

Environmental foresight review

Annexes



Office for
Environmental
Protection



Annex 1: Evidence review scoping note

This note outlines the key characteristics of the evidence review Ipsos conducted for environmental foresight evidence on behalf of the OEP, agreed during the initial phases of this project. The boxes below draw on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist,¹ which is an established framework for evidence syntheses in the health research and medical space.

At this early stage we set the broad terms of the review, which cover elements 1-8 in the PRISMA checklist. The remaining items of the checklist were added in subsequent stages of the project (methodological categorisation and short-listing).

Title and abstract

Ipsos worked with the OEP to conduct an evidence review and synthesis of existing work in environmental foresight and futures studies, with a focus on the UK (and England and Northern Ireland specifically).

Introduction

Rationale:

There is a large corpus of foresight evidence – both qualitative and quantitative in nature – around the environment and natural world. Yet it is rarely synthesised, meaning that the total of these individual research projects is unlikely to be greater than the sum of its parts.

Foresight is a critical field for the OEP's work as an independent assessor of government performance against its environmental targets. The challenges that the EIP and Environment Act statutory targets seek to address are long-term, requiring a clear vision of the future and an understanding of important waypoints and decisions that help organisations to arrive at their preferred future outcome.

The OEP therefore needs to develop an understanding of the range of approaches that are currently used and existing foresight evidence to help inform assessment approaches to achieve sustained improvement in the natural environment.

Objectives:

The objectives of this review were to give the OEP an understanding of:

- The **variety of credible, science-based, legitimate and policy-relevant approaches** that are currently applied in the field, as well as the typology of available evidence for anticipating environmental futures and evaluating pathways towards achieving stated goals and targets;
- The **applicability of both qualitative and quantitative foresight methods**, and how these methods vary across environmental goals and target areas established in the EIP targets with

¹ http://prisma-statement.org/documents/PRISMA_2020_abstract_checklist.pdf

special focus on (but not limited to) the achievability of targets related to nature (biodiversity), and water quality;

- The **existence, applicability and limitations of quantitative models** that can project environmental trajectories and assess the impacts of policy responses and actions, individually and in combination.

Methods

Eligibility criteria:

The overall criteria for inclusion consisted of the following:

- The EIP goals: Relevant to at least one of the 10 EIP goals
- Method: Use of qualitative and quantitative foresight methods applied to policy
- Geographical focus: England and the whole of the UK (where relevant). European and global sources will be considered where they are relevant for the whole global ecosystem

We also applied a specific criteria for the inclusion of sources under each of the 10 goal areas:

1. Thriving plants and wildlife
2. Clean air
3. Clean and plentiful water
4. Managing exposure to chemicals and pesticides
5. Maximise our resources, minimise our waste
6. Using resources from nature sustainability
7. Mitigating and adapting to climate change
8. Reduce risk of harm from environmental hazards
9. Enhancing biosecurity
10. Enhanced beauty, heritage and engagement with the natural environment

Information sources:

The main search platforms we used to identify peer-reviewed academic papers was Google Scholar. As some searches returned a large number of sources we limited our approach to the top five pages of search results returned.

As this research was focussed and policy based, we also paid particular attention to governmental and non-departmental organisations – such as the Department for Environment Food and Rural Affairs (Defra) and Department for Science, Innovation and Technology (DSIT), the Government Office for Science, the Joint Nature Conservation Committee (JNCC), UK Centre for Ecology and Hydrology (UK

CEH), Natural England and the Climate Change Committee (CCC). We conducted a Google search for white papers from civil society as well as social research from agencies and other bodies.

There are two further information sources we used: firstly we included source recommendations from the expert scoping interviews conducted as part of this phase. Secondly, we cross-referenced the search results with existing lists of evidence from other environmental foresight projects. This included an EEA list provided by the OEP.

Search strategy:

Our search strategy centred on ten search queries, structured around the ten EIP goal areas. We constructed ten boolean string search terms, each following the same format:

[Futures terminology] + [EIP goal area search terms] + [Geographical filters]

Below we detail the key terms used in each of the three sections:

- Futures terminology keywords – to be applied in all searches and separated with the boolean command “OR”. Note that where the terms can be either singular or plural we have added and asterisk to return both options: “foresight”, “future*”, “horizon scan*”, “scenario*”, “forecast*”, “delphi”, “trend*”, “driver*”, “backcast*”, “vision*”, “environmental intelligence”, “projection*”, “trajectory*”, “modelling”
- Geographical filters – also applied to all searches and separated with the “OR” command: “England” “UK” and “global”

We also applied specific search terms for each of the 10 EIP goal areas, agreed with the OEP. These are detailed below – these also utilised the “OR” command to broaden the search.

Thriving plants and wildlife:

Key search terms agreed with the OEP: “wildlife”, “biodiversity”, “natural landscape”, “habitats”, “ecosystems” “marine areas”, “sustainable forestry”, “sustainable farming”, “species restoration”, “protected sites”, “species abundance”, “protected species”, “habitat condition”, “nature”, “nature recovery”, “extinction risk”, “habitat loss” “ecosystem condition”

Our full Google search string for this goal area is below

(foresight OR future* OR “horizon scan*” OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR “environmental intelligence” OR projection* OR trajectory* OR modelling) AND (wildlife OR biodiversity OR “natural landscape” OR habitat* OR ecosystem* OR “marine areas” OR “sustainable forestry” OR “sustainable farming” OR “species restoration” OR “protected site*” OR “species abundance” OR “protected species” OR “habitat condition” OR nature OR “nature recovery” OR “extinction risk” OR “habitat loss” OR “ecosystem condition”) AND (England OR UK OR global)

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND (wildlife OR biodiversity OR habitat* OR ecosystem* OR marine OR forestry OR farming OR species OR extinction OR habitat) AND (England OR UK)*

Clean air:

Key search terms agreed with the OEP: "air quality", "domestic emissions", "industrial emissions", "transport emissions", "air quality management" "emission limits", "emission ceilings", "air pollution"

Our full Google search string for this goal area is below

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR "environmental intelligence" OR projection* OR trajectory* OR modelling) AND ("air quality" OR "domestic emissions" OR "industrial emissions" OR "transport emissions" OR "air quality management" OR "emission limit*" OR "emission ceilings" OR "air pollution") AND (England OR UK OR global)*

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND ("air quality" OR emissions OR domestic OR transport OR "emission limit*" OR "emission ceilings" OR "air pollution") AND (England OR UK)*

Clean and plentiful water:

Key search terms agreed with the OEP: "water pollution", "wastewater", "water system", "agricultural pollution", "resilient water supply" "river management", "water quality", "flooding", "drought", "river basin management", "discharge consents", "environmental permitting", "water resources", "water scarcity", "sewage"

Our full Google search string for this goal area is below

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR "environmental intelligence" OR projection* OR trajectory* OR modelling) AND ("water pollution" OR wastewater OR "water system" OR "agricultural pollution" OR "resilient water supply" OR "river management" OR "water quality" OR flooding OR drought OR "river basin management" OR "discharge consents" OR "environmental permitting" OR "water resource*" OR "water scarcity" OR sewage) AND (England OR UK OR global)*

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND ("water pollution" OR wastewater OR "agricultural pollution" OR "water quality" OR flooding OR drought OR sewage) AND (England OR UK)*

Managing exposure to chemicals and pesticides:

Key search terms agreed with the OEP: "chemical pollution", "chemical management", "chemical pathways", "chemical waste", "pesticides", "chemical mixtures", "chemical exposure" "insecticides", "persistent organic pollutants"

Our full Google search string for this goal area is below

(foresight OR future* OR "horizon scan*" OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR "environmental intelligence" OR projection* OR trajectory* OR modelling) AND ("chemical pollution" OR "chemical management" OR "chemical pathway*" OR "chemical waste" OR pesticide* OR "chemical mixture*" OR "chemical exposure" OR "insecticide*" OR "persistent organic pollutant*") AND (England OR UK OR global)

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND ("chemical pollution" OR "chemical waste" OR pesticide* OR "insecticide*" OR "persistent organic pollutant*") AND (England OR UK)*

Maximise our resources, minimise our waste:

Key search terms agreed with the OEP: "household waste", "biodegradable waste", "littering", "recycling system", "single use plastic", "food waste", "plastic pollution", "residual waste" "illegal waste", "waste crime", "hazardous waste", "commercial waste" "industrial waste", "residual waste", "landfill", "circular economy", "waste incineration" "resource management", "resource efficiency", "resource productivity"

Our full Google search string for this goal area is below

(foresight OR future* OR "horizon scan*" OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR "environmental intelligence" OR projection* OR trajectory* OR modelling) AND ("household waste" OR "biodegradable waste" OR littering OR "recycling system" OR "single use plastic" OR "food waste" OR "plastic pollution" OR "residual waste" OR "illegal waste" OR "waste crime" OR "hazardous waste" OR "commercial waste" OR "industrial waste" OR "residual waste" OR "landfill" OR "circular economy" OR "waste incineration" OR "resource management" OR "resource efficiency" OR "resource productivity") AND (England OR UK OR global)

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND (waste OR biodegradable OR litter* OR recycling OR plastic OR landfill OR "circular economy" OR "waste incineration") AND (England OR UK)*

Using resources from nature sustainably:

Key search terms agreed with the OEP: "supply chain", "forestry", "fish stock", "farming", "sustainable fishing", "soil health", "soil erosion", "food system", "forest management", "biofuels", "water resources", "water use", "land use", "energy use", "deep sea mining", "mining", "consumption", "peat", "intensive farming"

Our full Google search string for this goal area is below

(foresight OR future* OR "horizon scan*" OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR "environmental intelligence" OR projection* OR trajectory* OR modelling) AND ("supply chain" OR forestry OR "fish stock" OR farming OR "sustainable fishing" OR "soil health" OR "soil erosion" OR "food system*" OR "forest management" OR biofuel OR "water

resource*" OR "water use" OR "land use" OR "energy use" OR "deep sea mining" OR mining OR consumption OR peat OR "intensive farming") AND (England OR UK OR global)

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND (forestry OR farming OR fishing OR "soil health" OR biofuel OR "water use" OR "land use" OR "energy use" OR mining) AND (England OR UK)*

Mitigating and adapting to climate change:

Key search terms agreed with the OEP: "climate change", "climate mitigation", "climate resilience", "global warming", "climate adaptation", "net zero", "agricultural emissions", "carbon offsetting", "emissions trading", "tree planting", "peat restoration", "nature based solutions"

Our full Google search string for this goal area is below

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR "environmental intelligence" OR projection* OR trajectory* OR modelling) AND ("climate change" OR "climate mitigation" OR "climate resilience" OR "global warming" OR "climate adaptation" OR "net zero" OR "agricultural emissions" OR "carbon offset*" OR "emissions trading" OR "tree planting" OR "peat restoration" OR "nature based solution*") AND (England OR UK OR global)*

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND ("climate mitigation" OR "climate resilience" OR "climate adaptation" OR "agricultural emissions" OR "nature based") AND (England OR UK)*

Reduce risk of harm from environmental hazards:

Key search terms agreed with the OEP: "environmental hazards", "natural hazards", "flooding", "flood management", "extreme heat", "coastal erosion", "wildfires", "sea level rise", "surface water flooding", "intense rainfall"

Our full Google search string for this goal area is below

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR "environmental intelligence" OR projection* OR trajectory* OR modelling) AND ("environmental hazard*" OR "natural hazard*" OR flooding OR "flood management" OR "extreme heat" OR "coastal erosion" OR "wildfire*" OR "sea level rise*" OR "surface water flooding" OR "intense rainfall") AND (England OR UK OR global)*

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND ("environmental hazard*" OR "natural hazard*" OR flood* OR "extreme heat" OR "coastal erosion" OR wildfire OR rainfall) AND (England OR UK)*

Enhancing biosecurity:

Key search terms agreed with the OEP: “biosecurity”, “plant health”, “animal health”, “zoonotic diseases”, “high-risk plants”, “non-native species”, “invasive alien species”, “invasive non-native species”, “invasive species”, “tree health”

Our full Google search string for this goal area is below

(foresight OR future* OR “horizon scan*” OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR “environmental intelligence” OR projection* OR trajectory* OR modelling) AND (biosecurity OR “plant health” OR “animal health” OR “zoonotic disease*” OR “high risk plant*” OR “non native species” OR “invasive alien species” OR “invasive non native species” OR “invasive species” OR “tree health”) AND (England OR UK OR global)

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR “horizon scan*” OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND (“plant health” OR “animal health” OR “zoonotic disease*” OR biosecurity OR “non native species” OR “invasive species”) AND (England OR UK)*

Enhanced beauty, heritage and engagement with the natural environment:

Key search terms agreed with the OEP: “natural landscape”, “cultural heritage”, “protected areas”, “access to nature”, “green infrastructure”, “blue infrastructure”, “green prescribing”, “landscape character”, “greenspaces”, “cultural landscape”

Our full Google search string for this goal area is below

(foresight OR future* OR “horizon scan*” OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR “environmental intelligence” OR projection* OR trajectory* OR modelling) AND (“natural landscape” OR “cultural heritage” OR “protected area*” OR “access to nature” OR “green infrastructure” OR “blue infrastructure” OR “green prescribing” OR “landscape character” OR greenspace* OR “cultural landscape”) AND (England OR UK OR global)

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR “horizon scan*” OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND (“natural landscape” OR “protected area*” OR “access to nature” OR “green infrastructure” OR “cultural landscape” OR “cultural heritage”) AND (England OR UK)*

Cross-cutting themes and policy responses:

Key search terms agreed with the OEP: “green jobs”, “green finance”, “making green choices”, “mainstreaming nature”, “agriculture”, “farming schemes”, “Environmental Land Management”, “ELMS”, “Land Use Strategy”, “net gain”, “nature-based solutions”, “Green Infrastructure”

Our full Google search string for this goal area is below

(foresight OR future* OR “horizon scan*” OR scenario* OR forecast* OR delphi OR trend* OR driver* OR backcast* OR vision* OR “environmental intelligence” OR projection* OR trajectory* OR

modelling) AND ("green finance" OR "making green choices" OR "mainstreaming nature" OR "agriculture" OR "farming scheme*" OR "Environmental Land Management" OR "ELMS" OR "Land Use Strategy" OR "net gain" OR "nature-based solution*" OR "Green Infrastructure") AND (England OR UK OR global)

In Google Scholar there is a 256-character limit to searches – a shortened version of the string for use here is provided below:

(foresight OR future OR "horizon scan*" OR scenario* OR forecast* OR projection* OR trajectory* OR modelling) AND ("green finance" OR "mainstreaming nature" OR "agriculture" OR "farming scheme*" OR "ELMS" OR "nature-based solution*") AND (England OR UK)*

Selection process:

Ipsos reviewers worked independently to categorise each source according to:

- Study information: Organisation and authors, document name, year of publication, a hyperlink to the document itself, country or area of focus, a short description of the work and the method
- Relevant theme(s): The EIP goals to which each source connects to
- PESTLE factor(s): The overarching PESTLE factors each source connects to and in reference to EIP goals
- Presence of policy analysis: We will flag the sources which consider the effect of existing or future policy as this will be useful for the subsequent categorisation stages.

Annex 2: Methodological categorisation and shortlisting approach note

In discussion with OEP, Ipsos proposed a two-part process by which the evidence in the longlist was categorised and shortlisted. We detail the approach below.

Headline approach:

Step one – top level relevance and methodological quality scoring

Sifting for relevance to the UK context and methodological transparency

Step two – EIP relevance and detailed methodological analysis

Understanding methodologies and prioritising by relevance to (multiple) EIP domains

Step one detail

This first stage was designed to be a rapid assessment of the relevance and quality of the full source list.

Geographical relevance – categorical

Each source was assessed to understand whether it focusses on the UK (or constituent nations and localities). Each source was marked as “Yes” or “No” on this metric. In cases where the focus is global or regional (e.g. Europe) but the UK is included, or where the focus is exceptionally local (e.g. Northern Wales) this was marked as a yes.

Headline methodological quality - scoring

We also assessed each source to understand how transparent it was in its approach to quality control. There were three criteria that were assessed:

- Is there a statement of methodology, limitations or approach in the report? Does the paper list its limitations or the details of the approach taken (including information such as sample size, number of experts consulted etc).
- Was the research peer-reviewed? Has it been published in an academic journal, or are there details of a peer-review process by external authors?
- Were there other review mechanisms involved in the production of the report, for instance a steering group, expert advisory board, public panel or stakeholder workshops?

Where the answer for each of these questions was “yes”, the source was awarded a point. This gave a score of 0-3 for each of the papers in the evidence base.

End of stage review

Once the sources were reviewed according to this metric we assessed the scores and categorisation, with the aim of reducing the number of sources based on the results. The selection criteria or score was agreed with the OEP team and the subset of sources that is selected through this process was taken forward into step two.

Step two detail

At the second stage we engaged more fully with the relevance of the sources. There were two parts to this stage – an assessment of relevance to the OEP goal areas and a categorisation of the purpose of the outputs of the work.

Relevance to EIP goal areas and assessment needs – scoring

At the initial long-listing stage, each source was coded to its relevant EIP goal areas. At this stage the level of relevance the source has to key words associated with each goal area was assessed.

The format of this stage was a qualitative assessment of the relevance each source, resulting in a relevance score. Relevance was assessed qualitatively against a list of key terms under each area (included in table 1.1 below) – the more the source is focussed on the key terms, the higher its level of relevance to this study.

This was a relatively top-level process, focussed on reading abstracts and reviewing article full text. One relevance score was given for each source, regardless of the number of links between it and the EIP goal areas. We felt that it was likely that those linked to more EIP goal areas will be more relevant than those focussed solely on one area.

The assessment process was as follows: the source was given a score of 1-3, where one denotes a lower level of relevance and three the highest. This was a relative and qualitative metric so it was important for scoring to be assessed: OEP piloted the method to ensure they feel it is delivering a level of differentiation. Ipsos continued to spot check and compare the results as they were produced to ensure the process is returning useful results.

Output coding – categorical

The second stage was to categorise the sources by methodology. The primary aim of this step was not to influence the prioritisation and shortlisting, but to give additional information about the nature of the evidence we were dealing with at subsequent stages which also informed the shortlisting process.

There are two elements to this part of the categorisation:

- **Headline methodological category:** This captured the very top-line approach taken in each source – is it a mostly quantitative, qualitative or a mixed-methods approach? This applied even in the case of secondary/desk research, where a judgement was made on the nature of the inputs (e.g., is it using more statistical models and quantitative evidence, or focussed on existing ‘qualitative’ articles and sources). This was assigned from a drop-down menu containing these three options.
- **Methodological output:** We also captured the type(s) of output in each source, which was useful for informing the shortlisting and for subsequent analysis stages. The focus was on what different foresight outputs are used for, rather than the format or delivery of the work. Based on feedback from the OEP and building on the categorisation within the GO Science Futures toolkit, we

proposed a six-output categorisation, with the categories detailed below. We expected that some sources would have more than one category so provided space for two categorisations at this stage.

List of terms used in methodological categorisation stage

- **Horizon scan/Delphi/Issues paper** (outputs designed to gather intelligence about the future)
- **Driver mapping and analysis/Axes of uncertainty** (outputs designed to explore dynamics of change)
- **Scenarios/visions/SWOT analysis** (outputs for describing what the future might be like)
- **Backcasting/roadmapping/stress-testing** (outputs for developing and testing policy and strategy)
- **Projections/modelling/pathways** (outputs that project forward to determine likely futures)
- **Likelihoods/probabilities/meeting targets and goals** (outputs which rate how likely it is that future goals will be met)

End of stage review

At the end of this stage, we conducted a second selection based on the relevance criterion. This served to limit the amount of detailed assessment that will take place with sources in stage three. As with the last step, we worked with OEP to decide the criteria and likely number of sources selected here.

Table 1.1: Key words under each EIP goal area – for use in stage two assessment

EIP 2023 Goal Area	Themes in the monitoring report (key words for assessment)
<p>G1 - Clean air</p>	<ul style="list-style-type: none"> • Emissions to air (incl. sectoral breakdown) • Air quality (overall concentrations and hotspots) • Exposure and impacts (ecosystems and human wellbeing) <p><i>This goal area seeks to address emissions and ambient concentrations of air pollution, making air healthier to breathe and protecting the wider natural environment. There are five key air pollutants to human health; sulphur dioxide (SO2), fine particulate matter (PM2.5), nitrogen oxides (NOx), non-methane volatile compounds (NMVOCs) and ammonia (NH3).</i></p>

EIP 2023 Goal Area	Themes in the monitoring report (key words for assessment)
G2 - Clean and plentiful water	<ul style="list-style-type: none"> • Quality (pollution) • Quantity (resources) <p><i>This goal area seeks to bring the water environment (surface, ground, fresh) close to its natural state and to ensure water is sustainably managed. This is a broad goal area that includes protection and improvement of a wide range of ecosystems and species, drinking water and human wellbeing.</i></p>
G3 - Thriving plants and wildlife	<ul style="list-style-type: none"> • Habitat creation • Protection • Enhancement • Restoration (terrestrial, freshwater and marine) <p><i>This goal area seeks to protect and restore nature in terrestrial, freshwater and marine environments, so they are richer in plants and wildlife living in healthy, sustainable ecosystem.</i></p>
G4 - Reduced risk of harm from environmental hazards	<ul style="list-style-type: none"> • Risk reduction (drought, floods, erosion, wildfires) • Building resilience (green and blue infrastructure) <p><i>This goal area seeks to reduce the risk of harm to people, the environment and the economy from natural hazards.</i></p>
G5- Using resources from nature more sustainably and efficiently	<ul style="list-style-type: none"> • Agriculture • Forestry • Fisheries • Food system • Soils <p><i>Consumption of goods and services currently relies on using and exploiting natural resources, creating pressure on the environment. This goal area seeks to manage natural resource use to sustainable levels, such as woodland, water, fish and soil, for important uses, such as farming, drinking water, forestry and fishing.</i></p>
G6 - Enhancing beauty, heritage and engagement with the natural environment	<ul style="list-style-type: none"> • Access • Infrastructure development • Enablers (values, education and skills) <p><i>This goal area seeks to protect, enhance and safeguard natural heritage for future generations. It aims to support equitable access and connection to the natural environment for all.</i></p>

EIP 2023 Goal Area	Themes in the monitoring report (key words for assessment)
G7 - Mitigating and adapting to climate change	<ul style="list-style-type: none"> • Carbon mitigation from natural resource sectors (agriculture, forestry, food system, soils) • Nature based solutions (e.g. tree plants, peat restoration) • Environmental adaptation <p><i>This goal area aims to reduce greenhouse gas emissions from natural resources, and to increase carbon storage through nature-based solutions to help deliver Net Zero by 2050. The goal area also considers increasing environmental resilience to the impacts of climate change.</i></p>
G8 - Minimising waste and resource use	<ul style="list-style-type: none"> • Circular resource use • Waste prevention • Waste generation • Waste management <p><i>This goal area considers resource productivity and material consumption broadly, seeking to reduce the associated environmental impacts through promoting a circular economy. It also focuses on minimising waste downstream and managing materials at the end of their life to minimise impact on the environment.</i></p>
G9 - Managing exposure to chemicals and pesticides	<ul style="list-style-type: none"> • Emissions • Exposure • Risk reduction and management <p><i>Chemicals and mixtures of chemicals can be harmful to human health and the environment if not carefully controlled. This broad goal area seeks to ensure the safe use and management of all chemicals, which is a complex given then systemic use of chemicals across products. Initially, we have focused on is persistent organic compounds, hazardous waste, mercury and pesticide use.</i></p>

EIP 2023 Goal Area	Themes in the monitoring report (key words for assessment)
G10 - Enhancing biosecurity	<ul style="list-style-type: none">• Prevention• Management• Eradication• Invasive non-native species. <p><i>Native pests and diseases, those introduced from outside Great Britain, and other invasive non-native species present severe challenges to native wildlife and ecosystems, and to farming, forestry and other sectors of the economy. This goal area seeks to enhance biosecurity and tackle invasive non-native species, while increasing the resilience of the environment to novel and introduced hazard.</i></p>
Cross-cutting themes	<ul style="list-style-type: none">• Land use• Green finance• Skills• Jobs• Consumer behaviour• Effective governance. <p><i>The EIP2023 identified a number of cross-cutting themes that are critical enablers or barriers to achieving multiple EIP goals.</i></p>

Annex 3: Foresight quality assessment framework

In addition to the shortlisting process, Ipsos developed a quality assessment framework for reviewing environmental foresight and forecasting studies. This was considered during the evidence synthesis, to ensure sources in the shortlist are of high quality. Defining quality in foresight and forecasting is a difficult concept – as the future is uncertain and projected horizons can be decades away, the accuracy of prediction should not be used as a quality criterion.

However, if the role of foresight is to promote critical thought and engagement with possible futures, then the way that data, sources and voices are used to this end can be seen as a way to assess quality. As a result, this framework focuses on the steps taken in the methodology of studies to indicate a higher quality approach to *thinking* about the future. This judgement rests on assumptions in four key areas, which are outlined below:

- **Data quality:** The assumption that higher quality data collection and analysis is the sign of a better foresight process
- **Intention:** A more contextual judgement that considers the commissioners and practitioners of foresight, with the assumption that those with an established view on the topic may approach the exercise from a more biased position
- **Participation:** The assumption that wider participation (including external stakeholders and the public) and a more structured approach to soliciting that participation indicates a higher quality a more structured and participatory approach to foresight
- **Precision:** An assumption that a more open approach to dealing with uncertainty (and a lack of overclaim) also indicates a higher quality approach to foresight

These topics are wide-ranging and difficult to define: in particular, the intentionality criterion involves normative judgements about who can be considered unbiased or neutral. For this reason, alongside the fact that this framework is intended to be used for a wide range of foresight and forecasting outputs, there is no attempt made to quantify the framework.

Instead, the framework outlines key questions reviewers can ask of themselves when reviewing an environmental foresight output to come to a qualitative view on the calibre of the work. It can also help identify any “red flags” that indicate lower-quality foresight exercises.

The framework is structured under the four areas described briefly above. In the table below, the detailed definitions and key questions for each are provided:

	Definition	Key questions
Data quality	<p>Foresight is typically based on data – especially secondary analysis of existing quantitative sources and analysis.</p> <p>It can also encompass new quantitative data like surveys and forecasts, or qualitative data such as interviews, workshops and trend case studies.</p> <p>Assessing the quality of the underlying data can provide a way to assess the overall quality of the foresight itself.</p>	<p>What type of data is being used to inform foresight?</p> <p>Use of higher quality quantitative sources may indicate a more thorough approach to foresight. Key sources include Official Statistics (with a caveat around some national government data), new primary data and reanalysis of data inventories</p> <p>Higher quality qualitative data can include new primary data such as interviews, workshops and public engagement.</p> <p>Where the data is observational (e.g. examples of trends), evidence of an underlying framework and process that has been used to generate the examples can suggest a higher quality data collection exercise.</p> <p>How transparent is the sourcing and use of the data?</p> <p>Higher quality foresight will acknowledge where its sources are from, the methods used to interpret it, and any potential shortcomings</p> <p>How accessible is the underlying data?</p> <p>A related question is around the availability of the data for further analysis. Higher quality foresight will be based on quantitative data sources which are published and openly available. Higher quality qualitative data sources will be those which make their underlying data (e.g. transcripts) available for external review.</p>
Intention	<p>Foresight is deliberate: it is usually conducted for a specific purpose.</p> <p>Who commissions, funds and conducts foresight can have an influence on the judgement of its quality.</p>	<p>How open is the paper on who has commissioned and funded the work?</p> <p>If this is clear then a reviewer can approach the source with an understanding of potential sources of bias in the reporting.</p> <p>What is the organisation that conducted the work?</p>

Definition	Key questions
<p>Participation</p>	<p>Foresight conducted by the same organisation that commissioned it may be more susceptible to bias and inward-looking thinking.</p> <p>What is the mission or stated aim of the commissioning organisation?</p> <p>All foresight has biases; typically it supports whichever organisation commissioned it to survive into the future by preparing for future threats and opportunities.</p> <p>Where the commissioning organisation is clear this can indicate the types of biases that could exist. Where the organisation is unknown, this lack of transparency indicates other possible biases at play.</p> <p>More bias can arise (potentially making the source lower quality) if the organisation has a well-known angle or campaign in the area the foresight is focussed on.</p>
	<p>What evidence is there of seeking external perspectives?</p> <p>Higher quality foresight will display evidence of wider engagement than purely secondary analysis and the commissioning team:</p> <ul style="list-style-type: none"> ○ Engagements with internal experts or stakeholders within the organisation will ensure some broader perspective, but the quality will be limited compared with external stakeholder engagement ○ Engagements with external stakeholders suggest higher quality – e.g. sector/market expert interviews and workshops, or inclusion of public perspectives through dialogue or deliberative techniques <p>For solely quantitative foresight, evidence of seeking out a wider range (in terms of source and type) of data sources can speak to a measure of participation.</p> <p>How is structured is the participation process?</p>

	Definition	Key questions
<p>Precision</p>		<p>A more structured engagement process that seeks to bring insights across stakeholder groups, or from different parts of the public, also suggests a higher quality approach.</p>
	<p>Foresight always deals with uncertainty. Higher quality foresight will be open in how it deals with uncertainty and will not ‘predict’ or convey a false sense of precision based on its analysis.</p>	<p>How closely does the data used correspond to the issues addressed?</p> <p>Higher quality foresight will make use of data and sources that are tailored directly to the question it seeks to answer.</p> <p>Where precise data cannot be found and wider data sets are used, the study is transparent about its methodological limitations and their impact on the conclusions that can be drawn.</p> <p>In quantitative data, the sources used should be appropriate to the intended outputs. For instance, using European-level data to draw conclusions about the UK will lead to a less precise foresight exercise.</p> <p>The same is true for qualitative data: if primary data and secondary analysis is at the same geographical level as the region under study, this suggests greater precision in the information being used.</p> <p>For both methods, any primary data collection should cover the key questions under consideration, evidenced through interview or survey materials being published.</p> <p>How does the foresight deal with low probability, high impact events and futures?</p> <p>Identifying key uncertainties is a sign of higher quality foresight – this can be through the inclusion of wildcards or multiple scenarios for the future, rather than a single projection.</p>

Annex 4: Evidence synthesis and analytical questions

This document outlines the agreed focus of the OEP Environmental Foresight evidence review, covering the overall research question for the synthesis as well as the key analytical questions used to interrogate the shortlisted sources.

Research question

The top-level question this synthesis sought to answer is as follows:

Based on the collated foresight evidence, what are the key factors shaping the future in each of the EIP goal areas, and what are plausible trajectories for the natural environment in the UK for each?

This question set out some clear guidelines for the focus of the analysis:

- It is **focussed within the 10 EIP goal areas**, rather than across the wider environmental context. It may be valuable to identify factors that apply across the goal areas but the questions asked in the synthesis will focus at the goal area level.
- **The scope of environmental foresight is long-term.** For instance, the 25-year environmental plan on which the goal areas are based run until 2042. This informs the evidence and goal types that are most relevant: typically they will be quantitative rather than qualitative, and there is greater focus on forecasting than in other areas of foresight.
- **Understanding outcomes is important:** There is a need to differentiate between outputs and outcomes from environmental foresight. Projections and scenarios are examples of outputs; policy recommendations, target-seeking pathways and delivery timescales/recommendations are outcomes. It will be important for OEP to understand how other organisations have used the insights and findings from foresight and forecasting processes to inform outcomes, including policy recommendations and target-seeking pathways.
- **Inputs to environmental foresight processes** are also a key focus. It will be important in the synthesis to understand common drivers, data sources and scenarios to provide an idea of the breadth of sources that are being used (and to identify areas where there is a relative paucity of evidence).
- Throughout the synthesis, attention will be paid to **understanding how uncertainty is managed.** This includes how uncertainty is recognised in the inputs to foresight processes; how it is categorised and analysed in quantitative and qualitative methodologies; and how it is accommodated for in outputs and outcomes deriving from environmental foresight.

The synthesis was conducted on the final shortlist of foresight sources that Ipsos and OEP developed. As the sources went through multiple rounds of shortlisting there is no further need to categorise or assess the quality of the work. However, Ipsos shared a quality checking framework that outlines the questions which informed the shortlisting process and lay behind the synthesis process.

Evidence synthesis: analytical question framework

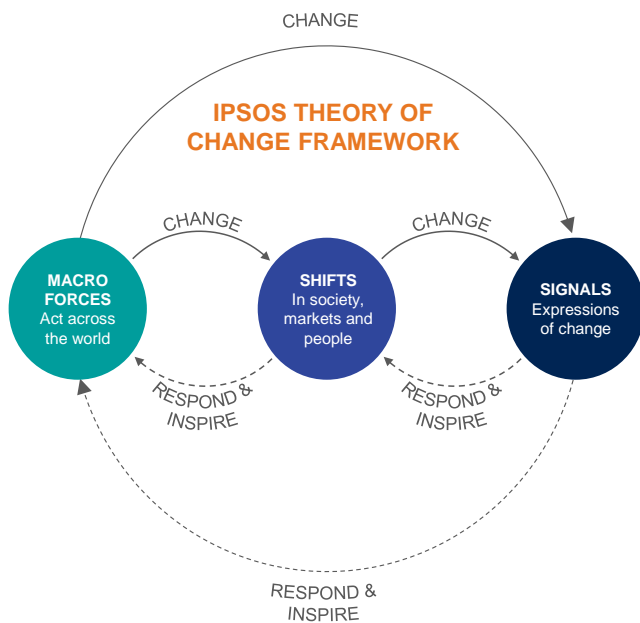
During an analytical workshop Ipsos and OEP key questions for the synthesis were discussed – these are detailed below. The questions build on seven outline areas detailed in the original project brief, updated to reflect the evolution of the project and understanding of the available sources.

These questions directly informed the synthesis approach as these were the questions Ipsos analysts sought to answer as they read the sources in detail. Below we detail the questions agreed, structured around a three-part foresight model of inputs, process and outcomes:

Foresight process stage	Analytical questions
Inputs	What emerging trends and long-standing drivers of change have been used to inform foresight and forecasting exercises?
	What are the key sources of uncertainty that have been identified? How have these, if at all, been quantified or structured?
Process/analysis	How have scenarios or pathways/projections been developed in the evidence? What structures and frameworks have been used?
	How, if at all, have uncertainties – provocations and ‘wild cards’ – been incorporated into the process?
Outputs and outcomes	What are the outputs of the work and what aspects of the future environment did they focus on? How are scenarios or projections, key uncertainties and questions or other outputs presented?
	What outcomes are derived from the work? How (if at all) are these outcomes quantified and how are they proposed to be monitored or updated?
	How, if at all, is uncertainty being acknowledged or incorporated into recommendations derived from the outcomes?

Approach to analysis: Ipsos Theory of change

Throughout the synthesis, Ipsos approached the analysis through the lens of its theory of change framework. This is a high-level structure for foresight thinking, which splits drivers of change and other evidence types into three parts:



Macro forces: Long-term and global pressures that are more understandable and quantifiable (if not more predictable) and can give a baseline projection forward for forecasts. For this work, sources like coastal flooding or air quality predictions might be aligned to the macro force part of the model.

Shifts: Changes in society including behaviours, attitudes and values – for instance, changes in public attitudes towards car use. These are measurable through tools such as surveys and qualitative research which gives a baseline of historical knowledge that can be used to project forward, although public attitudes and behaviours rarely develop in a straight line, especially over the decadal timescales being considered under this project.

Signals: Individual actions or innovations that occur against the background of macro forces and social shifts. Signals are an area of greater unpredictability; they can generate social change that can in turn affect social shifts and ultimately macro forces. How sources deal with the unpredictability of human responses to policy and environmental changes over the longer term will be a key part of the synthesis (see above).

The key insight of the model is not the three levels of change, but rather the interactions that occur between each. Forecasts and scenarios which consider the role and interrelationships between each level will be more flexible and able to deal with uncertainty into the future. This can be seen at each stage of the synthesis:

Inputs

Forecasts and quantitative sources may appear more certain about the future than is warranted as they project forward based on known macro forces and shifts. This straight-line assumption should be challenged, not least with error bars but with the acknowledgment that other sources of change such as shocks or changes in public attitudes and behaviours can influence the future direction of change.

By contrast, qualitative foresight sources will focus on the shifts and signals side of the model but will be less able to provide a long-term projection or target-seeking pathways. They may provide future visions of what the world could look like, but without macro-force evidence they will be less able to suggest the steps by which society moves from today to those points in the future.

Process

The theory of change should also inform how drivers of change, key uncertainties, scenarios and forecasts are created. In all cases, these foresight outputs should refer to all three levels of change and the connections between them to provide a more balanced set of potential futures.

Outcomes

The outcomes of environmental foresight should also reflect on the influence of multiple levels of change – especially on how the public respond to environmental policies. As forecasts or target-seeking pathways move further into the future the extent to which uncertainties from social shifts and signals of change can influence the future increases significantly. As a result, identifying key signals and developments to monitor is important to have confidence that a longer-term forecast acknowledges uncertainty and can be amended as time goes by.

Using the framework in analysis

The shortlisted studies were coded to this framework. Rather, it was used as a tool to help structure the analysis.

For instance, we expected that the framework could be used to consider the types of inputs that are used in each source, or to assess the comprehensiveness of their outputs across each of the EIP goal areas – as well as to come to a view on the overall nature of the evidence used in environmental foresight and forecasting. We also thought it likely that it could inform an approach for combining both types of future-looking environmental research for OEP, which could be discussed at the implications stage of this project.

Ipsos discussed with OEP the best approach for reflecting this theory of change in their foresight work going forward.

For more information

3 Thomas More Square
London
E1W 1YW

t: +44 (0)20 3059 5000

www.ipsos.com/en-uk
<http://twitter.com/IpsosUK>

