sustainable consumption.

While the currently available data predate the 25 Year Environment Plan, they provide the most recently available assessment of the overseas environmental impacts of UK consumption of key commodities. They enable a better understanding of a baseline from which to measure progress towards the goals of the 25 Year Environment Plan when the indicator is next updated.

Trend description for Figures K1i and K1ii

K1i) Tropical deforestation

UK consumption of crop, cattle-related and timber commodities in 2017 was responsible for an estimated 31,126 hectares of agriculture-driven tropical deforestation worldwide, a long-term decrease of 58% since the time series began in 2005. Comparing the 2017 footprint with 2012 reveals a short-term decrease of 41% and a decrease (6%) was also observed in the latest year (2017).

K1ii) Blue water use

UK consumption of crop commodities in 2017 was responsible for an estimated 367 billion cubic-meters of scarcity-weighted blue water use worldwide, a decrease of 48% since 2005. Comparing the 2017 footprint with 2012 reveals a 27% decrease, but there was very little change (1% increase) observed in the latest year (2017).

Assessment of change

This indicator was not assessed as it is newly introduced this year and data were not available in time to allow for analysis to be carried out. Assessment is intended to be made in future Outcome Indicator Framework updates.

K2 Developing countries better able to protect and improve the environment with UK support

Short description

The poorest people and countries in the world are often the most vulnerable and likely to be hardest hit by the degradation of natural environments. Climate change and the deterioration of natural environments are prime drivers of poverty, food insecurity and instability, and can trigger conflict and migration. This indicator will report outcomes of UK investment programmes into nature. These programmes include International Climate Finance, the Blue Planet Fund and other nature focussed programmes such as the Biodiversity Challenge Funds (for example, the Darwin Initiative and the Illegal Wildlife Challenge Fund); they support developing countries to protect and improve the environment, address illegal wildlife trade, mitigate and adapt to climate change and alleviate poverty.

Relevant goal in the 25 Year Environment Plan

- There are no specific goals in the 25 Year Environment Plan for this indicator; however, the Plan commits us to helping developing nations protect and improve the environment

Relevant target in the 25 Year Environment Plan

- None

Position in the natural capital framework

Service or benefit associated with natural capital asset

Related reporting commitments

- None

Geographical scope

International

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022. Further development is needed to identify how to assess outcomes of UK overseas investment building on existing and developing evaluation schemes for International Climate Finance, the Biodiversity Challenge Funds such as the Darwin Initiative, and other new programmes such as the Blue Planet Fund and Biodiverse Landscape Fund whilst reflecting further alignment with indicators for the post-2020 global biodiversity framework currently under negotiated.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

K3 Status of endemic and globally threatened species in the UK Overseas Territories

Short description

UK Overseas Territories (UKOTs) are home to rich, globally important biodiversity, with many species found nowhere else in the world. This indicator will track change in the status of key endemic and globally threatened species found in the Overseas Territories (OTs).

Relevant goals in the 25 Year Environment Plan

- There are no specific goals in the 25 Year Environment Plan for this indicator, but the Plan commits us to taking action to recover threatened, iconic or economically important species of animals, plants and fungi, and where possible to prevent human-induced extinction or loss of known threatened species, in the Overseas Territories.

Relevant target in the 25 Year Environment Plan

- None

Position in the natural capital framework

Condition of asset – species and ecological communities

Related reporting commitments

- Convention on Biological Diversity Aichi Target 12
- Sustainable Development Goals 14 and 15

Geographical scope

UK Overseas Territories

Status of indicator development

In development

Readiness and links to data

This indicator is not available for reporting in 2022. Preliminary work has been undertaken to explore potential sources of endemic species information for the UKOTs. A detailed exploratory analysis of both the International Union for Conservation of Nature Red List of Threatened Species and The UK's wildlife overseas : a stocktake of nature in our Overseas Territories has been conducted. The data sets were combined to identify endemic, native or non-native status on the Red List. Work is currently underway with

individual OTs; evaluating individual species records for UKOTs and assessing endemic status.

Assessment of change

No assessment of change was undertaken for this indicator as it is still in development.

K4 Extent and condition of terrestrial and marine protected areas in the UK Overseas Territories

Short description

The UK Overseas Territories (UKOTs) are home to a variety of spectacular and often unique marine and terrestrial ecosystems. Protected areas are a key tool for conserving the globally significant and, in many cases endemic, biodiversity found in the Territories. This indicator will have 2 components: (a) extent and (b) condition of UKOT protected areas. It will show changes in the coverage of protected areas and other effective area-based conservation measures (OECMs) across the UKOTs, from a 2020 baseline. The baseline is calculated using UKOT protected area extent data provided by UKOT governments. The areas are aggregated across UKOTs and geographical regions and percent coverage is calculated for the land and marine environments separately. The indicator will also demonstrate the condition of protected areas in the UKOTs, using aspects of protected area condition that can be assessed cost-effectively.

Relevant goal in the 25 Year Environment Plan

- There are no specific goals in the 25 Year Environment Plan for this indicator, but the Plan commits us to working with the Overseas Territories governments to implement effective monitoring and enforcement of large scale marine protected areas as part of the Blue Belt programme.

Relevant target in the 25 Year Environment Plan

- None

Position in the natural capital framework

Condition of assets – seas; land; species and ecological communities; freshwater

Related reporting commitments

- Convention on Biological Diversity Aichi Target 11
- Sustainable Development Goals 14 and 15

Geographical scope

UK Overseas Territories

Status of indicator development

Interim

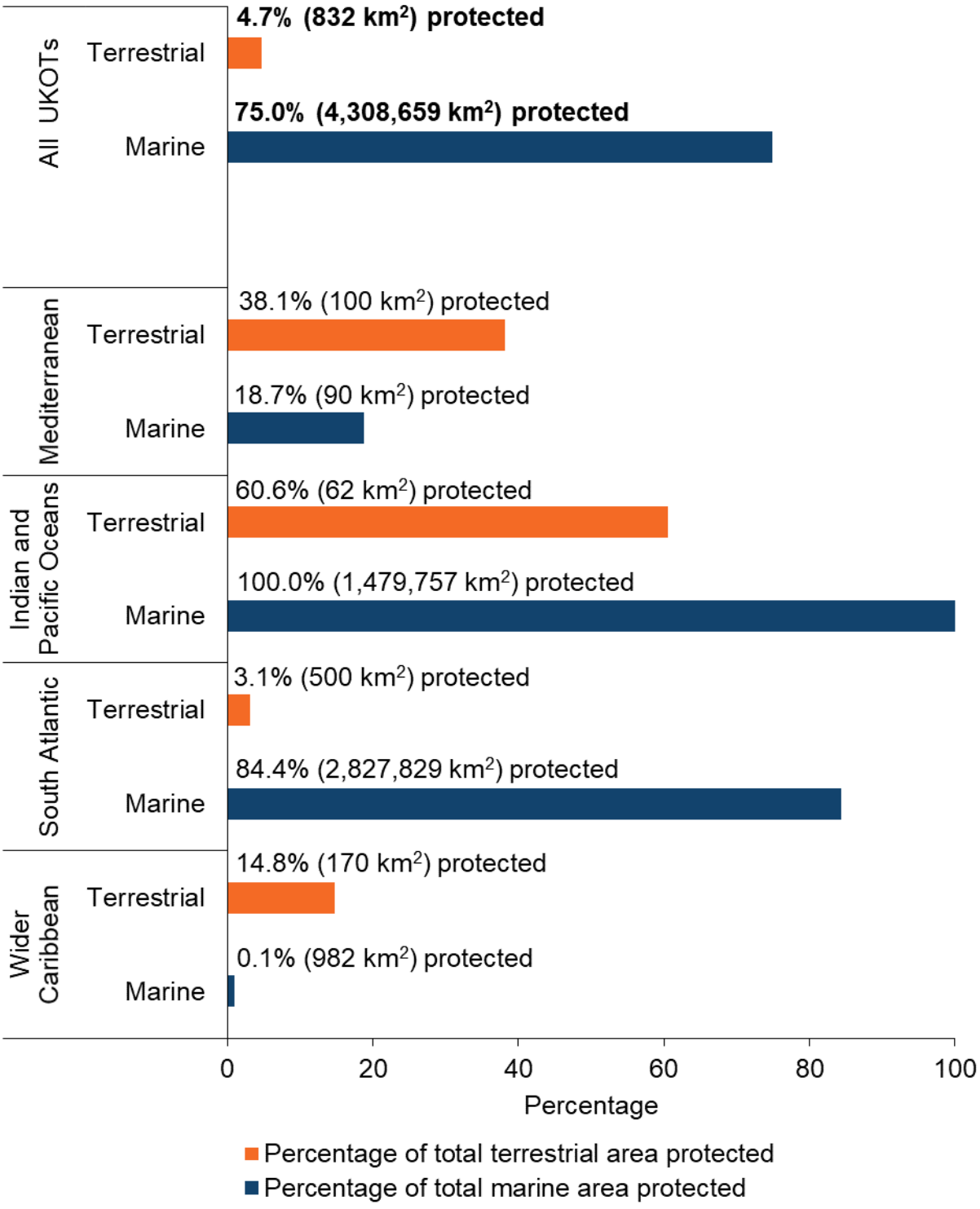
Readiness and links to data

This indicator is not available for reporting in 2022 in a finalised form. An interim indicator is presented here that shows the extent of protected areas and OECMs across the UKOTs. Information on how the data have been obtained and how the statistics have been calculated is available in JNCC Report Number 704. The data are being published as experimental statistics in order to facilitate user involvement in the development of this indicator.

We would therefore welcome any feedback on these statistics, particularly on their usefulness and value, via 25YEPindicators@defra.gov.uk.

Development of the condition aspect of this indicator has begun, exploring the feasibility of assessing terrestrial protected area condition and using 4 UKOTs as case studies to assess options for marine protected area condition.

Figure K4 (interim): Extent of terrestrial and marine protected areas and other effective area-based conservation measures in the UK Overseas Territories, in total and by region, 2021



Source, Joint Nature Conservation Committee

Note on Figure K4

'All UKOTs' (results presented in bold on the chart) includes 13 UK Overseas Territories; the British Antarctic Territory is not included. 'Mediterranean' includes the Sovereign Base

Areas of Akrotiri and Dhekelia and Gibraltar. ‘Indian and Pacific Oceans’ includes British Indian Ocean Territory and Pitcairn Islands group. ‘South Atlantic’ includes the Falkland Islands, St Helena, Ascension and Tristan da Cunha, and South Georgia and the South Sandwich Islands. ‘Wider Caribbean’ includes Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Montserrat, and Turks and Caicos Islands.

The indicator includes protected areas and OECMs formally established up to and during December 2021, where these are implemented for and/or deliver biodiversity conservation. There is a wide range of protected area designation types within and across the UKOTs; the data reported represent the UKOT governments’ views on the composition of their respective protected area networks. Extent is measured using the outer boundaries of sites; the indicator does not assess the extent of management measures within protected areas and OECMs. UK Hydrographic Office data are used to map UK Overseas Territories’ seas in the absence of formally agreed maritime boundaries.

A Marine Protection Zone covering 687,223 km^2 of Tristan da Cunha’s waters was formally designated in August 2021, this site has substantially increased marine protected area coverage across all UKOTs and within the South Atlantic region. A suite of new inshore marine protected areas were also designated in the Cayman Islands in March 2021.

Percentages for the extent of terrestrial and marine environments in protected areas have been rounded to the nearest 0.1% (including one result rounded up to 100%).

Trend description for Figure K4

As of the end of December 2021, protected areas and OECMs covered three-quarters (75%) of the marine environment in the UKOTs (up from 63% in 2020), but a much smaller proportion (4.7%) of the terrestrial environment (no change since 2020). Given the UKOTs’ combined marine area is more than 300 times larger than the land area (approximately 5,748,600 km^2 of sea compared to 17,738 km^2 of land), the extent of marine protection (4,308,659 km^2) is also 4 orders of magnitude larger than for the terrestrial environment (832 km^2). There are marked differences in protected area coverage between regions, with the 2 UKOTs in the Indian and Pacific Oceans protecting the greatest proportions of the terrestrial and marine environment (collectively) compared to other regions.

Assessment of change

No assessment of change was undertaken for this indicator as a suitable time series is not yet available in the Outcome Indicator Framework.

Section C: Assessment

Background

Aims of the assessment

The Outcome Indicator Framework assessment provides consistent categories of historic change to help make comparisons across indicators and bring results together for a holistic picture across groupings such as individual 25 Year Environment Plan goals. Charts showing trends for individual indicators are useful to visualise how indicators have changed over time, but do not always simply show whether that change is occurring in a favourable direction aligned with policy ambitions.

The Outcome Indicator Framework assessment aims to provide high level patterns for key environmental indicators to identify where there may be challenges of progress to date in achieving goals. This will support the targeting of further investigation to establish whether additional action is required. It can also highlight where there may be informative examples of success. The assessment is intended to be of value for key high-level messaging on environmental change.

There are limitations to the insights that can be gained from the Outcome Indicator Framework assessment alone. These indicators were originally selected to show change over time and were not designed to assess progress towards any specific targets. The results of this assessment show where improvements have been made, but supplementary analysis would be required to judge whether such improvements are occurring at a fast enough pace or large enough scale to meet specific targets.

The Environment Act 2021 creates a new statutory cycle of monitoring, planning and reporting on environmental improvement, based around a long-term Environmental Improvement Plan. The 25 Year Environment Plan is the first such Environmental Improvement Plan. Separately from the Outcome Indicator Framework update reports, government must report annually on what it has done to implement the Environmental Improvement Plan and on whether the natural environment (or particular aspects of it) has improved. That report will also consider the progress that has been made towards meeting targets.

The Outcome Indicator Framework was designed to provide a robust account of changes in the environment. It was not designed to establish a causal link between an indicator's observed trend and a specific driver of change (such as a policy intervention). Work to map indicator linkages for this assessment only highlights where indicators may be related. Further, detailed research would be required to prove the causes of any observed change in indicator trends.

The Outcome Indicator Framework assessment shows changes which have already occurred, but it does not make any predictions about whether these changes are likely to

continue into the future. The likelihood of such future trends will depend on a wide range of matters including environmental factors, policy interventions which are yet to take effect, and changes in human activity which may have associated environmental impacts. More elaborated modelling research would be required to make forward projections accounting for the likely effect of potential or planned interventions. Such a forward projection on an entire 25 Year Environment Plan scale is not a planned ambition of the Outcome Indicator Framework. Detailed forward projections are produced for some indicators in the framework. For example, projections of UK emissions of air quality pollutants are compiled by Defra to inform policy development and to enable comparison with international commitments.

Method

Data availability

Of the 66 indicators currently included in the Outcome Indicator Framework, 16 are still in the process of being developed so could not be assessed at this point in time. Interim indicators were assessed in addition to final indicators as they can still offer useful insights. Some indicators currently show results for the latest year rather than a time series, reflecting current data availability of newly-developed indicators. As the assessment is based on trends, these could not be assessed. Some indicators do not yet have sufficient data points for a trend assessment across all time periods.

Data processing

Some indicators have multiple components (different related metrics, or different variables such as various pollutants). Each indicator component was assessed separately to avoid masking important results through aggregation and to allow individual consideration.

Some indicator components have a regular time series with a small number of irregular missing years of data. To allow trend assessment, missing years were extrapolated using the Excel fill function for a linear trend.

Most indicator data were smoothed before undertaking trend assessments to reduce the influence of natural interannual variability. The need for smoothing is demonstrated clearly by the D4b indicator for widespread butterflies in woodland which presents both smoothed and unsmoothed data. The unsmoothed data fluctuates widely year by year as butterfly abundance is very susceptible to changes in weather. If the first or last data point in the assessed time period happen to be an unusually good or bad year, this will skew the percent change calculations. The smoothed values give users a more reliable indication of overall trend. A standard smoothing approach was adopted in most instances, as it is not practical to tailor smoothing for every indicator component individually. A Loess smoother was used as standard, as this is a versatile method suited to a wide variety of data.

Note that smoothed data represent modelled values while unsmoothed data represent the original recorded values. If there is a large amount of fluctuation in the time series, the smoothed values may be quite different from the original values. This means percent

change calculations based on smoothed data may also be quite different from what they would be if based on unsmoothed data. The decision on whether to use smoothed or unsmoothed data for individual indicator component assessments was made on a case by case basis, as deemed appropriate to suit the specific nature of the data series concerned.

Some indicators already produce smoothed data using a different approach selected specifically for that dataset. Where available, these existing smoothed values were used in the Outcome Indicator Framework assessment for consistency in messaging. Where indicators present a rolling average, smoothing was not considered necessary and the final year in the rolling time period was assigned to that data point. Smoothing was also not undertaken where there was no natural variability or error expected in the data (for example, the protected area extent values shown in D2). Where smoothed data were used, the most recent data point was excluded before calculating percent change. Due to the smoothing process, the last data point in a series is often associated with greater error and deviates from the trendline to a greater degree, so including this more erratic value would lower confidence in the percent change calculation. This is consistent with the approach taken elsewhere for assessment of some of the UK Biodiversity Indicators.

Where possible, trend assessments were undertaken for 3 time periods: the most recent 5 years (short term), the most recent 10 years (medium term), and the whole time series (long term). Some indicators have regular monitoring undertaken less frequently than every year; in these cases, an assessment was undertaken if at least 3 data points were available within the assessed time period. To provide clarity, the date range covered by each time period is specified for each indicator component and it is noted whether the percent change values are based on smoothed or unsmoothed data.

An additional assessment was also undertaken to show change since 2018 (when the 25 Year Environment Plan was published) as this information is valuable for contextual consideration of environmental change. Data were treated slightly differently for this period as there were generally only 2 or 3 years of data available. The unsmoothed data were always used and the last year of data included, so some assessment could be undertaken for as many indicators as possible. This assessment gives some indication of changes since 2018 but is not a comparably robust trend assessment to the other time periods considered and results should be treated with caution.

Assessment of change

The assessment of change is based on the percentage change seen over the assessed time period, along with the desired direction of change for moving towards environmental goals.

First, it is established whether a ‘significant change’ has been observed. For most indicators, a threshold of at least 3% change (positive or negative) is used. This is consistent with the approach adopted for assessment of some of the UK Biodiversity Indicators and some other government assessments, such as Forestry Commission Key Performance Indicators. Where existing official Defra assessments were available for the

same time periods using a more tailored methodology, these were replicated in the Outcome Indicator Framework assessment instead of applying the 3% threshold. The ‘little or no change’ category is intended to show indicators where any recorded change may be a result of random error in the dataset or due to chance, rather than a meaningful trend.

If a change has been observed, the direction of change is compared with the desired direction of change to assign a category of ‘improvement’ or ‘deterioration’. Some indicators do not have a desired direction of change (for example, E1 Area of agricultural land). These indicators may be provided for context to help understand other indicators, and additional information may be required to establish if an observed change is deemed to have a positive or negative connotation. Where a desired direction of change is not specified, indicators are assessed on whether change is significant.

Indicator links

A mapping exercise has been undertaken to show where indicators may be linked. Tables presented in the summary of results section capture whether relationships between linked indicators are likely to be positive or negative and the rationale for including a link. The indicator mapping has been used to create network diagrams to highlight the interconnectivity between different environmental goals.

Identified indicator links are supported by text in the Outcome Indicator Framework itself, original indicator methods and assessment reports referenced in the ‘Readiness and links to data’ sections of indicator fiches, or any additional key references relating to individual indicator development provided by indicator leads. It was not deemed necessary for references to prove a statistical, causal link. Links simply show that the 2 indicators are likely to be related and it is possible a change in one may influence the results of the other. For the purposes of this exercise, there needed to be a direct link identified between specific indicators, not a chain of links culminating in an impact made by one indicator upon another indirectly-linked indicator. Links have been made based on the coverage of the indicator inferred by the indicator name. For example, D7 will eventually cover species supporting various ecosystem functions but for the immediate future it will focus on pollinators, so links were made on this basis.

Important considerations for interpretation of results

There are necessary time lags between data collection and presentation of results in the Outcome Indicator Framework. It is also not always possible to collect annual data for every indicator component. This means that the latest data point is not necessarily for the current calendar year and will differ across indicators depending on reporting frequency and time needed for data processing and analysis. Therefore, it is important to note the specific date range of the time period for each assessment result. This is provided in all the tables of results in Section A and B.

As outlined further in the method section, assessment categories are often assigned based on smoothed data. The percent change values presented next to assessment of change categories in tables of results will often be based on smoothed data. This means

they may differ from values quoted elsewhere which are based on the raw, unsmoothed data, such as the trend description sections for individual indicators in this report. Tables of assessment results always note whether percent change values are based on smoothed or unsmoothed data.

Additional policy context is required to judge whether an assessment category is telling a positive story. A category of ‘improvement’ is clearly better than ‘deterioration’ but may not be positive if it is only a very small improvement for an indicator where are large amount of change is needed to meet an associated policy aspiration. Conversely, a category of ‘little or no change’ may not be a serious concern if any policy goals have already been achieved and current environmental status just needs to be maintained. A small number of indicators are slow moving, and change may not be expected to be observed in the short term. The narrative provided with indicator specific assessment results in Section B highlights any important caveats such as these.

Summary of results

These summaries present assessment results for indicators relevant to each 25 Year Environment Plan goal. Bar charts show the proportion of indicator components which are improving, deteriorating, show little or no change, or have not yet been assessed. Results tables are provided to show which specific indicator components have been assigned to each category. There are a number or reasons why an indicator may be unassessed; it could still be in development, the time series could not yet be sufficiently long, or the indicator could be in a format which is not appropriate for trend assessment (for example, a map). It should be noted that it is not yet clear how many indicator components will eventually be presented for indicators still in development. At present, indicators in development are counted as one component for the summary charts. The total number of indicator components may increase in the future if multiple components are presented for newly developed indicators, and this will affect the proportions of indicators displayed in summary charts. The assessment category of change since 2018 is not currently included in result summaries presented in this section, noting the current limited availability of data points which does not yet allow for robust trends to be confidently understood for many indicators.

Clean air

Figure 2 shows the proportion of indicators for which ‘Clean air’ is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

Of 10 indicator components, 6 showed an improvement over the short term. One indicator component showed little or no change and 3 showed a deterioration. This short-term time period covered the most recent 5 years for which an assessment can be made. This was 2013 to 2018 for most components, and 2014 to 2019 or 2015 to 2020 for others. Most indicator components recorded the same results over the medium and long-term time periods, where a sufficiently long time series was available to make an assessment.

However, emissions of ammonia assessed by A1 showed a deterioration in the short to medium term in contrast to little or no change over the long term.

Figure 2: Summary of assessment results for Clean Air indicator components

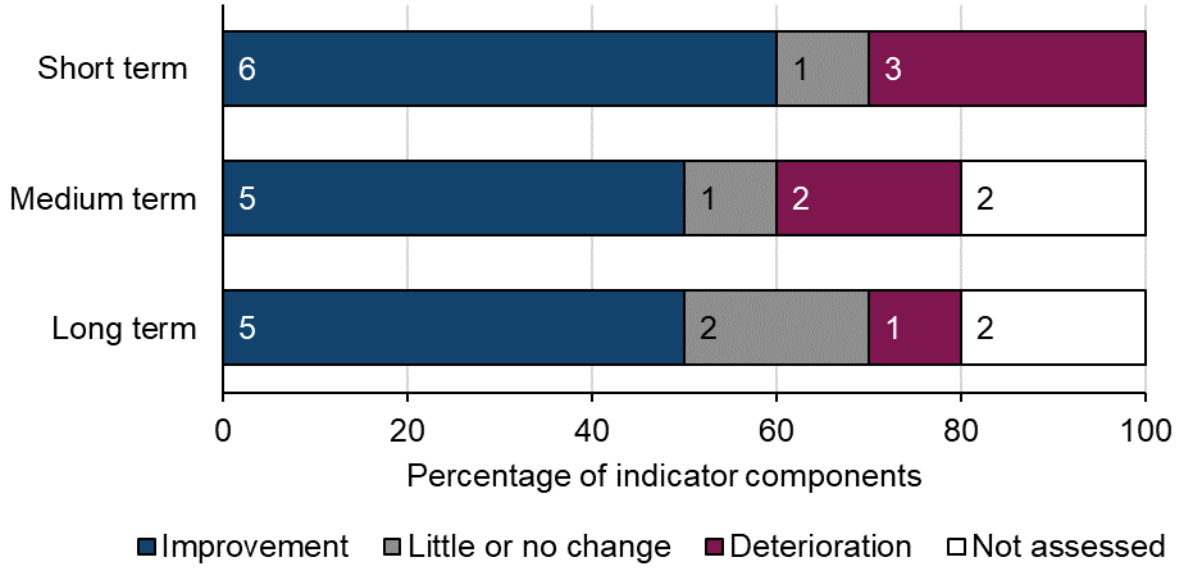


Table 3: Assessment results for Clean Air indicator components

Indicator component	Short term	Medium term	Long term
A1i Emissions of ammonia (NH_3) in England	Deterioration	Deterioration	Little or no change
A1ii Emissions of non-methane volatile organic compounds (NMVOC) in England	Improvement	Improvement	Improvement
A1iii Emissions of nitrogen oxides (NOx) in England	Improvement	Improvement	Improvement
A1iv Emissions of fine particulate matter ($PM_{2.5}$) in England	Improvement	Improvement	Improvement
A1v Emissions of sulphur dioxide (SO_2) in England	Improvement	Improvement	Improvement
A3 Concentrations of fine particulate matter ($PM_{2.5}$) in the air in England	Improvement	Not assessed	Not assessed
A4 Rural background concentrations of ozone (O_3) in England	Deterioration	Deterioration	Deterioration

Indicator component	Short term	Medium term	Long term
A5 Roadside nitrogen dioxide (NO_2) concentrations in England	Improvement	Improvement	Improvement
A6 Exceedances of damaging levels of nutrient nitrogen deposition on ecosystems in England	Little or no change	Little or no change	Little or no change
A7 Area of land in England exposed to damaging levels of ammonia (NH_3) in the atmosphere	Deterioration	Not assessed	Not assessed

The network diagram in Figure 3 summarises which Clean Air indicators may influence, or be influenced by, indicators for other goals. Air quality may have a negative impact on numerous indicators for thriving wildlife, the state of the water environment, volume of agricultural production, healthy soils, landscape and waterscape character, and health and wellbeing benefits. Air pollutants measured by air indicators may also have knock-on impacts for other measures of air quality. Air indicators may be influenced by volume of inputs used in agricultural production.

Figure 3: Potential links with Clean Air indicators

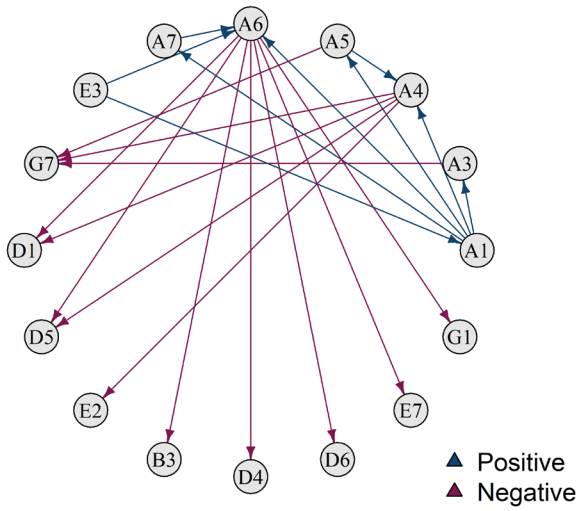


Table 4: Potential links with Clean Air indicators

From Indicator	To Indicator	Correlation	Rationale
A1 Emissions for five key air pollutants	A3 Concentrations of fine particulate matter ($PM_{2.5}$) in the air	Positive	A1 includes emissions of $PM_{2.5}$. As well as being emitted directly, particulate matter can be formed in the atmosphere from reactions between other pollutants, of which SO_2, NOx, NMVOCs and NH_3 are the most important.
A1 Emissions for five key air pollutants	A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	Positive	Damaging nutrient nitrogen comes predominantly from ammonia (NH_3) but partly nitrogen oxides (NOx) and long-range transport of air pollutants.
A1 Emissions for five key air pollutants	A7 Area exposed to damaging levels of ammonia (NH_3) in the atmosphere	Positive	A1 includes emissions of NH_3

From Indicator	To Indicator	Correlation	Rationale
A1 Emissions for five key air pollutants	A4 Rural background concentrations of ozone (O_3)	Positive	A1 includes NOx and VOC emissions. Chemical reactions in the air involving NOX and VOCs produce the toxic gas O_3.
A1 Emissions for five key air pollutants	A5 Roadside nitrogen dioxide (NO_2) concentrations	Positive	NOx emissions (A1) include NO_2 so contributes to roadside concentrations.
A3 Concentrations of fine particulate matter ($PM_{2.5}$) in the air	G7 Health and wellbeing benefits	Negative	Long-term exposure to particulate matter contributes to the risk of developing cardiovascular disease and lung cancer.
A4 Rural background concentrations of ozone (O_3)	G7 Health and wellbeing benefits	Negative	Ozone is a gas which is damaging to human health and can trigger inflammation of the respiratory tract, eyes, nose and throat as well as asthma attacks.
A4 Rural background concentrations of ozone (O_3)	D1 Quantity, quality and connectivity of habitats	Negative	Ozone can have adverse effects on the environment through oxidative damage to vegetation.
A4 Rural background concentrations of ozone (O_3)	D5 Conservation status of our native species	Negative	Ozone can have adverse effects on the environment through oxidative damage to vegetation.
A4 Rural background concentrations of ozone (O_3)	E2 Volume of agricultural production	Negative	Ozone can have adverse effects on the environment through oxidative damage to vegetation including crops.
A5 Roadside nitrogen dioxide (NO_2) concentrations	G7 Health and wellbeing benefits	Negative	Short-term exposure to concentrations of NO_2 can cause inflammation of the airways and increase susceptibility to respiratory infections and to allergens. NO_2 can exacerbate the symptoms of those already suffering from lung or heart conditions.

From Indicator	To Indicator	Correlation	Rationale
A5 Roadside nitrogen dioxide (NO_2) concentrations	A4 Rural background concentrations of ozone (O_3)	Positive	NO_2 is one of the precursors to O_3.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	B3 State of the water environment	Negative	Nutrients are a major cause of water bodies being at less than good ecological status and also affect drinking water quality. Nitrates account for 65% of the reasons for failure for those groundwaters that are protected for use for drinking water and are classed at poor status. Nitrate enters groundwater from diffuse pollution on land (mainly water run-off from agricultural land) or is deposited onto land from the air.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D1 Quantity, quality and connectivity of habitats	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D4 Relative abundance and distribution of widespread species	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D5 Conservation status of our native species	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D6 Abundance and distribution of priority species in England	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.

From Indicator	To Indicator	Correlation	Rationale
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	E7 Healthy soils	Negative	Excess deposition of NH_3 on natural ecosystems causes nutrient enrichment and changes in vegetation and soils.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	G1 Changes in landscape and waterscape character	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
A7 Area exposed to damaging levels of ammonia (NH_3) in the atmosphere	A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	Positive	NH_3 emissions can be deposited in soils or in rivers and lakes, for example, through rain. Resulting nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
E3 Volume of inputs used in agricultural production	A1 Emissions for five key air pollutants	Positive	Agricultural sources make up by far the largest component in the inventory for ammonia emissions with cattle manure management, manure applied to soils and inorganic fertilizers each accounting for 20% or more of the emissions from this sector. Agriculture also contributes a small proportion to NMVOC and $PM_{2.5}$ emissions.
E3 Volume of inputs used in agricultural production	A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	Positive	Agricultural sources make up by far the largest component in the inventory for ammonia emissions with cattle manure management, manure applied to soils and inorganic fertilizers each accounting for 20% or more of the emissions from this sector.

Clean and plentiful water

Figure 4 shows the proportion of indicator components for which ‘Clean and plentiful water’ is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

The 7 indicator components recorded under B1 (Pollution loads entering waters) have not been assessed as further development is required to present statistical trends for the selected contaminants. The 6 indicator components recorded under B3 (State of the water environment) were not assessed as results are not presented as a time series. The 2 indicator components recorded under B5 (Water bodies achieving sustainable abstraction criteria) could not be assessed as the time series was not yet sufficient. B6 (Natural functions of water and wetland ecosystems) is still in development.

Of the remaining 4 indicator components, 3 showed an improvement over the short term and one showed a deterioration (principal salmon rivers at risk in England). Note that the assessment of ‘improvement’ for B7b Classification of fish in English rivers does not include more recent years where a new method was adopted; these new data will be assessed once a sufficient time series has been built up. The short-term time period covered the most recent 5 years for which an assessment can be made (2009 to 2014, 2014 to 2019 or 2015 to 2020).

Figure 4: Summary of assessment results for Clean and plentiful water indicator components

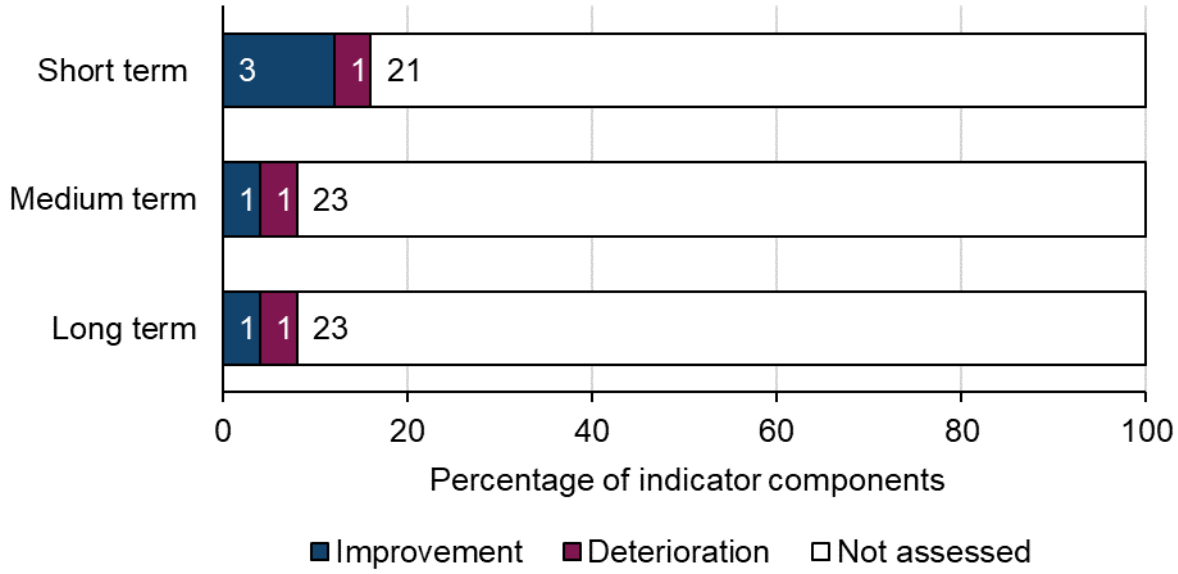


Table 5: Assessment results for Clean and plentiful water indicator components

Indicator component	Short term	Medium term	Long term
B2 Serious pollution incidents to water (category 1 and 2)	Improvement	Improvement	Improvement
B4 Condition of bathing waters in England (at least Sufficient)	Improvement	Not assessed	Not assessed
B7a Salmon stock status – principal salmon rivers at risk in England (Not at risk or Probably not at risk)	Deterioration	Deterioration	Deterioration
B7b Classification of fish in English rivers (high or good cycle 1)	Improvement	Not assessed	Not assessed

The network diagram in Figure 5 summarises which Clean and plentiful water indicators may influence, or be influenced by, indicators for other goals. Pollution loads entering waters and serious pollution incidents to water may have a negative influence on other water quality indicators as well as a range of wildlife indicators. Serious pollution incidents and condition of bathing waters may have negative consequences for health and wellbeing. Water bodies achieving sustainable abstraction criteria may influence natural functions of water and wetland ecosystems which, in turn, is linked to quantity, quality and connectivity of habitats and disruption or unwanted impacts from flooding or coastal erosion. Volume of inputs used in agricultural production, emissions of mercury and persistent organic pollutants and waste crime are all likely to negatively affect various water quality indicators.

Figure 5: Potential links with Clean and plentiful water indicators

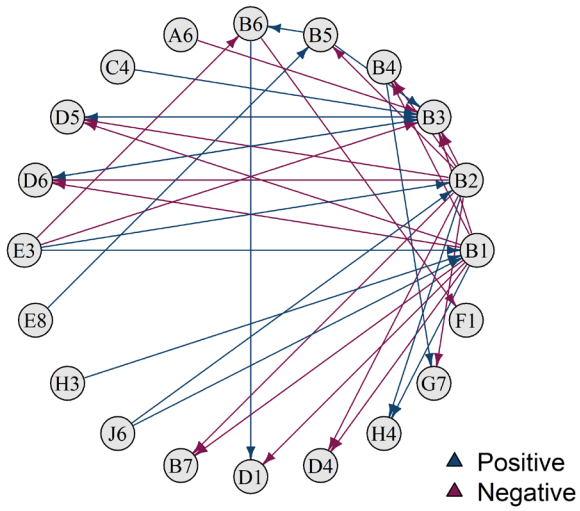


Table 6: Potential links with Clean and plentiful water indicators

From Indicator	To Indicator	Correlation	Rationale
B1 Pollution loads entering waters	B3 State of the water environment	Negative	Substances more often found in rivers at levels exceeding their environmental quality standard in water include metals such as cadmium, lead, nickel and zinc.
B1 Pollution loads entering waters	B4 Condition of bathing waters	Negative	B1 tracks changes in the inputs and discharges of selected contaminants such as nutrients and some toxic chemicals to rivers or directly to the sea, for example through sewage pipelines.
B1 Pollution loads entering waters	B7 Health of freshwaters assessed through fish stocks	Negative	Water quality issues were the cause of 38% of all fish test failures.

From Indicator	To Indicator	Correlation	Rationale
B1 Pollution loads entering waters	D1 Quantity, quality and connectivity of habitats	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B1 Pollution loads entering waters	D4 Relative abundance and distribution of widespread species	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B1 Pollution loads entering waters	D5 Conservation status of our native species	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B1 Pollution loads entering waters	D6 Abundance and distribution of priority species in England	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B1 Pollution loads entering waters	H4 Exposure and adverse effects of chemicals on wildlife in the environment	Positive	B1 includes emissions of mercury, H4 monitors exposure to mercury.
B2 Serious pollution incidents to water	B3 State of the water environment	Negative	B1 shows changes in the number of pollution incidents impacting on water health, including in rivers, lakes, reservoirs, canals, coasts, estuaries and groundwater.
B2 Serious pollution incidents to water	B4 Condition of bathing waters	Negative	The 2 higher categories of serious pollution event cause, for example, potential harm to bathers.

From Indicator	To Indicator	Correlation	Rationale
B2 Serious pollution incidents to water	B5 Water bodies achieving sustainable abstraction criteria	Negative	The 2 higher categories of serious pollution event cause, for example, the temporary cessation of abstraction from a river by a drinking water provider.
B2 Serious pollution incidents to water	B7 Health of freshwaters assessed through fish stocks	Negative	The 2 higher categories of serious pollution event cause, for example, death of fish.
B2 Serious pollution incidents to water	D4 Relative abundance and distribution of widespread species	Negative	The 2 higher categories of serious pollution event cause, for example, death of fish.
B2 Serious pollution incidents to water	D5 Conservation status of our native species	Negative	The 2 higher categories of serious pollution event cause, for example, death of fish.
B2 Serious pollution incidents to water	D6 Abundance and distribution of priority species in England	Negative	The 2 higher categories of serious pollution event cause, for example, death of fish.
B2 Serious pollution incidents to water	G7 Health and wellbeing benefits	Negative	The 2 higher categories of serious pollution event cause, for example, potential harm to bathers.
B2 Serious pollution incidents to water	H4 Exposure and adverse effects of chemicals on wildlife in the environment	Positive	Pollution incidents could involve the release of pollutants monitored through H4 for example, mercury.
B3 State of the water environment	D5 Conservation status of our native species	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.

From Indicator	To Indicator	Correlation	Rationale
B3 State of the water environment	D6 Abundance and distribution of priority species in England	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.
B4 Condition of bathing waters	G7 Health and wellbeing benefits	Positive	Status of bathing waters is based on a set of microbiological tests (measuring E.coli and intestinal enterococci) performed on waters used for bathing. The bacteria, if present, can cause severe stomach upsets and gastro-intestinal illness.
B5 Water bodies achieving sustainable abstraction criteria	B3 State of the water environment	Positive	Drinking water protected area status feeds into the B3 results.
B5 Water bodies achieving sustainable abstraction criteria	B6 Natural functions of water and wetland ecosystems	Positive	River flows and groundwater levels are considered sustainable when they support ecology that is only slightly impacted by human activity.
B6 Natural functions of water and wetland ecosystems	D1 Quantity, quality and connectivity of habitats	Positive	Indicator B6 is closely linked with indicator D1 on the extent, quality and connectivity of habitats as the naturalness of ecosystem function is also being considered within D1.
B6 Natural functions of water and wetland ecosystems	F1 Disruption or unwanted impacts from flooding or coastal erosion	Negative	Restoring natural functions to wetland ecosystems contributes to enhancing ecosystem services such as the provision of clean water and flood regulation.

From Indicator	To Indicator	Correlation	Rationale
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	B3 State of the water environment	Negative	Nutrients are a major cause of water bodies being at less than good ecological status and also affect drinking water quality. Nitrates account for 65% of the reasons for failure for those groundwaters that are protected for use for drinking water and are classed at poor status. Nitrate enters groundwater from diffuse pollution on land. (mainly water run-off from agricultural land) or is deposited onto land from the air.
C4 Diverse seas: condition of seafloor habitats	B3 State of the water environment	Positive	B3a assesses coastal waters and estuaries based on a saltmarsh indicator, C4c assesses the status of saltmarsh habitats.
D5 Conservation status of our native species	B3 State of the water environment	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.
D6 Abundance and distribution of priority species in England	B3 State of the water environment	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.
E3 Volume of inputs used in agricultural production	B1 Pollution loads entering waters	Positive	B1 tracks changes in the inputs and discharges of selected contaminants such as nutrients and some toxic chemicals to rivers or directly to the sea, for example through activities such as agriculture inputting substances directly.
E3 Volume of inputs used in agricultural production	B2 Serious pollution incidents to water	Positive	Agriculture is now the largest sector responsible for significant pollution events to water.
E3 Volume of inputs used in agricultural production	B3 State of the water environment	Negative	Agriculture and rural land management is one of the main activities that prevent water bosies reaching good status.

From Indicator	To Indicator	Correlation	Rationale
E3 Volume of inputs used in agricultural production	B6 Natural functions of water and wetland ecosystems	Negative	Nutrient run off affects the natural functions of wetland ecosystems, for example, through eutrophication.
E8 Sustainable use of water	B5 Water bodies achieving sustainable abstraction criteria	Positive	Reducing water consumption and leakage will help in achieving sustainable extraction.
H3 Emissions of mercury and persistent organic pollutants to the environment	B1 Pollution loads entering waters	Positive	B1 includes levels of mercury.
J6 Waste crime	B1 Pollution loads entering waters	Positive	If not handled properly, waste can cause serious pollution of the environment – air, land and water.
J6 Waste crime	B2 Serious pollution incidents to water	Positive	If not handled properly, waste can cause serious pollution of the environment – air, land and water.

Thriving plants and wildlife

Figure 6 shows the proportion of indicator components for which 'Thriving plants and wildlife' is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

Some indicator components were not assessed as they do not present results as a time series (C2 Seabed subject to high pressure from human activity, the 4 indicator components recorded under C4 Regional sea assessments and the status of coastal water bodies and offshore units for 4 UK seafloor habitats, C5a Changes in plankton communities, C5b Changes in phytoplankton biomass and zooplankton abundance, C7a Typical Length of demersal and pelagic fish communities and C7b Mean Maximum Length of demersal and pelagic fish communities). Five indicator components are still in development (C6 Status of threatened and declining features, C8 Marine food webs functioning, C9 Seafloor habitats functioning, D1 Quantity, quality and connectivity of habitats and D5 Conservation status of our native species).

Of the remaining 20 indicator components, 5 showed an improvement over the short term, 6 showed a deterioration and 9 showed little or no change. This short-term time period

covered the most recent 5 years for which an assessment can be made. Over the long term, more indicator components showed a deterioration, but a higher number were also improving. Several marine bird indicators, widespread butterflies in woodland and change in the distribution of pollinators moved from deterioration to little or no change in the short term. However, 2 indicator components for protected sites moved from improvement to little or no change.

Figure 6: Summary of assessment results for Thriving plants and wildlife indicator components

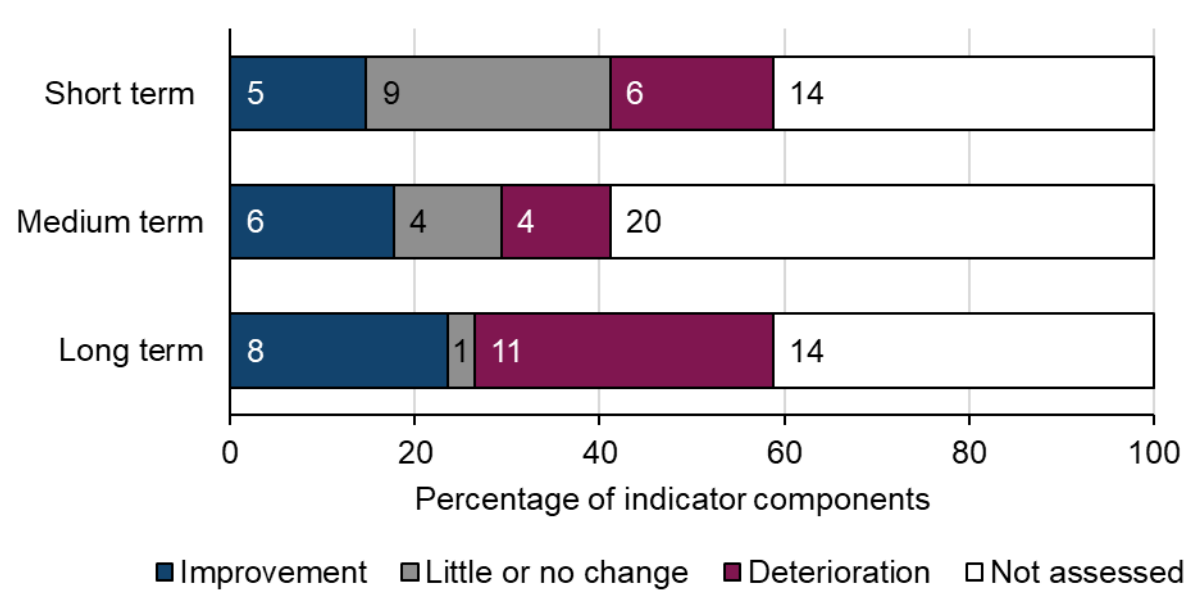


Table 7: Assessment results for Thriving plants and wildlife indicator components

Indicator component	Short term	Medium term	Long term
C3aia Abundance of harbour seals north-east England	Improvement	Improvement	Improvement
C3aib Abundance of harbour seals south-east England	Deterioration	Improvement	Improvement
C3aiia Atlantic grey seal pup production north-east England	Improvement	Improvement	Improvement
C3aiib Atlantic grey seal pup production south-east England	Improvement	Improvement	Improvement
C3bia Percentage of breeding seabirds meeting abundance targets for Good Environmental Status (GES) Greater North Sea	Little or no change	Deterioration	Deterioration

Indicator component	Short term	Medium term	Long term
C3bib Percentage of breeding seabirds meeting abundance targets for Good Environmental Status (GES) Celtic Seas	Little or no change	Deterioration	Deterioration
C3biia Percentage of wintering waterbirds meeting abundance targets for Good Environmental Status (GES) Greater North Sea	Little or no change	Deterioration	Deterioration
C3biib Percentage of wintering waterbirds meeting abundance targets for Good Environmental Status (GES) Celtic Seas	Deterioration	Deterioration	Deterioration
D2ai Extent of protected sites in England (sites on land and water)	Little or no change	Little or no change	Improvement
D2aii Extent of protected sites in England (sites at sea)	Improvement	Improvement	Improvement
D2b Condition of Sites of Special Scientific Interest in England (favourable condition)	Little or no change	Improvement	Deterioration
D3 Area of woodland in England	Little or no change	Little or no change	Improvement
D4ai Abundance of breeding wild birds in woodland in England	Deterioration	Not assessed	Deterioration
D4aii Abundance of breeding wild birds on farmland in England	Deterioration	Not assessed	Deterioration
D4bi Abundance of widespread butterflies in woodland in England	Little or no change	Little or no change	Deterioration
D4bii Abundance of widespread butterflies on farmland in England	Little or no change	Little or no change	Little or no change
D4c Abundance of widespread bats in England	Improvement	Not assessed	Improvement
D6ai Relative abundance of priority species in England	Deterioration	Not assessed	Deterioration
D6bi Distribution of priority species in England	Deterioration	Not assessed	Deterioration
D7i Change in the distribution of pollinators in the UK	Little or no change	Not assessed	Deterioration

The network diagram in Figure 7 summarises which Thriving plants and wildlife indicators may influence, or be influenced by, indicators for other goals. Seabed subject to high pressure from human activity is likely to negatively influence several marine wildlife indicators: status of mammals, birds and fish may be influenced by marine litter, condition of pelagic habitats and fish and shellfish populations. There are numerous links between indicators for thriving plants and wildlife. Wildlife indicators are likely to be influenced by a range of indicators for air quality, water quality, hazardous chemicals, non-native species, volume of inputs used in agricultural production and soil health.

Figure 7: Potential links with Thriving plants and wildlife indicators

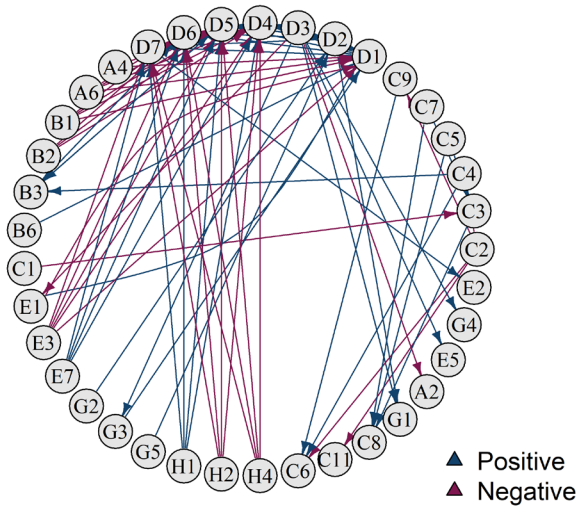


Table 8: Potential links with Thriving plants and wildlife indicators

From Indicator	To Indicator	Correlation	Rationale
C2 Seabed subject to high pressure from human activity	C4 Diverse seas: condition of seafloor habitats	Negative	C2 shows the intensity of potential physical damage on the seabed which will affect the condition of seafloor habitats.
C2 Seabed subject to high pressure from human activity	C6 Diverse seas: status of threatened and declining features	Negative	Impacts from bottom trawling, as measured by C2, is a key pressure affecting many sensitive marine features.

From Indicator	To Indicator	Correlation	Rationale
C2 Seabed subject to high pressure from human activity	C9 Healthy seas: sea-floor habitats functioning	Negative	C9 will be measured by level of physical loss, which includes is caused by very high levels of human activity measured by C2.
C2 Seabed subject to high pressure from human activity	C11 Productive seas: status of sensitive fish and shellfish stocks	Negative	C11 will show the status of fish and shellfish that are particularly sensitive to pressures such as fishing mortality. C2 shows level of pressure from some types of fishing.
C3 Diverse seas: status of mammals, birds and fish	C8 Healthy Seas: marine food webs functioning	Positive	C8 will be based on the UK Marine Strategy food webs indicator which measures progress towards achievement of the Good Environmental Status by using the assessments of fish, birds, seals, cetaceans and pelagic habitats.
C4 Diverse seas: condition of seafloor habitats	B3 State of the water environment	Positive	B3a assesses coastal waters and estuaries based on a saltmarsh indicator, C4c assesses the status of saltmarsh habitats.
C4 Diverse seas: condition of seafloor habitats	C6 Diverse seas: status of threatened and declining features	Positive	C4 includes some habitats which are also threatened and declining features.
C5 Diverse seas: condition of pelagic habitats	C8 Healthy Seas: marine food webs functioning	Positive	C8 will be based on the UK Marine Strategy food webs indicator which measures progress towards achievement of the Good Environmental Status by using the assessments of fish, birds, seals, cetaceans and pelagic habitats.
C5 Diverse seas: condition of pelagic habitats	C3 Diverse seas: status of mammals, birds and fish	Positive	The changes experienced by plankton communities could have implications for the health (functioning, dynamics and structure) of the whole marine ecosystem.

From Indicator	To Indicator	Correlation	Rationale
C7 Healthy Seas: fish and shellfish populations	C3 Diverse seas: status of mammals, birds and fish	Positive	Reduced availability of small fish, on which the seabirds feed, has been largely responsible for declines in seabird breeding abundance and the frequent, widespread breeding failures in some species.
C7 Healthy Seas: fish and shellfish populations	C8 Healthy Seas: marine food webs functioning	Positive	C8 will be based on the UK Marine Strategy food webs indicator which measures progress towards achievement of the Good Environmental Status by using the assessments of fish, birds, seals, cetaceans and pelagic habitats.
C9 Healthy seas: sea-floor habitats functioning	C6 Diverse seas: status of threatened and declining features	Positive	C9 will be based on the level of physical loss of seafloor habitats, which are also threatened and declining features.
D1 Quantity, quality and connectivity of habitats	D4 Relative abundance and distribution of widespread species	Positive	Across species groups we have seen significant declines mainly as a result of changes in land use which has led to the loss and deterioration of many wildlife habitats.
D1 Quantity, quality and connectivity of habitats	D5 Conservation status of our native species	Positive	Across species groups we have seen significant declines mainly as a result of changes in land use which has led to the loss and deterioration of many wildlife habitats.
D1 Quantity, quality and connectivity of habitats	D6 Abundance and distribution of priority species in England	Positive	Across species groups we have seen significant declines mainly as a result of changes in land use which has led to the loss and deterioration of many wildlife habitats.
D1 Quantity, quality and connectivity of habitats	D7 Species supporting ecosystem functions	Positive	Across species groups we have seen significant declines mainly as a result of changes in land use which has led to the loss and deterioration of many wildlife habitats.
D2 Extent and condition of protected sites – land, water and sea	D1 Quantity, quality and connectivity of habitats	Positive	D1 will use habitat extent and condition information from protected sites, as well as other areas.

From Indicator	To Indicator	Correlation	Rationale
D2 Extent and condition of protected sites – land, water and sea	D4 Relative abundance and distribution of widespread species	Positive	Nationally important SSSIs are designated with the aim of conserving specific biological or geological features.
D2 Extent and condition of protected sites – land, water and sea	D5 Conservation status of our native species	Positive	Nationally important SSSIs are designated with the aim of conserving specific biological or geological features.
D2 Extent and condition of protected sites – land, water and sea	D6 Abundance and distribution of priority species in England	Positive	Nationally important SSSIs are designated with the aim of conserving specific biological or geological features.
D2 Extent and condition of protected sites – land, water and sea	D7 Species supporting ecosystem functions	Positive	Nationally important SSSIs are designated with the aim of conserving specific biological or geological features.
D2 Extent and condition of protected sites – land, water and sea	G1 Changes in landscape and waterscape character	Positive	Changes in environmental outcomes from our Designated Landscapes will be considered as part of the G1 indicator.
D3 Area of woodland in England	A2 Emissions of greenhouse gases from natural resources	Negative	A2 includes negative emissions values from a forestry sink.
D3 Area of woodland in England	D4 Relative abundance and distribution of widespread species	Positive	Some widespread species indicators are for woodland habitat.
D3 Area of woodland in England	D5 Conservation status of our native species	Positive	Some native species occur in woodland habitat.

From Indicator	To Indicator	Correlation	Rationale
D3 Area of woodland in England	D6 Abundance and distribution of priority species in England	Positive	Some priority species occur in woodland habitat.
D3 Area of woodland in England	E5 Percentage of the annual growth of trees in English woodlands that is harvested	Positive	Source data for E5 includes National Forest Inventory forecasts of increase (increment) in the volume of wood that grows in England, which incorporate information on woodland area.
D3 Area of woodland in England	G1 Changes in landscape and waterscape character	Positive	G1 will consider attributes of landscape such as woodland cover.
D3 Area of woodland in England	G3 Enhancement of green/blue infrastructure	Positive	Woodland will be included in metrics of green infrastructure.
D3 Area of woodland in England	D1 Quantity, quality and connectivity of habitats	Positive	Increase in the area of woodland increases the area, and potentially connectivity, of woodland habitat.
D3 Area of woodland in England	E1 Area of productive agricultural land	Negative	In some situations, increase in woodland area will reduce the area of productive agricultural land.
D3 Area of woodland in England	G4 Engagement in the natural environment	Positive	Some visits to the natural environment will be visits to woodland.
D4 Relative abundance and distribution of widespread species	D2 Extent and condition of protected sites – land, water and sea	Positive	Protected area condition assessments take into account species composition.
D5 Conservation status of our native species	B3 State of the water environment	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.

From Indicator	To Indicator	Correlation	Rationale
D5 Conservation status of our native species	D2 Extent and condition of protected sites – land, water and sea	Positive	Protected area condition assessments take into account species composition.
D6 Abundance and distribution of priority species in England	B3 State of the water environment	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.
D6 Abundance and distribution of priority species in England	D2 Extent and condition of protected sites – land, water and sea	Positive	Protected area condition assessments take into account species composition.
D7 Species supporting ecosystem functions	E2 Volume of agricultural production	Positive	D7 shows trends in pollinators which are important for crop production.
A4 Rural background concentrations of ozone (O_3)	D1 Quantity, quality and connectivity of habitats	Negative	Ozone can have adverse effects on the environment through oxidative damage to vegetation.
A4 Rural background concentrations of ozone (O_3)	D5 Conservation status of our native species	Negative	Ozone can have adverse effects on the environment through oxidative damage to vegetation including crops.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D1 Quantity, quality and connectivity of habitats	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D4 Relative abundance and distribution of widespread species	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.

From Indicator	To Indicator	Correlation	Rationale
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D5 Conservation status of our native species	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	D6 Abundance and distribution of priority species in England	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
B1 Pollution loads entering waters	D1 Quantity, quality and connectivity of habitats	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B1 Pollution loads entering waters	D4 Relative abundance and distribution of widespread species	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B1 Pollution loads entering waters	D5 Conservation status of our native species	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B1 Pollution loads entering waters	D6 Abundance and distribution of priority species in England	Negative	B1 records the discharge/emission of contaminants that adversely affect the quality and uses of receiving waters. These affect the wildlife and ecology of rivers, estuaries and coastal waters.
B2 Serious pollution incidents to water	D4 Relative abundance and distribution of widespread species	Negative	The 2 higher categories of serious pollution event cause, for example, death of fish.

From Indicator	To Indicator	Correlation	Rationale
B2 Serious pollution incidents to water	D5 Conservation status of our native species	Negative	The 2 higher categories of serious pollution event cause, for example, death of fish.
B2 Serious pollution incidents to water	D6 Abundance and distribution of priority species in England	Negative	The 2 higher categories of serious pollution event cause, for example, death of fish.
B3 State of the water environment	D5 Conservation status of our native species	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.
B3 State of the water environment	D6 Abundance and distribution of priority species in England	Positive	B3 status assessments are based on indicators for specific species groups for example, plants and algae, invertebrates.
B6 Natural functions of water and wetland ecosystems	D1 Quantity, quality and connectivity of habitats	Positive	Indicator B6 is closely linked with indicator D1 on the extent, quality and connectivity of habitats as the naturalness of ecosystem function is also being considered within D1.
C1 Clean seas: marine litter	C3 Diverse seas: status of mammals, birds and fish	Negative	Marine litter can be harmful to wildlife. C1 includes indicator for plastic ingested by fulmars.
E1 Area of productive agricultural land	D1 Quantity, quality and connectivity of habitats	Positive	As well as being vital for food production, agriculture helps to shape the landscape, providing important recreational, spiritual and other cultural benefits.
E1 Area of productive agricultural land	D1 Quantity, quality and connectivity of habitats	Negative	As well as being vital for food production, agriculture helps to shape the landscape, providing important recreational, spiritual and other cultural benefits.

From Indicator	To Indicator	Correlation	Rationale
E3 Volume of inputs used in agricultural production	D1 Quantity, quality and connectivity of habitats	Negative	Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats.
E3 Volume of inputs used in agricultural production	D4 Relative abundance and distribution of widespread species	Negative	D4 shows the decline of certain species groups on farmland.
E3 Volume of inputs used in agricultural production	D5 Conservation status of our native species	Negative	Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats.
E3 Volume of inputs used in agricultural production	D6 Abundance and distribution of priority species in England	Negative	Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats.
E3 Volume of inputs used in agricultural production	D7 Species supporting ecosystem functions	Negative	Pesticide use affects pollinators.
E7 Soil health	D4 Relative abundance and distribution of widespread species	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.
E7 Soil health	D5 Conservation status of our native species	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.

From Indicator	To Indicator	Correlation	Rationale
E7 Soil health	D6 Abundance and distribution of priority species in England	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.
E7 Soil health	D7 Species supporting ecosystem functions	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.
G2 Condition of heritage features including designated geological sites and scheduled monuments	D2 Extent and condition of protected sites – land, water and sea	Positive	Geological sites are a subset of protected areas.
G3 Enhancement of green/blue infrastructure	D1 Quantity, quality and connectivity of habitats	Positive	Accessible natural greenspaces have an important contribution to make to the quality of the environment in urban areas. Such sites provide important refuges for wildlife in otherwise impoverished areas.
G5 People engaged in social action for the environment	D2 Extent and condition of protected sites – land, water and sea	Positive	G5 includes data on volunteer hours from organisations that manage protected areas such as the Wildlife Trusts.
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D4 Relative abundance and distribution of widespread species	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.

From Indicator	To Indicator	Correlation	Rationale
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D5 Conservation status of our native species	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D6 Abundance and distribution of priority species in England	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D7 Species supporting ecosystem functions	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.
H2 Distribution of invasive non-native species and plant pests and diseases	D4 Relative abundance and distribution of widespread species	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.
H2 Distribution of invasive non-native species and plant pests and diseases	D5 Conservation status of our native species	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.
H2 Distribution of invasive non-native species and plant pests and diseases	D6 Abundance and distribution of priority species in England	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.
H2 Distribution of invasive non-native species and plant pests and diseases	D7 Species supporting ecosystem functions	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.

From Indicator	To Indicator	Correlation	Rationale
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D4 Relative abundance and distribution of widespread species	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D5 Conservation status of our native species	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D6 Abundance and distribution of priority species in England	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D7 Species supporting ecosystem functions	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.

Reducing the risks of harm from environmental hazards

There are 3 indicators in development for Reducing the risks of harm from environmental hazards in development: F1 Disruption or unwanted impacts from flooding or coastal erosion, F2 Communities resilient to flooding or coastal erosion and F3 Disruption or unwanted impacts caused by drought. These will be assessed in future years when suitable data series become available.

The network diagram in Figure 8 summarises how indicators for the goal ‘reducing the risks of harm from environmental hazards’ may influence, or be influenced by, indicators for other goals. Natural functions of water and wetland ecosystems and soil health are likely to be important for reducing disruption or unwanted impacts from flooding or coastal erosion. Sustainable use of water is linked to disruption or unwanted impacts caused by drought.

Figure 8: Potential indicator links – Reducing the risks of harm from environmental hazards

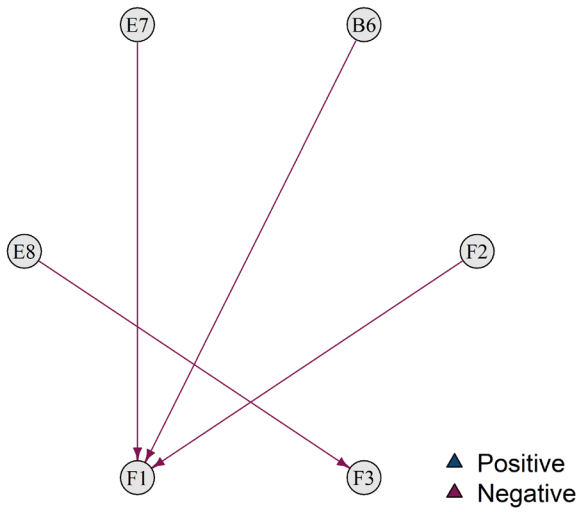


Table 9: Potential indicator links – Reducing the risks of harm from environmental hazards

From Indicator	To Indicator	Correlation	Rationale
F2 Communities resilient to flooding or coastal erosion	F1 Disruption or unwanted impacts from flooding or coastal erosion	Negative	Resilience reduces the disruption caused by flooding and coastal erosion.
B6 Natural functions of water and wetland ecosystems	F1 Disruption or unwanted impacts from flooding or coastal erosion	Negative	Restoring natural functions to wetland ecosystems contributes to enhancing ecosystem services such as the provision of clean water and flood regulation.
E7 Soil health	F1 Disruption or unwanted impacts from flooding or coastal erosion	Negative	Healthy soils underpin the multiple functions of soils in regulating water
E8 Sustainable use of water	F3 Disruption or unwanted impacts caused by drought	Negative	Reducing water consumption and leakage will mitigate the impacts of drought.

Using resources from nature more sustainably and efficiently

Figure 9 shows the proportion of indicator components for which 'Using resources from nature more sustainably and efficiently' is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

Three indicators are classed as 'not assessed' in Figure 9 because they are still in development (C11 status of sensitive fish and shellfish stocks, E7 healthy soils and E9 percentage of our seafood coming from healthy ecosystems, produced sustainably).

It is not possible to simply define any change in the 4 agriculture related indicators (E1 to E4) as an 'improvement' or 'deterioration' as this will depend on whether the specific farming practices driving change are positive for the environment and there will be inherent trade-offs of impact to account for. The assessment results for these indicators are therefore not included in Figure 9. However, it is possible to state the direction of change in Table 10. Both volume of agricultural production and volume of inputs used in agricultural production have increased in the short and medium term.

Of the remaining 8 indicator components, 7 showed an improvement over the medium term and 1 showed little or no change. However, over the short term, 5 indicators moved into a less positive category; E8b Per capita water consumption in England and J2a Raw material consumption moved to deterioration, and E5 Percentage of the annual growth of trees that is harvested, E8a Water leakage and J2b Gross value added per kg of raw material consumption moved to little or no change. The short-term time period covered the most recent 5 years for which an assessment could be made. This varied from 2012 to 2017 to 2016 to 2021, depending on the indicator. E5 and E6 did not have sufficiently long time series available for a long-term assessment, but all others showed an improvement over this period.

Figure 9: Summary of assessment results – Using resources from nature more sustainably and efficiently

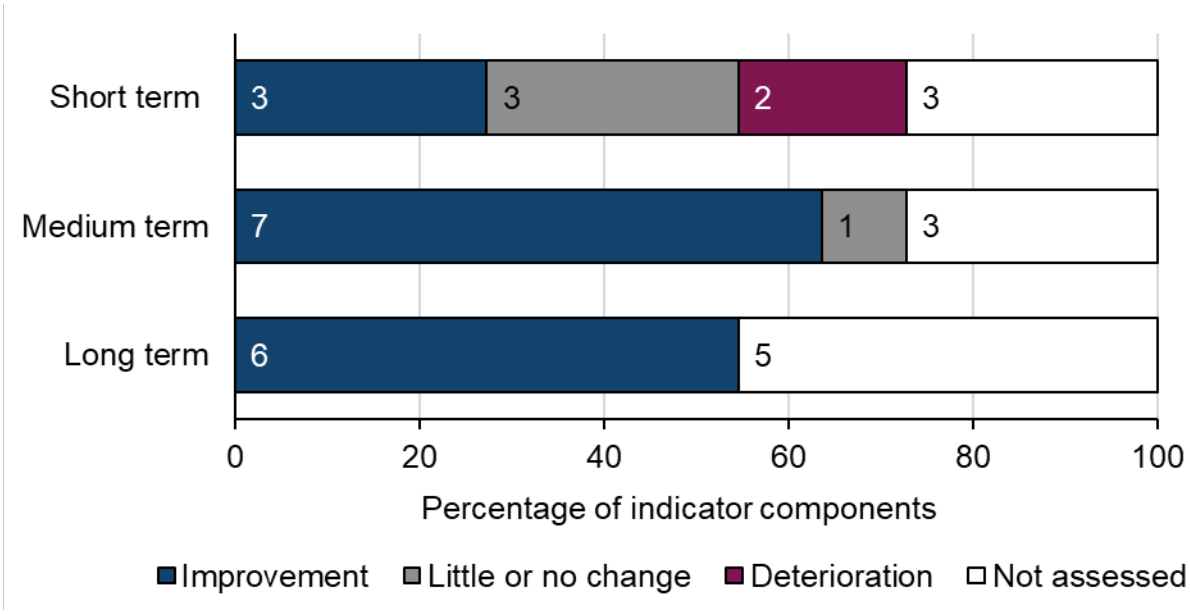


Table 10: Assessment results – Using resources from nature more sustainably and efficiently

Indicator component	Short term	Medium term	Long term
C10a Marine fish (quota) stocks of UK interest harvested sustainably (below F_{MSY} or in F_{MSY} range)	Improvement	Improvement	Improvement
C10b Marine fish (quota) stocks of UK interest with biomass at levels capable of maintaining full reproductive capacity (above MSY $B_{trigger}$)	Improvement	Improvement	Improvement
E1 Area of productive agricultural land in England	Little or no change	Little or no change	Change (decreasing)

Indicator component	Short term	Medium term	Long term
E2 Volume of agricultural production in the UK	Change (increasing)	Change (increasing)	Change (increasing)
E3 Volume of inputs used in agricultural production in the UK	Change (increasing)	Change (increasing)	Change (decreasing)
E4 Efficiency of agricultural production measured by Total Factor Productivity in the UK	Little or no change	Change (increasing)	Change (increasing)
E5 Percentage of the annual growth of trees in English woodlands that is harvested	Little or no change	Improvement	Not assessed
E6 Volume of timber brought to market from English sources	Improvement	Improvement	Not assessed
E8a Water leakage in England	Little or no change	Improvement	Improvement
E8b Per capita water consumption in England	Deterioration	Little or no change	Improvement
J2a Raw material consumption (excluding fossil fuels) per capita in England (total)	Deterioration	Improvement	Improvement
J2b Gross value added per kg of raw material consumption (excluding fossil fuels) in England	Little or no change	Improvement	Improvement

The network diagram in Figure 10 summarises how indicators for the goal ‘Using resources from nature more sustainably and efficiently’ may influence, or be influenced by, indicators for other goals. Volume of inputs used in agricultural production is linked to a whole range of indicators for air quality, water quality and wildlife, mainly due to ammonia pollution from fertilisers and the impacts of pesticides. Soil health is likely to influence indicators for wildlife as well as disruption or unwanted impacts from flooding or coastal erosion. Changes in several indicators may have implications for volume of agricultural production (soil health, species supporting ecosystem functions, distribution of invasive non-native species and plant pests and diseases, and rural background concentrations of ozone).

Figure 10: Potential indicator links – Using resources from nature more sustainably and efficiently

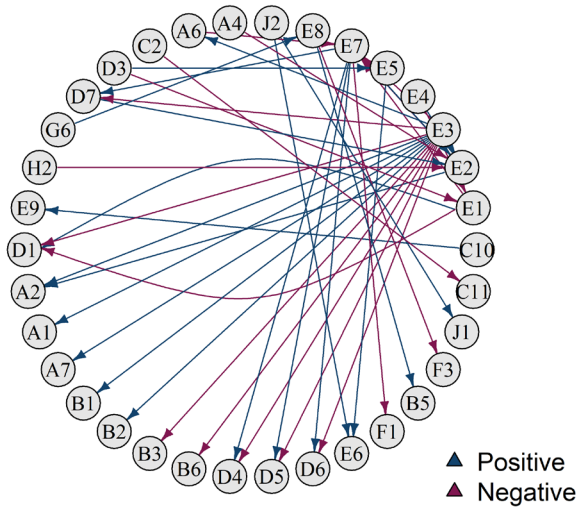


Table 11: Potential indicator links – Using resources from nature more sustainably and efficiently

From Indicator	To Indicator	Correlation	Rationale
C10 Productive seas: fish and shellfish stocks safe and environmentally sustainable	E9 Percentage of our seafood coming from healthy ecosystems, produced sustainably	Positive	E9 will use the data collected for the management of fish stocks to assess whether harvesting rates remain within sustainable limits (as shown in C10).
E1 Area of productive agricultural land	E7 Soil health	Negative	Agricultural production and the associated land use and management are key drivers of the environmental impacts from the sector.
E1 Area of productive agricultural land	D1 Quantity, quality and connectivity of habitats	Positive	As well as being vital for food production, agriculture helps to shape the landscape, providing important recreational, spiritual and other cultural benefits.

From Indicator	To Indicator	Correlation	Rationale
E1 Area of productive agricultural land	D1 Quantity, quality and connectivity of habitats	Negative	As well as being vital for food production, agriculture helps to shape the landscape, providing important recreational, spiritual and other cultural benefits.
E2 Volume of agricultural production	E7 Soil health	Negative	Agricultural production and the associated land use and management are key drivers of the environmental impacts from the sector.
E2 Volume of agricultural production	A2 Emissions of greenhouse gases from natural resources	Positive	A2 includes greenhouse gas emissions from agriculture as a component in the graph (approximately 30% of total emissions).
E3 Volume of inputs used in agricultural production	A1 Emissions for five key air pollutants	Positive	Agricultural sources make up by far the largest component in the inventory for Ammonia emissions with cattle manure management, manure applied to soils and inorganic fertilizers each accounting for 20% or more of the emissions from this sector. Agriculture also contributes a small proportion to NMVOC and $PM_{2.5}$ emissions.
E3 Volume of inputs used in agricultural production	A2 Emissions of greenhouse gases from natural resources	Positive	A2 includes greenhouse gas emissions from agriculture as a component in the graph (~30% of total emissions). This includes emissions from the use of agricultural inputs.
E3 Volume of inputs used in agricultural production	A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	Positive	Agricultural sources make up by far the largest component in the inventory for Ammonia emissions with cattle manure management, manure applied to soils and inorganic fertilizers each accounting for 20% or more of the emissions from this sector.

From Indicator	To Indicator	Correlation	Rationale
E3 Volume of inputs used in agricultural production	A7 Area exposed to damaging levels of ammonia (NH_3) in the atmosphere	Positive	Agricultural sources make up by far the largest component in the inventory for Ammonia emissions with cattle manure management, manure applied to soils and inorganic fertilizers each accounting for 20% or more of the emissions from this sector.
E3 Volume of inputs used in agricultural production	B1 Pollution loads entering waters	Positive	B1 tracks changes in the inputs and discharges of selected contaminants such as nutrients and some toxic chemicals to rivers or directly to the sea, for example through activities such as agriculture inputting substances directly.
E3 Volume of inputs used in agricultural production	B2 Serious pollution incidents to water	Positive	Agriculture is now the largest sector responsible for significant pollution events to water.
E3 Volume of inputs used in agricultural production	B3 State of the water environment	Negative	Agriculture and rural land management is one of the main activities that prevent water bosies reaching good status.
E3 Volume of inputs used in agricultural production	B6 Natural functions of water and wetland ecosystems	Negative	Nutrient run off affects the natural functions of wetland ecosystems, for example, through eutrophication.
E3 Volume of inputs used in agricultural production	D1 Quantity, quality and connectivity of habitats	Negative	Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats.
E3 Volume of inputs used in agricultural production	D4 Relative abundance and distribution of widespread species	Negative	D4 shows the decline of certain species groups on farmland.

From Indicator	To Indicator	Correlation	Rationale
E3 Volume of inputs used in agricultural production	D5 Conservation status of our native species	Negative	Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats.
E3 Volume of inputs used in agricultural production	D6 Abundance and distribution of priority species in England	Negative	Farm practices and the use of inputs (particularly fertilisers and pesticides) directly influence the environmental pressures from farming including the quality, composition and availability of habitats.
E3 Volume of inputs used in agricultural production	D7 Species supporting ecosystem functions	Negative	Pesticide use affects pollinators.
E3 Volume of inputs used in agricultural production	E2 Volume of agricultural production	Positive	Inputs include fertilisers and pesticides used to increase volume of agricultural production.
E3 Volume of inputs used in agricultural production	E7 Soil health	Negative	The E7 indicator will include chemical properties (such as soil carbon, nutrients and pH) which are affected by inputs used.
E4 Efficiency of agricultural production measured by Total Factor Productivity	E1 Area of productive agricultural land	Negative	Smaller amount of land required for same output from agricultural production if efficiency increased.
E4 Efficiency of agricultural production measured by Total Factor Productivity	E2 Volume of agricultural production	Positive	Smaller amount of land required for same output from agricultural production if efficiency increased.

From Indicator	To Indicator	Correlation	Rationale
E5 Percentage of the annual growth of trees in English woodlands that is harvested	E6 Volume of timber brought to market each year	Positive	Volume of timber brought to market will include timber harvested from English woodlands.
E7 Soil health	D4 Relative abundance and distribution of widespread species	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.
E7 Soil health	D5 Conservation status of our native species	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.
E7 Soil health	D6 Abundance and distribution of priority species in England	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.
E7 Soil health	D7 Species supporting ecosystem functions	Positive	Healthy soils underpin the multiple functions of soils in supporting wildlife.
E7 Soil health	E2 Volume of agricultural production	Positive	Healthy soils underpin the multiple functions of soils in food production.
E7 Soil health	F1 Disruption or unwanted impacts from flooding or coastal erosion	Negative	Healthy soils underpin the multiple functions of soils in regulating water.
E8 Sustainable use of water	B5 Water bodies achieving sustainable abstraction criteria	Positive	Reducing water consumption and leakage will help in achieving sustainable extraction.
E8 Sustainable use of water	F3 Disruption or unwanted impacts caused by drought	Negative	Reducing water consumption and leakage will mitigate the impacts of drought.

From Indicator	To Indicator	Correlation	Rationale
J2 Raw material consumption	J1 Carbon footprint and consumer buying choices	Positive	Raw materials are used in the production of goods measured by J1.
J2 Raw material consumption	E6 Volume of timber brought to market each year	Positive	Raw material consumption includes biomass products such as timber.
A4 Rural background concentrations of ozone (O_3)	E2 Volume of agricultural production	Negative	Ozone can have adverse effects on the environment through oxidative damage to vegetation.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	E7 Soil health	Negative	Excess deposition of NH_3 on natural ecosystems causes nutrient enrichment and changes in vegetation and soils.
C2 Seabed subject to high pressure from human activity	C11 Productive seas: status of sensitive fish and shellfish stocks	Negative	C11 will show the status of fish and shellfish that are particularly sensitive to pressures such as fishing mortality. C2 shows level of pressure from some types of fishing.
D3 Area of woodland in England	E5 Percentage of the annual growth of trees in English woodlands that is harvested	Positive	Source data for E5 includes National Forest Inventory forecasts of increase (increment) in the volume of wood that grows in England, which incorporate information on woodland area.
D3 Area of woodland in England	E1 Area of productive agricultural land	Negative	In some situations, increase in woodland area will reduce the area of productive agricultural land.
D7 Species supporting ecosystem functions	E2 Volume of agricultural production	Positive	D7 shows trends in pollinators which are important for crop production.
G6 Environmental attitudes and behaviours	E8 Sustainable use of water	Positive	G6 will include information on people's self-reported environmental behaviours, likely including questions on water use.

From Indicator	To Indicator	Correlation	Rationale
H2 Distribution of invasive non-native species and plant pests and diseases	E2 Volume of agricultural production	Negative	H2 includes tree pests that affect crops, such as Sweet chestnut blight.

Enhancing beauty, heritage and engagement with the natural environment

Figure 11 shows the proportion of indicator components for which 'Enhancing beauty, heritage and engagement with the natural environment' is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

Two indicators are classed as 'not assessed' in Figure 11 because they are still in development (G1 Changes in landscape and waterscape character and H5 Exposure to transport noise). A further 6 indicator components are presented as interim in this year's report, but currently only have one or two years of data so don't have a sufficient time series for an assessment. Three indicator components were assessed: Area of woodland in England, Frequency of visits to the natural environment and Volunteer time spent on the natural environment in England. The latter 2 indicators showed an improvement in the most recent 5-year period for which data were available (2013 to 2018). The observed increases in the area of woodland in England over the most recent 5 years (2016 to 2021) and in the medium term (2011 to 2021) are assessed as 'little or no change'.

Figure 11: Summary of assessment results – Enhancing beauty, heritage and engagement with the natural environment

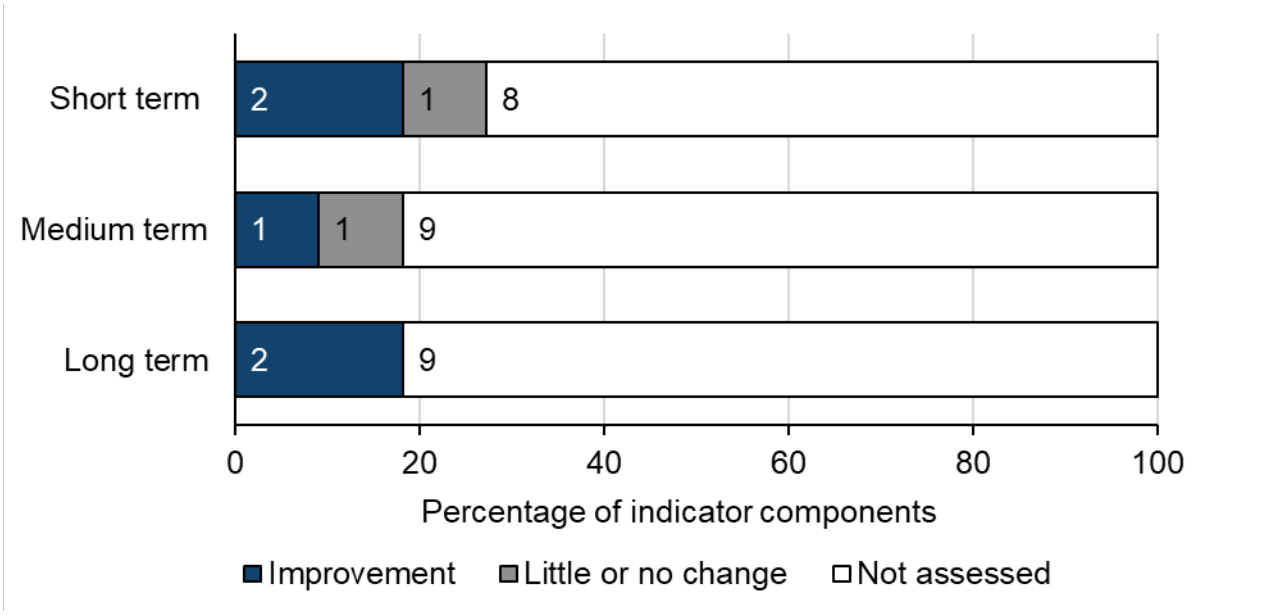


Table 12: Assessment results – Enhancing beauty, heritage and engagement with the natural environment

Indicator component	Short term	Medium term	Long term
D3 Area of woodland in England	Little or no change	Little or no change	Improvement
G4a Frequency of visits to the natural environment in the past 12 months in England	Improvement	Not assessed	Not assessed
G5 Volunteer time spent on the natural environment in England	Improvement	Improvement	Improvement

The network diagram in Figure 12 summarises which indicators for the goal 'Enhancing beauty, heritage and engagement with the natural environment' may influence, or be influenced by, indicators for other goals. A range of air quality indicators are likely to influence health and wellbeing, in addition to indicators for hazardous chemicals, engagement with the natural environmental and exposure to transport noise. Numerous indicators may also influence landscape character (exceedance of damaging levels of nutrient nitrogen deposition, area of woodland, extent and condition of protected sites, waste crime). Environmental attitudes and behaviours could lead to change in sustainable use of water, municipal waste recycling rates and carbon footprint related to consumer buying choices.

Figure 12: Potential indicator links – Enhancing beauty, heritage and engagement with the natural environment

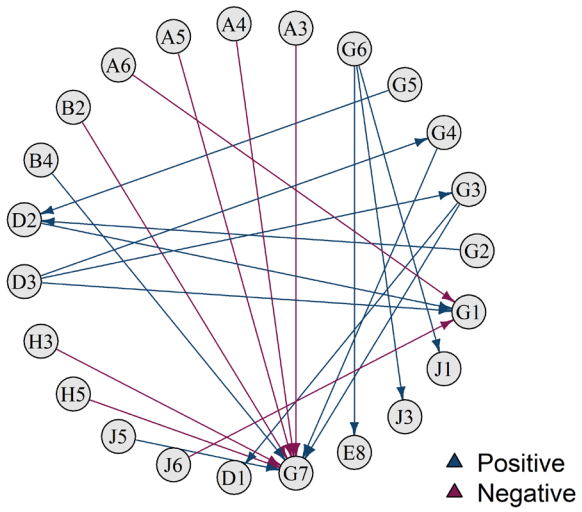


Table 13: Potential indicator links – Enhancing beauty, heritage and engagement with the natural environment

From Indicator	To Indicator	Correlation	Rationale
G2 Condition of heritage features including designated geological sites and scheduled monuments	D2 Extent and condition of protected sites – land, water and sea	Positive	Geological sites are a subset of protected areas.
G3 Enhancement of green/blue infrastructure	D1 Quantity, quality and connectivity of habitats	Positive	Accessible natural greenspaces have an important contribution to make to the quality of the environment in urban areas. Such sites provide important refuges for wildlife in otherwise impoverished areas.
G3 Enhancement of green/blue infrastructure	G7 Health and wellbeing benefits	Positive	Green and blue spaces and features in and around our built environment, including within Green Belts, are essential to health and well-being.
G4 Engagement in the natural environment	G7 Health and wellbeing benefits	Positive	G7 shows that most people agree that spending time outdoors is important for their physical and mental health.
G5 People engaged in social action for the environment	D2 Extent and condition of protected sites – land, water and sea	Positive	G5 includes data on volunteer hours from organisations that manage protected areas such as the Wildlife Trusts.
G6 Environmental attitudes and behaviours	E8 Sustainable use of water	Positive	G6 will include information on people's self-reported environmental behaviours, likely including questions on water use.
G6 Environmental attitudes and behaviours	J3 Municipal waste recycling rates	Positive	G6 will include information on people's self-reported environmental behaviours, likely including questions on waste.

From Indicator	To Indicator	Correlation	Rationale
G6 Environmental attitudes and behaviours	J1 Carbon footprint and consumer buying choices	Positive	G6 will include information on people's self-reported environmental behaviours, likely including questions on behaviours related to carbon use.
A3 Concentrations of fine particulate matter ($PM_{2.5}$) in the air	G7 Health and wellbeing benefits	Negative	Long-term exposure to particulate matter contributes to the risk of developing cardiovascular disease and lung cancer.
A4 Rural background concentrations of ozone (O_3)	G7 Health and wellbeing benefits	Negative	Ozone is a gas which is damaging to human health and can trigger inflammation of the respiratory tract, eyes, nose and throat as well as asthma attacks.
A5 Roadside nitrogen dioxide (NO_2) concentrations	G7 Health and wellbeing benefits	Negative	Short-term exposure to concentrations of NO_2 can cause inflammation of the airways and increase susceptibility to respiratory infections and to allergens. NO_2 can exacerbate the symptoms of those already suffering from lung or heart conditions.
A6 Exceedance of damaging levels of nutrient nitrogen deposition on ecosystems	G1 Changes in landscape and waterscape character	Negative	Nutrient nitrogen deposition affects the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses.
B2 Serious pollution incidents to water	G7 Health and wellbeing benefits	Negative	The 2 higher categories of serious pollution event cause, for example, potential harm to bathers.
B4 Condition of bathing waters	G7 Health and wellbeing benefits	Positive	Status of bathing waters is based on a set of microbiological tests (measuring E.coli and intestinal enterococci) performed on waters used for bathing. The bacteria, if present, can cause severe stomach upsets and gastro-intestinal illness.

From Indicator	To Indicator	Correlation	Rationale
D2 Extent and condition of protected sites – land, water and sea	G1 Changes in landscape and waterscape character	Positive	Changes in environmental outcomes from our Designated Landscapes will be considered as part of the G1 indicator.
D3 Area of woodland in England	G1 Changes in landscape and waterscape character	Positive	G1 will consider attributes of landscape such as woodland cover.
D3 Area of woodland in England	G3 Enhancement of green/blue infrastructure	Positive	Woodland will be included in metrics of green infrastructure.
D3 Area of woodland in England	G4 Engagement in the natural environment	Positive	Some visits to the natural environment will be visits to woodland.
H3 Emissions of mercury and persistent organic pollutants to the environment	G7 Health and wellbeing benefits	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
H5 Exposure to transport noise	G7 Health and wellbeing benefits	Negative	Health costs (and hence burden to the economy) of noise can be estimated from health outcomes associated with noise exposure (such as annoyance, sleep disturbance, and cardiovascular effects).
J5 Prevent harmful chemicals from being recycled	G7 Health and wellbeing benefits	Positive	Chemicals measured in J5 include POPs which can bioaccumulate and have harmful impacts on health.

From Indicator	To Indicator	Correlation	Rationale
J6 Waste crime	G1 Changes in landscape and waterscape character	Negative	Fly tipping will influence changes in the public's perceptions of landscape character and quality, which will become part of the G1 indicator.

Mitigating and adapting to climate change

Figure 13 shows the proportion of indicator components for which 'Mitigating and adapting to climate change' is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

Both A2 Emissions of greenhouse gases from natural resources in England and J1 Consumption based greenhouse gas emissions in England showed an improvement over all assessed time periods. The short-term time period relates to the most recent 5 years for which an assessment could be undertaken (2013 to 2018 for A2 and 2012 to 2017 for J1).

The inclusion of this assessment is based on the individual indicators with a relevant primary goal; additional valuable insights can be understood by considering the holistic relevance of additional indicators, as many will be sensitive to the issue of climate change. The first Outcome Indicator Framework report (published in 2019) lists a sub-selection of indicators which are expected to give some indication of progress on adaptation, the need for adaptation or the resilience of natural assets to climate change. Future assessments of the Outcome Indicator Framework will continue to consider how best to derive inferences of progress to aid in understanding progress of the 25 Year Environment Plan.

Figure 13: Summary of assessment results – Mitigating and adapting to climate change

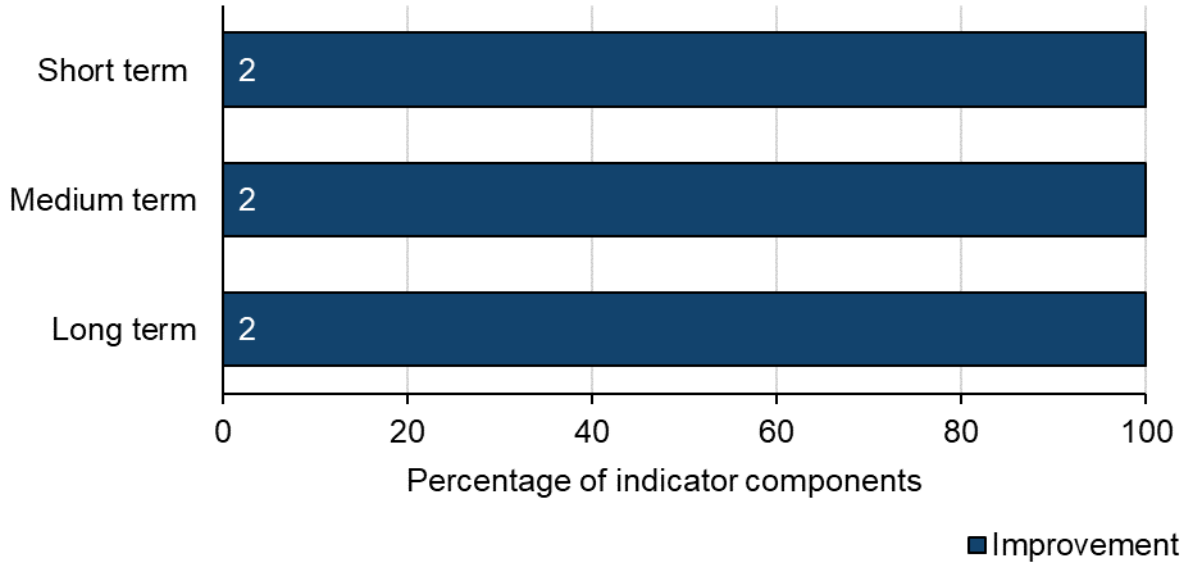


Table 14: Assessment results – Mitigating and adapting to climate change

Indicator component	Short term	Medium term	Long term
A2 Emissions of greenhouse gases from natural resources in England	Improvement	Improvement	Improvement
J1 Consumption based greenhouse gas emissions in England (total)	Improvement	Improvement	Improvement

The network diagram in Figure 14 summarises which indicators for the goal 'Mitigating and adapting to climate change' may influence, or be influenced by, indicators for other goals. Increases in volume of agricultural production and volume of inputs used in agricultural production may lead to increases in emissions of greenhouse gases from natural resources, while increased area of woodland in England may have the opposite effect. Raw material consumption is linked to carbon footprint and consumer buying choices.

Figure 14: Potential indicator links – Mitigating and adapting to climate change

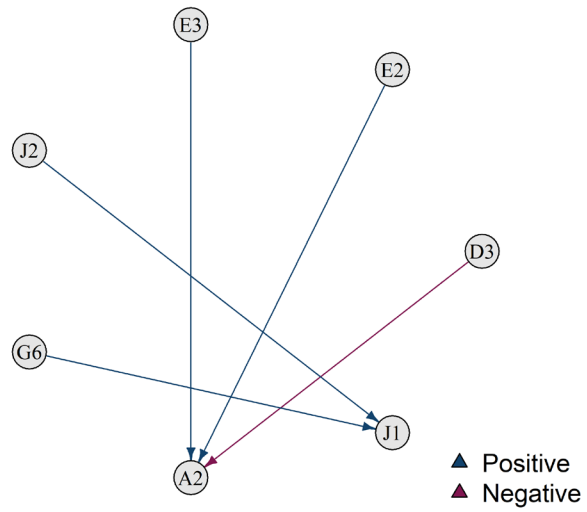


Table 15: Potential indicator links – Mitigating and adapting to climate change

From Indicator	To Indicator	Correlation	Rationale
D3 Area of woodland in England	A2 Emissions of greenhouse gases from natural resources	Negative	A2 includes negative emissions values from a forestry sink.

From Indicator	To Indicator	Correlation	Rationale
E2 Volume of agricultural production	A2 Emissions of greenhouse gases from natural resources	Positive	A2 includes greenhouse gas emissions from agriculture as a component in the graph (approximately 30% of total emissions).
E3 Volume of inputs used in agricultural production	A2 Emissions of greenhouse gases from natural resources	Positive	A2 includes greenhouse gas emissions from agriculture as a component in the graph (approximately 30% of total emissions). This includes emissions from the use of agricultural inputs.
J2 Raw material consumption	J1 Carbon footprint and consumer buying choices	Positive	Raw materials are used in the production of goods measured by J1.
G6 Environmental attitudes and behaviours	J1 Carbon footprint and consumer buying choices	Positive	G6 will include information on people's self-reported environmental behaviours, likely including questions on behaviours related to carbon use

Minimising waste

Figure 15 shows the proportion of indicator components for which 'Minimising waste' is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

Of the 8 indicator components for which Minimising Waste is the primary goal, all showed an improvement over the medium and long term. However, several indicators did not have a sufficiently long time series to be assessed for these time periods. Over the short term, 3 indicator components showed an improvement, 2 showed little or no change and 3 showed a deterioration. The 2 indicator components for waste crime shifted into a less positive assessment category over the short term; one moved to little or no change and one to deterioration. There was a continued improvement for 2 of the marine litter indicator components and consumption-based greenhouse gas emissions. Two additional indicator components could be assessed for the short-term time period; waste from households recycling rates showed little or no change, and residual waste showed a deterioration. The short-term time period covered the most recent 5 years for which an assessment could be made, which was 2009 to 2014 for C1a, 2014 to 2019 for C1b, 2012 to 2017 for J1, 2015 to 2020 for J3, and 2013 to 2018 for J4 and J6.

Figure 15: Summary of assessment results for Minimising Waste indicator components

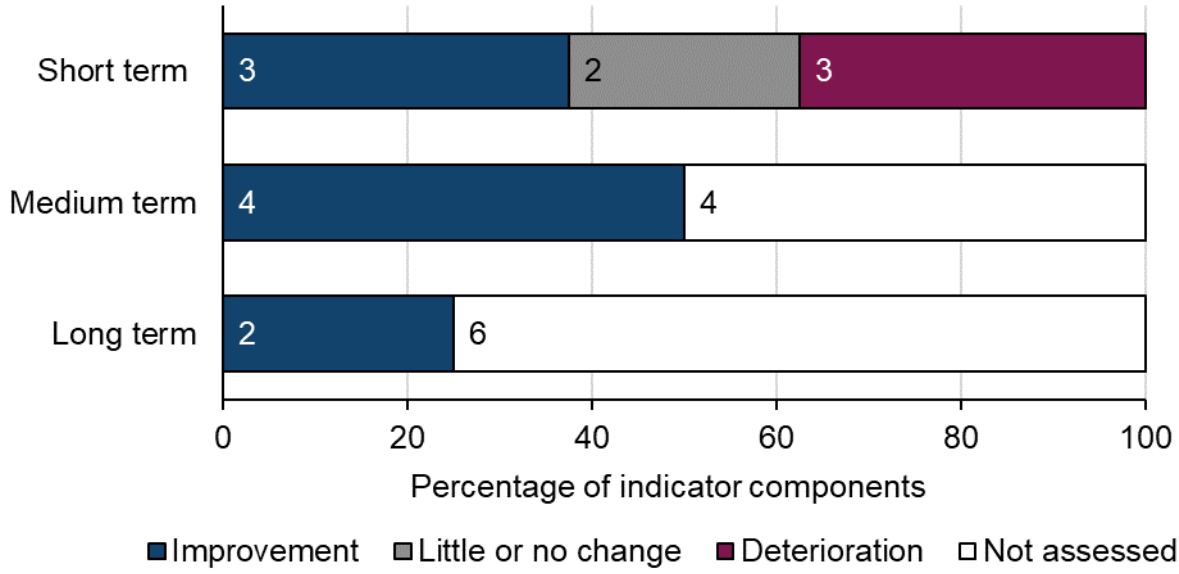


Table 16: Assessment results for Minimising Waste indicator components

Indicator component	Short term	Medium term	Long term
C1ai Items of litter per 100m of beach, Celtic Seas	Improvement	Not assessed	Not assessed
C1aii Items of litter per 100m of beach, Greater North Sea	Deterioration	Not assessed	Not assessed
C1b Percentage of sampled fulmars having more than 0.1g of plastic in their stomach, UK	Improvement	Improvement	Improvement
J1 Consumption based greenhouse gas emissions in England (total)	Improvement	Improvement	Improvement
J3 Waste from households recycling rates in England	Little or no change	Not assessed	Not assessed
J4 Residual waste (excluding major mineral wastes) in England (total)	Deterioration	Not assessed	Not assessed
J6a Illegal waste sites in England (total active sites)	Little or no change	Improvement	Not assessed
J6b Fly-tipping incidents in England	Deterioration	Improvement	Not assessed

The network diagram in Figure 16 summarises which Minimising Waste indicators may influence, or be influenced by, indicators for other goals. Waste crime may have a negative impact on indicators for water pollution, marine litter, and landscape and waterscape character. Environmental attitudes and behaviours may influence municipal recycling rates and carbon footprint related to consumer buying choices, and marine litter may have a negative effect on status of marine mammals, birds and fish.

Figure 16: Potential links with Minimising Waste indicators

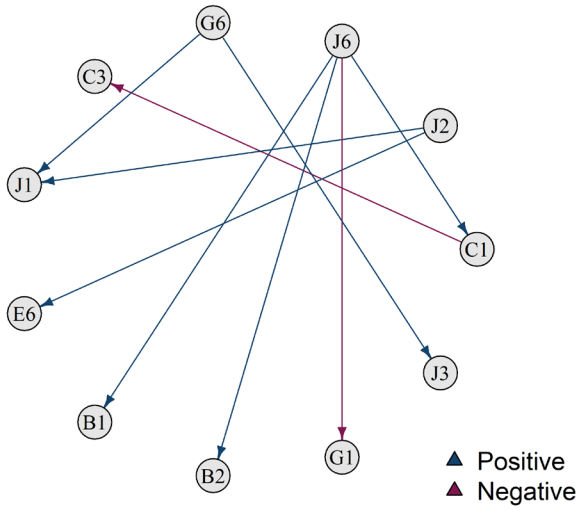


Table 17: Potential links with Minimising Waste indicators

From Indicator	To Indicator	Correlation	Rationale
C1 Clean seas: marine litter	C3 Diverse seas: status of mammals, birds and fish	Negative	Marine litter can be harmful to wildlife. C1 includes indicator for plastic ingested by fulmars.
J2 Raw material consumption	J1 Carbon footprint and consumer buying choices	Positive	Raw materials are used in the production of goods measured by J1.
J2 Raw material consumption	E6 Volume of timber brought to market each year	Positive	Raw material consumption includes biomass products such as timber.

From Indicator	To Indicator	Correlation	Rationale
J6 Waste crime	B1 Pollution loads entering waters	Positive	If not handled properly, waste can cause serious pollution of the environment – air, land and water.
J6 Waste crime	B2 Serious pollution incidents to water	Positive	If not handled properly, waste can cause serious pollution of the environment – air, land and water.
J6 Waste crime	C1 Clean seas: marine litter	Positive	J6 includes fly tipping which could result in marine litter.
J6 Waste crime	G1 Changes in landscape and waterscape character	Negative	Fly tipping will influence changes in the public's perceptions of landscape character and quality, which will become part of the G1 indicator.
G6 Environmental attitudes and behaviours	J3 Municipal waste recycling rates	Positive	G6 will include information on people's self-reported environmental behaviours, likely including questions on waste.
G6 Environmental attitudes and behaviours	J1 Carbon footprint and consumer buying choices	Positive	G6 will include information on people's self-reported environmental behaviours, likely including questions on behaviours related to carbon use.

Managing exposure to chemicals

Figure 17 shows the proportion of indicator components for which 'Managing exposure to chemicals is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

J5 (Prevent harmful chemicals from being recycled) is still in development and H4 (Exposure of wildlife to chemicals in the environment in England) does not currently present information as the time series needed for applying the assessment method. H3a (emissions of mercury to air land and water in England) does not yet have a sufficiently long time series for assessment of trend. H3b (emissions of persistent organic pollutants to air land and water in England) could be assessed.

All of the pollutants measured by H3b showed an improvement over the medium and long term. However, emissions of hexachlorobenzene increased over the short term and polychlorinated naphthalenes showed little or no change. The short-term time period covered the most recent 5 years for which an assessment can be made (2013 to 2018 for H3b).

Figure 17: Summary of assessment results for Managing exposure to chemicals indicator components

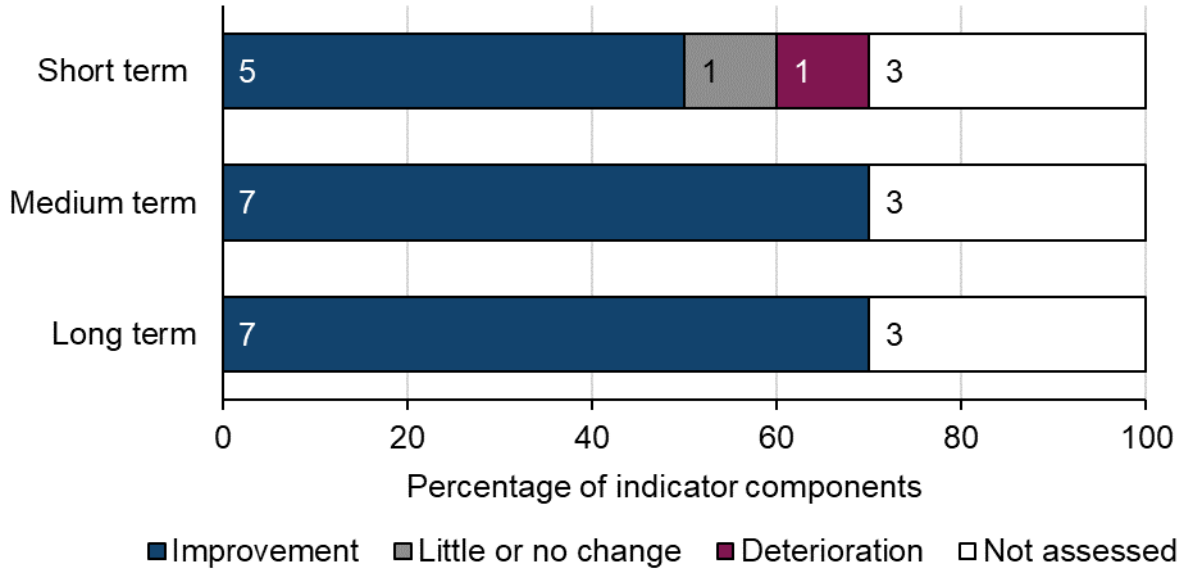


Table 18: Assessment results for Managing exposure to chemicals indicator components

Indicator component	Short term	Medium term	Long term
H3bi Emissions of dioxins and furans to air land and water in England	Improvement	Improvement	Improvement
H3bii Emissions of hexachlorobenzene to air land and water in England	Deterioration	Improvement	Improvement
H3biii Emissions of pentachlorophenol to air land and water in England	Improvement	Improvement	Improvement
H3biv Emissions of polychlorinated biphenyl to air land and water in England	Improvement	Improvement	Improvement
H3bv Emissions of dioxin-like polychlorinated biphenyl to air land and water in England	Improvement	Improvement	Improvement
H3bvi Emissions of polychlorinated naphthalenes to air land and water in England	Little or no change	Improvement	Improvement
H3bvii UK emissions of pentachlorobenzine to air land and water in England	Improvement	Improvement	Improvement

The network diagram in Figure 18 summarises which Managing exposure to chemicals indicators may influence, or be influenced by, indicators for other goals. Emissions of mercury and persistent organic pollutants to the environment may lead to increases in water pollution and exposure and adverse effects of chemicals on wildlife in the environment, which in turn may influence wildlife indicators. There may also be negative links to health and wellbeing. The indicator for preventing harmful chemicals from being recycled may be related to changes in the opposite direction, leading to reduced exposure and adverse effects of chemicals and increased health and wellbeing.

Figure 18: Potential links with Managing exposure to chemicals indicators

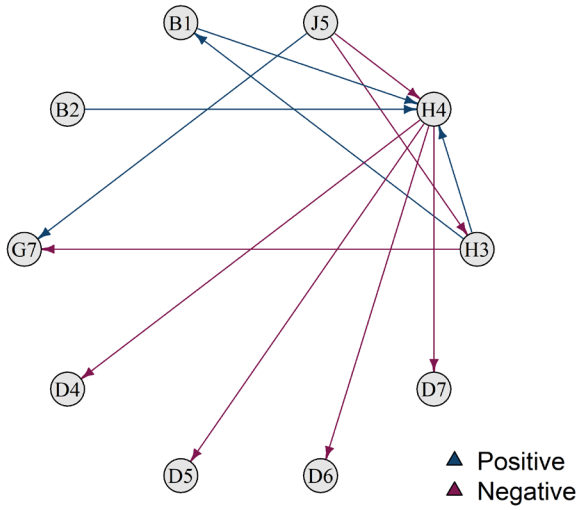


Table 19: Potential links with Managing exposure to chemicals indicators

From Indicator	To Indicator	Correlation	Rationale
H3 Emissions of mercury and persistent organic pollutants to the environment	H4 Exposure and adverse effects of chemicals on wildlife in the environment	Positive	H3 includes exposure to POPs and mercury.

From Indicator	To Indicator	Correlation	Rationale
H3 Emissions of mercury and persistent organic pollutants to the environment	B1 Pollution loads entering waters	Positive	B1 includes levels of mercury.
H3 Emissions of mercury and persistent organic pollutants to the environment	G7 Health and wellbeing benefits	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D4 Relative abundance and distribution of widespread species	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D5 Conservation status of our native species	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.

From Indicator	To Indicator	Correlation	Rationale
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D6 Abundance and distribution of priority species in England	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
H4 Exposure and adverse effects of chemicals on wildlife in the environment	D7 Species supporting ecosystem functions	Negative	POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the tissues of humans and wildlife, and have harmful impacts on human health or on the environment. Mercury is toxic and can cause damage to human health and accumulates in the environment and the food chain.
J5 Prevent harmful chemicals from being recycled	H3 Emissions of mercury and persistent organic pollutants to the environment	Negative	Harmful chemicals measured in J5 include POPs.
J5 Prevent harmful chemicals from being recycled	H4 Exposure and adverse effects of chemicals on wildlife in the environment	Negative	Harmful chemicals measured in J5 include POPs and PCBs and H4 measures the effects of these on wildlife.
J5 Prevent harmful chemicals from being recycled	G7 Health and wellbeing benefits	Positive	Chemicals measured in J5 include POPs which can bioaccumulate and have harmful impacts on health.
B1 Pollution loads entering waters	H4 Exposure and adverse effects of chemicals on wildlife in the environment	Positive	B1 includes emissions of mercury, H4 monitors exposure to mercury.

From Indicator	To Indicator	Correlation	Rationale
B2 Serious pollution incidents to water	H4 Exposure and adverse effects of chemicals on wildlife in the environment	Positive	Pollution incidents could involve the release of pollutants monitored through H4 for example, mercury.

Enhancing biosecurity

Figure 19 shows the proportion of indicator components for which 'Enhancing biosecurity' is the primary goal that have been assigned to each assessment category, with the exact number of indicator components shown as a label on the bars.

H1 (Abatement of the number of invasive non-native species entering and establishing against a baseline) reports one cumulative data point for each 10-year period included within the indicator, so it is only possible to assess long-term trends as there are insufficient data points to establish trends over shorter time periods. H1 showed a deterioration for freshwater, marine and terrestrial ecosystems over the long term. H2 (Distribution of invasive non-native species and plant pests and diseases) showed an improvement over the medium and long term, moving to 'little or no change' in the short term.

Figure 19: Summary of assessment results for Enhancing biosecurity indicator components

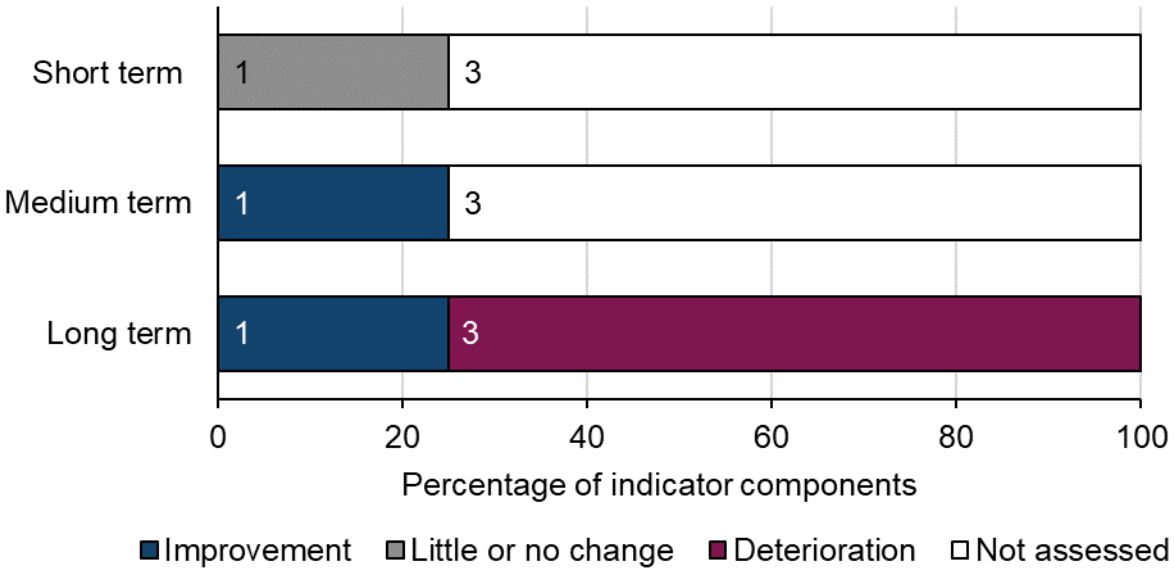


Table 20: Assessment results for Enhancing biosecurity indicator components

Indicator component	Short term	Medium term	Long term
H1i Number of invasive non-native species established across or along 10% or more of the land area or coastline of Great Britain (freshwater)	Not assessed	Not assessed	Deterioration
H1ii Number of invasive non-native species established across or along 10% or more of the land area or coastline of Great Britain (marine)	Not assessed	Not assessed	Deterioration
H1iii Number of invasive non-native species established across or along 10% or more of the land area or coastline of Great Britain (terrestrial)	Not assessed	Not assessed	Deterioration
H2 Number of additional tree pests and diseases becoming established in England	Little or no change	Improvement	Improvement

The network diagram in Figure 20 summarises which Enhancing biosecurity indicators may influence, or be influenced by, indicators for other goals. Both indicators may have a negative influence on a range of wildlife indicators. The number of additional tree pests and diseases becoming established in England may also negatively influence volume of agricultural production.

Figure 20: Potential links with Enhancing biosecurity indicators

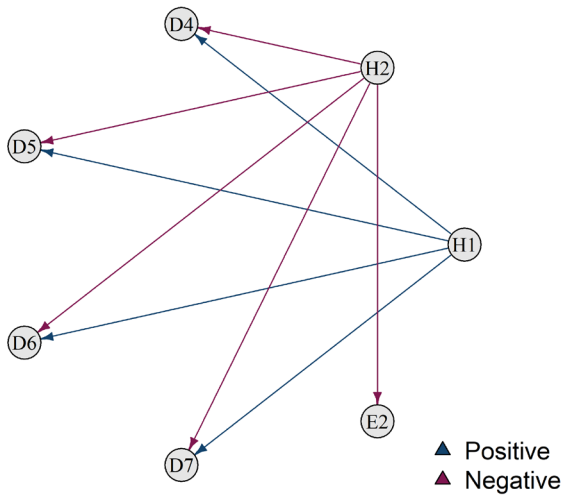


Table 21: Potential links with Enhancing biosecurity indicators

From Indicator	To Indicator	Correlation	Rationale
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D4 Relative abundance and distribution of widespread species	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D5 Conservation status of our native species	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D6 Abundance and distribution of priority species in England	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.
H1 Abatement of the number of invasive non-native species entering and establishing against a baseline	D7 Species supporting ecosystem functions	Positive	The H1 indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity.
H2 Distribution of invasive non-native species and plant pests and diseases	D4 Relative abundance and distribution of widespread species	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.
H2 Distribution of invasive non-native species and plant pests and diseases	D5 Conservation status of our native species	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.

From Indicator	To Indicator	Correlation	Rationale
H2 Distribution of invasive non-native species and plant pests and diseases	D6 Abundance and distribution of priority species in England	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.
H2 Distribution of invasive non-native species and plant pests and diseases	D7 Species supporting ecosystem functions	Negative	Preventing the spread of invasive non-native species limits their ability to disrupt ecosystems.
H2 Distribution of invasive non-native species and plant pests and diseases	E2 Volume of agricultural production	Negative	H2 includes tree pests that affect crops, such as Sweet chestnut blight.

Annex 1: Official statistics

The term official statistics comprises National Statistics, official statistics and experimental statistics.

All official statistics are produced by crown bodies, those acting on behalf of crown bodies, or those specified in statutory orders, as defined in the Statistics and Registration Service Act 2007.

National Statistics have been assessed by the Office for Statistics Regulation, the regulatory arm of the UK Statistics Authority, as fully compliant with the Code of Practice for Statistics. Accredited National Statistics are identified by the following quality mark:

Official statistics are produced in accordance with the Code of Practice for Statistics and its key principles of trustworthiness, quality and value.

Experimental statistics are newly developed or innovative statistics published so that users and stakeholders can be involved in the assessment of their suitability and quality at an early stage.

Measuring environmental change: Outcome Indicator Framework for the 25 Year Environment Plan

Statement of Voluntary Application of the Code of Practice for Statistics

Although this report is not in itself an official statistic or National Statistic compendium publication, where possible we follow the UK's Code of Practice for Statistics in its production and in the compilation of the indicator framework within it.

The code is built around 3 main concepts, or pillars:

Trustworthiness – The focus of this principle is about building and maintaining confidence in the people and the organisations that publish information including that derived from National and official statistics.

Quality – The focus of this principle is on ensuring that we use data and methods that produce assured statistics.

Value – The focus of this principle is on publishing statistics that support society's need for information, addressing the questions that external users wish to have answered.

The following explains how these pillars have been applied in a proportionate way to enable us to demonstrate voluntary compliance with many parts of the Code, in line with the Guide to Voluntary Application of The Code.

Trustworthiness

Measuring environmental change: Outcome Indicator Framework for the 25 Year Environment Plan provides references on the sources of all of the quoted information. For the most part, the report draws on formally published National or official statistics – either produced by Defra or by the department's Arms' Length Bodies, often with input from external environmental partners.

This release is not covered by the normal orderly release process required for all new National and official statistics – primarily because it draws upon already published information. This different release process is also appropriate in that this is in essence an operational performance report, used within the Defra Group to identify the outcomes of delivery to date and to prioritise areas for further action. Hence the draft report is circulated internally in advance of publication.

Quality

Where the statistics used in this report are National or official statistics, they have an existing quality assessment process. Details on the methodologies used in constructing the underlying statistics are set out in the original publications, which are referenced.

Where there are new indicators in development, these are clearly flagged. Where possible we will use the processes for 'experimental' statistics set out in the Code of Practice to govern their development and any future confirmation of these indicators. We continue to

actively develop indicators in conjunction with stakeholders and for those evolving experimentally we are requesting user feedback, in particular to gauge the usefulness and value of the statistics. Where appropriate, we will also seek peer review of the methods underpinning our development indicators before removing their experimental statistics status.

Value

The indicators presented within this report were identified by a cross-disciplinary and cross-organisational team and views were sought from a range of external stakeholders and acted upon.

The Outcome Indicator Framework is intended to inform the separate annual progress report of the 25 Year Environment Plan, which meets the government commitment to produce an annual assessment of the progress in meeting the objectives set out in the 25 Year Environment Plan. Regular engagement and regular reviews should ensure that the suite of indicators continues to be informed by and responsive to views from outside government as well as tracking commitments made inside government.