THE OXFORDSHIRE COUNTY COUNCIL (DIDCOT GARDEN TOWN HIGHWAYS

INFRASTRUCTURE – A4130 IMPROVEMENT (MILTON GATE TO COLLETT ROUNDABOUT), A4197 DIDCOT TO CULHAM LINK ROAD, AND A415 CLIFTON HAMPDEN BYPASS) COMPULSORY PURCHASE ORDER 2022

THE OXFORDSHIRE COUNTY COUNCIL (DIDCOT TO CULHAM THAMES BRIDGE) SCHEME 2022

THE OXFORDSHIRE COUNTY COUNCIL (DIDCOT GARDEN TOWN HIGHWAYS INFRASTRUCTURE – A4130 IMPROVEMENT (MILTON GATE TO COLLETT ROUNDABOUT), A4197 DIDCOT TO CULHAM LINK ROAD, AND A415 CLIFTON HAMPDEN BYPASS) (SIDE ROADS) ORDER 2022

THE CALLED-IN PLANNING APPLICATION BY OXFORDSHIRE COUNTY COUNCIL FOR THE DUALLING OF THE A4130 CARRIAGEWAY, CONSTRUCTION OF THE DIDCOT SCIENCE BRIDGE, ROAD BRIDGE OVER THE APPLEFORD RAILWAY SIDINGS AND ROAD BRIDGE OVER THE RIVER THAMES, AND ASSOCIATED WORKS BETWEEN THE A34 MILTON INTERCHANGE AND THE B4015 NORTH OF CLIFTON HAMPDEN, OXFORDSHIRE (APPLICATION NO: R3.0138/21

PLANNING INSPECTORATE REFERENCE:

APP/U3100/V/23/3326625 and NATTRAN/SE/HAO/286 (DPI/U3100/23/12)

### Appendices to the Proof of Evidence of

### **CHRIS LANDSBURGH**

(Climate Change)

(Part 2)

Appendix CL2.15

Institute for Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2015)

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### IEMA's support to the National Adaptation Programme

IEMA worked with the Department for Environment, Food & Rural Affairs (Defra) in developing the National Adaptation Programme with a particular focus around Objectives 21, 23 and 24, which focus on:

- promoting and gaining widespread uptake in other sectors of adaptation measures that benefit, or do not adversely affect, the natural environment;
- amending awareness and understanding among businesses about climate change risks; and
- increasing the extent to which businesses are actively considering climate change impacts in their risk management, resilience planning and decisionmaking processes, and taking appropriate adaptive action.



## **ABOUT IEMA**

The Institute of Environmental Management & Assessment (IEMA) is the professional home of over 15,000 environment and sustainability professionals from around the globe. We support individuals and organisations to set, recognise and achieve global sustainability standards and practice.

We are independent and international, enabling us to deliver evidence to Governments, information to business, inspiration to employers and great stories to the media that demonstrate how to transform the world to sustainability.

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### **1. SCOPE OF THIS GUIDE**

This guide provides a framework for the effective consideration of climate change resilience and adaptation in the Environmental Impact Assessment (EIA) process, in line with the 2014 European Union (EU) Directive.<sup>1</sup>

The EU Directive will not be implemented in UK regulations until May 2017. It is IEMA's intention that EIA practitioners use this guide to help develop their knowledge and experience, and that they capture and feedback any lessons learned. This feedback will be built into a planned second edition of the guidance, to be produced when the new UK EIA regulations are implemented in 2017.

This guide has been prepared to help UK developers understand the new requirements that will be coming into effect in future. This is particularly important for major developments that will be requiring approvals in 2017 or beyond, for which EIA activities will be undertaken in 2015 and 2016.

This guide will enable practitioners to include an effective consideration of both climate change resilience and adaptation in the EIA process. It should be read in conjunction with IEMA's 2010 publication, IEMA Principles Series Climate Change Adaptation in EIA, and the broader components of the related IEMA Principles Series Climate Change Mitigation in EIA, which establish the role of EIA in the management of greenhouse gas emissions.

Definition of climate change, resilience, adaptation and EIA mitigation, along with other terms commonly used in this guide, are included in the Glossary. An Environmental Statement<sup>2</sup> produced in line with this advice will:

- always make reference to climate change;
- provide a concise explanation of how the project's resilience to climate change was considered;
- set out clearly how effects related to climate change have been assessed; and
- define the significance of effects by pragmatically taking account of the knowledge base used in the impact assessment.

In defining the scope of this guide, systematic consideration was given to the key stages of the EIA process, and how climate adaptation and resilience links to that process. An overview of these linkages is presented in Figure 1.

### 1.1. Proportionate assessment

EIA should focus on a project's specific impacts: this guide is predicated on all assessments being proportional to the scientific evidence available. It does not recommend a level of detail that creates undue burden to developers and regulators. A focus on proportionate assessment is particularly important here, due to the uncertainties associated with predicting how the environment will respond to climate change.

<sup>1</sup> Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU. <sup>2</sup> The Environmental Statement is the report produced to record the outcome of an EIA.

#### Figure 1: Scope of this guide



## 2. LEGISLATIVE AND POLICY SETTING FIGURE 1: SCOPE OF THIS GUIDE

# 2.1. Environmental Impact Assessment Directive 2014/52/EU

Directive 2014/52/EU<sup>3</sup> on the assessment of the effects of certain public and private projects on the environment (hereafter, the EIA Directive) came into force in May 2014 and must be transposed in Member States within three years.

The UK is unlikely to transpose the amendments prior to this deadline, as such revised EIA Regulations reflecting the 2014 Directive amendments are likely to come into force in the UK in May 2017.<sup>4</sup> The revisions do not specifically refer to 'climate change' in Article 3 (they simply refer to 'climate'), but the need to consider climate change specifically is confirmed through revisions to Annex IV (see below). <sup>5</sup>

The revisions identify the important role that EIA can play in assessing climate change, stating in the preamble to the 2014 amendments to the EIA Directive<sup>6</sup> that:

(7) Over the last decade, environmental issues, such as resource efficiency and sustainability, biodiversity protection, **climate change**, and risks of accidents and disasters, have become more important in policy making. They should therefore also constitute important elements in assessment and decision-making processes.

and:

(13) **Climate change** will continue to cause damage to the environment and compromise economic development. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to **climate change**.

The 2014 amendments to the EIA Directive incorporate the inclusion of both 'climate' and 'climate change' within the following.

### Article 3:

(1)The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

(c) land, soil, air, water and climate;

(d) material assets, cultural heritage and the landscape;
(e) the *interaction*<sup>7</sup> between the factors referred to in points (a) to (d). [emphasis added]

Annex III (criteria to determine whether the projects listed in Annex II should be subject to an EIA) – where selection criteria to determine whether the projects listed in Annex II should be subject to an EIA are to include, among other characteristics:

1(f) the risk of major accidents and/ or disasters which are relevant to the project concerned, including those caused by **climate change**, in accordance with scientific knowledge. [emphasis added]

Annex IV (information to be included within the EIA report):

(4) A description of the factors specified in Article 3(1) likely to be significantly affected by the project, including **climate** (for example greenhouse gas emissions, impacts relevant to adaptation).

(5) A description of the likely significant effects of the project on the environment resulting from, inter alia ...
(f) The impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.

<sup>&</sup>lt;sup>3</sup> Directive 2014/52/EU amending the EIA Directive 2011/92/EU:

http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32014L0052

<sup>\*</sup>Paul Suff, Built to assess impacts, The Environmentalist, 7 April 2014 http://www.environmentalistonline.com/article/built-assess-impacts
\*Annex IV sets out the information to be included in an Environmental Impact Assessment report (i.e. the Environmental Statement). Paragraph 5(f) therein has specific requirements

<sup>&</sup>lt;sup>3</sup>Annex IV sets out the information to be included in an Environmental Impact Assessment report (i.e. the Environmental Statement). Paragraph 5(f) therein has specific requirements relating to climate change. <sup>6</sup>Ibid

<sup>&</sup>lt;sup>4</sup> blid <sup>6</sup> blid <sup>7</sup> The reference to 'interaction between the factors' provides the facility to consider the effect that climate may have on issues considered under other factors (i.e. the influence that climate stresses may have on biodiversity considerations of the project).

### 2.2. European Union guidance

In 2013, the European Commission launched guidance documents that focused on how to consider biodiversity and climate change in EIA<sup>8</sup> and Strategic Environmental Assessment.<sup>9</sup> The EIA-focused guidance provides useful context on the types of risks that are likely to increase in line with our changing climate, and also provides some direction on how these risks could interact with environmental factors (e.g. water, air, land, etc) listed in Article 3 of the EIA Directive.

Given the EU-wide scope of the guidance, it inevitably retains a strategic focus and only provides a broad, question-oriented approach to advising on the actual assessment of climate change in EIA. While it is a key reference document for practitioners working in this area, further professional judgement will be needed to account fully for climate change in many EIA processes, in line with the guidance provided below. A recording of an IEMA webinar from May 2013 – led by the European Commission and one of the guide's principal authors – is available, and provides a useful introduction to the Commission's ambitions for EIA's consideration of climate.<sup>10</sup>

#### 2.3. United Kingdom policy and regulation

The Climate Change Act 2008 established the context for government action, incorporating a requirement to undertake climate change risk assessments<sup>11</sup> and to develop a National Adaptation Programme (NAP)<sup>12</sup> to address the opportunities and risks from climate change. The Government commissioned the completion of the National Climate Change Risk Assessment, which was reported in January 2012. The Climate Change Risk Assessment provides a useful basis for assessing the likely future environment which EIAs need to consider, and provides information on the range of impacts likely to be experienced in the following sectors:

- agriculture;
- biodiversity and ecosystem services;
- the built environment;
- business, industry and services;
- energy;
- floods and coastal erosion;
- forestry;
- health;
- marine and fisheries;
- transport; and
- water.<sup>13</sup>

The Centre for Climate Change Economics and Policy produced a policy brief in March 2013<sup>14</sup> to inform the preparation of the NAP, incorporating useful guidance on the NAP and flow diagrams to consider when undertaking climate change in an appraisal (it should be noted that appraisal is different to EIA).

In terms of planning, the UK Government addresses climate change through the National Planning Policy Framework. This recognises that planning plays a key role in minimising vulnerability, providing resilience and managing the risks associated with climate change.<sup>15</sup> The Framework does not make specific reference to EIA's role in mitigating and adapting to climate change; however, it does recognise that local planning authorities should adopt proactive strategies to mitigate and adapt to climate change.

<sup>&</sup>lt;sup>8</sup> European Commission (2013) Guidance on integrating climate change and biodiversity into Environmental Impact Assessment ec.europa.eu/environment/eia/pdf/EIA Guidance.pdf

<sup>&</sup>lt;sup>9</sup> European Commission (2013) Guidance on integrating climate change and biodiversity into Strategic Environmental Assessment ec.europa.eu/environment/eia/pdf/SEA Guidance.pdf

<sup>&</sup>lt;sup>10</sup> IEMA (2013) Introducing the European Commission's guides to integrating climate change and biodiversity in EIA and SEA http://www.iema.net/event-reports/introducing-europeancommissions-eia-and-sea-guides-integrating-climate-change-and

<sup>&</sup>lt;sup>11</sup> There are numerous reports produced as part of the national Climate Change Risk Assessment – summarised in HM Government, 'UK Climate Change Risk Assessment: Government Report', January 2012: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report

<sup>&</sup>lt;sup>12</sup> Department for environment, food and rural affairs and Department of Health (2013) National adaptation programme, https://www.gov.uk/government/publications/adapting-to-climate change-national-adaptation-programme https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/209866/pb13942-nap-20130701.pdf

<sup>&</sup>lt;sup>13</sup> There are summary and technical scientific reports on all these sectors, along with 'The UK Climate Change Risk Assessment 2012 Evidence Report': http://randd.defra.gov.uk/Document. aspx?Document=TheUKCCRA2012EvidenceReport.pdf

<sup>&</sup>lt;sup>14</sup> Fankhauser (et al) An Independent National Adaptation Programme for England, Centre for Climate Change Economics and Policy (March, 2013): http://www.cccep.ac.uk/Publications/ Policy/briefingNotes/2013/independent-national-adaptation-programme-briefing-note.aspx

<sup>&</sup>lt;sup>15</sup> Department for Communities and Local Government (2012) National Planning Policy Framework, Chapter 10: https://www.gov.uk/government/uploads/system/uploads/attachment\_data/ file/6077/2116950.pdf

The NAP is primarily for England but also covers reserved, excepted and non-devolved matters. The individual devolved administrations (Scotland, Wales and Northern Ireland) have developed their own programmes, and the UK Government is working with them to share areas of common interest, to ensure a consistent approach in the shape and focus of all the programmes. Details of the specific approaches being taken in each of the devolved administrations are set out as follows:

• Scotland – a Scottish Adaptation Programme<sup>16</sup> addressed the risks identified for Scotland in the UK Climate Change Risk Assessment. It replaced the existing adaptation framework which already contributes to building resilience and capacity to adapt to climate change.

• Wales – the Climate Change Strategy for Wales<sup>17</sup> <sup>18</sup>sets out an adaptation framework to present a national, coordinated approach to ensure that Wales understands the risks and opportunities that climate change presents, and is well placed to adapt in a sustainable way. The Welsh Government also has developed sectoral adaptation plans across five important sectors, and has put programmes in place to embed resilience measures against extreme weather events and climate change into all that it delivers.<sup>19</sup>

• Northern Ireland – a cross-departmental Northern Ireland adaptation programme has been developed. Progress on climate change adaptation is reported annually to the Northern Ireland Executive by the Cross-Departmental Working Group on Climate Change.<sup>20</sup>

<sup>16</sup> Scottish Government (2013) Scottish Climate Change Adaptation Programme http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/adaptation

<sup>17</sup> Welsh Government (2011), Climate Change Strategy for Wales, http://gov.wales/docs/desh/publications/101006ccstratfinalen.pdf

<sup>18</sup> Welsh Government (2011) Adaptation Delivery Plan: Climate Change Strategy for Wales, http://wales.gov.uk/topics/environmentcountryside/climatechange/publications/ adaptationplan/?lang=en

<sup>20</sup> Department of Environment Northern Ireland (2012) Northern Ireland Climate Change Adaptation Programme, http://www.doeni.gov.uk/index/protect\_the\_environment/climate\_change/ climate\_change\_adaptation\_programme.htm

<sup>&</sup>lt;sup>19</sup> Welsh Government (2014) Climate Change Publications, http://gov.wales/topics/environmentcountryside/climatechange/publications/?lang=en

### 3. RESOURCING ENVIRONMENTAL IMPACT ASSESSMENTS TO EFFECTIVELY ASSESS CLIMATE CHANGE EFFECTS

### 3.1. Introduction

In order to integrate climate properly into the EIA process, it will be important for informed advice to be available to EIA technical specialists on future potential climate conditions. Future climate projections are published by the Met Office through the UK Climate Projection website.<sup>21</sup> These projections (currently based on 2009 publications, and called UKCP09) produce information that is available to practitioners, but the information is complex and needs to be used with care.

For any EIA development, developers should consider how climate change may affect the project as part of the design process. If this is not the case, then the EIA leader must raise this as a significant requirement of the EIA process (Annex IV(5) of the EIA Directive).

#### 3.2. Climate change co-ordinator

IEMA recommends that every EIA team includes a practitioner who is knowledgeable about future climate change scenarios, and is experienced in the use and interpretation of future climate projections. This person should be:

- fully conversant with the UKCP09 projections and how these differ;
- able to provide advice on the range of climate change scenarios that could be considered; and
- able to provide advice on the potential range of effects of climate change (e.g. how temperature will vary).

It is recommended that one person within an EIA team is given the responsibility of:

- identifying what climate projection information is most relevant to the EIA;
- ensuring consistency in approach to climate change in the EIA; and

 providing information on the broad range of topic specific guidance available in relation to climate change (e.g. the National Planning Policy Framework guidance on water and flood risk, or Design Manual for Roads and Bridges guidance on drainage design and water resources impact assessment<sup>22</sup>).

In this guide this individual is referred to as the climate change co-ordinator (CC co-ordinator). However, it is important to stress that this guide is not specifically advocating the involvement of a climate specialist; simply that a nominated team member has the required understanding of climate factors to perform the tasks outlined below.

#### The CC co-ordinator should:

- be able to access readily available information sources, such as regional climate patterns and national datasets, and make recommendations to the EIA co-ordinator on these projections – such datasets are provided by the Met Office and the UKCP09 climate projections, and Intergovernmental Panel on Climate Change (IPCC) reports;
- write the background on climate change in the Environmental Statement that is appropriate to the EIA – this should refer to any relevant Strategic Environmental Assessments, local and national climate change adaptation plans, other EIAs for projects in the area, and local experience and observations to inform the EIA team;
- 3. work with EIA technical specialists to ensure that the information being used in the EIA does not contradict any topic-specific guidance – if there are inconsistencies in the approach recommended in different technical guidance documents in relation to climate change, then the CC co-ordinator should provide advice on how to manage these in the EIA.

<sup>21</sup> UK Climate Projections (2009) http://ukclimateprojections.metoffice.gov.uk/22537

<sup>22</sup> National Planning Policy Framework, Technical Guidance includes factors to allow for sea level rise and rainfall changes (Department for Communities and Local Government, March 2012), and Design Manual for Roads and Bridges, Volume 11, Section 3, Part 10 – HD45/09, Chapter 4 discusses climate change and how to allow for this in the EIA process.

### 4. IDENTIFYING THE FUTURE CLIMATE

### 4.1. Introduction

Scientific evidence shows that our climate is changing. However, there are significant uncertainties in the **magnitude, frequency** and **spatial occurrence** – either as changes to average conditions, or extreme conditions. Such uncertainties make it difficult to assess the impacts of climate change in relation to a project. It is the role of the EIA co-ordinator to ensure that the uncertainties highlighted are properly understood and addressed in the EIA, whether this is covered by the CC co-ordinator or the various topic specialists.

An added consideration is the fact that climate change predictions are based on global models for a range of greenhouse gas emission scenarios (called climate change projections) and look generally at regional responses to climate change. In comparison, almost all EIAs look at specific sites compared to regional or national-level climate change models, and the uncertainty of predicting future climate effects on such a small spatial area is potentially large.

There are three aspects of uncertainty that need to managed:

- which climate change projection to use as this informs the parameters to account for in the assessment and design process;
- what climate change scenario is to be included in the design – i.e. how resilient to climate change does the proposed design need to be; and
- what the environmental baseline will be under the future projected climate – and how can it be assessed.

### 4.2. Selecting a climate change projection

Where climate change adaptation is included in the EIA, a key step will be to define an emissions scenario<sup>23</sup> and probability, to identify the range of potential future

climate conditions to use in the EIA: this should be done at the scoping stage. Once a projection has been identified, then this must be used by all disciplines thereafter as the basis of the EIA process, to ensure consistency in approach. However, there could be situations where additional sensitivity testing is needed for very vulnerable, high-value receptors, where the impact of climate variations under other projections may need to be considered.

Climate projections are updated periodically: it should be the responsibility of the CC co-ordinator to ensure that the EIA is based on the latest projections, and that all the topic specialists fully understand what they are required to use in their assessments. Further reading on climate projections is available from the UKCP09 website.<sup>24</sup>

UKCP09 considers the effects arising from a series of emissions scenarios which project how future climatic conditions are likely to change at a local level (i.e. at a sub-regional scale in the UK), accounting for naturally occurring climate variations.

During the EIA it is important to understand and take account of the uncertainty associated with the selected climate projection, and all outputs must reflect any assumptions made. It is also important to understand that the inertia in the climate system means that climate change over the next two or three decades (up to about 2040) will be relatively insensitive to emissions (see Figure 2). As such, a short lifespan development is not likely to be particularly sensitive to which emissions scenario is selected for the EIA.

However, after the 2040s the projections for different emissions scenarios increasingly diverge, and it will be important to take a considered approach to identifying the right emissions scenario to select where the planned operational life of a scheme goes significantly beyond 2040.

<sup>23</sup> IEMA (2010) Principles on Considering Climate Change Mitigation in EIA. For further guidance, see: www.iema.net/eia-cc.

24 UK Climate Projections (2009) http://ukclimateprojections.metoffice.gov.uk/



Figure 2: Interaction of climate and business risk timelines, indicating overlap between climate impact and development planning and operational cycles

Source: Matt Macdonald / Global Sustainability Institute, Climate Change and Business Survival (2015)

Once an appropriate emission scenario is selected, it can be used to build up a holistic picture of future climate. It is recommended that a summary of the range of projections under the selected scenario is produced – an example of which is shown in Table 1 – to ensure consistency across topics in the EIA.

Probabilistic projections, such as those provided by UKCP09, give a range of possible climate change outcomes and their relative likelihoods, which typically give climate information that is considered unlikely, likely or very likely (i.e. ranging across 10th to 90th percentiles) outcomes. The EIA will have to consider if a specific percentile outcome is used, or whether it is appropriate to consider a range of potential outcomes. This will be influenced by the sensitivity of the project to climate change, and whether there are specific environmental receptors within the project zone of influence that will be especially vulnerable to climate change. For example, in Table 1, by the 2050s the 50th percentile change predicts a decrease in mean summer precipitation of 20%. This change is very unlikely to be more than a decrease of 45% or an increase of 8%. The wider range of uncertainty is a change of -45% to 16%.

Future environmental baselines for an EIA may choose to focus on the 'central estimate' (50th percentile). However, in some cases it may be appropriate to ensure a higher degree of resilience to climate risks (e.g. for critical infrastructure), by choosing the extremes of the 'likely range' to use in the assessment.

The source of climate projections and the range of projections used in the EIA (and project design) must be clearly described in the Environmental Statement.

	VARIABLE	TIME LOWEST PROJECTED PERIOD CHANGE	LOWEST	PROJECTED CHANGE AT			HIGHEST
SEASON			PROJECTED CHANGE	10TH Percentile	50TH PERCENTILE	90TH PERCENTILE	PROJECTED CHANGE
WINTED	Mean temperature (°C)	2020s	0.5	0.5	1.2	2.0	2.0
		2050s	0.8	1.3	2.3	3.5	3.5
		2080s	1.4	2.1	3.4	5.1	5.1
	Mean precipitation (%)	2020s	-3	-2	6	8	20
		2050s	0	3	18	41	41
		2080s	5	8	31	73	73
	Mean	2020s	0.5	0.5	1.5	2.6	2.7
	temperature	2050s	1.1	1.4	3.1	5.1	5.1
SUMMER	(°C)	2080s	1.3	2.7	5.0	7.9	7.9
Johniek	Mean precipitation	2020s	-27	-24	-5	18	18
		2050s	-45	-45	-20	8	16
	(%)	2080s	-58	-58	-30	4	13

**Table 1:** Example of projected change in selected climate variables in the South West (UK)for the high emissions scenario

Met Office (2009) UKCP09 maps and key findings (http://ukclimateprojections.metoffice.gov.uk/21708)

It is recommended that project designers conduct a risk assessment to evaluate what resilience measures may be appropriate to include in the design (this should take place at all stages of design development - from optioneering through to detailed design).<sup>25</sup> As discussed in Section 4, the longer the lifetime of a development, the greater the uncertainty about the impact of climate change over time. The risk assessment should be used to identify appropriate adaptive measures, including design features and construction materials, to provide an appropriate resilience to increased extreme weather as well as changes in average conditions. Such adaptive measures need to consider whether there are opportunities to introduce them later with more certainty, or whether they have to be allowed for in the initial design.

The design of any development takes place in stages: the number of design stages reflect the complexity of the development itself. It is good practice to consider the effects of climate change on the development at all stages of design.

## In doing so, the developer needs to define the level of risk that is acceptable, taking account of:

- the acceptability of any disruption in use;
- its capital value if it has had to be replaced;
- its neighbours; and
- (for certain kinds of development) its place in any interconnected network of nationally important assets.

In order to do this, the developer should look at the impact of weather on normal operations, and extreme weather-related disaster scenarios.

The developer should identify an acceptable risk profile for the development, and identify means to mitigate unacceptable risks to acceptable levels. This should include building resilience to climate effects into the scheme. If this has not been done before the EIA commences, then it should be done during finalisation of the design used in the EIA process, following an iterative design process (as illustrated in Figure 3).

If the project's purpose could be affected by a changed climate, such that the project were potentially no longer viable, then the design would have to be changed. Similarly, if the project could suffer a catastrophic failure due to an extreme weather event, then the design will need to be changed, taking account of the need to protect the environment from the effect of catastrophic impacts, and to ensure that the viability of the project is not compromised.

# The project design team should consider resilience measures including:

- preventing the loss (total or partial) of the project or components of the project due to the (direct or indirect) effects of extreme climatic events;
- understanding the risks of cascading failure impacting the functionality of the project – e.g. how dependent the project is on telecommunications being maintained 100% of the time;
- changes to operating parameters to maintain productivity and/or functionality under a different average climate;
- changes to capital costs to ensure project resilience under extreme and average climate conditions – e.g. accounting for average temperature impacts on bearings in a bridge over a river, as well as the capacity of the bridge to permit flood flows to pass;
- any variations to maintenance regimes to account for climate change, and
- future-proofing the project to enable modifications in future where some resilience measures are unlikely to be required immediately – e.g. putting in larger foundations to accommodate future increases to flood defence barriers.

<sup>25</sup> See IEMA (2015), IEMA Environmental Impact Assessment Guide to: Shaping Quality Development.

The EIA may identify climate change risks to the project, which should be communicated to the design team to ensure that they are aware of potential residual issues. The outcome of this process of design for resilience needs to be properly reported in the final Environmental Statement, under the scheme description and consideration of alternatives.

Figure 3: Ensuring climate change is embedded in project design



# 6. INTEGRATING CLIMATE CHANGE ADAPTATION INTO THE ENVIRONMENTAL IMPACT ASSESSMENT

Currently, detailed consideration of climate change in UK EIA is limited. EIA Quality Mark data indicate that only 50% of the Environmental Statements reviewed for the scheme from 2013 achieved a 'pass' grade in relation to the adequacy of their coverage of climatic factors. However, this is set to change with the enhanced focus on climate change within the 2014 amendments to the EIA Directive.

The UK's transposition of these new requirements will see a formal requirement for greater consideration of climate change in UK EIA. As such, this guide advocates that practitioners and competent authorities begin to give enhanced consideration to climate risks in the EIA process in advance of 2017, to ensure that risks are appropriately managed for projects under current consideration, and to support the evolution of sound practice prior to the change in the regulatory regime.

The resilience of the project to the extreme impacts of climate change should be taken into account when screening whether proposed development is likely to be EIA development. Therefore, any screening opinion request should consider climate change in addition to the usual range of receptors and baseline conditions. As part of this consideration, practitioners are advised to review the requirements of Annex III, para. 1(f) of the EIA Directive.

The remainder of this chapter sets out the considerations that should be given to climate adaptation at key stages in the EIA process. Figure 4 shows the steps to be followed, with an indication of the climate change-specific actions that are likely to be required at each stage of the process. Emphasis has been placed on scoping the assessment, as this is the process whereby broad principles need to be translated into tangible plans for addressing climate adaptation issues through the EIA process. Figure 4 : Step by step approach to considering Climate Change Adaption in Environmental Impact Assessment



# 6.1 STEP 1: SCOPING CLIMATE CHANGE ADAPTATION INTO THE ENVIRONMENTAL IMPACT ASSESSMENT

# 6.1.1. The basics: climate change adaptation during scoping

Where EIA is required, the scoping process should consider the significance of effects arising from climate change to ensure that appropriate project mitigation and risk management is included in the development. However, there will be development proposals where climate change adaption can be reasonably scoped out of the EIA.

In order to complete scoping of the EIA, the following should be achieved (Step 1, Figure 4):

- agreement with key stakeholders<sup>26</sup> on the most appropriate climate change projection to adopt for the assessment (see Section 4.2), and any necessary methodological considerations to ensure that climate change is appropriately considered;
- identification of the scale and scope of the project's initial design and its potential impact on the receiving environment, taking into account how this will be affected by a changing climate; and

• engagement with key stakeholders to identify the policies and regulatory regime regarding climate change in the project area.

The incorporation of climate change into the EIA process should not change fundamental EIA processes or accepted conventions and practices. However, it will necessitate interdisciplinary consideration of climate parameters over the lifespan of the project. This should encourage developers to take account of climate change in the project design (as discussed previously), which (iteratively) may significantly alter key characteristics of the project design and, therefore, its impact on the environment.

Preliminary scoping of a project, taking into account climate change, should focus on general considerations rather than detailed, quantitative analysis (see Box 1). To do this will require an early decision on the climate change projection to be used in the EIA process by the project's CC co-ordinator (see Section 3.2).

Box 1: Climate issues to consider during scoping

## Climate issues to consider during scoping should include:

- applicable regulatory and legislative requirements;
- the nature of the project, its location and and resilience to climate change;
- the duration of the project;
- the climate-related parameters likely to influence the project;
- anticipated changes to those climatic parameters over the life of the project;
- how sensitive is the environment potentially affected by the project to those climate parameters

<sup>26</sup> Developer, approving authority and any key stakeholders (e.g. Department of Energy and Climate Change, or equivalent devolved administration government department).

Topic leaders should use information collated by the CC co-ordinator, in combination with professional judgement and local knowledge, to determine if climate change effects should be a potential consideration in their part of the EIA process.

Use of the following hierarchy will assist.

- All Annex I projects should include appropriate consideration of climate change impacts in the EIA (climate change should never be entirely scoped out).
- Annex II projects requiring EIA for reasons other than climate change still warrant appropriate scoping of key climate change risks (it may be appropriate to scope out climate change effects for some particular technical topics that are not sensitive to climate change).
- 3. Where climate change is scoped into EIA, then all climate change issues should be established according to legislative requirements, stakeholder and public interest and professional judgement. There may be broad categories of potential project impacts or specific areas of concern. In either case, they should be assessed during the EIA for the whole project lifecycle – i.e. at the design, construction, operation and decommissioning or abandonment stages.

The scoping report should explain how climate considerations will be included in the technical assessments being carried out within the EIA process. In setting the methodology, care is required to ensure that the method is proportional to the evidence base available to support any assessment.

It is worth noting that some topics will be able to deal with climate change relatively easily, while others will be challenged to develop any kind of quantitative assessment.

# 6.1.2. Defining the boundaries of the climate change assessment

The relevance of climate change should be analysed within spatial and temporal boundaries, which must be clearly established and communicated in the scoping report. The key difference from most historic and current EIAs is that the temporal scope will need to be more clearly defined at the outset, as this will set how future baseline changes need to be accounted for: i.e. agree with the developer the potential project lifespan. This is likely to be longer than the design life embedded in the engineering design, as many developments remain in situ long after the original development has fulfilled its objectives.

The EIA should consider the legacy period of the development, which could be at the end of decommissioning (e.g. when an oil refinery is decommissioned), or which could extend well beyond the lifetime of the original purpose of the development (e.g. the London 2012 Olympic park).

However, the temporal scope needs to be realistic and not assume that a development will remain in situ beyond a reasonably foreseeable timescale. In doing this, consideration should be given to differentiating between elements of the project design which are 'maintenance items', which would be expected to be replaced during the project life, and those elements which are 'fixed assets'.

It may be the case that for some major, long-term projects, the project life exceeds the range over which climate change projections are available (e.g. current UK climate projections (UKCP) are up to 100 years in the future, whereas a major infrastructure project (e.g. a railway line or dam) could have a life of up to 150 years).

In such cases, careful thought is needed to identify the key receptors most vulnerable to climate change and the project, and to determine whether additional information is needed on the climate change effects beyond 100 years. This is only likely to affect nationally important infrastructure, and where there is concern about very long-term effects relating to climate change, then the developer needs to be engaging with relevant government agencies (e.g. the Met Office) for additional advice. The EIA practitioner should obtain the necessary guidance on how to accommodate such long-term climate change variations from the CC co-ordinator, in consultation with key regulators.

### 6.1.3. Consultation during the scoping process

Standard consultation requirements are not affected by including climate change in the EIA process. However, it is important that climate change is covered in consultations, as increasingly local authorities and statutory bodies will have dedicated climate change policies with which to comply. In addition, they may have officers with specific responsibility for climate change who can assist in completion of the scoping report.

In many cases a local authority or statutory body may have already considered the implications of climate change. From their knowledge of their area, they could help to identify specific concerns relating to climatic resilience and the changing climate that could be affected by, or affect, the proposed development.

Unless specific studies and reports are available, EIA practitioners, local authorities and statutory bodies will need to use professional judgement, knowledge and experience in determining the issues to be considered in assessment and agreed at the scoping stage.

### **6.2 EXECUTING THE IMPACT ASSESSMENT**

The incorporation of climate change resilience into EIA is described in the remainder of this section. These activities cover:

- identifying the emerging baseline, taking account of the influence of climate change;
- identifying the potential impacts from the scheme during construction, operation and decommissioning;
- assessing the sensitivity of baseline receptors to climate change;
- assessing the scale of impact of the project in combination with climate change;
- assessing the significance of the combined impact;
- identifying mitigation measures and, where these do not result in acceptable impacts, refine the design and reassess the significance until the project achieves the minimum acceptable requirements; and developing a climate change adaptation plan

Practitioners should note that the 2013 EU Guidance on Integrating Climate Change and Biodiversity into EIA includes questions that need to be considered when carrying out the EIA.<sup>27</sup>

### 6.2.1. Step 2: Defining the emerging baseline

The current baseline is defined by historic climate conditions and the prevailing conditions at the time of the assessment. One fundamental aspect of including climate change into EIA is to understand how this baseline will adapt in the coming decades to the changing climate. The practitioner needs to look at recent weather patterns, identifying extreme events (e.g. short-term events such as cold snaps and torrential downpours, or moderately lengthy events such as drought). These short-term variations will be useful in determining how the project needs to take climate change into account in the immediate future (e.g. during construction).

This is important, as it is not uncommon to describe the existing baseline using historical trends which may not properly account for climate changes which already have occurred.

However, in assessing climate change risks in the medium (say 15 to 30 years) and longer term (more than 30 years), it is likely that the climate change projection selected for the project will provide more useful guidance on the likely conditions that will alter the baseline.

The practitioner needs to consider a range of factors including:

- extremes in **short-term weather** events that produce sudden shocks, which can have substantial effects on some baseline receptors, such as:
- heatwaves;
- extreme flooding and freezing conditions;
- gales and hurricane-force windstorms;
- storm surges along coastlines.
- extremes in longer-term climatic variability, including:

- variations in precipitation over one or more seasons resulting in drought or extremely wet conditions;

- variations in average temperature which, for example, might affect receptors reliant on temperature to drive when breeding cycles commence or end (this may be affected by the availability of specific food sources);

- potential changes in prevailing wind directions, as the weather system over central Europe changes.

27 Table 8, p. 31 sets out questions relating to adaptation EC (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment.

- changes in average climate norms resulting in:
- sea level rise;
- increases in freezing or thawing;

- average ambient temperatures that might affect human behaviour or mobile species (e.g. the increased presence of certain bird species currently uncommon in the area);

- changes in seasonal rainfall patterns.

It may be beneficial to develop a matrix to define the physical location of the project, taking account of topography, hydrology, soil conditions, habitats and communities, then to consider how climate change might affect these, and therefore how the baseline is likely to alter (see Table 2 as an example layout).

For longer-lasting projects (e.g. a major infrastructure likely to be in place for upwards of 100 years), it is probably more useful to define several future baseline environments (the current baseline, then in 30, 50, 70 years' time, and more than 100 years' time).

### Table 2: Sample presentation of predicted trends in climatic variables

VARIABLE	PREDICTED CHANGE IN TREND AT:			
	10th Percentile	50th Percentile	90th Percentile	
Temparture				
Mean minimum winter temperature (°C) Mean winter temperature (°C) Mean maximum winter temperature (°C) Mean minimum summer temperature (°C) Mean summer temperature (°C)	Ŷ	Ŷ	Ţ	
Warmest day of summer (°C)	$\downarrow$			
Precipitation				
Annual mean precipitation (%)	$\downarrow$	$\Diamond$		
Mean winter precipitation (%)	$\updownarrow$	$\uparrow$		
Mean summer precipitation (%)	$\downarrow$	$\downarrow$	$\uparrow$	
Wettest day in winter (%)	$\Diamond$	$\uparrow$		
Wettest day in summer (%)	$\downarrow$	$\Diamond$		
Cloud cover				
Winter cloud amount	1	$\Diamond$	$\uparrow$	
Summer cloud amount	$\checkmark$	$\downarrow$	$\Diamond$	
Humidity				
Winter mean relative humidity	1	$\updownarrow$	$\uparrow$	
Summer mean relative humidity	$\checkmark$	$\downarrow$	I	
Wind				
Winter wind speed (m/s)	1	$\uparrow$	<b>^</b>	
Summer wind speed (m/s	$\checkmark$	$\checkmark$	I	

Continued on page 20

Snow			
Snowfall - winter		$\downarrow$	
Snowfall - spring		\$	
Fog			
Fog days – annual		$\downarrow$	
Fog days – winter		\$	
Fog days – spring Fog days – summer Fog days – autumn		$\downarrow$	
Storms			
Storms		-	
Lightning – winter			
Lightning – spring	$\downarrow$	$\uparrow$	•
Lightning – summer Lightning – autumn	$\updownarrow$	I	Ť
Sea Level			
Sea level rise		$\uparrow$	

Source: UKCP09 reports and guidance: http://ukclimateprojections.metoffice.gov.uk/22530

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## 6.2.2. Step 3: Identifying climate change vulnerability and sensitivity of receptors

Having identified the range of potential climate change most likely to affect future baseline conditions, individual receptors need to be assessed as to their vulnerability to the future climate. This should be done using at least three levels of sensitivity, as follows.

• **High vulnerability** – the receptor is directly dependent on existing and/or prevailing climatic factors, and reliant on these specific existing climate conditions continuing in future (e.g. river flows and groundwater level); or only able to tolerate a very limited variation in climate conditions.

• Moderate vulnerability – the receptor is dependent on some climatic factors, but able to tolerate a range of conditions (e.g. a species which has a wide geographic range across the entire UK, but is not found in southern Spain)

• Low vulnerability – climatic factors have little influence on receptors (therefore, consider whether it is justifiable to assess such receptors further within the context of EIA – i.e. it is likely that such issues will have been excluded in scoping process).

#### 6.2.3. Step 4a: Identify future impacts

Practitioners need to consider whether the impacts of the scheme are likely to be different because of the likely changing climate. In doing this, they must look at the future baseline and decide if the likely impacts of the proposed scheme would be increased or decreased under the emerging climate.

It is unlikely that completely new direct impacts will arise as a result of climate change. However, it is worth considering whether the geographic spread or scale of potential impacts might be changed under the future climate. The recommended approach is to: • assess the magnitude of the impacts of the project on baseline conditions under current conditions, and the significance of effects (i.e. conduct the EIA as normal without climate change);

• identify the effect of climate change on receptors without the project (this is the future baseline);

• assess whether the impacts of the project will be worse or improved on the future baseline;

• define if these changes affect the significance of effects identified for the project without climate change.

### 6.2.4. Step 4b: Assessing in-combination impacts

As mentioned previously (see Section 1), the level of assessment and methodology needs to be proportional to the evidence base available to support it.

Given the level of uncertainty, a qualitative assessment based on objective professional judgement of the information available is preferred, unless there are published, accepted quantifiable methods for assessing in-combination effects (e.g. the National Planning Policy Framework on flood risk assessment, specifying rainfall factors to include in flood modelling).

If the same type of receptor is currently found in geographic locations that experience similar climate conditions to those predicted at the site, it may be reasonable to consider how the receptor would be likely to be impacted if the development happened in that location. However, this would need to be done with care, as many other location-specific factors could influence the receptor (e.g. soil and geology variations between the proposed site, and the proxy climatic equivalent could produce significant variations in responses to rainfall). If there is a compelling reason to take this approach, it may be of value to develop an understanding of the receptors' sensitivities in the climatic proxy site, in order to assess how these compare to its sensitivity under current climatic norms at the EIA site.

### 6.2.5. Step 5: Significance assessment

This guidance is not proposing changes to the significance criteria used in the EIA process. However, the susceptibility or resilience of the receptor to climate change must be considered as well as the value of the receptor.

Therefore, a high-value receptor that has very little resilience to changes in climatic conditions should be considered more likely to be significantly affected than a high-value receptor that is very resilient to changes in climatic conditions.

The uncertainty of the combined effect needs to be taken into account. If uncertainty about how a receptor will adapt to a changing climate is high, then it is recommended that a conservative threshold of significance is adopted within the evaluation.

# 6.3 CLIMATE CHANGE ADAPTATION PLAN: MITIGATION AND ADAPTIVE MANAGEMENT (STEPS 6 AND 7)

A key means of dealing with uncertainty is to introduce the concept of **adaptive management**.<sup>28</sup> Adaptive management is the process that enables uncertainty to be included in operational decision-making. This process is not unique, and is practiced widely in all areas where uncertainty in the future is present.

Adaptive management enables the potential impacts from changes in the climate to be dealt with as they become more likely (see Section 6.3.2). By taking an adaptive management approach, projects can introduce additional mitigation if their impact is starting to cause unacceptable effects on the receiving environment.

Currently, this concept is not commonly used in EIA, but it will become increasingly important to avoid inappropriate mitigation being implemented at the wrong time in a project's life.

### 6.3.1. Step 6: Mitigation

Mitigation should be considered against the timescale of the project, and when mitigation might be most usefully implemented. In all but exceptional circumstances (e.g. when having to design in the fixed elements of a project that cause significant negative effects on current and future baseline conditions), it will not be appropriate to propose that costly and permanent mitigation be put in place if it is not going to be required for another 50 years.

Key considerations in developing mitigation should include:<sup>29</sup>

- 'no-regret' or 'win-win' options that provide benefits under multiple scenarios;
- 'win-win' options that resolve predicted future impacts to bring economic, social and environmental benefits;
- favouring flexible mitigation options over options which are locked and cannot be modified in future;

- allowing for safety margins in developing the project design, or in mitigation designs, to ensure resilience of the project or proposed mitigation to climate change;
- shortening the lifetime of front-end elements of the project, to minimise the need for mitigation; and
- delaying elements of the project with high risk or uncertainty until a later date, when the risk associated with uncertainty is likely to be less

In defining EIA mitigation, consideration needs to be given to the mitigation heirachy. The following principles identify how this may apply to climate adaptation-related risks:  $^{30,31}$ 

- what measures are available to avoid, control or manage identified risks? (avoid, prevent or minimise);
- does the mitigation strengthen the project's capacity to be resilient to climate change itself? (enhance);
- are there risk reduction measures available? (avoid or prevent);
- will the mitigation improve the project's functionality under future climate conditions? (enhance);
- can the mitigation exploit opportunities offered by the natural environment? (minimise or enhance); or
- can the mitigation provide opportunities for environmental improvements that depend on the climate changing? (enhance or compensate).

<sup>29</sup> Adapted from the EC (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment.

<sup>&</sup>lt;sup>28</sup> See Section 6.5.3 of IEMA, 'Special Report: The State of Environmental Impact Assessment Practice in the UK' (2011) for further detail regarding adaptive management in EIA.

<sup>&</sup>lt;sup>30</sup> Adapted from EuropeAid (2009), 'Guidelines on the Integration of Environment and Climate Change in Development Cooperation', Guidelines No. 4, November 2009. https://ec.europa.eu/ europeaid/sites/devco/files/methodology-tools-and-methods-series-integration-environment-in-development-200911\_en\_2.pdf

<sup>&</sup>lt;sup>31</sup> IEMA (forthcoming, 2016), IEMA Environmental Impact Assessment Guide to: Delivering Post-consent.

### 6.3.2. Step 7: Adaptive management

The key steps of an adaptive management process that would be appropriate to recommend as part of an environmental management plan are as follows:

#### 1. Conceptualise the issues by completing the EIA and:

a. identify the significant potential impacts and which receptors are at risk;

b. identify the critical areas of risk and threat.

# 2. Manage uncertainty (e.g. by incorporating adaptive management principles into the environmental management plan) by:

a. setting goals and/or objectives including threshold criteria that would require action to be taken; b. identifying the assumptions on which these goals or objectives are reliant;

c. developing a monitoring plan to check that the assumptions remain valid;

*d. developing a process to implement when assumptions are no longer valid; and* 

e. defining roles, responsibilities and funding streams.

#### 3. Implement the plan: <sup>32</sup>

a. implement the mitigation planned for development; and b. monitor and analyse results.

### 4. Review and update the plan:

a. regularly collate and analyse the monitoring data; b. review the assumptions and objectives; c. update and adapt the plan as appropriate, based on results of analysis; and d. implement appropriate additional mitigation.

### 5. Report and update the knowledge base:

a. disseminate the lessons learned; b. roll out the updated plan and inform key stakeholders of proposed changes; c. move back to Step 1. Where climate change adaptation and/or resilience are a prominent feature in the significant effects identified in an EIA, it is recommended that a 'whole-life climate change adaptation plan' be formulated that documents how to take forward the mitigation measures, following the five-step process set out above. This document should contain:

- existing policy objectives and regulatory requirements affecting proposed mitigation;
- any planning or licence conditions;
- responsibility and ownership of the plan, including any financial agreements in place or required in future;
- timelines for mitigation implementation; and
- a procedure to ensure review and update of the plan.

### **7 PRESENTATION IN THE ENVIRONMENTAL STATEMENT**

IEMA's Principles on Climate Change Adaptation and EIA<sup>33</sup> (published in 2010) set out the approach to be used in presenting climate change information within an Environmental Statement.

- Where adaptation is considered in EIA, it must be clearly presented within the Environmental Statement – this could be in a climate change section, in a relevant topic chapter, or across a number of different parts of the document.
- Any modelling or detailed quantification of the effects of the changing climate in combination with the project's anticipated impacts should be presented, as relevant, within an appendix. This should be appropriately cross-referenced within the main Environmental Statement.
- Where other assessments of the effect of climate change on either the project or the environment are required, they should be referenced within the Environmental Statement. As a minimum, the Environmental Statement must summarise any other climate-related report's findings, and make effective cross-reference to it.

Recognising the Environmental Statement as an important tool for informing meaningful consultation and decision-making, the climate aspects of the project (whether stand alone, or integrated into other chapters), must be written in a manner that makes it easy for stakeholders and other interested parties to understand the approach and findings of the EIA.

<sup>33</sup> IEMA (2010) Principles on Climate Change Adaptation and EIA, www.iema.net/eia-cc

### **7 FURTHER READING AND SOURCES OF FUTURE BASELINE INFORMATION**

Department for Business Innovation & Skills (BIS) / Government Office for Science 'Foresight Projects': https:// www.gov.uk/government/collections/foresight-projects

Department for Communities and Local Government (2012) Technical Guidance to the National Planning Policy Framework, https://www.gov.uk/government/uploads/ system/uploads/attachment\_data/file/6000/2115548.pdf

Department for Environment, Food & Rural Affairs (Defra) (2012) UK Climate Change Risk Assessment, *https://www.* gov.uk/government/publications/uk-climate-change-riskassessment-government-report

Department of Energy & Climate Change (2010) '2050 Pathways Project': www.gov.uk/2050-pathways-analysis

Environment Agency (2011) Strategic Environmental Assessment and Climate Change: Guidance for Practitioners, https://www.gov.uk/government/publications/ strategic-environmental-assessment-sea-and-climate-change

European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment, http://ec.europa.eu/environment/eia/ pdf/EIA%20Guidance.pdf

European Environment Agency (2010) The European Environment: State and Outlook 2010 – Synthesis, http:// www.eea.europa.eu/soer/synthesis/synthesis

European Environment Agency (nd) 'Climate Change Data Centre Overview': *www.eea.europa.eu//themes/climate/dc* 

European Environment Agency (nd) 'EEA Activities': www. eea.europa.eu/themes/scenarios/scenarios-and-forwardstudies-eea-activities

European Environment Agency (nd) 'PRELUDE Scenarios Interactive Tool': www.eea.europa.eu/multimedia/ interactive/prelude-scenarios/prelude

Fast Future (2005) Baseline Scanning Project: A Research Study for Defra's Horizon Scanning and Futures Programme and Strategy and Sustainable Development Directorate.

Highways Agency, Transport Scotland, Welsh Assembly Government and Department for Regional Development Northern Ireland (2008) Assessment and Management of Environmental Effects. Design Manual for Roads and Bridges, Volume 11, Section 2, Part 5. HA 205/08, http:// www.standardsforhighways.co.uk/DMRB/vol11/index.htm IEMA (2010) IEMA Principles Series: Climate Change Adaptation & EIA, www.iema.net/eia-cc

International Association for Impact Assessment (IAIA) (2012) Climate Change in Impact Assessment: International Best Practice Principles, *http://www.iaia.org/ publicdocuments/special-publications/SP8%20Climate%20 Change\_web.pdf* 

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Mott MacDonald & Global Sustainability Institute (2015) Climate Change and Business Survival, *https:// www.mottmac.com/download/file/127/6772/climate%20 change%20and%20business%20survival.pdf* 

Natural England (2009) England's Natural Environment in 2060: Issues, Implications and Scenarios, *http://publications. naturalengland.org.uk/publication/31030* 

Natural England Secure Environmental Future Project www. naturalengland.org.uk/ourwork/securefuture/default.aspx

Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) (2014) Assessing the Treatment of Climate Change Impacts and Adaptation in Project-Level EAs in the Canadian Mining Sector, http://www. climateontario.ca/doc/p\_ECCC/A\_Review\_of\_Mining\_Sector\_ Environmental Assessments OCCIAR RSI.pdf

Organisation for Economic Co-operation and Development (OECD) (2012) Environmental Outlook to 2050: The Consequences of Inaction, *http://www.oecd.org/env/ indicators-modelling-outlooks/* 

UK Climate Projections (nd) 'UKCPO09': http:// ukclimateprojections.defra.gov.uk/

United Nations Environment Programme (UNEP) (2012) GEO5 Global Environmental Outlook: Environment for the Future We Want, *http://www.unep.org/geo/geo5.asp* 

United Nations Environment Programme (UNEP) (2014) 'Global Environmental Outlook': www.unep.org/geo/

World Bank (2015) 'Climate & Disaster Risk Screening Tools': http://climatescreeningtools.worldbank.org/

## GLOSSARY

Adaptive management	A systematic process which monitors the ongoing effectiveness of mitigatory and compensatory measures to determine if they are achieving their desired objectives – and where they are not, either modifies the action, or identifies additional actions to be taken <sup>34</sup>
Carbon emissions scenarios	The basis on which global climate change models are developed that take account of different levels of global carbon emissions. The scenarios are based on complex economic models, but can be simply summarised as low, medium or high emissions scenarios. It is considered highly unlikely that a low carbon emission scenario is a realistic scenario on which to base assessments
Climate	The general weather conditions prevailing over a long period of time. Climate change will see trends in the climate conditions changing (seasonal averages and extremes)
Climate change adaptation (Adaptation)	The process that a receptor or project has to go through to ensure it maintains its resilience to climate change. In the case of a development, project adaptation can be embedded in the design to account for future climate conditions, or the project can introduce measures to ensure it retains it resilience (i.e. the project adapts) to future climate conditions. Environmental receptors will adapt to climate change in varying degrees, depending on how vulnerable they are to climate
Climate change co-ordinator	The practitioner within an EIA team who may or may not be a 'climate expert' has a thorough grasp of climate change projections, policy and regulation, and who is also conversant with the emerging climate change guidance relating to specific technical topics. It is important that all EIA teams have access to a competent climate change co-ordinator
Climate change mitigation	Measures included in a project to reduce the emissions of greenhouse gases. Not to be confused with <i>EIA mitigation</i>
Climate change projection	The range of possible climate conditions predicted for a range of probability that the conditions will occur for a specific carbon emissions scenario
Climate change resilience (Resilience)	A measure of ability to respond to changes that something experiences. If a receptor or project has good climate change resilience, it is able to respond to the changes in climate in a way that ensures it retains much of its original function and form. A receptor or project that has poor climate change resilience will lose much of its original function or form as the climate changes

EIA co-ordinator	The practitioner with overall responsibility for ensuring that the quality of the EIA satisfies current regulatory requirements, and is consistent with the requirements published for EIA by IEMA. This person should be a chartered environmentalist with experience in the preparation and delivery of EIA, who will be responsible for ensuring climate change adaption is properly accounted for in the EIA process. This practitioner has specific responsibility for advising developers of their obligations under the revised EIA Directive and the implications thereof – especially in advance of the revised EIA regulations that will be introduced in 2017
EIA mitigation	Measures identified during the EIA process to reduce or enhance the negative or positive impacts of a project respectively. Not to be confused with <i>climate change mitigation</i>
Projection	A possible outcome defined by modelling of climate variables to give a <i>possible</i> outcome. This is in contrast to a prediction which is a statement of <i>probable</i> change
<b>UKCP09</b>	UK Climate Projections 2009 is a climate analysis tool produced by the UK Met Office and funded by Defra. Projections are broken down to a regional level across the UK and are shown in probabilistic form, illustrating the potential range of changes and level of confidence in each prediction
Weather	What we experience on a daily basis and defined by atmospheric conditions (such as temperature, wind, cloud cover rain) prevailing at specific moments in time, or over short time periods

Appendix CL2.16

Institute for Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2020)



# **Environmental Impact Assessment Guide to:** Climate Change Resilience & Adaptation



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## 1. Scope of this Practitioner Note

The purpose of the Environmental Impact Assessment (EIA) process is to provide objective evidence to decisionmakers during the development of a scheme, to ensure that the impacts of the scheme are understood and either mitigated or accepted as a part of wider planning and consenting process.

In the UK and European Union (EU), the EIA process is based on EU Directive 2011/92/EU (as amended by EU Directive 2014/52/EU). The EIA Directive states: 'Climate change will continue to cause damage to the environment and compromise economic development. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to climate change.<sup>1</sup>

Therefore, it is important that EIA Reports (the final EIA report is called the 'Environmental Statement' in England, Wales and Northern Ireland), provide clarity on whether climate resilience has been appropriately considered in the design and development of a development scheme.

This guide provides a framework for the effective consideration of climate change resilience and adaptation in the EIA process in line with the UK Town and Country Planning (EIA) Regulations (2017)<sup>2</sup> – alongside the regional variations in Scotland, Wales and Northern Ireland – which (among other UK statutory instruments) transposed into UK law the EU Directive, including a new requirement to consider climate within. A fuller summary of the underlying policy documents is included in Appendix 2 – Legislative and Policy Setting.

This document is a revision of the 2015 IEMA guidance on Climate Resilience and Adaptation in EIA (2015) and reflects lessons learnt from emerging practice. It also includes case studies of EIAs which have considered climate adaptation and resilience issues. The guide does not address methods for the assessment of greenhouse gases within EIA. For guidance in this area, practitioners should refer to IEMA's 2017 <u>Environment</u> <u>Impact Assessment Guide to Assessing Greenhouse Gas</u> <u>Emissions and Evaluating their Significance</u>.

Assessing the impacts of climate change on a scheme is fundamentally different to the assessment of impacts arising from the scheme in other EIA topics, since it focusses on the impact of an external factor (climate change) on the scheme, rather than the impact of the scheme on environmental receptors. This can lead to some difficulty in the language and style of the assessment used, which is explored further in this guidance.

Definitions of climate change, resilience, adaptation and EIA mitigation, along with other terms commonly used in this Guide are included in the <u>Glossary</u>.

#### EIA Reports<sup>3</sup> produced in line with this advice will:

- be proportionate in their approach and not include superfluous assessment that does not address likely material issues;
- always make reference to climate change;
- provide a concise explanation of how the project's resilience to climate change was considered;
- set out clearly how effects related to climate change have been assessed; and
- define significance of effects pragmatically, taking account of the knowledge base used in the impact assessment.

<sup>1.</sup> Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

<sup>2.</sup> Town and Country Planning (Environmental Impact Assessment) Regulations 2017, No. 571. Available at: http://www.legislation.gov.uk/uksi/2017/571/pdfs/uksi\_20170571\_en.pdf

<sup>3.</sup> Note: Statutory EIA reports are called 'Environmental Statements' in England, Wales and Northern Ireland and 'Environmental Reports' in Scotland.

## 2. How to use this Guidance Note

This guidance note is structured around eight key procedural steps. These steps set out what actions should be taken to integrate climate adaptation and resilience issues into the EIA process. These are broadly aligned to the statutory stages of EIA (but including preapplication and post application activities).

In addition to this, several appendices have been developed which set out additional supporting guidance on suggested roles and responsibilities, technical guidance on the use of climate projections, experience of integrating adaptation and resilience issues into the EIA process, and policy context in the UK. This guidance was previously integrated into the main text but has been separated to make the document more accessible and user friendly. It is vital to highlight that the procedural steps and the supporting guidance are not discrete, and users must read the full document prior to applying the principles within the document.

The document is set out into the following sections:

#### Table 1: Document layout

Preamble	<ol> <li>Scope of this Practitioner Note</li> <li>How to use this Guidance</li> <li>Overview and Key Principles</li> </ol>
Procedural Guidance	<ol> <li>Step 0 – Building climate resilience into the project</li> <li>Step 1 – Scoping CC Requirements for the EIA</li> <li>Step 2 – Defining the future (climate) baseline</li> <li>Step 3 – Identifying and determining sensitivity of receptors</li> <li>Step 4 – Reviewing and determining magnitude of the effect</li> <li>Step 5 – Determination of significance</li> <li>Step 6 – Developing additional adaptation/EIA mitigation<sup>4</sup> measures</li> <li>Step 7 – Monitoring and Adaptive Management</li> </ol>
Supporting Guidance	<ul> <li>A1. Climate Change Risk Assessment</li> <li>A2. Legislative and Policy Setting</li> <li>A3. Case Studies</li> <li>A4. Identifying the future climate</li> <li>A5. The role of the Climate Change Adaptation and Resilience Coordinator (CCAR Coordinator)</li> <li>A6. Further Reading</li> <li>A7. Glossary and Definitions</li> </ul>

<sup>4.</sup> Unless otherwise indicated in the text, 'mitigation' refers to the concept as accepted in EIA terminology (i.e. a measure designed to eliminate, reduce or compensate for an impact) rather than that accepted in Climate Change terms (i.e. reduction in greenhouse gas emissions).

## 3. Overview and Key Principles

#### 3.1. Overview

The remainder of this guidance document sets out the considerations that should be given to climate adaptation, at key stages in the EIA process. Figure 1 shows the steps to be followed with an indication of the climate change specific actions that are likely to be required at each stage of the process. Emphasis has been placed on scoping the assessment, as this is the process whereby broad principles need to be translated into tangible plans for addressing climate adaptation issues through the EIA process.

Steps 3, 4 and 5 have been divided into two to emphasise the difference between assessing the impacts of climate change on the project (climate change resilience assessment) and assessing the impacts of climate change on the effects of the project on other environmental receptors.

#### Figure 1: Climate Change Adaptation and EIA <sup>5</sup>

Pre-Application Stage	Pre- EIA	Step 0 Building climate resilience into the project	<ul> <li>Consider the resilience of the stage, including early phases of change risk assessment, or by</li> <li>Identify appropriate mitigation incorporate these into design</li> <li>Reflect the outcome of design the description of the project</li> </ul>	<ul> <li>Consider the resilience of the project to climate change impacts during the design stage, including early phases of design. This can be done through delivery of a climate change risk assessment, or by following the principles set out in Steps 2 - 6 below</li> <li>Identify appropriate mitigation measures (to reduce the effect of impacts) and incorporate these into design as necessary</li> <li>Reflect the outcome of design for resilience in the Environmental Statement under the description of the project/alternatives studied</li> </ul>				
	Scoping	Step 1 Scoping CC Requirements for the EIA	<ul> <li>Identify the scale and scope of the project, including design life</li> <li>Identify the climate change projections for use in the assessment</li> <li>Identify key climatic variables relevant to the project</li> <li>Identify likely effects</li> <li>Engage with and discuss the above with stakeholders/regulators</li> </ul>					
	EIA Stage	Step 2 Defining the future (climate) baseline	<ul> <li>Define baseline conditions u</li> <li>Define future baseline, using summarise projected change increase in mean summer te</li> <li>Produce summary of projected</li> </ul>	nder historic/existing climate conditions selected climate change projections. This will es in key climate variables (e.g. increase in rainfall, emperature, wind strength) ed future climate changes for non-climate expert audience				
		Step 3 Identifying and determining sensitivity of receptorsClimate Resilience• Identify receptors within the elements of the project• Evaluate the selected receptors to identify their susceptibility and vulnerability as well as their importance		<ul> <li>In-Combination Climate Impacts</li> <li>Collate the receptors identified relevant to the location, nature and scale of the project and the likely effects identified as part of the EIA and to be reported within the Environmental Statement</li> <li>Evaluate the selected receptors whether the susceptibility and vulnerability as well as their value/ importance changes with future climatic projections identified in Step 2</li> </ul>				

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<sup>5.</sup> Screening is excluded from this flow chart as it is considered there will be limited occasions where climate change adaptation will be a decisive factor at the screening stage. However, further guidance is included in Section 3.3 below.

Pre-Application Stage	EIA Stage	Step 4 Reviewing and determining magnitude of the effect	<ul> <li>Climate Resilience</li> <li>Review effects likely to arise from the project identified at Step 2</li> <li>Consider probability and consequence to determine the magnitude of the effect</li> </ul>	<ul> <li>In-Combination Climate Impacts</li> <li>Collate the likely effects identified as part of the EIA and to be reported within the Environmental Statement</li> <li>Consider the magnitude of the effects identified by other topics and evaluate whether the probability and/or consequence of the effect changes with future climatic projections</li> </ul>		
		Step 5 Determination of significance	Climate Resilience • Use the sensitivity of receptors identified at Step 3 and the magnitude of the effect identified at Step 4 alongside professional judgement to determine whether the effect is significant/the degree of effect.	<ul> <li>In-Combination Climate Impacts</li> <li>Assess the significance of the project effects under the existing climate baseline using standard methodologies for each relevant environmental topic</li> <li>Assess the in-combination climate impact applying the significance criteria developed by the relevant environmental topics and using the outcome of the evaluation of sensitivity of receptors/magnitude of effect identified at Step 3 and Step 4</li> <li>Determine whether the significance/degree of the effect remains the same or changes with the future climate conditions</li> </ul>		
				Step 6 Developing additional adaptation/ EIA mitigation measures	<ul> <li>Identify additional (secondary) mitigation measures against timescale of future likely significant effects</li> <li>Fixed elements for full duration need mitigation built in based on predicted climate effects (less desirable)</li> <li>Project elements subject to maintenance/future change can have mitigation set for future implementation based on actual climate effects being observed (more desirable)</li> <li>Prepare, if appropriate, a Climate Change Resilience and Adaptation Plan that covers the above and includes allocation of responsibilities and funding streams</li> </ul>	
			Regulator approval obtained Move to post-EIA	d, project implemented. work phase		
Step 7 Monitoring and Adaptive Management		Step 7 Monitoring and Adaptive Management	<ul><li>Implement project mitigation</li><li>Review and approval with stake</li></ul>	Implement project mitigation measures/Climate Change Resilience and Adaptation Plan Review and approval with stakeholders based on evidence of effects on emerging baseline		

#### **Key Principles**

In developing this guidance document, the authors noted several key principles which, while embedded in the detailed guidance that follows, are critical messages which warrant drawing out as Key Principles or 'golden rules' which practitioners are encouraged to take onboard.

- Climate change must be integrated into the design process and should be evident in design decisions from the earliest stage. This is likely to require consideration well before the EIA team is mobilised. If this is not the case, the EIA leader must raise this as a significant requirement of the EIA process (UK 2017 Town and Country Planning Regulations).
- 2. The EIA Report has an important role to play in documenting, for the benefit of decision-makers, how consideration of climate change and extreme weather events has been integrated into the design (indeed this might even form the basis for 'scoping out' climate adaptation issues). This is considerably more valuable than mitigating impacts at the end of the design process.
- Every EIA Report should include a clear characterisation of the future climate and at least a narrative of how this has been considered in the design process.
- 4. The developer should put forward a single, sensible and unambiguous climate scenario of how the climate is going to change, which is consistent with other statutory planning frameworks and not 'cherry picked' for the project or aspects of the project. As set out in <u>Appendix 4</u>, the use of the high emissions scenarios (Met Office UKCP18 RCP8.5) is generally recommended, unless the case can be made for using a different, lower emissions scenario.

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- 5. If the risks are minimal or are addressed elsewhere (e.g. in design standards) then the scope of assessment should be proportionately reduced. It should be OK to say that there are no significant risks; if that can be supported by evidence. Padding out an EIA Report with superfluous assessment dilutes the value of EIA Reports where there are tangible risks that need to be managed.
- 6. The EIA team must include someone with adequate knowledge of climate science (the Climate Change Adaptation and Resilience (CCAR) Coordinator). This does not have to be a specific Climate Scientist (although larger projects may dictate that this is necessary) but they do have to be familiar with the broad climate policy context, with UKCP18 climate projections data, and be able to communicate this to other members of the team.<sup>6</sup>
- 7. There are two key strands to assessing climate adaptation issues within EIA, which need separate treatment: the risks of changes in the climate to the project (i.e. the resilience or conversely the vulnerability of a project to future climate changes) and the extent to which climate exacerbates or ameliorates the effects of the project on the environment (i.e. 'in-combination' effects).
  - a. Project resilience to climate change impacts needs to be assessed as a part of the design (and is generally best reported in the analysis of alternatives). It is also better suited to a Risk Assessment type process than traditional EIA 'determination of significance';
  - b. In-Combination Assessment (where climate is exacerbating or conversely diminishing the effect of an existing impact of the project) is largely best analysed in the existing chapters and is suited to using traditional significance criteria from the respective chapters:
- 8. Reporting: following on from point 7 above, a separate climate chapter is not a pre-requisite of good reporting, although in larger or more complex projects it may be desirable.

#### 3.2. Screening

There will be limited occasions where climate change adaptation will be a decisive factor in whether an EIA is required or not for a particular project, particularly given that current EIA regulations allow for 'proposed measures envisaged to avoid or prevent significant adverse effects on the environment' (mitigation) to be taken into account at the screening stage. However, climate change adaptation should be given appropriate consideration from the outset of the design and EIA processes to minimise the likelihood of adverse effects.

With respect to the resilience of the project to climate change, while the project's vulnerability to increased flood risk may have been taken into account at the siting and outline design stages, it is possible that potential overheating and vulnerability to extreme events may have been given only limited or no consideration. Importantly, developments are starting to be refused planning permission due to concerns about overheating, which suggests that the range of likely significant effects with respect to climate change adaptation is not always investigated appropriately at an early stage (see, for example, the Planning Inspectorate appeal decision 3198899, relating to retirement homes in Bristol (January 2019)).

With respect to 'in-combination effects', at the EIA screening stage, consideration should be given as to whether climate change could exacerbate the likely effects of an existing impact of the project to such an extent that significant effects become likely, either due to a change in the value/importance of a receptor or in the scale/geographic spread of impact, or wholly, new additional effects are likely to arise from the project which are significant. This should be undertaken with reference to the screening/significance criteria already developed for each topic area.

# **4. STEP 0:** Building Climate Resilience into the Project

It is important that project designers incorporate climate resilience into the design of the project at an early stage. This means evaluating what resilience measures may be appropriate to include in the design, and this should take place at all stages of design development – from optioneering through to detailed design, not just as a part of the EIA process.

If it is done before the start of EIA, building climate resilience into the project can be achieved by carrying out a Climate Change Risk Assessment. Details on Climate Change Risk Assessment methodology together with examples are included in <u>Appendix 1 – Climate</u> <u>Change Risk Assessment</u>. Alternatively, practitioners may wish to follow the principles set out in Steps 2 to 6 below, with regards to identifying climate risks and formulating measures to reduce their impact.

The aim of this is to identify appropriate mitigation measures, including design features and construction materials, to provide an appropriate resilience to increased extreme weather as well as changes in average conditions. Such measures need to consider whether there are opportunities to introduce them later with more certainty, or whether they have to be allowed for in the initial design. The design of any development takes place in stages, the number of design stages reflecting the complexity of the development itself. It is good practice to consider the effects of climate change on the development at all stages of design. If this is not done in the earliest stages, costly reversals in design (for example, potential additional land take) could arise if climate resilience is only included in the later stages of design.

#### Factors to consider when assessing the risks to a project:

- its reliance on interconnected networks (be this a transport network, power supplies or telecoms for example);
- its vulnerability to the impact of weather on both normal operations and extreme weather-related disaster scenarios.

The developer should identify an acceptable risk profile for the development and the means to mitigate unacceptable risks to acceptable levels. This should include building resilience to climate impacts on the scheme.

If this has not been done before the EIA commences then it should be done during the finalisation of the design used in the EIA process, following an iterative design process (as illustrated in Figure 2).

#### Figure 2: Ensuring climate change is embedded in project design



If the project could be affected by climate change impacts or extreme weather events to such an extent that the project was potentially no longer viable, then the design should be changed or the project stopped.

### The project design team should consider resilience measures including:

- preventing the loss (total or partial) of the project or components of the project due to effects (direct or indirect) of extreme climatic events;
- understanding the risks of cascade failure impacting the functionality of the project (e.g. how dependent is the project on telecommunications being maintained 100% of the time);
- changes to operating parameters to maintain productivity/functionality under a different average climate;
- changes to capital costs to ensure project resilience under extreme and average climate conditions (e.g. accounting for average temperature impacts on bearings in a bridge over a river as well as the capacity of the bridge to permit flood flows to pass);
- any variations to maintenance regimes to account for climate change; and
- future proofing the project to build flexibility into designs, enabling future modifications, is useful where resilience measures are unlikely to be required immediately (e.g. putting in larger foundations to accommodate future increases to flood defence barriers).

The EIA team may identify climate change risks to the project which should be communicated to the design team to ensure they are aware of potential residual issues.

The outcome of this process of design for resilience needs to be properly reported in the final EIA Report or Environmental Statement under the scheme description and consideration of alternatives, or in a climate chapter if a separate climate chapter is included.

### BOX 1 – ADAPTATION RESPONSES TO CLIMATE RISKS

The lifecycle of the project and the timeframes over which change might occur need to be considered in adaptation responses.

As an example, take the construction of a tunnel to accommodate a road scheme. It will be almost impossible to increase the diameter of the tunnel to allow for heating impacts under a warmer climate and so this needs to be accounted for in the initial design.

However, if the project has elements that will have to be replaced or maintained every 10 years (such as the road surface) then clearly there is an opportunity to introduce additional resilience measures as appropriate in due course. This is the basis of the adaptive management approach discussed further in Step 7.

# **5. STEP 1:** Scoping Climate Change Adaptation into the EIA

### 5.1.1. The Basics – Climate Change Adaptation during Scoping

The purpose of Scoping is, where EIA is required, to determine the extent of issues to be considered in the EIA and provides a mechanism to agree this with the planning authority.<sup>8</sup> It provides an important opportunity to agree the extent to which climate change adaptation and resilience issues should be considered in the EIA. However, equally, there will be development proposals where climate change adaptation can be reasonably scoped out of the EIA.

In order to complete Scoping of the EIA, the following should be achieved (Step 1, Figure 1)

- agreement with key stakeholders<sup>9</sup> on the most appropriate climate change projection to adopt for the assessment (see <u>Appendix 4 - Identifying the</u> <u>future climate</u>) and any necessary methodological considerations to ensure climate change is appropriately considered. This may include the exclusion of explicit consideration of climate adaptation and resilience issues if it is agreed that existing design codes or standard assessment methodologies contain adequate in-built consideration of adaptation and resilience issues;<sup>10</sup>
- identification of the scale and scope of the project's initial design, including the duration;
- identification of climate-related parameters likely to influence the project, and anticipated changes to these climatic parameters over the lifetime of the project;
- identification of the potential impact of the project on the receiving environment, the sensitivity of this environment, and taking into account how this will be affected by a changing climate;

- engagement with key stakeholders to identify the policies and regulatory regime regarding climate change in the project area; and
- accurate recording of all the assumptions made with regard to the above points.

The incorporation of climate change into the EIA process should not change fundamental EIA processes or accepted conventions and practices. However, it will necessitate interdisciplinary consideration of CCAR parameters over the life span of the project. This should encourage developers to take account of climate change in the project design (as discussed previously), which iteratively may significantly alter key characteristics of the project design and, therefore, its impact on the environment.

Scoping of a project, taking into account climate change, should focus on general trends in climate rather than detailed, quantitative analysis. To do this will require an early decision on the climate change projection to be used in the EIA process by the project's CCAR Coordinator (see <u>Appendix 5 - The role of the Climate</u> <u>Change Adaptation and Resilience Coordinator (CCAR</u> <u>Coordinator</u>).

Topic leaders should use information collated by the CCAR Coordinator in combination with professional judgement and local knowledge to determine if climate change effects should be a potential consideration in their part of the EIA process. Where there is uncertainty, a precautionary approach should be applied, and risks scoped out at a later date.

9. Developer, approving authority and any key stakeholders (e.g. national climate change government department)

<sup>8.</sup> From the Scoping section of https://www.gov.uk/guidance/environmental-impact-assessment#Preparing-an-Environmental-Statement1

<sup>10.</sup> Such decisions need to be robustly and transparently documented in the Scoping Report so that they are material to any subsequent Scoping Opinion and future reliance on that Opinion.

#### Use of the following hierarchy will assist:

- All Annex I<sup>11</sup> projects should include appropriate consideration of climate change impacts in the EIA (climate change should never be entirely scoped out).
- 2. Annex II projects requiring EIA for reasons other than climate change still warrant appropriate scoping of key climate change risks (it may be appropriate to scope out climate change effects for some particular technical topics that are not sensitive to climate change).
- 3. Where climate change is scoped into EIA then all climate change issues should be established according to legislative requirements, stakeholder and public interest and professional judgement. There may be broad categories of potential project impacts or specific areas of concern, for example those identified in policy documents such as the National Climate Change Risk Assessment or Local/ Regional Climate Change Risk Assessments. In either case, they should be assessed during the EIA for the whole project lifecycle, i.e. at the design, construction, operation and decommission/ abandonment stages.

The Scoping Report should explain how climate considerations will be included in the technical assessments being carried out within the EIA process. In setting the methodology, care is required to ensure that the method is proportional to the evidence base available to support any assessment.

It is worth noting some topics will be able to assess the impact of climate change relatively easily, for example, the methodology for assessing impacts of climate change on flood risk is well developed, whereas other topics will be challenged to develop any kind of quantitative assessment.

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### 5.1.2. Defining the boundaries of the climate change adaptation assessment

The relevance of climate change adaptation should be analysed within spatial and temporal boundaries, which must be clearly established and communicated in the Scoping Report. The key difference from most historic and current EIAs is that the temporal scope will need to be more clearly defined at the outset as this will set how future baseline changes need to be accounted for, i.e. agree with the developer the potential project life span. This is likely to be longer than the design life embedded in the engineering design as many developments remain in situ long after the original development has fulfilled its objectives.

The EIA should consider the legacy period of the development which could be at the end of decommissioning (e.g. when an oil refinery was decommissioned) or which could extend well beyond the lifetime of the original purpose of the development (e.g. the London 2012 Olympic Park).

However, the temporal scope needs to be realistic and not assume a development will remain in situ beyond a reasonably foreseeable timescale. Consideration should be given to differentiating between elements of the project design which are 'maintenance items', and would therefore be expected to be replaced during the project life, and those elements which are 'fixed assets'.

11. i.e. Town and Country Planning (Environmental Impact Assessment) Regulations 2017, No. 571. Available at: http://www.legislation.gov.uk/uksi/2017/571/pdfs/uksi\_20170571\_en.pdf It may be the case that for some major, long-term projects, the project life exceeds the range over which climate change projections are available (e.g. current UKCP18 projections provide data up to 2100 for most variables, whereas a major infrastructure project (e.g. a railway line or dam) could have a life of up to 150 years). In such cases, careful thought is needed to identify the key receptors most vulnerable to climate change and the project, and determine if additional information is needed on the climate change effects beyond 100 years. This is only likely to affect nationally important infrastructure and where there is concern about very long-term effects (i.e. timescales beyond the end of the century) relating to climate change then the developer needs to be engaging with relevant government agencies (e.g. the Met Office) for additional advice. The EIA practitioner should obtain the necessary guidance on how to accommodate such long-term climate change variations from the CCAR Coordinator in consultation with key regulators (Environment Agency, local authority, PINS or others).

#### 5.1.3. Consultation during the scoping process

Standard consultation requirements are not affected by including CCAR in the EIA process. However, it is important that this is covered in consultations, as Local Authorities and statutory bodies will increasingly have dedicated climate change policies to comply with. In addition, they may have officers with specific responsibility for climate change who can assist in the completion of the Scoping Report.

At the same time, it is important to recognise the potential imbalance of resources between local authorities and developers in terms of available personnel. Proportionate EIA is an important part of this. It is not appropriate or proportional, nor is it good practice, to produce exceedingly lengthy EIA documentations which a local authority may be unable to consider and assess in detail.

In many cases, a Local Authority or statutory body may have already considered the implications of climate change. From their knowledge of their area they could help identify specific concerns relating to climatic resilience and the changing climate that could be affected by, or affect, the proposed development.

Unless specific studies and reports are available, EIA practitioners, local authorities and statutory bodies will need to use professional judgement, knowledge and experience in determining the issues to be considered in assessment and agreed at the scoping stage.

# **6. STEP 2:** Defining the Future Baseline

The future climate baseline should ideally have been identified during Step 0: Building climate resilience into the project. If this has not been carried out, it should be developed following scoping.

The current baseline is defined by historic climate conditions and the prevailing conditions at the time of the assessment. One fundamental aspect of including climate change assessment in EIA is to understand how this baseline climate will change in the coming decades.

The practitioner needs to look at recent weather patterns identifying extreme events (e.g. short-term events such as cold snaps, torrential downpours or moderately lengthy events such as drought). These short-term variations will be useful in determining how the project needs to take climate change into account in the immediate future (e.g. during construction and within the first 10 years of the project).

This is important, as it is not uncommon to describe the existing baseline using historical trends which may not properly account for climate changes which have already occurred.

However, in assessing climate change risks in the short (15 to 20 years) and longer term (>30 years), the climate change projection scenarios selected for the project will provide more useful guidance on the likely conditions that will alter the baseline.

The choice of climate scenario and time period for which climate projections data are selected is an important step in defining the future baseline, and further detail on the choice of climate scenario is set out in Appendix 4 - Identifying the future climate.

#### UKCP18 AND CLIMATE SCENARIOS

The UK Met Office Hadley Centre published an updated set of climate projections for the UK in 2018 (UKCP18). These superseded UKCP09, and should now be used as the best available information on UK climate projections.

UKCP18 has moved away from the use of low, medium, high emissions scenarios, and instead uses Representative Concentration Pathways (RCPs). These are named according to the concentration of greenhouse gas modelled to occur in the atmosphere in 2100. There are 4 RCPs available in the UKCP18 climate projections: 2.6, 4.5, 6.0 and 8.5, and RCP 8.5 is the most conservative, highest-impact scenario.

### The practitioner needs to consider a range of factors including:

- extremes in **short-term weather** events that produce sudden shocks that can have substantial effects on some baseline receptors, such as:
  - heat waves;
  - extreme flooding and freezing conditions;
  - gales and hurricane force windstorms;
  - storm surges along coastlines.
- Extremes in longer-term climatic variability including:
  - variations in precipitation over one or more seasons resulting in drought or extremely wet conditions;
  - variations in average temperature which might affect receptors reliant on temperature to, for example, time when breeding cycles commence or end (which may be affected by availability of specific food sources);
  - potential changes in prevailing wind directions as the weather system over central Europe changes.

- Changes in average climate norms resulting in:
  - sea level rise;
  - increases in freezing/thawing;
  - changes in seasonal rainfall patterns.

**Information sources:** the majority of the above information is available from UKCP18; however, some data may need to be drawn from additional sources.

When engaging with EIA practitioners, it may be beneficial to develop a matrix indicating the direction of change for key climate variables (according to the latest climate projections, UKCP18). For non-climate specialists such as other topics leads (landscape, land quality, community) this provides a simple visual guide to key projected changes in climate variables. This can be developed in addition to a numeric future baseline, which is more likely to be needed by the design team when assessing the impacts of climate change to the design of the scheme, in particular where there are hard threshold values to be considered (e.g. maximum temperature values for materials integrity). An example is included in Table 2 – Example presentation of projected trends in climatic variables\* below.

For longer-lasting projects (e.g. major infrastructure likely to be in place for upwards of 100 years), it is probably more useful to define several future baseline environments (current baseline and then in, for example, 50 years' time and in 100-plus years' time).

Table 2 –	Example	presentation	of	projected	trends	in	climatic	variab	les*
	Example	presentation	۰.	projected	ci ci i dio		cannado	Variao	

Mariakla	Projected change in trend at					
Variable	10th percentile	50th percentile	90th percentile			
Temperature						
Mean minimum winter temperature (ºC)						
Mean winter temperature (°C)	<b>†</b>					
Mean summer temperature (ºC)	l I	1	1			
Mean maximum summer temperature (ºC)						
Warmest day of summer (ºC)	Ļ					
Precipitation						
Annual mean precipitation (%)	Ļ	1				
Mean winter precipitation (%)	1	1				
Mean summer precipitation (%)	Ļ	Ļ	1			
Wettest day in winter (%)	1	1	_			
Wettest day in summer (%)	Ļ	\$				
Snow						
Snow fall – winter		Ļ				
Snow fall – spring		1				
Sea Level						
Sea level rise (cm)		1				

Source: UKCP09<sup>12</sup> Reports & guidance. \*Additional variables such as Humidity, Wind, Cloud cover, and Fog may be relevant to some schemes, in which case they should be included in the table. Similarly, if any variables, e.g. sea level rise, are not relevant, these need not be included.

<sup>12.</sup> This table was originally developed based on UKCP09 climate projections outputs; however, the projected direction of change for key climate variables in UKCP18 is the same/has not changed.

Table 3 – Example presentation of a quantitative future baseline for key climatic variables. This is data for the South East of the UK under RCP 8.5 (the highest emission scenario in UKCP18)<sup>13</sup>

				Pro			
Season	Variable	Time 5th period* percentile	10th percentile	50th percentile	90th percentile	95th percentile	
		2030s	-0.1	0.1	0.9	1.8	2
	Mean	2050s	0.2	0.5	1.7	2.9	3.3
	(ºC)	2070s	0.4	0.9	2.5	4.2	4.8
Winter		2090s	1	1.5	3.6	5.8	6.4
winter	Mean Precipitation (%)	2030s	-9	-5	8	23	27
		2050s	-10	-5	13	34	40
		2070s	-12	-5	20	49	58
		2090s	-10	-3	27	63	75
		2030s	0.1	0.4	1.3	2.4	2.6
	Mean	2050s	0.8	1.1	2.5	4	4.4
	(ºC)	2070s	1.2	1.8	3.9	6.1	9.5
Supersor		2090s	2.2	2.9	5.8	8.7	9.5
Summer		2030s	-36	-30	-9	13	19
	Mean	2050s	-55	-48	-22	5	14
	(%)	2070s	-69	-61	-30	1	9
		2090s	-85	-77	-41	-3	7

\*UKCP18 provides 20-year time slices, hence: 2030s (2020-2039), 2050s (2040-2059), 2070s (2060-2079) and 2090s (2080s-2099)

# **7. STEP 3:** Identifying Climate Change Vulnerability and Sensitivity of Receptors

#### **Climate resilience**

Potential receptors within elements of the project relevant to the location, nature and scale of the development should be identified using the information gathered at Steps 0 – 2. These receptor groups may include:

- Buildings and infrastructure receptors (including equipment and building operations)
- Human health receptors (e.g. construction workers, occupants and site users)
- Environmental receptors (e.g. habitats and species)
- Climatic systems.

The sensitivity of the receptor/receiving environment is the degree of response of a receiver to a change and a function of its capacity to accommodate and recover from a change if it is affected.

Sensitivity is determined using quantifiable data, where available, the consideration of existing designations, relevant legislation, national and local policy and international, national, regional and local standards.

In ascribing the sensitivity of receptors in relation to potential climate change effects, the following factors must also be considered as well as the value or importance of the receptor:

- Susceptibility of the receptor (e.g. ability to be affected by a change) (the opposite of resilience); and
- Vulnerability of the receptor (e.g. potential exposure to a change).

The susceptibility of the receptor can be determined using the following scale:

- High susceptibility = receptor has no ability to withstand/not be substantially altered by the projected changes to the existing/prevailing climatic factors (e.g. lose much of its original function and form).
- Moderate susceptibility = receptor has some limited ability to withstand/not be altered by the projected changes to the existing/prevailing climatic conditions (e.g. retain elements of its original function and form).
- Low susceptibility = receptor has the ability to withstand/not be altered much by the projected changes to the existing/prevailing climatic factors (e.g. retain much of its original function and form).

The vulnerability of a receptor can be defined using the following scale:

- **High vulnerability** = receptor is directly dependent on existing/prevailing climatic factors and reliant on these specific existing climate conditions continuing in future (e.g. river flows and groundwater level) or only able to tolerate a very limited variation in climate conditions.
- Moderate vulnerability = receptor is dependent on some climatic factors but able to tolerate a range of conditions (e.g. a species which has a wide geographic range across the entire UK but is not found in southern Spain).
- Low vulnerability = climatic factors have little influence on the receptors (consider whether it is justifiable to assess such receptors further within the context of EIA – i.e. it is likely that such issues should have been excluded through the EIA scoping process).

A combination of susceptibility and vulnerability in addition to value/importance of the receptor should be used to reach a reasoned conclusion on sensitivity. The greater the susceptibility and/or vulnerability of the receptor, the greater the likelihood that receptor would also be of higher sensitivity. As an example, a high-value receptor that has very little resilience to changes in climatic conditions should be considered more likely to have a higher sensitivity than a high-value receptor that is very resilient to changes in climatic conditions.

Professional judgement should be applied by the CCAR Coordinator to determine sensitivity and this must be supported by evaluation and evidence.

#### In-Combination Climate Impacts

The receptors relevant to the location, nature and scale of the project and which have been identified as part of the EIA and reported within the Environmental Statement from other environmental topics, should be collated.

The CCAR Coordinator, working with other topicspecific competent experts in the EIA team, along with the EIA Coordinator should work together to consider the impact of the projected climate conditions on the susceptibility/vulnerability/value and/or importance of the identified sensitive receptors without the development (i.e. the future baseline) and determine whether these are changed. A reasoned judgement on whether the sensitivity of receptors will be greater or lesser with the future climate conditions must be made, supported by evaluation and evidence.

# **8. STEP 4:** Identifying and Determining Magnitude of Effect

#### **Climate resilience**

The climate assessment undertaken during the design stage, as described in Step 0, will have identified the likely effects on the development associated with climate change resilience. These effects will then be evaluated further to identify their magnitude.

The magnitude is the degree of a change from the relevant baseline conditions which derives from the construction and operation (plus decommissioning, if relevant) of a development.

Magnitude is based on a combination of:

- probability, which would take into account the chance of the effect occurring over the relevant time period (e.g. lifespan) of the development if the risk is not mitigated; and
- consequence, which would reflect the geographical extent of the effect or the number of receptors affected (e.g. scale), the complexity of the effect, degree of harm to those affected and the duration, frequency and reversibility of effect.

A combination of probability and consequence should be used to reach a reasoned conclusion on the magnitude of the effect. It is likely that if the probability and/or consequence of the effect is high that the magnitude of the effect would also be high.

Professional judgement should be applied by the CCAR Coordinator to assign magnitude. Where professional judgement is used, this must be clearly outlined and supported by evaluation and evidence.

The magnitude assigned to the effect should also consider control mechanisms that may already be in place (e.g. due to legislation and commonly occurring standards (also termed 'Tertiary Mitigation')) which would reduce the probability or the consequence of the effect and therefore the overall magnitude.

#### In-Combination Climate Impacts

The likely significant environmental effects and their associated magnitude of effect identified within the other topics being assessed as part of the EIA and reported within the EIA Report or Environmental Statement should be collated.

The impact of the projected climate conditions on the magnitude of these effects without the development (i.e. the future baseline) should then be evaluated in terms of whether the probability and/or consequence of the effect changes. The judgement should then be made on whether the magnitude of the effect will be worse or improved with the future climatic baseline. This must be supported by evaluation and evidence.

## 9. STEP 5: Significance Assessment

#### **Climate resilience**

Once the sensitivity and magnitude have been determined, these should be combined to reach an overall judgement on the significance of the likely environmental effect. As there is no legislative definition of 'significance', the conclusion of whether an effect is significant/the level of significance is down to the CCAR Coordinator in conjunction with the EIA Coordinator. An explanation of the outcomes of the assessment should be clearly set out.

Appropriate criteria for sensitivity, magnitude and significance for the climate resilience assessment should be developed on a project-by-project basis by the CCAR Coordinator in conjunction with the EIA Coordinator, and should take into account the aims/purpose of the project. For example, a transport or road project has the purpose of providing transport options – therefore an impact which temporarily removes this should be considered significant. The criteria should take into consideration feedback from scoping and stakeholder engagement.

#### In-Combination Climate Impacts

The assessment of the likely significant environmental effects should be undertaken under the existing climate baseline using standard methodologies for each relevant environmental topic being assessed as part of the EIA and reported within the Environmental Statement.

The CCAR Coordinator and EIA lead, as well as the individual topic leads, also need to consider if the impacts of the development on environmental receptors are likely to be different because of the projected future climate conditions compared with the existing baseline conditions.

Consideration should also be given to whether completely new effects will arise as a result of the development during construction and/or operation with the future climate conditions. Building on the evaluation of sensitivity undertaken at Step 3 and magnitude of the effect at Step 4, an assessment should be undertaken to identify whether the additional effects of future climate impacts alter the sensitivity and/or magnitude of the effect so that the significance/level of significance of the effects within other topics identified against baseline conditions changes.

This assessment should use the approach, methodology and significance criteria used by the other topics being assessed as part of the EIA and reported within the Environmental Statement. This process should be documented.

The uncertainty of the combined effect needs to be taken into account. If uncertainty about how a receptor will adapt to a changing climate or how the severity of environmental effect could be modified with a future climate is high, then it is recommended that a more conservative position is adopted within the evaluation in terms of sensitivity and/or magnitude of the effect.

# 10. Climate Change Adaptation Plan – mitigation and adaptive management **(STEPS 6 & 7)**

Once the influence that climate change may have on the project and its impacts are clear, it is necessary to capture how the project will address those issues. Some of this may be achieved by specific additional mitigation measures that can be applied to the project from the outset. However, given the uncertainty of particularly longer-term climate projections, there is also a need to identify possible future interventions that may depend on what actually happens to the climate in the future.

A key means of dealing with this kind of uncertainty is to introduce the concept of **adaptive management**<sup>14</sup>. Adaptive management is the process that enables uncertainty to be included in future operational decisionmaking. This process is not unique and is practised widely in all areas where uncertainty in the future is present.

This section identifies the principles that should be applied to both Mitigation and Adaptive Management in the context of an EIA.

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## **11.STEP 6:** Developing EIA Mitigation Measures

Additional mitigation should be considered against the timescale of the project and when mitigation might be most usefully implemented. In all but exceptional circumstances (e.g. when having to design in fixed elements of a project that cause significant negative effects on current and future baseline conditions), it will not be appropriate to propose that costly and permanent mitigation be put in place if it is not going to be required for another 50 years.

Key considerations in developing mitigation should include<sup>15</sup>:

- favouring flexible mitigation options over options which are locked and cannot be modified in future (adaptive management);
- allowing for safety margins in developing the project design, or in mitigation designs to ensure resilience of the project or proposed mitigation to climate change;
- delaying elements of the project with high risk/ uncertainty until a later date when the risk associated with uncertainty is likely to be less;
- identifying who (which party) will be responsible for delivering the mitigation measure (e.g. designer, contractor, developer);
- when defining the EIA mitigation consideration needs to be given to the mitigation hierarchy. The following principles identify how this may apply to climate adaptation-related risks:
  - What measures are available to avoid, control or manage identified risks? (avoid, prevent or minimise);
  - Does the mitigation strengthen the project's capacity to be resilient to climate change itself? (enhance);
  - Are there risk reduction measures available? (avoid or prevent);

- Will the mitigation improve the project's functionality under future climate conditions? (enhance);
- Can the mitigation exploit opportunities offered by the natural environment? (minimise or enhance); or
- Can the mitigation provide opportunities for environmental improvements that depend on the climate changing? (enhance or compensate).

Developing mitigation measures is a collaborative task, which will involve the CCAR Coordinator working with the design team (for climate resilience issues) and the environmental topic leads and EIA Coordinator (for incombination aspects).

# **12. STEP 7:** Monitoring and Adaptive Management

Adaptive management is the process that enables uncertainty to be included in operational decision-making. This process is not unique and is practised widely in all areas where uncertainty in the future is present. Adaptive management enables the potential impacts from changes in the climate to be dealt with as they become more likely (see section 13). By taking an adaptive management approach, projects can introduce additional mitigation if the project's impact is starting to cause unacceptable effects on the receiving environment. This concept is not currently commonly used in EIA, but it will become increasingly important to avoid inappropriate mitigation being implemented at the wrong time in a project lifecycle.

The key steps of an adaptive management process that would be appropriate to recommend as part of an environmental management plan are:

- 1. Conceptualise the issues by completing the EIA and:
  - a. identify the significant potential impacts and which receptors are at risk; and
  - b. identify the critical areas of risk and threat.
- Manage uncertainty (e.g. through an Environmental Management Plan that incorporates adaptive management principles) by:
  - a. setting goals/objectives including threshold criteria that would require action to be taken;
  - identifying the assumptions these goals/ objectives are reliant upon;
  - developing a monitoring plan to check the assumptions remain valid;
  - d. developing a process to implement when assumptions are no longer valid; and
  - e. defining roles and responsibilities and funding streams;
- 3. Implement the Plan:<sup>16</sup>
  - a. implement mitigation planned for development; and
  - b. monitor and analyse results.

- 4. Review and update the Plan:
  - a. regularly collate and analyse the monitoring data;
  - b. review the assumptions and the objectives;
  - c. update and adapt the plan as appropriate based on results of analysis; and
  - d. implement appropriate additional mitigation.
- 5. Report and update knowledge base:
  - a. disseminate lessons learnt;
  - b. roll out updated plan, inform key stakeholders of proposed changes;
  - c. move back to Step 1.

Often, incorporating adaptive management into standard operations and maintenance procedures can be preferable to having a separate adaptation plan, as this ensures consideration of climate impacts and adaptation are mainstreamed into operations.

However, where climate change adaptation and/or resilience are a prominent feature in the significant effects identified in an EIA, it is recommended that a 'whole life climate change adaptation plan' be formulated that documents how to take forward the mitigation measures, following the five-step process set out above. This document should contain:

- existing policy objectives and regulatory requirements affecting proposed mitigation;
- any planning or licence conditions;
- responsibility and ownership of the Plan, including financial agreements in place, or required in future;
- timelines for mitigation implementation; and
- a procedure to ensure review and update of the Plan.

## 13. Presentation in an EIA Report

IEMA's <u>Principles on climate change adaptation & EIA</u><sup>17</sup> (published in 2010) set out the approach to be used in presenting climate change information within an EIA Report (or Environmental Statement):

- Where adaptation is considered in EIA it must be clearly presented within the EIA Report. This could be in a climate change chapter, if it is felt there is sufficient analysis and assessment of climate resilience to warrant it, however it is not necessary to always have a separate climate chapter. Alternatively, the consideration of climate change resilience can be presented in the analysis of alternatives, and the assessment of In-Combination Climate Change impacts within each individual topic chapter.
- Any modelling or detailed quantification of the effects of the changing climate in combination with the project's anticipated impacts should be presented, as relevant, within an appendix. This should be appropriately cross-referenced within the main EIA Report.
- Where other assessments of the effect of climate change on either the project or the environment are required, they should be referenced within the EIA Report. As a minimum, the EIA Report must summarise any other climate-related report's findings and make effective cross-reference to it.

Recognising the EIA Report as an important tool for informing meaningful consultation and decision-making, the climate aspects of the project (whether standalone or integrated into other chapters), must be written in a manner that makes it easy for stakeholders and other interested parties to understand the approach and findings of the EIA.

## **14. Appendix 1** – Climate Change Risk Assessment

#### Climate change risk assessment methodology

Climate change risk assessment is a risk assessment-based methodology for identifying potential climate impacts and assessing their severity.

Carrying out a climate change risk assessment, at the simplest level, can be summarised into the following steps:

- identifying potential climate change risks to a scheme or project;
- assessing these risks (potentially prioritising to identify the most severe); and
- formulating mitigation actions to reduce the impact of the identified risks.

Any assessment of risk includes assessing the likelihood (or probability) and magnitude (or severity) of the impacts identified. This method is widespread within the climate change resilience assessments carried out by projects and cities to date.<sup>18</sup>

Definitions of likelihood and magnitude will vary from scheme to scheme, and should be tailored to a specific project. It is not within the scope of this guidance to prescribe a single approach to the assessment of likelihood and magnitude of climate impacts.

As general considerations, the assessment of likelihood should include consideration of available climate projections data for the project.

Assessment of the magnitude of impacts should take into account factors including:

- the acceptability of any disruption in use if the project fails;
- its capital value if it had to be replaced;
- its impact on neighbours;
- the vulnerability of the project element or receptor; and
- if there are dependencies within any interconnected network of nationally important assets on the new development.

Examples of how likelihood and magnitude have been defined in projects to date are included below:

#### Table 4 – Likelihood and consequence criteria used in Highways England EIA projects

#### Likelihood categories

Likelihood Category	Description (probability and frequency of occurrence)
Very high	The event occurs multiple times during the lifetime of the project (60 years), e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years), e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years), e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the project (60 years), e.g. once in 60 years.
Very low	The event may occur once during the lifetime of the project (60 years).

#### Table notes:

- Project lifetime is considered to include construction and operational stages.
- Project lifetime is taken to be 60 years in line with WebTAG.

#### Measure of consequence.

Consequence of Impact	Description
Very large adverse	National-level (or greater) disruption to strategic route(s) lasting more than 1 week.
Large adverse	National-level disruption1 to strategic route(s) lasting more than 1 day but less than 1 week <b>OR</b> Regional level disruption to strategic route(s) lasting more than 1 week.
Moderate adverse	Regional level disruption to strategic route(s) lasting more than 1 day but less than 1 week.
Minor adverse	Regional level disruption to strategic route(s) lasting less than 1 day.
Negligible	Disruption to an isolated section of a strategic route lasting less than 1 day.

<sup>18.</sup> Two examples: Public Infrastructure Engineering Vulnerability Committee (PIEVC) a climate risk assessment methodology developed in Canada by Engineers Canada, as used in the Toronto Hydro-electric system limited climate change vulnerability assessment report (Aecom & RSI, 2015). Separately, C40 Cities climate change risk assessment guidance (C40 Cities, 2018), here defines risk levels as 'likelihood x impact'.

		Measure of Likelihood				
		Very low	Low	Medium	High	Very High
o	Negligible	NS	NS	NS	NS	NS
e of	Minor	NS	NS	NS	S	S
nbe	Moderate	NS	NS	S	S	S
Mea	Large	NS	S	S	S	S
0	Very large	NS	S	S	S	S

#### Significance matrix

Table notes:

NS = Not significant
S = Significant

The criteria as defined by the Canadian risk assessment methodology PIEVC is summarised below.

#### Table 5 – PIEVC Methodology: Probability scores, Severity scores and risk matrix

PIEVC (Version 10) Probability Scores – Method B

Score	Probability		
0	<0.1%	< 1 in 1,000	
1	1%	1 in 100	
2	5%	1 in 20	
3	10%	1 in 10	
4	20%	1 in 5	
5	40%	1 in 2.5	
6	70%	1 in 1.4	
7	> 99%	> 1 in 1.01	

#### Source:

AECOM, RSI, 2015. Toronto Hydro-Electric System Limited. Climate Change Vulnerability Assessment. Toronto: AECOM, pp.1-92. [online] Available at: http:// www.piev xternal\_ june\_1\_2015\_-\_sep\_14\_revision\_web.pdf. [Accessed 11 Nov. 2015].

#### PIEVC (Version 10) Severity Scores – Method E

Score	Method E					
0	Negligible or Not Applicable					
1	Very Low/Unlikely/Rare/Measurable Change					
2	Low/Seldom/Marginal/Change in Serviceability					
3	Occasional Loss of Some Capacity					
4	Moderate Loss of Some Capacity					
5	Likely Regular/Loss of Capacity and Loss of Some Function					
6	Major/Likely/Critical Loss of Function					
7	Extreme/Frequent/Continuous/Loss of Asset					

#### Source:

Extracted from Toronto Hydro-Electric System Limited. Climate Change Vulnerability Assessment (AECOM, RSI, 2015)

PIEVC provides two models for scoring the severity of an event. Method E is the more qualitative assessment, which is suitable when there is insufficient hard data to support Method D, which is a numerical method.

#### **PIEVC Risk Rating Matrix**

Severity	7	0	7	14	21	28	35	42	49
	6	0	6	12	18	24	30	36	42
	5	0	5	10	15	20	25	30	35
	4	0	4	8	12	16	20	24	28
	3	0	3	6	9	12	15	18	21
	2	0	2	4	6	8	10	12	14
	1	0	1	2	3	4	5	6	7
	0	0	0	0	0	0	0	0	0
		0	1	2	3	4	5	6	7

#### Probability

Low Risk	Special Case	Medium Risk	High Risk
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# **15. Appendix 2** – Legislative and Policy Setting

#### 15.1. The 'EIA' Directive 2014/52/EU

Directive 2014/52/EU<sup>19</sup> on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as 'the EIA Directive') came into force on 16th April 2014 and was transposed into UK law by the Town and Country Planning (Environmental Impact Assessment) Regulations May 2017. <sup>20</sup>

The revisions to the Directive do not specifically refer to climate change in Article 3 (they simply refer to climate), but the need to consider climate change specifically is confirmed through revisions to Annex IV – see below.<sup>21</sup>

The revisions identify the important role that EIA can play in assessing climate change, stating in preamble of the 2014 amendments to the EIA Directive <sup>22</sup> that:

(7) Over the last decade, environmental issues, such as resource efficiency and sustainability, biodiversity protection, climate change, and risks of accidents and disasters, have become more important in policy-making. They should therefore also constitute important elements in assessment and decisionmaking processes.

#### And

(13) *Climate change* will continue to cause damage to the environment and compromise economic development. In this regard, it is appropriate to assess the impact of projects on climate (for example, greenhouse gas emissions) and their vulnerability to climate change.

The 2014 amendments to the EIA Directive incorporate the inclusion of both climate and climate change within:

#### 'Article 3:

 'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors: (a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

(c) land, soil, air, water and climate;

(d) material assets, cultural heritage and the landscape;

(e) the **interaction<sup>23</sup>** between the factors referred to in points (a) to (d).

### • Annex III: (Criteria to determine whether the projects listed in Annex II should be subject to an EIA)

- Where selection criteria to determine whether the projects listed in Annex II should be subject to an EIA are to include amongst other characteristics:
  - 1(f) 'the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge';

### Annex IV: (Information to be included within the EIA Report)

- (4) A description of the factors specified in Article
   3(1) likely to be significantly affected by the project, including climate (for example, greenhouse gas emissions, impacts relevant to adaptation).
- (5) A description of the likely significant effects of the project on the environment resulting from, inter alia,
  - (f) The impact of the project on climate (for example, the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.'

<sup>19.</sup> Directive 2014/52/EU amending the EIA Directive 2011/52/EU - https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0052

<sup>20.</sup> http://www.legislation.gov.uk/uksi/2017/571/contents/mac

Annex IV sets out the information to be included in an EIA Report (i.e. formerly the Environmental Statement). Paragraph 5(f) therein has specific requirements relating to climate change.
 Ibid.

<sup>23.</sup> The reference to interactions between the 'factors' provides the facility to consider the effect that climate may have on issues considered under other factors (i.e. the influence climate stresses may have on biodiversity considerations of the project).

#### 15.2. The UK Town and Country Planning (Environmental Impact Assessment) Regulations 2017<sup>24</sup>

The requirements of the 2014 amended EU EIA Directive were transposed into UK law by the UK Town and Country Planning (Environment Impact Assessment) Regulations 2017 and came into force on 16th May 2017.

The amended regulations introduce climate change as a new topic, broadening the potential scope of an EIA.

The regulations require the impact that the project will have on climate change to be assessed alongside an assessment of the project's vulnerability to climate change. The regulations state the following information must be included in the Environment Statement:

**5.** A description of the likely significant effects of the development on the environment resulting from, inter alia:

(f) the impact of the project on climate (for example, the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;

#### 15.3. EU Guidance

In 2013, the European Commission launched guidance documents that focussed on how to consider Biodiversity and Climate Change in EIA<sup>25</sup> and SEA<sup>26</sup> (Strategic Environmental Assessment). The EIA-focussed guidance provides useful context on the types of risks that are likely to increase in line with our changing climate, and also provides some direction on how these risks could interact with environmental factors (e.g. water, air, land, etc) listed in Article 3 of the EIA Directive. Given the EU-wide scope of the guidance, it inevitably retains a strategic focus and only provides a broad, question-oriented approach to advising on the actual assessment of climate change in EIA. While a key reference document for practitioners working in this area, further professional judgement will be needed to fully account for climate change in many EIA processes, in line with the guidance provided below. A recording of an IEMA webinar from May 2013 – led by the European Commission and one of the Guide's principle authors – is available, and provides a useful introduction to the Commission's ambitions for EIA's consideration of climate.<sup>27</sup>

#### 15.4. Wider UK Policy and Regulation

The Climate Change Act 2008 established the context for Government action and incorporated the requirement to undertake Climate Change Risk Assessments,<sup>28</sup> and to develop a National Adaptation Programme (NAP)<sup>29</sup> to address opportunities and risks from climate change. The Government commissioned the completion of the National Climate Change Risk Assessment which was reported in January 2012. The CCRA provides a useful basis for assessing the likely future environment which EIAs need to consider, and provides information on the range of impacts likely to be experienced in the following sectors: *Agriculture, Biodiversity & Ecosystem Services, Built Environment, Business, Industry and Services, Energy, Floods and Coastal Erosion, Forestry, Health, Marine & Fisheries, Transport and Water.* <sup>30</sup>

The Centre for Climate Change Economics and Policy produced a policy brief in March 2013 to inform the preparation of the NAP, incorporating useful guidance on the NAP and flow diagrams to consider when undertaking climate change in an appraisal (note, appraisal is different to EIA).

30. Summary and technical scientific reports on all these sectors are available along with 'The UK Climate Change Risk Assessment 2012 Evidence Report'.

<sup>24.</sup> http://www.legislation.gov.uk/uksi/2017/571/schedule/2/made

<sup>25.</sup> ec.europa.eu/environment/eia/pdf/EIA Guidance.pdf

<sup>26.</sup> ec.europa.eu/environment/eia/pdf/SEA Guidance.pdf

<sup>27.</sup> http://www.iema.net/event-reports/introducing-european-commissions-eia-and-sea-guides-integrating-climate-change-and

<sup>28.</sup> Numerous reports produced as part of the national Climate Change Risk Assessment are summarized in 'UK Climate Change Risk Assessment:

Government Report'. January 2012, HM Government. <u>https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-govern-</u> ment-report

<sup>29.</sup> https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/209866/pb13942-nap-20130701.pdf

In terms of planning, the UK Government addresses climate change through the National Planning Policy Framework (NPPF). This recognises that planning plays a key role in minimising vulnerability, providing resilience and managing risks associated with climate change.<sup>31</sup> The NPPF does not make specific reference to EIA's role in mitigating and adapting to climate change; however, it does recognise that local planning authorities should adopt proactive strategies to mitigate and adapt to climate change.

The NAP is primarily for England but also covers reserved, excepted and non-devolved matters. The individual Devolved Administrations (Scotland, Wales and Northern Ireland) have developed their own programmes and the UK Government is working with them to share areas of common interest, to ensure a consistent approach in the shape and focus of all the programmes. Details of the specific approaches being taken in each of the Devolved Administrations are set out below.

#### Scotland

The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017<sup>32</sup> include a requirement for the same information specified in the UK Town and Country Planning (EIA) Regulations 2017 to be included in the Environmental Report (referred to as Environmental Statement in England, Wales and Northern Ireland) in relation to climate change.

The Climate Change (Scotland) Act 2009 places a duty on Scottish Ministers to set out a programme for climate change adaptation. The first Scottish Climate Change Adaptation Programme (SCCAP) was launched in 2014.<sup>33</sup> The SCCAP aims to build resilience of Scotland's people, environment and economy to the impacts of climate change. Progress on the programme is reported annually. The Scottish Government are in the process of developing a new five-year climate change adaptation programme.

In 2015, the Scottish Government introduced the Climate Change (Duties of Public Bodies: Reporting Requirements) (Scotland)<sup>34</sup> Order, which places a requirement on 'major players' in the Scottish public sector to annually report on their compliance with climate change duties. These requirements include both emissions reporting alongside climate resilience and adaptation efforts.

The Scottish Government also funds the Adaptation Scotland<sup>35</sup> programme which provides advice and support to the Scottish public sector, businesses and communities to ensure they are equipped for a changing climate. A new Climate Change Bill was introduced to Parliament in May 2018 by the Scottish Government.<sup>36</sup> It will amend the Climate Change (Scotland) Act 2009, increasing the 2050 target to 90% for all greenhouse gas emissions.

#### Wales

The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 includes the requirement for the same information to be included in the Environmental Statement<sup>37</sup> in relation to climate change.

The Climate Change Strategy for Wales<sup>38</sup> sets out an adaptation framework to present a national, co-ordinated approach to ensure that Wales understands the risks and opportunities that climate change presents and is well placed to adapt in a sustainable way. The Welsh Government has also developed Sectoral Adaptation Plans across five important sectors and has put programmes in place to embed resilience measures against extreme weather events and climate change into all it delivers.<sup>39</sup>

39. http://gov.wales/topics/environmentcountryside/climatechange/publications/?lang=en

<sup>31.</sup> DCLG (2012) National Planning Policy Framework (NPPF), Chapter 10. <u>https://www.gov.uk/government/uploads/system/uploads/attachment\_data/</u> <u>file/6077/2116950.pdf</u>

<sup>32.</sup> http://www.legislation.gov.uk/ssi/2017/102/pdfs/ssi\_20170102\_en.pdf

<sup>33.</sup> https://www.gov.scot/publications/climate-ready-scotland-scottish-climate-change-adaptation-programme/

<sup>34.</sup> http://www.legislation.gov.uk/ssi/2015/347/contents/made

<sup>35.</sup> https://www.adaptationscotland.org.uk/

<sup>36.</sup> https://www.gov.scot/policies/climate-change/climate-change-bill/

<sup>37.</sup> https://www.legislation.gov.uk/wsi/2017/567/pdfs/wsi\_20170567\_mi.pdf

<sup>38.</sup> http://wales.gov.uk/topics/environmentcountryside/climatechange/publications/adaptationplan/?lang=en

The Environment (Wales) Act 2016<sup>40</sup> provides a framework for managing natural resources in Wales in a manner which is climate change ready. The Well-being of Future Generations (Wales) Act 2015<sup>41</sup> aims to improve the social, economic, environmental and cultural well-being of Wales. The Act contains a number of areas which are important to climate change as this is integral to the future well-being of the country.

The Welsh Government is developing a five-year Climate Change Adaptation Plan<sup>42</sup> for Wales which contains actions to reduce the risks of climate change to Wales. The consultation for the Draft Climate Change Adaptation Plan ended in March 2019.

#### Northern Ireland

The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017<sup>43</sup> also requires the Environmental Statement to include the same information in relation to climate change as the UK Town and Country Planning (Environment Impact Assessment) Regulations 2017.

A cross-departmental Northern Ireland Adaptation Programme (NICCAP) has been developed for the period 2014-2019. Progress on the NICCAP is reported annually to the Northern Ireland Executive by the Cross-Departmental Working Group on Climate Change.<sup>44</sup> The Department of Agriculture, Environment and Rural Affairs (DAERA) is currently developing the next NICCAP which will cover the period 2019-2024.

#### 15.5. Potential impact of Brexit on UK Regulations

At the time of writing, following the triggering of Article 50, the UK is in preparatory stages of an exit from the EU. Upon exiting the EU (including any transitional arrangements which may apply) it is understood that the extant UK legislation governing EIA will remain in place.

The primary consequence will be that the European Court of Justice will no longer hold jurisdiction over the application of EIA in the UK. However, we do not believe that this is material to the content of this guidance note and until such time as the UK Parliament instigates new or revised legislation for EIA, this guidance will remain current.

42. <u>https://gov.wates/climate-change-adaptation-plan-for-wates</u>

44. http://www.doeni.gov.uk/index/protect\_the\_environment/climate\_change/climate\_change\_adaptation\_programme.htm

<sup>40. &</sup>lt;u>https://www.wcva.org.uk/what-we-do/the-environment-(wales)-act</u>

<sup>41.</sup> http://futuregenerations.wales/about-us/future-generations-act/ 42. https://gov.wales/climate-change-adaptation-plan-for-wales

<sup>43.</sup> https://www.legislation.gov.uk/nisr/2017/83/pdfs/nisr\_20170083\_en.pdf

## 16. Appendix 3 – Case Studies

The following case studies illustrate emerging best practice in the assessment of climate change resilience and adaptation within EIA. They have been kindly provided by contributors to this guidance.

#### 16.1. Case Study 1: Energy from Waste (EfW) facility

Turley Ltd was commissioned to carry out an EIA for this EfW facility.

**1. Summary of the project:** name, brief description of key aspects, sector, scale and expected lifespan of project.

Proposed 49MW Energy from Waste (EfW) facility at Protos, Cheshire, on behalf of This is Protos LLP ('TIP', a company of Peel Environmental).

EIA undertaken as part of the Section 73 Application seeking removal of a condition attached to the original planning permission requiring delivery of the first phase of a rail line and rail head prior to operation of the EfW facility. The ES was prepared subsequent to implementation of the 2017 UK EIA Regulations and as a result, climate change was scoped in (unlike the 2007 and 2016 ESs prepared previously for the project).

A 25-year lifespan was assumed for the purpose of the climate change assessment work.

**2. Reporting:** were the results of the assessment reported in a separate chapter or in-built to the EIA report?

The climate change adaptation assessment is reported within a separate Climate Change ES chapter (which also covers climate change mitigation issues).

**3. Key challenges:** Given the location of the project on the south bank of the Manchester Ship Canal, it was important to understand the potential implications of sea level rise and ensure the development was not at risk over the long term. This required consideration of climate change projections for sea level rise and existing and planned sea defences for which information is limited. **4. Accessibility of sector guidance:** is there any sector guidance? If yes was it used? Provide references to guidance. If guidance exists and was not used, set out reasoning behind this.

No sector-specific guidance was identified or used by the climate change adaptation assessment (although a number of sector-specific guidance documents were identified and used for the GHG emissions/climate change mitigation assessment). The IEMA guidance on assessment of adaptation and resilience in EIA, and the guidance on mitigation, were consulted during the development of the assessment.

# 5. Climate scenarios and timelines considered and reasoning for this: The proposed development was anticipated to be constructed from 2019-2022, commencing operations in 2022 and operating until 2047. UKCP09 climate projections for the 2020s and

2050s time periods were selected on the basis of being commensurate to the above construction and operational phase timescales of the development proposals.

The central estimate for the high emissions scenario was used to establish likely worst-case changes to climatic conditions in the North West of England during these periods.

**6. Future baseline:** did you present a future baseline (summary of projected changes to climate variables in future). If yes, how/in which format did you present it? Include example for case study.

Yes, separate tables are presented on projected future baseline conditions for the construction (2020s) and operational phases (2050s). These tables present future changes projected to climatic parameters of key relevance to the proposals in the form of percentage increases/decreases (for winter, summer and annual rainfall) and increases/decreases in temperate (°C) (for winter, summer and annual temperatures).

Timeframe	2020s	2050s			
	Increase in winter mean temperature is 1.2C	Increase in winter mean temperature is 2.1C			
	Increase in summer mean temperature is 1.5C	Increase in summer mean temperature is 3C			
Tomporaturos	Increase in summer mean maximum	Increase in summer mean maximum			
remperatures	temperatures is 1.9C	temperatures is 3.8C			
	Increase in summer mean daily minimum	Increase in summer mean daily minimum			
	temperature is 1.4C	temperature is 2.9C			
	Change in annual mean precipitation is 0%	Change in annual mean precipitation is 0%			
Rainfalls	Change in winter mean precipitation is 4%	Change in winter mean precipitation is 13%			
	Change in summer mean precipitation is -5%	Change in summer mean precipitation is 18%			

#### Table 6 - Projected future baseline conditions for the construction (2020s) and operational phases (2050s)

Given the location of Protos on the south bank of the Manchester Ship Canal, UKCP09 sea level rise projections up to the year 2095 were also considered.

7. Treatment of vulnerability: method used to assess, any significant impacts identified, any significant changes made to design as a consequence of the climate vulnerability assessment.

Thresholds for 'magnitude of effect', 'sensitivity of receptor', 'significance of effect' and 'climate change resilience' determined using IEMA guidance and professional judgement. Thresholds are presented for 'negligible', 'very low', 'low', 'moderate' and 'high' levels. Thresholds were defined as follows:

- High sensitivity Receptor particularly sensitive to the climate effect and potential impacts, and/or receptor includes safety critical infrastructure which if damaged could result in significant risks to people and/or property. Mitigation required to reduce the impact as a priority.
- Negligible sensitivity Receptor not sensitive to the effects of climate change effects and mitigation not required.
- High effect Ongoing annual impact with the potential for extreme events to cause operational or

structural damage. For example, higher temperatures causing a major failure in structures or buildings with the potential for injury.

 Negligible effect – Minimal impact, either positive or negative and likely to be mitigated through resilience measures included through regulatory or best practice.

The FRA prepared for the previous (2016) ES had already accounted for projected effects of climate change on peak rainfall, peak river flows and sea level change and resulted in a range of mitigation measures that were implemented into the development design including minimum floor levels, minimum road levels, provision of a flood warning system and preparation of a flood plan showing evacuation procedures.

So, while no changes to development design were required as a consequence of the climate assessment, water management measures were included in Construction Environmental Management Plan (CEMP) to monitor mains water consumption and promote water efficiency during construction in response to the increased risk of drought in relation to climate change.

#### 8. Treatment of in-combination effects or

**environmental effects:** method used, any significant impacts identified, any key changes made to the design or to mitigation measures as a consequence.

Regarding intra-project cumulative effects, a number of potential interactions between the future effects of climate change and other ES topics are identified with the ES chapter. Where necessary, the technical team responsible for those topics were contacted to discuss these potential in-combination effects, with appropriate assessment and mitigation undertaken accordingly.

No inter-project cumulative effects are anticipated on the basis that climate change adaptation effects and impacts are specific to the development and will not result in impacts to neighbouring development.

9. Any mitigation, management or monitoring identified, including post-EIA: The key climate change adaptation mitigation measures (relating to flood risk and habitat creation  $\mathcal{E}$  management, with measures such as consideration of climate tolerant species) are enforced via planning condition and anticipated to reduce identified effects to become not significant, and as a result no post-mitigation monitoring is required.

**10. Lessons learnt:** The level of policy, legislation and tertiary mitigation available, even in relation to risks such as sea level rise is extensive. Early engagement with project consultants and the design team is essential to ensuring the potential impacts of climate change are understood and mitigated as part of the design stage. Increased awareness and understanding of potential impacts in relevant disciplines can reduce the scope of assessment required significantly.

### 16.2. Case Study 2: Expansion of London Stansted Airport

Arup was commissioned to carry out an EIA for the proposed Stansted Airport expansion project.

**1. Summary of the project:** name, brief description of key aspects, sector, scale and expected lifespan of project.

*Name:* Transforming London Stansted Airport, 35+ planning application *Sector:* Aviation

Scale and short description: New airfield infrastructure. This new infrastructure will enable Stansted Airport to make better and more efficient use of its existing single runway. The planning application seeks permission for an additional rapid access taxiway (RAT) and rapid exit taxiway (RET) to serve the existing runway, together with nine additional aircraft parking stands. STAL also seeks permission for a proposed 23% uplift to its existing annual passenger cap of 35 million passengers per annum (mppa) to 43mppa, while retaining its approved limit of 274,000 total aircraft movements per annum. Together, these physical and operational changes comprise the proposed development (also referred to as '35+ Project').

**2. Reporting:** were the results of the assessment reported in a separate chapter or in-built to the EIA report?

The results of both a climate change resilience assessment, and an In-Combination Climate Change Impacts assessment were presented in a chapter within the Environmental Statement.

**3. Key challenges:** Few precedents available of climate change assessment for airports within EIAs. Assessments required expert judgement as little guidance on qualitative assessments was available.

At the time of the project, the UK TCPA regulations had only recently been amended to include a requirement to assess climate change. A clear and comprehensive reporting was of high importance to address the new requirements.

**4. Accessibility of sector guidance:** is there any sector guidance? If yes was it used? Provide references to guidance. If guidance exists and was not used, set out reasoning behind this.

Table 7 - Tec	hnical guidance	relevant to the	development
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Technical guidance	Relevance
ICAO (2016) On Board a Sustainable Future: 2016	Extreme weather risks and international airport case
Environmental Report.	studies
European Commission (2013) Guidance on Integrating	Informed development of methodologies for the
Climate Change and Biodiversity into EIA.	assessments
EUROCONTROL (2013) Challenges of Growth 2013:	Climate change risks to the aviation industry up to 2050
Summary Report.	and potential resilience measures
EUROCONTROL (2016) European Aviation Environmental	Climate change risks to the aviation industry and
Report.	adaptation case studies
Institute of Environmental Impact Assessment (IEMA) (2015)	Describes approach to integrating CCAR assessments into
IEMA guide to climate change resilience and adaptation.	the EIA process in the UK
Department for Communities and Local Government	Focus on integration of adaptation and mitigation
(DCLG) (2017) Planning practice guidance.	approaches in the planning process

### 5. Climate scenarios and timelines considered and reasoning for this:

**Timelines**: 2020s and 2050s, these periods cover the construction and operation stages of the proposed development and represent short- and medium-term climate change impacts

**Scenarios:** medium emissions and high emissions scenario at the 50% probability level. A reference range is provided in each case, using the 10% probability level medium scenario as a lower limit and the 90% probability level high scenario as an upper limit. These scenarios and probability levels were used to provide a wide range of credible projected changes including an indicative level of uncertainty.

**6. Future baseline:** did you present a future baseline (summary of projected changes to climate variables in future). If yes, how/in which format did you present it? Include example for case study.

Yes, the future baseline was presented in a table format. See example at the end of this document.

7. Treatment of vulnerability: method used to assess, any significant impacts identified, any significant changes made to design as a consequence of the climate vulnerability assessment.

The approach to assess CCR included:

- 1. analysis of relevant climate change and weather data, emissions scenarios, timescales and probability levels;
- 2. identification and assessment of climate hazards and disruptive weather conditions;
- identification of potential risks from these climate hazards to the infrastructure and operations of STAL;
- consideration of the resilience of the planning application within the context of any incorporated mitigation measures;
- 5. identification of need for any further resilience measures.

No significant changes were made to the design due to identified climate change impacts. Nonetheless, a series of mitigation measures to reduce climate change impacts were recommended to complement the existing embedded mitigation, related to: demand on energy supplies due to increase in temperatures, review of allowances for maximum aircraft operating temperatures, wind speeds for take-off, review and monitor the capacity of balancing ponds; and monitoring of lightning events. It was recommended that these measures should be incorporated as part of STAL's update to their climate change adaptation risk register in 2021.

#### 8. Treatment of in-combination effects or

**environmental effects:** method used, any significant impacts identified, any key changes made to the design or to mitigation measures as a consequence.

The method used to assess ICCI effects involved: defining a future baseline as for the climate change resilience assessment , review of guidance and topic-specific literature on climate change impacts; assessment of each environmental topic's respective significant effects and the corresponding mitigation measures identified by each topic; assessment of potential in-combination impacts and significant effects; consideration of additional mitigation measures and inclusion of allowances for future mitigation measures and monitoring.

No ICCI significant effects were identified for the construction phase; for operation, the following effects were identified:

- Increased stress on existing road and rail network in combination with increase in frequency of extreme weather events negatively impacting surface access and transport.
- Increased prevalence of hotter and drier conditions in combination with increase in vehicle and aircraft emissions may result in changes in concentrations of nitrogen oxides (NOx), fine particulate matter (PM10 and PM2.5) and ozone (O3).
- Increase in frequency of extreme weather events in combination with direct and indirect job creation during operation leading to increased stress on local infrastructure.

However, no further mitigation was required because adequate mitigation measures were already in place. The following recommendations were made for monitoring: ensuring climate change resilience plans are robust; continued monitoring of trends in weather events; and continued review of resilience measures related to interdependencies.

#### 9. Lessons learnt:

- importance of awareness and understanding of climate change assessments within EIAs, including why they are required and how they are carried out;
- ensure any documents relating to current operations, resilience plans, etc. if available are considered early on in the assessment in the climate change resilience assessment;
- engagement with other topic experts is key for the ICCI assessment. Clearly communicate to other topic experts that the in-combination assessment requires findings from these assessment topics as an input.

		'202	20s' (2010-20	)39)	'2050s' (2040-2069)		
F * =	Parameter and baseline (in brackets) baseline data unavailable	Medium emissions scenario (50% level)	High emissions scenario (50% level)	Range⁴⁵	Medium emissions scenario (50% level)	High emissions scenario (50% level)	Range
	Mean winter daily temperature [°C] (*)	5.11	5.12	4.36-5.98	5.98	6.30	4.92-7.61
ature	Mean summer daily temperature [°C] (*)	17.2	17.2	16.29-18.39	18.42	18.76	16.98-20.84
	Mean daily summer maximum temperature [°C] (21.1)	22.62	22.57 <sup>46</sup>	21.26-24.07	24.11	24.63	22.05-27.41
Temper	Mean daily summer minimum temperature [°C] (11.2)	12.22	12.27	11.39-12.35	13.39	13.81	11.98-15.85
	Mean daily winter maximum temperature [°C] (6.9)	8.0	8.0	7.16-8.98	8.77	9.04	7.48-10.77
	Mean daily winter minimum temperature [°C] (1.4)	2.20	2.28	1.29-3.22	3.10	3.54	1.69-5.22
Precipitation	Annual mean daily precipitation [mm/day] (1.68)	1.67	1.67	1.59-1.76	1.67	1.66	1.58-1.76
	Winter mean daily precipitation [mm/day] (1.63)	1.74	1.75	1.58-1.29	1.89	1.92	1.68-2.24
	Summer mean daily precipitation [mm/day] (1.70)	1.58	1.63 <sup>47</sup>	1.27-1.99	1.39	1.38	1.03-1.84
Wind	Change in winter mean daily wind speed (*)	-	-	-	-	-	-
	Change in summer mean daily wind speed (*)	-	-	-	-	-	-
Relative humidity	Annual relative humidity (*)	81.55	81.58	79.89-83.11	80.42	80.08	77.95-82.35
Cloud cover	Annual cloud cover [%] (*)	0.66	0.66	0.64-0.69	0.65	0.65	0.62-0.68

#### Table 8 - Climate change projections data for Stansted Airport expansion Climate Assessment

47. Value for the '2020s' high emission scenario at the 50% probability level is marginally higher than value for the medium emissions scenario, but overall trend for the 2020s and 2050s is a decrease.

<sup>45.</sup> Range is from 10% probability level at the medium emissions scenario to 90% probability level at the high emissions scenario.

<sup>46.</sup> Value for the '2020s' high emission scenario at the 50% probability level is marginally lower than value for the medium emissions scenario, but overall trend for the 2020s and 2050s is an increase.
## 16.3. Case Study 3: HS2 Phase 1 and 2a

This case study is based on published information/ lessons learnt from HS2 (publicly available information).

**1. Summary of the project**: name, brief description of key aspects, sector, scale and expected lifespan of project.

- High Speed Two (HS2) is the Government's proposal for a large-scale, new, high-speed north-south railway. The proposal is being taken forward in phases: Phase One will connect London with Birmingham and the West Midlands; Phase 2a will extend the route to Crewe; and Phase 2b will extend the route to Manchester, Leeds and beyond.
- The lifespan of the project is excess of 120 years.

**2.Reporting:** were the results of the assessment reported in a separate chapter or in-built to the EIA report?

- The results of the assessment were presented in a separate chapter. Three distinct climate assessments were presented in Volume 3 Route-wide effects of the EIA:
  - a climate change resilience assessment;
  - an In-Combination Climate Change Impacts assessment; and
  - a greenhouse gases (GHG) assessment.
- In addition, more detailed information was presented in Volume 5 Appendices:
  - climate data and information (presented current and future baseline data);
  - results of climate change assessments; and
  - summary greenhouse gas calculation outputs.

## 3. Key challenges:

- Determining:
  - which climate change projection to use as this informs the parameters to account for in the assessment and design process;
  - what the environmental baseline will be under the future projected climate – and how can it be assessed.
- Addressing longer-term uncertainty of climate projections (beyond 2050).

## 4. Accessibility of sector guidance:

The following guidance was consulted at the time of the development of the climate assessments:

- IEMA Guidance on Climate change resilience and adaptation in EIA (2015);
- guidance on climate change allowances to be used in flood risk assessments, produced by the Environment Agency in 2016 and set out in the National Planning Policy Framework (NPPF).

## 5. Climate scenarios and timelines:

- The UK Climate Projections 2009 (UKCP09) were used. At the time, these were the most recent projections available for the UK.
- Timelines of the project were used to inform the study:

	Interim preliminary design and future	Construction	Operation (start) and maintenance	Operation (peak) and maintenance	Operation (continued) and maintenance	Design life of Proposed Scheme
Proposed Scheme activities stages	2012-2017	2017-2026	2026 onwards	2041	2041 onwards	2026-2146
UKCPo9 time period	20205 (2010-2039)	20205 (2010-2039)	20205 (2010-2039)	20505 (2040-2069)	20805 (2070-2099)	2100+ (Outside standard UKCPo9 time periods)

## Table 9 - Project timeline in relation to UKCPo9 time period

 In order to provide a balanced and representative approach, projections from both the Medium and High emissions scenario were taken (both at 50th percentile level), for two time periods: the 2020s (2010-2039) and the 2080s (2070-2099).

**6. Future baseline**: did you present a future baseline (summary of projected changes to climate variables in future)? If yes, how/in which format did you present it? Include example for case study.

- A future baseline was presented in Volume 5 Technical appendix Climate data and information (CL-001-000). This included projected changes for four variables: temperature, precipitation, relative humidity and cloud cover; with data given for two timelines the 2020s and the 2080s.
- A range of values was presented, in order to provide a representative indication of projected future changes. Hence the projections data for both the medium emissions and high emissions scenario (both at 50th percentile level) were presented.

7. Treatment of vulnerability: method used to assess, any significant impacts identified, any significant changes made to design as a consequence of the climate vulnerability assessment.

A high-level climate change resilience assessment was undertaken to identify the potential risks of climate change on the Proposed Scheme and to assess the Proposed Scheme's resilience and capacity to cope with these potential risks. The assessment considered risks posed by climate-related hazards such as extreme hot and cold weather, heavy rain, high winds and storms to the infrastructure and assets associated with the railway including tracks, tunnels, overhead line equipment, rolling stock, stations and earthworks. The likelihood and consequences of climate hazards were considered based upon the trends within the UK climate projections.

No significant effects were found for construction or operation. This is due to the range of mitigation measures which were already embedded in the design, or were to be included in the development of maintenance and monitoring procedures, or to be developed during future design stages. Key examples of how climate change resilience was addressed include:

- the Proposed Scheme is designed to the 1 in 100 year plus climate change allowance (which is dependent on river basin and flood zone) peak river flow event. In addition, the railway infrastructure will be protected from the 1 in 1,000 year peak river flow event;
- drainage is designed to the 1 in 100 year plus climate change allowance (40% increase) peak rainfall event;
- lineside vegetation and landscape planting areas will be managed to minimise the likelihood of windborne debris blocking watercourses and drainage systems, obstructing the tracks or causing damage to overhead line equipment; and
- measures to mitigate the potential risk of increased lightning strikes to structures and systems will be addressed during further design stages.

## 8. Treatment of in-combination effects or

**environmental effects:** method used, any significant impacts identified, any key changes made to the design or to mitigation measures as a consequence.

The assessment considered how climate change, in combination with the impacts of the Proposed Scheme, may affect communities, businesses and the natural, historic and built environment along the Phase 2a route.

Each environmental topic considered changes to long-term, seasonal average and extreme weather events as set out in the future baseline, in order to carry out a qualitative assessment of the combined effects of climate change and the Proposed Scheme. One significant effect of an ICCI was found: drier and wetter conditions in future as a result of climate change were found to potentially affect the ability of 'dry' and 'wet' soils both to retain and drain moisture. This effect was relevant to both the agricultural, forestry and soils, and the landscape and visual topics considered, due to the relationships between the resilience of soils and the resilience of planted vegetation.

This effect is mitigated by the following measures:

- the creation of deeper, more moisture-retentive soil profiles to mitigate longer-term drought effects;
- the creation of better-draining soil profiles to mitigate longer-term flood effects on restored and reinstated soils where reasonably practicable; and
- permanently displaced soils to be used to reinstate soils with deeper profiles than the original where reasonably practicable (with preferably higher organic matter content);

A number of mitigation measures were also included within the design of the proposed scheme, including:

- ecological mitigation measures which will enable habitats to adapt to climate change by maintaining and enhancing ecological conditions and creating and restoring habitats to increase species' resilience to changes in climate;
- trees which will be selected from a range of latitudes and climate zones to increase species' resilience to hotter, drier and/or wetter conditions, and landscape planting palettes which will be designed to increase species' resilience and adaptability; and
- the performance of the Proposed Scheme has been assessed against a range of design floods up to and including the 1% (1 in 100) annual probability event, including the addition of the relevant future climate change allowances in line with the latest guidance from the Environment Agency.

## 9. Any mitigation, management or monitoring identified, including post-EIA:

Examples of ongoing climate change resilience post-EIA:

- Work during further design stages will assess the impacts of climate change on interdependencies between the Proposed Scheme and other organisations such as rail, road, power and telecoms infrastructure operators. This will use the assessments carried out for Phase One of HS2 as its basis; and
- Climate change resilience assessments will continue to take place throughout the design, construction and operation stages of the Proposed Scheme.

## 10. Lessons learnt:

- the effects of developing a methodology for a new assessment, in this case the ICCI assessment methodology, requires flexibility during the process of assessment;
- importance of setting of a single future baseline for topics to consider (so both climate resilience and ICCI and all topics consider the same future baseline);
- importance of presenting the future climate baseline in a manner accessible to non-climate experts, so that all environmental topics teams and design teams can access it and contribute to ICCI assessment and CCR assessment respectively; and
- importance of taking into account the full design life of the project in the climate change resilience assessment, and defining the future climate baseline accordingly. In addition, the assessment needs to be commensurate with the design stage of the project and design detail available.

# **17. Appendix 4** – Identifying the Future Climate

## 17.1. Introduction

Scientific evidence shows that our climate is changing; however, there are significant uncertainties in the 'magnitude', 'frequency' and 'spatial occurrence' either as changes to average conditions or extreme conditions. Such uncertainties generally make it difficult to assess the impacts of climate change in relation to a specific project.

An added consideration is the fact that climate change projections are based on global models simulating a range of greenhouse gas emission scenarios and look (generally) at regional responses to climate change. In comparison, almost all EIAs look at specific sites compared to regional/national-level climate change models, and the uncertainty of predicting future climate effects on such a small spatial area is potentially large. There are two aspects of uncertainty that need to be managed:

- Which climate change scenario/s are to be included in the design (i.e. how resilient to climate change does the proposed design need to be)?
- 2. What will the environmental baseline be under the future projected climate and how can it be assessed?

## 17.2. Selecting a climate change scenario

Where climate change adaptation is included in the EIA, a key step will be to define an emissions scenario and probability to identify the range of potential future climate conditions to use in the EIA. This should be done at the scoping stage. Once a projection is identified then this must be used by all disciplines thereafter as the basis of the EIA process to ensure consistency in approach.

The recommended approach is to use a high emissions scenario, in the UK this would be RCP 8.5.<sup>48</sup> However, there could be situations where additional

sensitivity testing is needed for very vulnerable, high-

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value receptors, where the impact of climate variations under other emissions scenarios may need to be considered.

Climate projections are updated periodically and it should be the responsibility of the CCAR Coordinator to ensure that the EIA is based upon the latest projections and that all the topic specialists fully understand what they are required to use in their assessments. The UK Met Office produced an updated set of climate projections in 2018, known as UKCP18. The majority of the data for these projections was published in November 2018, with the more detailed data expected for publication in late 2019. Detailed guidance on climate projections and the use of UKCP18 data is available from the UKCP18 website. <sup>49</sup>

UKCP18 considers the effects arising from a series of emissions scenarios which project how future climatic conditions are likely to change at a local level (i.e. at a sub-regional scale in the UK), accounting for naturally occurring climate variations.

During the EIA, it is important to understand and take account of the uncertainty associated with the selected climate projection and all outputs must reflect any assumptions made. It is also important to understand that the inertia in the climate system means that climate change over the next two or three decades (up to about 2040) is relatively insensitive to emissions. As such, a short lifespan development is not likely to be particularly sensitive to which emissions scenario is selected for the EIA.

However, after the 2040s, the projections for different emissions scenarios increasingly diverge and it will be important to have a considered approach to identifying the right emissions scenario to select where the planned operational life of a scheme goes significantly beyond 2040.

 <sup>48.</sup> RCP: Representative Concentration Pathways. RCPs are the new definition used by the IPCC in their latest climate projections, and are based on the projected concentration of greenhouse gases in the atmosphere in 2100, so e.g. RCP 8.5 models a radiative forcing of 8.5 in 2100. These replace the previous Low, Medium and High scenarios. There are 4 RCPs in UKCP18 (2.6, 4.5, 6.0 and 8.5), and they do not directly map onto the Low, Medium, High scenarios used previously. However, RCP 2.6 is the lowest emissions scenario, and RCP 8.5 the highest.
 49. https://www.metoffice.gov.uk/research/collaboration/ukcp

## 17.2.1. Criteria for choice of climate change scenario

1). Recommended best practice is to use the higher emissions scenario (RCP 8.5 in the latest UKCP18 projections) at the 50th percentile, for the 2080s timelines, unless a substantiated case can be made for not doing this (e.g. anticipated lifespan of the project is shorter than 2080s).

This provides a suitably conservative approach to climate assessment. Projects wanting to test a worsecase but feasible scenario are recommended to consider the 80th percentile values of the RCP8.5 for sensitivity testing.

## WHY RCP 8.5?

In the absence of alternative guidance, or a project driver indicating the use of either multiple climate scenarios, or a lower emission scenario, this guidance recommends the use of RCP 8.5.

The reason for this is to ensure a suitably conservative approach. It is also in line with the National Policy Statement on National Networks, which states that developments should use the UKCP09 high emissions scenario at the 50% probability level.

This is the recommendation in the absence of other sector-specific guidance, or guidance from planning authorities. If either of these exist, as outlined below, they should be followed.

2). If there is sectoral guidance, this will take precedence and should be followed. For example, the Environment Agency has published specific guidance on climate change for flood risk assessments. Other sectoral guidance may be less specific, but still provide helpful guidance. 3). If no sectoral guidance exists, consult with the relevant planning authority regarding the choice of emission scenario, and appropriate timeline, taking into account expected lifespan of the development, maintenance points and any post-operational lifespan (decommissioning),

Emerging practice to date has been for higherconsequence projects to use the High emissions scenario as a precautionary approach.

Once an appropriate emission scenario is selected, it can be used to build up a holistic picture of future climate. It is recommended a summary of the range of projections under the selected scenario is produced, an example of which is shown in Table 7 below, to ensure consistency across topics in the EIA.

Probabilistic projections, such as those provided by UKCP18, give a range of possible climate change outcomes and their relative likelihoods, which typically give climate information that is considered the unlikely, likely or very likely (i.e. ranging across 10th to 90th percentiles) outcomes. We recommend the use of the 50th percentile of the RCP 8.5 climate scenario. If a different scenario or different percentile is used, the EIA report should clearly set out the justification for this.

It can often be appropriate to consider a range of potential outcomes; for example, considering the 50th percentile during the design process, and also assessing the impact of 90th percentile values as sensitivity testing for worse-case scenarios.

	Variable	Time period*	5th percentile	Projected change at			
Season				10th percentile	50th percentile	90th percentile	95th percentile
		2030s	-0.1	0.1	0.9	1.8	2
	Mean	2050s	0.2	0.5	1.7	2.9	3.3
	(ºC)	2070s	0.4	0.9	2.5	4.2	4.8
Winter		2090s	1	1.5	3.6	5.8	6.4
winter		2030s	-9	-5	8	23	27
	Mean Precipitation (%)	2050s	-10	-5	13	34	40
		2070s	-12	-5	20	49	58
		2090s	-10	-3	27	63	75
	Mean Temperature (ºC)	2030s	0.1	0.4	1.3	2.4	2.6
		2050s	0.8	1.1	2.5	4	4.4
		2070s	1.2	1.8	3.9	6.1	9.5
Summer		2090s	2.2	2.9	5.8	8.7	9.5
Summer	Mean Precipitation (%)	2030s	-36	-30	-9	13	19
		2050s	-55	-48	-22	5	14
		2070s	-69	-61	-30	1	9
		2090s	-85	-77	-41	-3	7

Table 9 – Example presentation of a quantitative future baseline for key climatic variables. This is data for the South East of the UK under RCP 8.5 (the highest emission scenario in UKCP18) <sup>50</sup>

\*UKCP18 provides 20-year time slices, hence: 2030s (2020-2039), 2050s (2040-2059), 2070s (2060-2079), 2090s (2080-2099).

The source of climate projections and the range of scenarios used in the project design (and therefore the EIA process) must be clearly described in the EIA report.

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## **18. Appendix 5** – The role of the Climate Change Adaptation and Resilience Coordinator (CCAR Coordinator)

## 18.1. Introduction

There is a great deal of scientific evidence in the public domain presenting scenarios for how the climate may change. In the UK, this takes the form of future climate projections published by the Meteorological Office through the UK Climate Projection website. <sup>51</sup> These projections (currently the UKCP18 climate projections) produce information that is available to practitioners, but the information is complex and needs to be used with care. Competent advice needs to be available to EIA practitioners on how to consistently interpret this data.

## 18.2. CCAR Coordinator

IEMA recommend that every EIA team includes access to a practitioner who is knowledgeable about future climate change scenarios and experienced in the use and interpretation of future climate projections. This person should be:

- fully conversant with the UKCP18 climate projections;
- able to provide advice on the range of climate change scenarios that could be considered;
- able to access readily available information sources such as regional climate patterns and national data sets and make recommendations to the EIA Coordinator on these projections – such data sets are provided by the Met Office and the UKCP18 climate projections, and Intergovernmental Panel on Climate Change (IPCC) reports;
- able to provide advice on the potential range of effects of climate change (e.g. how temperature will vary); and

 able to work with EIA technical specialists to ensure the information being used in the EIA does not contradict any topic-specific guidance. If there are inconsistencies in the approach recommended in different technical guidance documents in relation to climate change, then the CCAR Coordinator should provide advice on how to manage these in the EIA.

It is recommended one person within an EIA team is given the responsibility of:

- identifying what climate projection information is most relevant to the EIA;
- ensuring consistency in approach to climate change in the EIA;
- writing the background on climate change in the Environmental Report or Environmental Statement, that is appropriate to the EIA, which should refer to any relevant Strategic Environmental Assessments (SEAs), policies in the Local Plan, local and national climate change adaptation plans, other EIAs for projects in the area, and local experience and observations to inform the EIA team; and
- providing information on the broad range of topicspecific guidance available in relation to climate change (e.g. NPPF guidance on water and flood risk, or DMRB guidance on drainage design and water resources impact assessment). 52

In this guide, this individual is referred to as the CCAR Coordinator. However, it is important to stress that this guide is not specifically advocating the involvement of a climate specialist; simply that a nominated team member has the required understanding of climate factors to perform the tasks outlined above.

51. http://ukclimateprojections.metoffice.gov.uk/22537

<sup>52.</sup> National Planning Policy Framework, Technical Guidance includes factors to allow for sea-level rise and rainfall changes (published by Department for Communities and Local Government, March 2012) and DMRB Volume 11, Section 3, Part 10 – HD45/09, Chapter 4 discusses climate change and how to allow for this in the EIA process.

## 19. Appendix 6 – Further Reading

Aecom & RSI (2015) Toronto hydro-electric system limited climate change vulnerability assessment.

Department for Communities and Local Government (2012) *Technical Guidance to the National Planning Policy Framework*.

Department of the Environment (1995) *Preparation of Environmental Statements for Planning Projects that Require Environmental Assessment: A Good Practice Guide. HMSO.* 

Department of the Environment, Transport and the Regions (DETR) and the National Assembly for Wales (2000) *Environmental Impact Assessment: A Guide to the Procedures. HMSO.* 

Environment Agency (2011) *Strategic Environmental Assessment and Climate Change: Guidance for Practitioners.* 

European Commission (2013) *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment.* 

Highways Agency, Transport Scotland, Welsh Assembly Government and the Department for Regional Development Northern Ireland (2008) Assessment and Management of Environmental Effects. *Design Manual for Roads and Bridges, Volume 11, Section 2, Part 5.* HA 205/08.

IAIA (2012) Climate Change in Impact Assessment – International Best Practice Principles.

IEMA (2010) <u>IEMA Principles Series - Climate Change</u> Adaptation & EIA

IEMA (2011) <u>Special Report – The State of</u> <u>Environmental Impact Assessment Practice in the UK</u>

IEMA (2017) Environmental Impact Assessment Guidance to Assessing Greenhouse Gas Emissions and Evaluating their Significance IFC (2013) Enabling Environment for Private Sector Adaptation - An Index Assessment Framework.

Morris, P. and Therivel, R. (2009) *Methods of Environmental Impact Assessment*.

Mott MacDonald & Global Sustainability Institute. (2015) *Climate Change and Business Survival.* 

OCCIAR (2014) Assessing the Treatment of Climate Change Impacts and Adaptation in Project-Level EAs in the Canadian Mining Sector.

World Bank – Climate & Disaster Risk Screening Tools (<u>http://climatescreeningtools.worldbank.org/</u>) Accessed May 2015

## Useful Sources of Future Baseline/Projections Information

Department for Business Innovation & Skills (BIS) Foresight projects <u>http://www.bis.gov.uk/foresight</u>

Department of Energy and Climate Change (DECC) (2010) 2050 Pathways Project. <u>https://www.gov.</u> <u>uk/2050-pathways-analysis</u>

Department for Environment, Food and Rural Affairs (Defra) (2012) UK Climate Change Risk Assessment (CCRA).

European Environment Agency overview of tools: http://www.eea.europa.eu/themes/scenarios/ scenarios-and-forward-studies-eea-activities

European Environment Agency Climate Change Data Centre <u>http://www.eea.europa.eu//themes/climate/dc</u>

European Environment Agency PRELUDE Land Use Scenarios: <u>http://www.eea.europa.eu/multimedia/</u> interactive/prelude-scenarios/prelude

European Environment Agency (2010) The European Environment: State and Outlook 2010 – Synthesis. Fast Future (2005) Baseline Scanning Project: A Research Study for Defra's Horizon Scanning and Futures Programme and Strategy and Sustainable Development Directorate.

Natural England Secure Environmental Future Project <u>http://www.naturalengland.org.uk/ourwork/</u> securefuture/default.aspx

Natural England (2009) England's Natural Environment in 2060 – Issues, Implications and Scenarios.

OECD (2012) Environmental Outlook to 2050: The Consequences of Inaction.

Scottish Environmental Protection Agency Climate Change Publications <u>http://sepa.org.uk/climate\_</u> <u>change/publications.aspx</u>

UKCP18 UK Climate Projections <u>https://www.</u> metoffice.gov.uk/research/approach/collaboration/ ukcp/index

UKCP18 UK Climate Projections 2018 <u>https://www.metoffice.gov.uk/research/collaboration/ukcp</u> and <u>https://www.metoffice.gov.uk/research/collaboration/</u><u>ukcp/download-data</u>

United Nations Environment Programme Global Environmental Outlook <u>http://www.unep.org/geo/</u>

United Nations Environment Programme (2012) GEO5 Global Environmental outlook – Environment for the Future We Want.

Task Force on Climate-Related Financial disclosures (2017). Technical Supplement: The use of scenario analysis in disclosure of climate-related risks and opportunities. <u>https://www.fsb-tcfd.org/wp-</u> <u>content/uploads/2017/06/FINAL-TCFD-Technical-</u> <u>Supplement-062917.pdf</u>

http://ec.europa.eu/environment/eia/review.htm

http://www.europarl.europa.eu/sides/getDoc. do?type=TA&reference=P7-TA-2014-0225&language= EN&ring=A7-2013-0277

# **20. Appendix 7** – Glossary and Definitions

Term	Explanation
Adaptive management	A systematic process which monitors the ongoing effectiveness of mitigatory and compensatory measures to determine if they are achieving their desired objectives and where they are not, either modifies the action, or identifies additional actions to be taken. <sup>53</sup>
Baseline	The environmental or social baseline for a study comprises information gathered to understand the current or future state conditions within an identified impact area prior to implementation of a project. This is the benchmark against which impacts from subsequent development can be referenced. <sup>54</sup>
Carbon emissions scenarios	The basis on which global climate change models are developed that take account of different levels of global carbon emissions. The scenarios are based on complex economic models but can be simply summarised as low, medium or high emissions scenarios. It is considered highly unlikely that a low carbon emission scenario is a realistic scenario on which to base assessments.
Climate	The general weather conditions prevailing over a long period of time. Climate change will see trends in the climate conditions changing (seasonal averages and extremes).
Climate change adaptation (/Adaptation)	The process that a receptor or project has to go through to ensure it maintains its resilience to climate change. In the case of a development project, adaptation can be embedded in the design to account for future climate conditions, or the project can introduce measures to ensure it retains it resilience (i.e. the project adapts) to future climate conditions. Environmental receptors will adapt to climate change in varying degrees depending on how vulnerable they are to climate.
CCAR Coordinator	The practitioner within an EIA team who may or may not be a 'climate expert' has a thorough grasp of climate change projections, policy and regulation and who is also conversant with the emerging climate change guidance relating to specific technical topics. It is important all EIA teams have access to a competent CCAR Coordinator.
Climate change mitigation	Measures included in a project to reduce the emissions of greenhouse gases. See below for EIA mitigation.
Climate change projection	The range of possible climate conditions projected for a range of probability that the conditions will occur for a specific carbon emissions scenario.
Climate change resilience (Resilience)	The resilience of something is a measure of its ability to respond to changes it experiences. If a receptor or a project has good climate change resilience, it is able to respond to the changes in climate in a way that ensures it retains much of its original function and form. A receptor or project that has poor climate change resilience will lose much of its original function or form as the climate changes.
Cumulative impact	The combined impact of a given type, from a range of different activities or sources, perhaps in conjunction with past/future development or activity. <sup>55,56</sup> For example, the air quality impact from one development may be of low significance but the cumulative impact from several developments with individually low significance may become collectively significant.

55. Developed from: https://transform.iema.net/article/eia-assessing-combination-effects

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<sup>53.</sup> Based on: www.iema.net/assets/uploads/Special%20Reports/iema20special20report20web.pdf

<sup>54.</sup> Developed from: Therivel, R. & Wood, G., 2018. Methods of Environmental and Social Impact Assessment. 4th Edition. Taylor & Francis: New York, pp. 4-6.

<sup>56.</sup> Developed from: Therivel, R. & Wood, G., 2018. Methods of Environmental and Social Impact Assessment. 4th Edition. Taylor & Francis: New York, p706

Term	Explanation
EIA Coordinator	The practitioner with overall responsibility for ensuring the quality of the EIA satisfies current regulatory requirements and is consistent with the requirements published for EIA by IEMA. This person should be a chartered environmentalist with experience in the preparation and delivery of EIA and who will be responsible for ensuring climate change adaptation is properly accounted for in the EIA process. This practitioner has specific responsibility for advising developers of their obligations under the revised EIA Directive and the implications thereof – especially in advance of the revised EIA regulations that will be introduced in 2017.
EIA mitigation	Measures identified during the EIA process to reduce/enhance the negative/positive impacts of a project respectively. Not to be confused with climate change mitigation (see above).
Environmental Report	The name of the final statutory report in Scotland presenting the findings of the EIA. The equivalent terminology in England, Wales and Northern Ireland is Environmental Statement. Outside of Scotland, Environmental report (lower case) may refer to any document or appendix relating to the EIA process.
Environmental Statement	The name of the final statutory EIA Report submitted in England, Wales and Northern Ireland presenting the findings of the EIA.
In-combination effect	When a particular receptor is affected by impacts from the same scheme in different ways, such as by both noise and air pollution.
In-Combination Climate Impact effect (ICCI)	When a projected future climate impact (e.g. increase in temperatures) interacts with an effect identified by another topic and exacerbates its impact. For example, if the biodiversity topic identifies an effect on a habitat or species receptor due to a project/scheme, such as loss of habitat, and in addition projected future higher temperatures will increase the vulnerability of this habitat to fragmentation, this is an ICCI.
Projection	A possible outcome defined by modelling of climate variables to give a possible outcome. This is in contrast to a prediction which is a statement of probable change.
Receptor	An aspect of the natural or man-made environment which may potentially be significantly affected by a development. <sup>57</sup>
Significance	Significance is assessed by comparing the magnitude of an impact with a receptor's value, sensitivity, permanence or reversibility, in an assessment-specific matrix. The criteria in this matrix can be pre-set, allowing for objective impact assessment rather than subjective impact evaluation. <sup>58</sup>
UKCP09	UK Climate Projections 2009 is the suite of climate change projections produced by the UK Met Office Hadley centre, funded by Defra. Projections are broken down to a regional level across the UK and are shown in probabilistic form – illustrating the potential range of changes and the level of confidence in each projection. These have recently been superseded by UKCP18, but were previously in use for many years.

Term	Explanation
	The most recent climate projections produced by the UK Met Office Hadley Centre, these represent an update from the UKCP09 projections.
UKCP18	The new projections use Representative Concentration Pathways (RCPs) rather than the previous 'low, medium, high' emission scenarios.
	Most of the UKCP18 data outputs were published in late 2018. The detailed 2.2km resolution projections will be available in late 2019.
Vulnerability (to climate change)	The inverse of climate resilience, vulnerability to climate change refers to an aspect of infrastructure, operations or a project which is susceptible to impacts arising from climate change, e.g. a building may be vulnerable to overheating due to future increases in temperature if it has not been designed with consideration of higher temperatures.
Weather	Weather is what we experience on a daily basis. It is defined by the atmospheric conditions (such as temperature, wind, cloud cover, rain) prevailing at specific moments in time, or over short time periods.





## About IEMA

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## Appendix CL2.17

The CCC's Progress Report to Parliament (2023)

## June 2023

## Progress in reducing emissions 2023 Report to Parliament



Progress in reducing UK emissions 2023 Report to Parliament

Climate Change Committee June 2023

Presented to Parliament pursuant to Section 36 (1) of the Climate Change Act 2008. This report was laid before Parliament on 28 June 2023 and is available online at: <a href="http://www.theccc.org.uk/publications">www.theccc.org.uk/publications</a>

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This is my final report as Chairman of the Climate Change Committee, containing our clearest analysis of UK progress yet. The Climate Change Act and the Committee were originally seen as a bold experiment in climate governance; they are now an essential legal framework and a trusted institution. We should cherish the central role that objective, robust analysis of climate change now plays in the debate over our economy and society. The UK continues to avoid the polarised climate politics that plague other countries, but that must never be taken for granted.

My particular privilege has been to lead this organisation over a crucial decade, where the Committee has informed and supported Governments across the UK to raise their climate ambition. Much has been said of the UK's climate leadership, including here, but the willingness of UK Ministers to embrace Net Zero, and accept a legal obligation to meet targets on that path, represented genuine leadership.

However, the true test of leadership is delivery. And here, I am more worried. The commitment of Government to act has waned since our COP26 Presidency. There is hesitation to commit fully to the key pledges.

This will not win the fight. Our successes have come when we have been bold, harnessing the power of the private sector to work collectively towards lower emissions, to the benefit of people across the UK. Our much-heralded approach to offshore wind has been successful precisely through this effort. It was Government commitment to delivery that made possible this cleaner, cheaper generation.

In this report, we comment on a curious situation. This year, the Government has published more detail on their climate programme than ever before, cajoled to do so by the Courts. But Ministers seem less willing to put that programme at the centre of their stated aims. Our confidence in the achievement of the UK's 2030 target and the Fifth and Sixth Carbon Budgets has markedly declined from last year.

Leadership is required to broaden the national effort to every corner of our economy. That means investing now in low-carbon industries to deliver lasting economic benefits to the UK. It means committing with confidence to the key dates and policies that will deliver zero-emission buildings and transport and facing down the critics. It demands that we earn the support of farmers and rural communities with policies that bring together our climate and food security aims. It requires our unambiguous commitment to the fossil fuel phase out, accepting that global reserves are already too great. And it means providing people in the UK with positive choices that benefit the climate. That is where enduring public support lies. In fighting climate change, we are not only averting disaster, we are building a better, cleaner, fairer world.

All of this is still within our grasp, but this is a key moment to remake the arguments for faster progress. I urge Government to find the courage to place climate change once again at the heart of its leadership. It would be a terrible error if we in Britain hesitate just as the rest of the world wakes up to the opportunity of Net Zero.

Lord Deben, Chairman of the Climate Change Committee

## The Committee



#### The Rt. Hon John Gummer, Lord Deben, Chairman

Lord Deben was the UK's longest-serving Secretary of State for the Environment (1993 to 1997). He has held several other high-level ministerial posts, including Secretary of State for Agriculture, Fisheries and Food (1989 to 1993). Lord Deben also runs Sancroft, a corporate responsibility consultancy working with blue-chip companies around the world on environmental, social and ethical issues.



#### **Professor Keith Bell**

Keith Bell is a co-Director of the UK Energy Research Centre (UKERC), a Chartered Engineer and a Fellow of the Royal Society of Edinburgh. He has been at the University of Strathclyde since 2005, was appointed to the Scottish Power Chair in Smart Grids in 2013 and has been involved in energy system research in collaboration with many academic and industrial partners.



#### **Professor Michael Davies**

Michael Davies is Professor of Building Physics and Environment at the UCL Institute for Environmental Design and Engineering (IEDE). At UCL his research interests relate to the complex relationship between the built environment and human wellbeing. He is also Director of the Complex Built Environment Systems Group at UCL and a member of the Scientific Advisory Committee of 'Healthy Polis'.



#### **Professor Piers Forster**

Piers Forster is Director of the Priestley International Centre for Climate and Professor of Physical Climate Change at the University of Leeds. He has played a significant role authoring Intergovernmental Panel on Climate Change (IPCC) reports, and is a coordinating lead author role for the IPCC's sixth assessment report.





#### Professor Corinne Le Quéré FRS

Corinne Le Quéré is a Royal Society Research Professor at the University of East Anglia (UEA), specialising in the interactions between climate change and the carbon cycle. She was lead author of several assessment reports for the UN's Intergovernmental Panel on Climate Change (IPCC) and she currently Chairs the French Haut Conseil pour le Climat.

#### **Nigel Topping CMG**

Nigel Topping was appointed by the UK Prime Minister as UN Climate Change High Level Champion for COP26. In this role Nigel mobilised global private sector and local government to take bold action on climate change, launching the Race To Zero and Race To Resilience campaigns and, with Mark Carney, the Glasgow Financial Alliance for Net Zero.



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For many in the UK, 2022 was the year that climate change arrived, with the UK's first ever 40°C day.\* It was the UK's warmest recorded year and one of the six warmest years on record globally. The record-breaking temperatures seen in the UK in summer 2022 brought unprecedented numbers of heat-related deaths, wildfire incidents and significant infrastructure disruption. Human activities are causing our climate to change. Only decisive action will slow further changes.

The UK has lost its clear global leadership position on climate action. We are no longer COP President; no longer a member of the EU negotiating bloc. Our response to the recent fossil fuel price crisis did not embrace the rapid steps that could have been taken to reduce energy demand and grow renewable generation. We have backtracked on fossil fuel commitments, with the consenting of a new coal mine and support for new UK oil and gas production – despite the strong wording of the Glasgow Climate Pact. And we have been slow to react to the US Inflation Reduction Act and the EU's proposed Green Deal Industrial Plan, which are now a strong pull for green investment away from the UK. It is critical that the UK re-establishes its climate leadership with a clearer strategy to develop Net Zero industries and technologies in the UK and capture the economic benefits of Net Zero, with actions that create demand-pull for the critical technologies that will shape the UK's progress over the next decade.

This year saw the release of new detail on the Government's plans for Net Zero with the publication of the Carbon Budget Delivery Plan (CBDP) prompted by last year's High Court judgement. But policy development continues to be too slow and our assessment of the CBDP has raised new concerns. Despite new detail from Government, our confidence in the UK meeting its medium-term targets has decreased in the past year. The increased transparency embodied in the CBDP is welcome, but a key opportunity to raise the overall pace of delivery has been missed.

At COP26, the UK made stretching 2030 commitments in its Nationally Determined Contribution (NDC) – now only seven years away. To achieve the NDC goal of at least a 68% fall in territorial emissions from 1990 levels, the rate of emissions reduction outside the power sector must almost quadruple. Continued delays in policy development and implementation mean that the NDC's achievement is increasingly challenging. Some of the key planks of the UK Net Zero Strategy have substantial lead-times (e.g. hydrogen storage, greenhouse gas removals and carbon capture and storage (CCS) more generally). Progress in other areas is also too slow, including tree planting and the roll-out of low-carbon heating. There continues to be an overly narrow approach to solutions, which crucially does not embrace the need to reduce demand for high-carbon activities. A more realistic approach to delivery is needed. This cannot wait until after the next General Election.

Without human activity, the 40°C heatwave would have been extremely unlikely. World Weather Attribution (2022) Without human-caused climate change temperatures of 40°C in the UK would have been extremely unlikely.

The key messages in this report are:

- A lack of urgency. While the policy framework has continued to develop over the past year, this is not happening at the required pace for future targets. The Net Zero target was legislated in 2019, but there remains a lack of urgency over its delivery. The Net Zero transition is scheduled to take around three decades, but to do so requires a sustained high-intensity of action. This is required all the more, due to the slow start to policy development so far. Pace should be prioritised over perfection.
- Stay firm on existing commitments and move to delivery. The Government has made a number of strong commitments, notably on the 2030 fossil fuel vehicle phase-out, the 2035 decarbonisation of the electricity system, the commitment to install 600,000 heat pumps per year by 2028, and the deployment at scale of new industries such as hydrogen and greenhouse gas removals. These must be restated and moved as swiftly as possible towards delivery, including by ensuring the UK has the skills base it needs to deliver on its commitments and building on its promising plans to guide private sector action and investment. The recent announcement of up to £20 billion funding for CCS is welcome we look forward to the detail and implementation of these spending plans.
- **Retake a clear leadership role internationally.** The UK will need to regain its international climate leadership. This means taking urgent action to reduce emissions in line with delivering the UK's ambitious NDC for 2030 and fulfilling other pledges made in international climate negotiations, ensuring that decisions on UK fossil fuel production and infrastructure are consistent with Net Zero and the UK's expectations of others, and putting climate back at the front and centre of UK diplomacy from the highest level.
- Immediate priority actions and policies. Action is needed in a range of areas to deliver on the Government's emissions pathway. New policies are urgently needed in industry, especially in the steel sector where the Government has high ambitions for decarbonisation but no policy to deliver it, as well as wider incentives for electrification of industry. Policies are required to step up the rates of tree planting and peatland restoration. The Government needs to overcome the uncertainty being caused by its planned 2026 decision on the role of hydrogen in heating, to accelerate deployment of electric heating and press ahead with low-regret energy infrastructure decisions. We welcome the commitment to rebalance electricity and gas prices by spring 2024, which will support electrification.
- Develop demand-side and land use policies. The Government's current strategy has considerable delivery risks due to its over-reliance on specific technological solutions, some of which have not yet been deployed at scale. This lack of balance carries considerable and increasing risks to meeting the emissions targets. Recent experience on societal changes (e.g. to travel patterns) following the pandemic has shown that substantial changes to behaviours are possible, although these have not been due to climate policy. It is essential that policies to empower and support people to make low-carbon lifestyle choices are implemented now, especially on home energy use, shifting to healthier and more sustainable diets, and reducing air and car travel. Further strengthening of policy in these areas may be required subsequently given risks of shortfalls in delivery elsewhere.

- Empower and inform households and communities to make low-carbon choices. Despite some positive steps to provide households with advice on reducing energy use in the last year, a coherent public engagement strategy on climate action is long overdue. Increased concern about climate change and relatively high knowledge about Net Zero provide a potentially favourable context for engaging with the public. People should be empowered to make green choices, through a better understanding of how they can play their part and supported by a positive vision and leadership from Government about the societal changes required. Information alone is not sufficient it must be accompanied by implementation of policies that both make low-carbon choices easy, attractive and affordable. Deliberative processes should be considered for navigating challenging policy decisions, building on the insights and lessons from the UK Climate Assembly.
- Planning policy needs radical reform to support Net Zero. In a range of areas, there is now a danger that the rapid deployment of infrastructure required by the Net Zero transition is stymied or delayed by restrictive planning rules. The planning system must have an overarching requirement that all planning decisions must be taken giving full regard to the imperative of Net Zero.
- Expansion of fossil fuel production is not in line with Net Zero. As well as pushing forward strongly with new low-carbon industries, Net Zero also makes it necessary to move away from high-carbon developments. The decision on the Cumbrian coal mine sent a very concerning signal on the Government's priorities. The UK will continue to need some oil and gas until it reaches Net Zero, but this does not in itself justify the development of new North Sea fields.
- The need for a framework to manage airport capacity. There has been continued airport expansion in recent years, counter to our assessment that there should be no net airport expansion across the UK. No airport expansions should proceed until a UK-wide capacity management framework is in place to assess annually and, if required, control sector CO<sub>2</sub> emissions and non-CO<sub>2</sub> effects.

We present the rest of this Executive Summary in six sections:

- 1. Progress in reducing emissions
- 2. Indicators of progress
- 3. Policy risks and gaps
- 4. The urgent need for action and strategy
- 5. Progress against last year's recommendations
- 6. Priority recommendations in this report

Emissions in 2022 were 0.8% higher than in 2021, remaining 9% below pre-pandemic levels in 2019 and 46% below 1990 levels.

The change in emissions in 2022 was driven by an almost doubling of aviation emissions balanced by a 16% decrease in emissions from residential buildings, due to mild winter months and high gas prices. UK greenhouse gas emissions were 450 MtCO<sub>2</sub>e in 2022, including the UK's share of international aviation and shipping, which is 46% below 1990 levels. This is an increase of 0.8% since 2021, but remains 9% below pre-pandemic (2019) levels.

Changes in emissions in 2022 were mainly driven by transient differences in demand and temperature (Figure 1):

- Aviation emissions almost doubled in 2022 compared with 2021 as the sector recovered from the pandemic, but remained 25% lower than in 2019.
- Surface transport emissions increased by 3%, but remained 8% below prepandemic (2019) levels, with some evidence that car-kilometres have reached a reduced steady state.
- There was a 16% decrease in emissions from homes, largely driven by winter temperatures but with some effect due to very high fossil fuel prices.
  - The headline fall in emissions was predominantly due to a relatively mild winter in 2022 (compared to the colder winter of 2021). After adjusting for winter temperatures, emissions from homes fell by only 6% in 2022, which is likely to have been driven by a behavioural response to the record-high gas prices.
  - However, it is unclear what the balance was between improvements in efficiency (e.g. reducing boiler flow temperatures) and people having colder homes due to the unaffordability of energy.
- The UK became a net exporter of electricity in 2022 rather than a net importer, as has typically been the case in previous years. This increased gas-fired electricity production above what it otherwise would have been, although increased renewable generation meant that power sector emissions were stable.
  - Shortfalls of energy in mainland Europe, due to the lack of Russian gas supply and low generation from French nuclear plants, meant that the UK imports of liquefied natural gas were then re-exported to the rest of Europe both as gas and gas-fired electricity.
  - While it is difficult to estimate the precise impact of the additional emissions from gas power plants, we estimate that emissions might otherwise have been lower by around 3 MtCO<sub>2</sub>e (6% of electricity supply emissions) in 2022 without this export effect.

Given that much of the recent change in emissions has been driven by exceptional circumstances, it is more instructive to look back further in time to see the overall rate of progress. The pace of emissions reduction has been slow in recent years in all sectors apart from electricity supply (Figure 2). In agriculture and land use, emissions are essentially unchanged from a decade ago. Significant risks and policy gaps remain in these sectors, and elsewhere.

The rate of emissions reduction will need to significantly increase for the UK to meet its 2030 NDC and the Sixth Carbon Budget. If the UK is to achieve its NDC, the rate of emissions reduction outside the electricity supply sector must almost quadruple, from 1.2% annual reductions to 4.7%. The Government's quantified plans in the CBDP fall slightly short of this, falling by an annual average of 4.4%, with the Government taking the position that unquantified plans will make up this shortfall (Figure 3). We set out the necessary immediate actions in section 4.



If the UK is to achieve its 2030 NDC, the rate of emissions reduction outside electricity supply must almost quadruple.

Emissions in 2022 increased slightly by 0.8% due to an almost doubling of aviation emissions balanced by a 16% decrease in emissions from residential buildings.

> Source: DESNZ (2023) Provisional UK greenhouse gas emissions national statistics 2022; BEIS (2023) Final UK greenhouse gas emissions national statistics: 1990 to 2021; CCC analysis. Notes: Global warming potentials from IPCC AR5 without feedback are used. Provisional 2022 estimates are not made for non-CO<sub>2</sub> greenhouse gases, so the change in 2022 agriculture emissions is not shown.



Notes: (1) The Carbon Budget Delivery Plan (CBDP) projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (2) Sectoral emissions pathways are indicative only, they are not viewed by the CCC as sectoral targets. (3) We have adjusted the Government's CBDP pathway and baseline for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories.

If the UK is to achieve its 2030 NDC, the rate of emissions reduction outside the electricity supply sector must almost quadruple.

## Figure 3 Change in total emissions excluding electricity supply, aviation and shipping (2014 to 2022 and required from 2022 to 2030)



Notes: (1) Aviation and shipping omitted due to ongoing pandemic effects on 2022 emissions. (2) The Carbon Budget Delivery Plan (CBDP) projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (3) We have adjusted the Government's published CBDP pathway for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories. In our 2022 UK Progress report, we introduced our new Monitoring Framework and increased our focus on tracking against real-world indicators of progress. We continue this approach in this report, with recent progress in different sectors and in cross-cutting issues discussed in the following chapters.

While there have been some positive developments, our indicators show action being significantly off track in a range of areas. Table 1 summarises the progress seen this year in key sectors. While there have been some positive developments, we see action being significantly off track in a range of areas:

- **Surface transport.** Sales of new electric cars are continuing to grow ahead of our pathway, although electric van sales are still lagging and remain significantly off track. This is particularly concerning given that van traffic is also increasing fast, already exceeding our pathway.
- **Electricity supply.** Renewable electricity capacity increased in 2022, but not at the rate required to meet the Government's stretching targets, particularly for solar deployment. Given short lead-times, rapid deployment of onshore wind and solar could have helped to mitigate dependence on imported gas during the fossil fuel crisis.
- **Buildings.** The Government proposes to scale-up the market for heat pump installations to 600,000 by 2028, but current rates are around one-ninth of this and are not increasing fast enough. Installation rates of energy efficiency measures continue to be below necessary levels and fell further in 2022.
- Electricity prices. The Government's decision to take policy costs off electricity prices as part of financial support on energy bills means that the ratio of electricity prices to gas prices has fallen. It is now essential that this improvement in relative prices is made permanent, in the rebalancing of electricity and gas prices which the Government has committed to implement by March 2024.
- Land use. Tree-planting rates continue to be too low and are not increasing at the rate required. Rates will need to double by 2025 for the Government to reach its target of 30,000 hectares per year of woodland creation. Peatland restoration rates increased slightly in 2022 but remain a factor of five less than our recommended rates.
- **Agriculture.** Livestock numbers are on track despite no policy support in this area to support the current momentum in the right direction. Reported meat consumption is also on track, but data on meat availability shows a less clear picture; further policy intervention on diets is therefore required.
- **Industry.** Progress in this sector is hard to track due to poor availability of data, but is off track for most available indicators. As we recommended last year, the Government should review, invest in and reform industrial decarbonisation data collection and reporting.

Table 1         Summary of progress against key indicators					
Surface transport	Energy supply	Buildings	Industry	Agriculture and land	
Electric car sales (G)	Grid storage (G)	Electricity to gas price ration (G)	Bioenergy use in industry (G)	Livestock numbers (G)	
Battery cell prices (O)	Dispatchable low- carbon capacity in development (G)	Greening Government commitments (G)	Electricity use in industry (O)	Livestock exports (G)	
Petrol / diesel car intensity (O)	Offshore wind (O)	Low-carbon share of heat supply (O)	Energy consumption per unit of GVA (O)	Food waste (G)	
Petrol/diesel van intensity (O)	Onshore wind (O)	Energy efficiency measures (R)	Private sector targets (R)	Woodland management (O)	
Van km (O)	Unabated gas (O)	Heat pump installations (R)	Industrial process emissions (R)	Crop yields (O)	
HGV km (O)	Refineries emissions (O)	Heat pump costs (R)	Hydrogen use in industry (W)	New woodland (R)	
Electric van sales (R)	Solar PV (R)	Trained heat pump installers (R)	Pipeline of hydrogen projects (Gr)	Peatland restoration (R)	
Car km (W)	Active demand response (W)	Residential energy demand (W)	Industrial energy efficiency (Gr)	Anaerobic digestion (R)	
Public chargepoints (W)	Low-carbon hydrogen production (W)	Non-residential energy demand (W)	Pipeline of industrial CCS projects (Gr)	Energy crops (W)	
Public transport demand (LGr)	Oil and gas production emissions (W)	Non-residential buildings energy intensity (W)	Industry consumption emissions (LGr)	Meat consumption (W)	
Key:         On track (G)       Too early to say (W)         Slightly off track (O)       Data not reported (Gr)         Significantly off track (R)       No benchmark or target (LGr)         Notes: An indicator is on track if it is going in the right direction at an appropriate rate. This is determined by comparing the historical data to Government ambition or the CCC's recommended by a considering wider contextual factors.					
The increased transparency embodied in the CBDP sets a minimum standard for the detail in which the Government plans on Net Zero are set out.

Our assessment of the prospects of meeting the NDC for 2030 and the Sixth Carbon Budget for the mid-2030s has worsened since last year.

## (a) Latest assessment of the risks to meeting emissions targets

The increased transparency embodied in the CBDP sets a minimum standard for the detail in which the Government plans on Net Zero are set out, enabling scrutiny from Parliament, the CCC and wider stakeholders. The CBDP was published in response to the High Court ruling that the Government's 2021 Net Zero Strategy (NZS) did not comply sufficiently with the Climate Change Act due to it lacking this detail. The Government has therefore had to provide a firmer public commitment to its plans, which has resulted in some changes in approach and ambition.

Despite the new detail provided in the CBDP, our assessment of the prospects of meeting the NDC for 2030 and the Sixth Carbon Budget for the mid-2030s has worsened since last year. This is due to a combination of delays in action leading to increased delivery risk, together with a more detailed assessment of the Government's plans, enabled by the publication of the CBDP. There has been some improvement in prospects for meeting the Fourth Carbon Budget due to an improved outlook for transport emissions.

- The Carbon Budget Delivery Plan has highlighted areas in which commitment may be lacking. The CBDP has some changes in approach and ambition compared to the NZS, most notably the decision not to quantify potential emissions savings from policies aiming to reduce carkilometres, and a reduction in ambition in the land use sector.
- Our confidence in the UK meeting the Fourth Carbon Budget (2023-2027) has slightly increased in the last year. This is largely driven by an approximately 5% decrease in vehicle-kilometres due to societal changes following the pandemic that appears to have reached a steady state, and increased confidence in the transition to electric vehicles in the near term, as sales continue to grow.
- However, our confidence in the UK meeting the 2030 NDC and the Sixth Carbon Budget (2033-2037) has decreased since last year (Table 2, Figure 4 and Table 3). This is driven by a combination of delays in action leading to increased delivery risk and the extra detail in the CBDP allowing for a more thorough assessment. While we would expect policies to be less developed for targets further away in time, the NDC is now only seven years away.
  - There is an increase in the risk to emissions reduction from surface transport and electricity supply, predominantly due to delays in developing the zero-emissions vehicle mandate and the continued lack of a strategy for decarbonising the electricity system, alongside increasing delivery risks.
  - There have been more policy gaps identified in industrial electrification and resource efficiency; in agriculture and land, due to a lack of long-term funding and a more apparent reliance on the voluntary uptake of low-carbon measures; and in engineered removals due to delays in funding and guidance.

### Table 2

Summary policy scorecard for sectors to meet the 2030 NDC and the Carbon Budgets

Sector	Change in emissions 2022-2035	Delivery mechanisms & responsibilities	Funding and other financial incentives	Enablers in place / barriers overcome	Timeline for future policies	Overall sector assessment
Surface transport	-61 MtCO2e (-58%)	G	Y	0	Y	Y
Electricity supply	-44 MtCO2e (-93%)	G	G	0	Y	Y
Industry	-44 M†CO2e (-69%)	0	0	0	R	0
Buildings	-33 M†CO2e (-43%)	0	0	0	0	0
Engineered removals	-25 MtCO <sub>2</sub> e	Y	0	0	R	0
Fuel supply	-21 MtCO2e (-64%)	Y	Y	0	0	0
Agriculture	-10 MtCO <sub>2</sub> e* (-20%)	0	R	R	0	R
Land: sources	-4 MtCOae*	0	0	0	0	0
Land: sinks	11110020	Y	Y	0	0	0
Aviation	-7 M†CO2e** (-17%)	0	0	0	0	0
F-gases	-8 MtCO2e* (-69%)	G	G	G	G	G
Waste	-7 MtCO <sub>2</sub> e* (-30%)	0	Y	0	0	0
Shipping	-3 M†CO2e** (-22%)	0	Y	0	0	0

Source: DESNZ (2023) Provisional UK greenhouse gas emissions national statistics 2022; BEIS (2023) Final UK greenhouse gas emissions national statistics: 1990

to 2021; DESNZ (2023) Carbon Budget Delivery Plan; BEIS (2021) Net Zero Strategy; CCC analysis. Notes: (1) See Annex 1 for the assessment criteria. (2) \*Provisional 2022 estimates are not made for non-CO<sub>2</sub> greenhouse gases, so the change is relative to 2021. \*\*Relative to 2019 due to ongoing pandemic effects on emissions.

Plans are insufficient or at significant risk for approximately half the required emissions reduction for the 2030 NDC.

## Figure 4 Assessment of policies and plans



## a) Overall assessment of policies and plans







Source: DESNZ (2023) Carbon Budget Delivery Plan; DESNZ (2023) Energy and emissions projections: 2021 to 2040; BEIS (2021) Net Zero Strategy; CCC (2020) The Sixth Carbon Budget; CCC analysis. Notes: (1) This assessment uses Government plans listed in Annex B, tables 5 & 6 of the Carbon Budget Delivery Plan (CBDP). See Annex 1 for the assessment criteria. (2) The baseline is an adjustment to the Government's CBDP baseline, with the impact of some policies removed so that they can be assessed. Refer to each sector chapter for additional notes on our methodology. (3) We have adjusted the Government's published CBDP pathway and baseline for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories. (4) The CBDP projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (5) For comparability, the CBDP's emissions pathway for international aviation and shipping (IAS) has been added to the target values for CB4 and the NDC.

For the 2030 NDC insufficient plans come predominantly from industry.

Table 3Assessment of Government p	plans in cross-cutting areas		
	Ambition & timeline of proposals	Delivery mechanism (including funding and incentives)	Overall assessment
Public engagement and green choices	0	Y	0
Workers and skills	R	0	0
Business and finance	Y	0	0
Innovation	Y	0	0
Fair funding and affordability	R	0	0
	Current structures & processes	Mechanisms & timelines for overcoming barriers	Overall assessment
Governance	0	Y	0
Source: CCC analysis. Notes: See Annex 1 for the assessment criteria.			

The Government's decarbonisation framework is currently missing coherent plans to mitigate the delivery risks to meeting the UK's 2030 NDC and the Sixth Carbon Budget.

# (b) Risk management and contingency plans

The Government's decarbonisation framework is currently missing coherent plans to mitigate the delivery risks to meeting the UK's 2030 NDC and the Sixth Carbon Budget. The current strategy has considerable delivery risks due to its over-reliance on specific technological solutions, some of which have not yet been deployed at scale. This lack of balance carries considerable and increasing risks to meeting the emissions targets.

There is already a clear case for demand-side policies to reduce emissions. These should be implemented now, as a core part of the decarbonisation strategy, especially on home energy use, shifting to healthier and more sustainable diets, and reducing air and car travel. Further strengthening of policy in these areas may be required subsequently given the risks of shortfalls in delivery elsewhere.

With the 2030 NDC only seven years away, it is vital that alternative plans are developed that identify decarbonisation options beyond those quantified in the CBDP and could deliver an appropriate amount of additional emissions reduction on the required timescale. The plans should ensure there is sufficient time for policies to be implemented in a sensible, cost-effective and fair way and ensure that there is a governance framework for their implementation on a timely basis. We present some suggested measures in Figure 5.

Developing contingency plans would significantly reduce delivery risk for the NDC, but current plans must also be strengthened.

## Figure 5 Contingency options for 2030





The slow progress to date on delivery towards Net Zero means that it is no longer tenable for the Government to develop strategies that do not contain committed policies.

The lack of a strategic direction on the roles of electrification and hydrogen in providing lowcarbon heat is creating systemic uncertainty. The slow progress to date on delivery towards Net Zero means that it is no longer tenable for the Government to develop strategies that do not contain committed policies. Policies with immediate delivery are needed, in parallel with development of new strategic visions. In most sectors, there is a clear set of actions that can be taken now and should be pursued while the longer-term picture is clarified. Alongside ambitious plans to reduce emissions, steps to integrate measures to adapt to the UK's changing climate should be taken wherever possible.

Land use. Last year, the UK Government committed to delivering a Land Use Framework that will set out how England will manage land use for multiple functions such as food security, recreation, climate mitigation and adaptation, and nature recovery. Originally indicated for publication for summer 2023, this has been pushed to the autumn with no formal date scheduled. Land use and agriculture in England remains one of the few sectors where the Government has not set out a coherent, strategic approach to coordinated policy to meet the multiple needs for land. This is vital if current barriers to climate action are to be overcome and for action to be aligned across the UK and devolved administrations. In parallel, there is an urgent need to scale up key land use mitigation measures such as tree planting and peatland restoration.

**Buildings.** The Government has committed to take strategic decisions by 2026 on the roles of electrification and hydrogen in providing low-carbon heat. However, the lack of a strategic direction is creating systemic uncertainty. This is actively hindering the growth of supply chains for low-carbon heat and limiting progress on power and hydrogen infrastructure. Waiting three more years to set a clear direction will lead to further lost progress in buildings, and hinder infrastructure development more widely.

The Government should push forward on areas where there are no-regret and low-regret options, and seek to develop and move forward with a strategic approach:

- In our assessment, this is likely to entail pushing ahead with electrification wherever this is feasible, with at most a small, focused, role for hydrogen use in buildings.
- Rapid and forceful pursuit of zero-carbon new-build, energy efficiency improvements to existing buildings, low-carbon heat networks and electrification will reduce emissions and cut fossil fuel dependence this decade, while developing the supply chains and public trust that are crucial enablers for subsequent acceleration of electrified heating solutions.

In parallel with this, the Government should develop a strategic approach to lowcarbon heating. This should: provide confidence that the UK can reach zero buildings emissions by 2050, including substantial progress on reducing these emissions by 2030; give medium-term clarity for infrastructure and supply-chain development; form the basis of a fair, deliverable transition that builds and sustains public consent while delivering ever-greater progress; and fit into the overall strategic approach to reducing the UK's energy import dependence and to delivering progress towards the 2040 net exporter target. **Electricity decarbonisation.** The Government has committed to decarbonising electricity supply by 2035, subject to ensuring security of supply, together with ambitious targets for building new renewables and nuclear. However, the Government has not yet published an overarching standalone plan or strategy for delivering a decarbonised and reliable electricity system by 2035 that is resilient not only to average weather, but to plausible future extreme weather and demand scenarios. Doing so would facilitate a more coordinated and strategic approach to delivery and improve visibility and confidence for investors. In parallel with this, there is an immediate need for policy to move ahead with ensuring adequate network capacity and connections, bringing forward low-carbon flexibility solutions, and reforming electricity market design.

An overarching strategy for public engagement and communications is lacking.

**Cross-cutting enablers.** There has been some sector-specific progress in engaging with the public on green choices, but an overarching strategy for public engagement and communications is lacking. A strategic approach to fiscal and policy levers that ensures low-carbon options are affordable and costs are distributed fairly, including by rebalancing policy costs on electricity and gas, is needed. Government's Net Zero and Nature Workforce Action Plan planned for early 2024 is welcome; it is important that it goes beyond high level aims and into detail on priority sectors, regions and associated actions to grow the UK skills base. Work is underway to improve green finance and corporate reporting, but the private sector response is being held back in many sectors by weak policy signals, uncertainty, and barriers to investment.

**Waste.** Greater strategic coordination of plans to decarbonise the waste sector is needed including: much greater emphasis on waste prevention, clarity on future residual waste capacity needs, and the suitability of incentives and interactions with other sectors such as waste as a feedstock for Sustainable Aviation Fuels. Energy from Waste (EfW) emissions are already higher than the Government's CBDP anticipates and EfW capacity is set to increase in the coming years. A comprehensive systems-approach to control and reduce EfW emissions is urgently needed, including clarity on carbon pricing. We recommend a moratorium on additional EfW capacity until a review of capacity requirements has been completed and an updated assessment of residual waste treatment capacity requirements published.

**Industry.** The Government's commitment to steep reductions in industrial emissions (69% by 2035, relative to 2022) requires urgent and radical change in the UK's manufacturing sector. There is little evidence this change is underway. Furthermore, our assessment is that current plans are insufficient to reduce emissions at the required pace and scale. The lack of ambition of current industrial policies also increases the risk of manufacturers relocating to countries with a more attractive investment environment. It is vital for Government to do more to support industrial decarbonisation. In particular it should act to accelerate the electrification of industrial heat, the decarbonisation of dispersed sites and pursue opportunities to reduce consumption of industrial products.

**Biomass.** The Government's Biomass Strategy was due for publication by the end of 2022, but has still not been published at the timing of writing. This should be published as soon as possible.

There has been some progress against the recommendations we made last year, but overall the progress has been insufficient. Broadly speaking, in most areas policy development has proceeded too slowly, and has not led to the necessary action on the ground (Figure 6).

While DESNZ has made progress in a range of areas, overall insufficient progress has been made. In particular, no progress appears to have been made on seven of the priority recommendations we made in last year's progress report:

- Develop and publish new policies (with a clear implementation timeline) to ensure that owner-occupied homes reach a minimum energy performance of EPC C by 2035.
- Develop and begin to implement contingency plans to address the range of risks to meeting carbon budgets. These should broaden the set of emissions reductions pursued, in particular by including demand-side policies, and avoid increasing reliance on engineered removals.
- Publish a comprehensive long-term strategy for electricity decarbonisation, including the roles for low-carbon flexibility options.
- Develop minimum emissions-intensity standards for domestic oil and gas production by the next licensing round.
- Consult on a funding mechanism(s) to support the additional operational and capital costs of electrification in manufacturing, enabling electrification to compete on a level playing field with other means of decarbonisation.
- Review, invest in, and initiate reform of industrial decarbonisation data collection and annual reporting to enable effective monitoring and evaluation, and policy implementation.
- In line with the Glasgow Climate Pact commitment to phase out inefficient fossil fuel subsidies, undertake a review of the role of tax policy in delivering Net Zero.

These recommendations all remain essential, and the Government should enact them as soon as possible.

While other departments had fewer recommendations, both Defra and DLUHC have failed to achieve any priority recommendations and have made insufficient or no progress on a large majority of the non-priority recommendations.



The 27 priority recommendations made in this report are set out in full immediately following this executive summary, and are summarised in Table 4. Our recommendations to each department for the next year are available in Annex 2 to this report and in sortable and filterable tables in our accompanying webpage.

Table 4         Summary of priority recommendations			
Cross-cutting	Surface transport	Energy supply	Aviation
<ul> <li>Re-balancing the costs of electricity and gas.</li> <li>Guidance for business use of carbon offsets.</li> <li>Risk mitigation and alternative plans e.g. empowering people to make green choices.</li> <li>Public engagement on green choices.</li> <li>Action plan for Net Zero skills.</li> <li>Coordinated energy planning at different geographical scales.</li> <li>Make the National Planning Policy Framework consistent</li> </ul>	<ul> <li>Confirm ZEV mandate details in regulation.</li> <li>Buildings</li> <li>Narrow scope of strategic decision on role of hydrogen for heat.</li> <li>Confirm regulatory mechanism for fossilfuel boiler phase-out.</li> <li>Implement plans for EPC C in privately rented homes by 2028.</li> </ul>	<ul> <li>Strategy for full decarbonisation of electricity by 2035.</li> <li>Identify low-regret electricity and hydrogen investments.</li> <li>Create a minister-led infrastructure delivery group.</li> <li>Planning frameworks to presume against new coal.</li> <li>Stringent test for new oil and gas extraction.</li> <li>Clarify institutional responsibilities for planning and delivery.</li> </ul>	<ul> <li>No airport expansion without UK-wide capacity- management framework.</li> <li>Waste</li> <li>Address rising energy from waste emissions.</li> </ul>
with Net Zero.	Industry	Agriculture and land use	Engineered removals
International	Policies for     electrification.	Publish the land use framework.	Business model for     large-scale
• Announce a Secretary of State-level Climate Envoy.	<ul> <li>Incentives for non-ETS decarbonisation.</li> <li>Strategy for decarbonising iron and steel.</li> </ul>	<ul> <li>Funding and delivery support for tree planting.</li> <li>Delivery mechanism for peatland restoration.</li> </ul>	deployment.

ID	Sector	Priority recommendations	Timing
Priority: R2022-200	Cross-cutting: Fair funding and affordability	As part of reforms to electricity pricing, remove legacy policy costs associated with the historical deployment of less-mature low-carbon electricity generation from electricity prices. The rebalancing of policy costs should remove market distortions, and manage any adverse distributional impacts of a 'polluter pays' approach. <b>Primary responsibility: HMT</b> Supporting actors: DESNZ	2022 Overdue
Priority: R2023-165	Cross-cutting: Business	Publish guidance for businesses on what activities it is appropriate to 'offset' and when. This guidance should include confirmation that a business can only accurately use carbon credits to claim to be 'Net Zero' once nearly all emissions are reduced and the remaining are neutralised by high-quality permanent removals. Formalise this by: establishing 'Net Zero' as a statutory definition; drawing on consumer protection law or advertising standard rules to ensure businesses don't claim 'Net Zero' based on an inappropriate reliance on 'offsetting'; and setting out in UK Environmental Reporting Guidelines and the Net Zero Transition Plan Standard a requirement for businesses to disclose why carbon credits are used rather than direct emissions reduction in net emissions claims. <b>Primary responsibility: DESNZ</b> Supporting actors: Defra; HMT	2024
<b>Priority:</b> R2022-119	Cross-cutting: Governance	Develop and begin to implement alternative options to address the range of risks to meeting the NDC and carbon budgets. These should broaden the set of emissions reductions pursued, in particular by implementing policies aiming to empower the public to make green choices and stating clearly how they will contribute to emissions reduction. The timeline for implementing the plans should consider the time it takes policies to take effect. <b>Primary responsibility: DESNZ</b>	Q1 2023 Overdue
<b>Priority:</b> R2023-162	Cross-cutting: Public engagement	Empower people to make green choices by communicating the most impactful ways to reduce emissions, such as changing car travel, home energy use and dietary behaviours and reducing air travel, and support people to make these choices including through regulation and incentives. Government should lead by example by visibly adopting these green choices. <b>Primary responsibility: DESNZ</b>	2024
Priority: R2022-128	Cross-cutting: Workers and skills	Publish an evidence-based Action Plan for Net Zero Skills that includes a comprehensive assessment of when, where, and in which sectors there will be skills gaps specific to Net Zero. This should include consideration of particular barriers to inclusive and accessible labour market entry into occupations needed for the transition and Government plans for action on the skills system to facilitate entry into these occupations. <b>Primary responsibility: DESNZ</b> Supporting actors: DfE; DWP; DLUHC; Home Office	2022 Overdue

ID	Sector	Priority recommendations	Timing
Priority: R2023-176	Cross-cutting; Buildings; Electricity supply	Set out a clear process and governance framework for delivering credible, coordinated energy planning across local, regional and national levels. This should include guidance on responsibilities for producing, feeding into and implementing plans at each level (e.g. clarifying the respective roles of local authorities, Ofgem, the Future System Operator, network operators and the Government among others); their scope and the decisions to be made at each level; and a required methodology and standardised assumptions framework. This should include providing appropriate support and funding for delivery, ensure that proposals complement existing initiatives (e.g. on heat network zoning) and put in place processes for coordinating across boundaries and incorporating meaningful public engagement into decision-making. <b>Primary responsibility: DESNZ</b> Supporting actors: DLUHC; Scotland; Wales; Northern Ireland	Q1 2024
<b>Priority:</b> R2023-155	Cross-cutting: Governance	Review and update the National Planning Policy Framework to ensure that Net Zero outcomes are consistently prioritised through the planning system, making clear that these should work in conjunction with, rather than being over-ridden by, other outcomes such as development viability. <b>Primary responsibility: DLUHC</b>	2023
Priority: R2023-111	International: UK Climate Envoy	Announce a Secretary of State-level Climate Envoy that acts as the ministerial Head of Delegation before the 2023 UN General Assembly.	Q3 2023
Priority: R2022-272	Surface transport: Electric cars and vans	Confirm the details of the ZEV mandate in regulation. As set out in the consultation, this should impose targets on manufacturers that are at least as ambitious as those in the Transport Decarbonisation Plan and should drive consistent growth in sales of EV cars and vans through the 2020s to meet the 2030 phase-out date. <b>Primary responsibility: DfT</b> Supporting actors: Scotland; Wales; Northern Ireland	Q1 2023 Overdue
<b>Priority:</b> R2023-190	Buildings: Low-carbon heat	Narrow the scope of the strategic decision prior to 2026 by: publicly affirming that electrical heat is the default option in all new buildings and existing properties off the gas grid; prohibiting connections to the gas grid for new buildings from 2025; setting out clear routes for other properties or areas where electrification or heat networks represent low-regret options; and clarifying the Government's position on the economy-wide priority of use-cases for hydrogen – in particular its potential to help manage peak demands for both heat and electricity, and its role in hybrid heating systems. <b>Primary responsibility: DESNZ</b>	2023
<b>Priority:</b> R2022-072	Buildings: Low-carbon heat	Finalise and ensure the timely implementation of plans to prohibit fossil fuel boiler replacements in off-gas grid buildings from 2026 (2024 for large non-residential buildings). Confirm the proposed regulatory mechanism for phasing out fossil fuel boilers, and clarify whether the required powers are devolved or reserved. <b>Primary responsibility: DESNZ</b>	2022 Overdue

ID	Sector	Priority recommendations	Timing
Priority: R2022-073	Buildings: Energy efficiency	Respond to the 2020 consultation by finalising and implementing plans to require privately rented homes in England and Wales to reach EPC C by 2028 (as the Government committed to in autumn 2021). <b>Primary responsibility: DESNZ</b>	2022 Overdue
<b>Priority:</b> R2023-080	Industry: Electrification	Develop policies for industrial electrification that address general barriers such as investment constraints, as well as specific barriers for different industrial sub-sectors. <b>Primary responsibility: DESNZ</b>	H1 2024
Priority:           R2022-241           Priority:           R2023-088	Industry: Fuel switching Industry: Steel	Create clear incentives for manufacturing facilities not currently covered by the UK ETS to decarbonise. <b>Primary responsibility: DESNZ</b> Supporting actors: HMT Publish a strategy and timeline for the decarbonisation of the iron and steel industry in line with the Carbon Budget Delivery Plan. <b>Primary responsibility: DBT</b>	Q1 2023 Overdue Q1 2024
Priority: R2023-138	Electricity supply: Strategy	Supporting actors: DESNZ Publish a comprehensive long-term strategy for the delivery of a decarbonised, resilient, power system by 2035. This should comprise a portfolio approach to developing the full range of low-carbon flexibility options, including demand flexibility, storage, hydrogen, gas CCS and interconnection capacity. It should set out how the low-carbon flexibility required to replace unabated gas will be delivered (12-20 GW of low-carbon dispatchable capacity by 2035), as well as clarifying any minimal residual role unabated gas is expected to play by 2035 (up to around 2% of annual electricity production) and the strategy for unabated gas phase-out. It should cover the strategic decisions required, the milestones and timeline for delivery and the governance and oversight arrangements. It must set out plans and contingencies for addressing key risks on a co-ordinated basis (e.g. network development and connections, planning and consenting, CCS, hydrogen and nuclear). <b>Primary responsibility: DESNZ</b>	2023 Overdue
Priority: R2023-128	Electricity supply; Fuel supply; Cross- cutting	Identify a set of low-regret electricity and hydrogen infrastructure investments that can proceed now. Either prior to, or as part of publication of the cross-sectoral infrastructure strategy, identify on a whole system and economy-wide basis which areas are unlikely to be suitable for hydrogen (such that electrification and alternatives can be progressed), alongside potential candidate areas for hydrogen. This should be used to inform a set of low-regret investments that can proceed immediately. <b>Primary responsibility: DESNZ</b> Supporting actors: FSO	2024

ID	Sector	Priority recommendations	Timing
Priority: R2023-129	Electricity supply: Networks; Governance	Create a Minister-led infrastructure delivery group, advised by the new Electricity Networks Commissioner, to ensure enabling initiatives for energy infrastructure build are taken forward at pace and necessary policy changes are implemented across the UK, to deliver a decarbonised and resilient power system by 2035. This should bring together key senior parties in DESNZ, Ofgem, Defra, DLUHC, the Scottish and Welsh Governments, the Future System Operator and asset owners, to deliver necessary policy changes and monitor progress across the initiatives so that swift action can be taken where required to expedite progress. Priorities include overhauling planning and consenting (with strategically important projects prioritised); adequately resourcing regulatory, planning and environmental consenting bodies; reforming the connections process; driving strategic investment; and ensuring the necessary strategic planning and skills/supply chain development is taking place. <b>Primary responsibility: DESNZ</b> Supporting actors: Ofgem; Defra; DLUHC; Scottish Govt; Welsh Govt; FSQ: Electricity Networks Commissioner	2023
Priority: R2023-092	Fuel supply: Fossil fuel supply	Ensure that planning frameworks and guidance across the UK support a clear presumption against new consents for coal production. New coal extraction, whether in new mines or through the extension of existing infrastructure, should only be permitted for safe decommissioning, or where firm policy can be demonstrated to require the coal produced to be used (domestically or internationally) in a way that is compatible with Net Zero pathways (e.g. with at least 95% CO <sub>2</sub> capture and storage). Planning Frameworks should reflect the declining role of coal in the context of binding UK and international GHG emissions targets. At present local plans are still required to proactively identify sites for future coal extraction. This practice is outdated and encourages new coal development. This practice should be ended immediately. <b>Primary responsibility: DLUHC</b> Supporting actors: Scotland; Wales; N. Ireland; DESNZ	2023
<b>Priority:</b> R2023-093	Fuel supply: Fossil fuel supply	Strengthen and clarify the tests in place for allowing any further exploration and extraction of oil and gas. Stringent tests, in line with the advice in our 2022 oil and gas letter, should be applied at each stage of the licensing and consenting process. These tests should be underpinned by a presumption against exploration and tighter limits on production, be assessed against more ambitious decarbonisation targets (well beyond the 50% target set out in the North Sea Transition Deal), and make use of the best available technology to minimise emissions associated with production. The criteria for approval, including with regard to decarbonisation targets, should be set out clearly and transparently. <b>Primary responsibility: DESNZ</b> Supporting actors: NSTA; OPRED; DLUHC	2023

ID	Sector	Priority recommendations	Timing
Priority: R2023-126	Electricity supply; Fuel supply	Clarify urgently and formalise the institutional responsibilities of the FSO, Ofgem and Ministers, for strategic planning and delivery of a decarbonised, resilient energy system. As part of this, Ofgem's objectives and duties must be updated to drive explicitly the delivery of the statutory Net Zero target, and to ensure climate and weather resilience. In addition to its Net Zero objective, the FSO must have responsibility for ensuring weather and climate resilience through its strategic planning role. The critical role of strategic investment in delivering these outcomes must be recognised, with appropriate mandates and powers for Ofgem and the FSO. The formalisation of responsibilities should be implemented through the Energy Bill and revisions to the Strategy and Policy Statement. As part of the phased approach to the implementation of the FSO, expanding the remit with respect to hydrogen should be considered as a priority. <b>Primary responsibility: DESNZ</b> Supporting actors: Ofgem; FSO	2023
Priority: R2023-102	Agriculture & land use: Agriculture and land use strategy	Publish the land use framework. Set out how this feeds into a wider agriculture and land use strategy that brings together how land can deliver its multiple functions including: reducing emissions and sequestering carbon, adapting to climate change, food security, biodiversity, domestic biomass production and wider environmental goals. The strategy must clearly outline the relationships and interactions with other relevant strategies and action plans across the UK, be spatially and temporally targeted, and aligned with action in the devolved administrations.	Q3 2023
		<b>Primary responsibility: Defra</b> Supporting actors: Scotland; Wales; N. Ireland	
Priority: R2023-192	Agriculture & land use: Trees and woodland	Ensure that funding and support are set at the correct level to meet the UK Government afforestation target of 30,000 hectares per year by 2025, and illustrative Net Zero Strategy targets of 40,000 hectares and 50,000 hectares by 2030 and 2035 respectively. Further clarity is required regarding funding beyond 2025. Support for delivery of new woodland creation should integrate with nature and adaptation objectives, and also address contractor availability, capacity to process funding applications, and advice for farmers to transition to woodland management approaches. <b>Primary responsibility: Defra</b> Supporting actors: Scotland; Wales; N. Ireland	2023 Overdue
Priority: R2023-171	Agriculture & land use: Peatlands	Implement a comprehensive delivery mechanism to address degraded peatland and extend current restoration ambition set out by the UK government and the devolved administrations beyond existing timeframes, including through addressing barriers to increasing capacity. Peat restoration targets include the need to remove all low-productive trees (i.e. less than YC8) from peatland (equivalent to 16,000 hectares by 2025), and restore all peat extraction sites by 2035 (equivalent to 50,000 hectares by 2025). <b>Primary responsibility: Defra</b> Supporting actors: Scotland; Wales; Northern Ireland	2024

ID	Sector	Priority recommendations	Timing
Priority: R2023-037	Aviation: Demand	No airport expansions should proceed until a UK-wide capacity management framework is in place to annually assess and, if required, control sector GHG emissions and non-CO <sub>2</sub> effects. A framework should be developed by DfT in cooperation with the Welsh, Scottish and Northern Irish Governments over the next 12 months and should be operational by the end of 2024. After a framework is developed, there should be no net airport expansion unless the carbon-intensity of aviation is outperforming the Government's emissions reduction pathway and can accommodate the additional demand. <b>Primary responsibility: DfT</b>	H1 2024
Priority: R2023-073	Waste: Energy from Waste / Incineration	Implement a whole-systems approach to address Energy from Waste (EfW) emissions, including setting out the implications of rising EfW use for waste decarbonisation and confirming plans to include EfW within the UK ETS. A moratorium on additional EfW capacity should be introduced subject to a review of capacity needs and how they align with Government emissions pathways. Further clarity is also needed on how decisions on allowing further EfW plants will be made. <b>Primary responsibility: DESNZ</b> Supporting actors: Defra	H1 2024
<b>Priority:</b> R2022-207	Engineered removals: Funding	Publish a proposal on the business model for deployment of large- scale (>1 MtCO <sub>2</sub> /year) engineered removals. <b>Primary responsibility: DESNZ</b>	Q1 2023 Overdue



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## Introduction and key messages

Devastating heatwaves and droughts have meant that climate change, and its impacts on the planet, have been making headlines across the world over the past year. 2023 has a high likelihood of an approaching El Niño event and greater warming than seen in previous years, signalling a likely increase in the combined risks of climate change and extreme weather events.

This chapter examines what has happened to global temperatures, climate impacts and emissions over the past year.

Our key messages are:

- **Global climate change.** 2022 was one of the six warmest years on record, and the warmest year on record for the UK. 2023 is likely to be warmer than 2022. In 2022, the Earth was 1.15°C (± 0.13°C) warmer than the pre-industrial (1850 1900) average.<sup>1</sup>
- Climate impacts. Extreme weather events have drawn attention to climate impacts across the globe, making it clear that adverse impacts pose threats to developed as well as developing countries. Climate impacts and risks will escalate with every increment of global warming, with risks becoming increasingly complex and difficult to manage.<sup>2</sup>
- **Global emissions.** Preliminary estimates for 2022 show relatively small increases in fossil CO<sub>2</sub> emissions, with no signs yet of decreasing emissions beyond fluctuations related to the COVID-19 pandemic. There are some signs of progress through continued strong growth in renewables, but this growth must be supported by improved permitting processes for renewable projects, management of supply chain risks and financing that supports rapid deployment across the globe.

This chapter covers the key indicators of global climate change in three sections:

- 1. Global climate change
- 2. Global climate impacts
- 3. Global greenhouse gas emissions

2022 was one of the six warmest years on record. 2023 is likely to be warmer than 2022. 2022 was one of the six warmest years on record globally. Natural climate variability has meant that warming from human activities has been temporarily offset by cooling effects from a triple-dip La Niña<sup>\*</sup> event in recent years. Global temperatures can fall by around 0.2°C in a La Niña episode, meaning the size of the human-induced warming effect is likely to have been greater than presently observed.<sup>3</sup> However, these cooling effects are coming to an end and conditions are favourable for the development of a warming El Niño event this year,<sup>4</sup> suggesting 2023 is likely to be warmer than 2022.<sup>5</sup> 2022 was the warmest year on record for the UK (Box 1.1).<sup>6</sup>

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Cycle Synthesis Report (Box 1.2) states that observed temperature increases are unequivocally the result of greenhouse gas (GHG) emissions resulting from human activities (Figure 1.1).<sup>2</sup>



La Niña and El Niño refer to the respective cooling and warming of the sea surface temperature in the Pacific that affect climate worldwide.

### **Box 1.1** Observed climate change in the UK

2022 was an unprecedented year for the UK's climate. It was the warmest year on record and the first year to exceed an average temperature of 10°C. All four seasons were in the top-ten warmest on record for the UK. The mid-July heatwave broke the previous UK maximum temperature by 1.6°C, exceeding 40°C for the first time with a temperature of 40.3°C recorded at Coningsby in Lincolnshire on 19 July.

In 2022 the UK was also drier and generally sunnier than average. Storm Eunice on 18 February was a notable extreme storm with a new wind gust speed record for England (122mph) recorded in the Isle of Wight.

These record-breaking extremes are consistent with continued global warming and are likely to occur more frequently in the coming decades.



Source: Climate Change Committee (2023) Progress in adapting to climate change: 2023 Report to Parliament; Met Office (2023) Climate Summaries: Monthly, seasonal and annual summaries 2022: Annual.

### **Box 1.2** IPCC Sixth Assessment Synthesis Report

The IPCC Synthesis Report draws together evidence from across the Sixth Assessment Reports (AR6). Reports in this assessment cycle include Working Groups 1: The Physical Science Basis; 2: Impacts, Adaptation and Vulnerability; and 3: Mitigation of Climate Change; as well as three Special Reports: Global Warming of 1.5°C; Climate Change and Land; and The Ocean and Cryosphere in a Changing Climate.

The key messages are:

- **Global climate.** Human activities have unequivocally caused global warming. Global surface temperatures have increased by 1.15°C in 2013-2022 since 1850-1900 and rapid changes across the atmosphere, ocean, cryosphere and biosphere have occurred, affecting every region across the globe.
- **Climate risk.** The risks and projected adverse impacts from climate change escalate with every increment of global warming. Climate change impacts are becoming increasingly complex and difficult to manage, with multiple climate hazards occurring simultaneously and interacting.
- **Progress in adaptation.** Adaptation to climate change is reducing climate risks and vulnerability in some cases, but gaps are widening and progress is unevenly distributed. There are feasible and effective adaptation actions which can reduce risks to people and ecosystems but there are also adaptation limits. With increasing global warming, some adaptation options that are feasible today will become constrained and less effective in the future.
- **Progress in mitigation.** There has been an expansion in policies and laws targeting emissions reduction in recent years, but gaps remain between required global ambition and declared national ambitions (NDCs) and between NDCs and implemented policies. Well-targeted climate policy, increased volume and quality of financial flows towards low-carbon investment and international cooperation are key enablers of a strengthened mitigation response.
- Emissions pathways. Reducing CO<sub>2</sub> emissions to Net Zero is essential in limiting human-caused global warming. In most cases, modelled pathways that limit warming to 1.5°C require deep and immediate GHG reductions in all sectors this decade. Any overshoot will entail additional risks and some irreversible impacts.
- **Mitigation, adaptation and development.** Accelerated action on mitigation and adaptation is required for sustainable development. Inclusive development choices that prioritise risk reduction, equity and justice can enable climate-resilient development.

Source: Intergovernmental Panel on Climate Change (2023) Synthesis Report of the Sixth Assessment Report Cycle (AR6): Summary for Policymakers.

Extreme weather events in 2022 had severe impacts on lives and livelihoods and highlighted resilience risks. According to the IPCC AR6 Synthesis Report, human-induced climate change is already affecting weather and climate extremes in every region. Many extreme weather events can be linked to climate change, with human-induced warming affecting both the intensity and frequency of events. A number of extreme weather events took place over the past year that were notable in terms of the resulting loss of lives and livelihoods. These events have drawn attention to climate risks across the globe and have highlighted the severity of the impacts that could be faced, particularly by climate vulnerable nations, with future warming:

- Flooding in Pakistan caused widespread devastation in the summer of 2022, with over 1,700 lives lost and eight million people displaced. Impacts disproportionately affected the most vulnerable groups, with many women suffering losses to livelihoods in agriculture and stagnant floodwater increasing the risk of water-borne disease in poor districts. The World Bank estimates the total economic losses at \$15 billion.<sup>7</sup> While the range of natural variability in rainfall makes it difficult to quantify the role human-induced warming played in this particular disaster, there is a clear relationship between warming and increased peaks in extreme rainfall in Pakistan.<sup>8</sup>
- Prolonged heatwaves in China in the summer of 2022 led to drought in the Yangtze River Basin that affected inland shipping and crops. The drought also impacted hydropower generation, leading to power rationing and a slowdown in industrial activity, demonstrating the need for power systems that are resilient to future climate impacts.<sup>9</sup> Human-induced climate change made the 2022 drought in the Northern Hemisphere (excluding tropical regions) more likely.<sup>10</sup>
- 2022 had the hottest summer on record for Europe.<sup>11</sup> Heat-related deaths are estimated at above 20,000 across the continent in 2022.<sup>12</sup> A study of heatwaves over the last 20 years suggests that resulting damages amount to 0.3 – 0.5% of Europe's GDP.<sup>13</sup> Human-induced climate change made the 2022 drought in West and Central Europe more likely.<sup>11</sup>

Adaptation is key to avoiding and limiting the adverse impacts of climate change. The United Nations Environment Project (UNEP) found that while adaptation actions were increasing, they were not keeping up with climate impacts. A step change is needed both in the quality and quantity of adaptation projects, with estimated needs five to ten times higher than current international financial flows to adaptation.<sup>14</sup>

Gaps remain in adaptation action and financing.

The IPCC AR6 Synthesis Report highlighted the urgent need to cut global GHG emissions. Modelled pathways limiting warming to 2°C (with a probability of greater than 67%) require rapid, deep and, in most cases, immediate emissions reductions across all sectors this decade.

Global GHG emissions are expected to have grown by a small amount, potentially reaching a new high. Preliminary estimates suggest that global fossil CO<sub>2</sub> emissions (i.e. CO<sub>2</sub> emissions excluding emissions from land-use) increased by around 1% in 2022 and that global GHG emissions are expected to have grown by a small amount, potentially reaching a new high (Figure 1.2).

- The Global Carbon Project estimates that fossil CO<sub>2</sub> emissions increased by 1% on 2021 levels in 2022 (range 0.1% - 1.9%). These estimates are based on energy statistics and cement production data. Emissions from coal use may reach a new peak in 2022 while gas-related emissions are set to slightly decline relative to 2021.<sup>15</sup>
- The International Energy Agency (IEA) estimates that global energy-related CO<sub>2</sub> emissions increased by 0.9% on 2021 levels in 2022. Its figures suggest that reductions in emissions from natural gas of 1.6% were more than offset by increases in emissions from gas-to-coal switching.<sup>16</sup>
- An emissions growth rate of 1% would suggest a continuation of the growth trend of the past decade (with global GHG emissions growing at an average annual rate of 1.3% between 2010 and 2019).<sup>7</sup> Although this represents a reduction in the 2.1% average annual rate of growth between 2000 and 2009, there is no sign of a decrease in emissions beyond the temporary pandemic-related fluctuations in 2020.



Notes: The fossil CO<sub>2</sub> data are taken from Global Carbon Project, with data for all other greenhouse gases use taken from the IPCC AR6 WGI report. The fossil CO<sub>2</sub> figure for 2022 is a projection. Aggregation of greenhouse gas emissions is done using the global warming potential metric at a time horizon of 100 years. Values from the IPCC 6th Assessment report are used.

Increases in fossil fuel use have been partially countered by reductions in industrial output and continued strong growth in renewables (Figure 1.3).

2022 was a strong year for investment in renewables, with the global energy crisis emphasising the energy security benefits of domestic renewable generation and high fossil fuel prices further improving the competitiveness of wind and solar. The IEA expect that global renewable capacity grew by 8% in 2022, representing an increase on the 6% rate of growth seen in 2021.<sup>17</sup> Delays in global supply chains, high commodity and mineral prices and lengthy domestic permitting processes must be managed carefully if global renewable energy capacity is to continue growing at the same or higher rates. The past year has also seen advances in international climate and energy policy that are expected to provide a further boost to the rollout of clean technologies in future years (see Chapter 2 on international progress for further details).

It is likely that reductions in industrial production in China have also placed a downward pressure on global emissions. Contractions in the Chinese construction sector have led to lower output in steel and cement, reducing emissions from these energy intensive industries.<sup>18</sup>

Less progress has been seen in reducing global fossil fuel use. Price shocks following COVID-19 recovery and Russia's invasion of Ukraine have led to gas-to-coal switching, resulting in increases in CO<sub>2</sub> emissions from coal (243 Mt CO<sub>2</sub>) that are almost twice the size of reductions in emissions from gas (118 Mt CO<sub>2</sub>). Similar increases were seen in emissions from oil.<sup>18</sup> These trends pose substantial risk to global progress towards Net Zero, both in terms of growth in emissions and in terms of disrupting the downward trend in coal consumption.

Progress in reducing UK emissions: 2023 Report to Parliament

Renewable capacity continues to expand in the midst of energy market disruptions.

Increases in  $CO_2$  emissions from coal are expected to be almost twice the size of reductions in emissions from gas.

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The share of renewables in the global electricity generation mix is increasing, but coal and gas still comprise over half of all generation.



- <sup>1</sup> World Meteorological Organization (2023) State of the Global Climate in 2022, https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate.
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- <sup>3</sup> BBC (2023) What are El Niño and La Niña, and how do they change the weather?, <u>https://www.bbc.co.uk/news/science-environment-64192508</u>.
- <sup>4</sup> National Oceanic and Atmospheric Association (2023) What to Watch For: El Nino Likely to Develop This Summer, <u>https://www.noaa.gov/news/what-to-watch-for-el-nino-likely-to-develop-</u> <u>summer</u>.
- <sup>5</sup> Met Office (2022) 2023 set to be tenth consecutive year at 1°C or above, <u>https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2022/2023-global-temperature-forecast</u>.
- <sup>6</sup> Met Office (2023) Climate change drives UK's first year over 10°C, <u>https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2023/climate-change-drives-uks-first-year-over-10c.</u>
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# Chapter 2: International climate progress

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## Introduction and key messages

The past year saw countries reassess the resilience of their energy systems in response to disruptions following Russia's invasion of Ukraine, and come together at COP27 and COP15 to forge new agreements on climate and nature. While some progress has been made, much more must be done, particularly when it comes to UK action.

2023 is a critical year for climate action. As governments, businesses and consumers respond to major policy shifts from the US and the EU and countries prepare to gather in the UAE for COP28, there is a window of opportunity for the UK to reassert its position as a competitive player on the international stage.

The UK has lost its clear global leadership position on climate action and is in a weaker position on international climate than it was a year ago. Though some positive steps have been taken, the Government's retreat from progressive, public leadership, its support for new fossil fuel production and its failure to keep pace with policy shifts and low-carbon investments overseas all point to a need for an increase in the scale and ambition of the UK's international climate action over the next year.

Our key messages are:

- Leadership. The UK has had an impressive history of climate leadership. However, a muted response to the energy crisis, support for new fossil fuel production and a retreat from public leadership within the COP process all pose risks to the UK's international reputation. These must all be addressed to reinstate the UK as a credible, impactful climate leader on the international stage.
- Delivery against the NDC. As we approach the conclusion of the Global Stocktake, all countries must demonstrate that they are delivering against their 2030 NDCs. The Government must address the remaining gaps to the 2030 NDC and mitigate delivery risks to demonstrate best practice within this process.
- International commitments. International pledges launched at COPs must begin to deliver real-world action to accelerate emissions reduction this decade. While the UK has had a role in advancing progress on initiatives on forests and ZEVs, its contribution to the Global Methane Pledge remains weak. The UK must also ensure that all international agreements to which it is party support efforts to transition to Net Zero. It is therefore necessary to reassess both the UK's lack of climate trade principles and membership of the Energy Charter Treaty (ECT) in line with this aim.

In the rest of this chapter, we discuss progress in three sections:

- 1. Low-carbon competitiveness and responses to the energy crisis
- 2. Progress in international climate and nature policy
- 3. UK international climate action

Since 2020, countries have faced significant disruption to their economies, including their energy markets, due to the COVID-19 pandemic and Russia's invasion of Ukraine. Concerns around a resulting regression in climate and energy matters have been partially realised through gas-to-coal switching. However, there has also been a reassuring push by some countries to respond to these crises in a sustainable, resilient way by reducing energy demand, investing in renewables and providing support for low-carbon industries.

The UK has a history of climate leadership, bolstered by being the first major economy to legislate for Net Zero and setting an ambitious 2030 NDC. However, the scale and ambition of its policy response to the energy crisis leaves much room for improvement and risks the UK being left behind in a race to the top as the EU, US and, to some extent, China make bold moves in this area.

This section will explore low-carbon competitiveness and responses to the energy crisis in two subsections:

- (a) International policy: climate, energy and competitiveness
- (b) The UK response to international policy shifts and the energy crisis

## (a) International policy: climate, energy and competiveness

The ongoing shocks to energy markets resulting from Russia's invasion of Ukraine have produced ambitious energy and climate policy responses in some major economies (Box 2.1). These responses are diverse in approach, with policies from the US, the EU and China shaped by each country or bloc's specific principles and political realities. However, what they have in common is their scale and their focus on growth and competitiveness:

- The US Inflation Reduction Act makes a strong play for green industries to locate in the US, offering tax credits for the production of green hydrogen, renewable energy and sustainable aviation fuel and the capture and storage of CO<sub>2</sub>. In addition, domestic production criteria that require goods to be made or processed in the US to qualify for additional support provide a boost for domestic businesses and incentivise multinationals to set up US manufacturing bases. The more recent proposal to require organisations to have emissions reduction targets in line with the Science Based Targets initiative in order to be eligible for US Government procurement contracts complements these measures.<sup>1</sup>
- The EU's proposed Net Zero Industry Act looks to boost domestic manufacturing, setting an intention for 40% of the EU's deployment needs for 'strategic Net Zero technologies' to be met through domestic production by 2030.<sup>2</sup> The Act also includes provisions to simplify and streamline permitting processes for green projects, making it faster and easier for developers to invest in the EU.
- China has made substantial investments in overseas critical minerals assets and developed large-scale processing and refining facilities, giving it significant market power in materials needed to manufacture many lowcarbon technologies.<sup>3</sup> Its extensive renewables development programme

The UK risks being left behind as other countries introduce bold climate and energy policy responses to the energy crisis.

The US, EU and China are making concerted efforts to improve their low-carbon competitiveness.

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Climate policy packages in other countries could help to bring down technology costs in the UK. also supports fast-growing domestic solar PV and wind turbine production and enhances energy security.

It is too early to judge the overall impact of these policies. However, if successfully implemented, they could help to bring down global technology costs, direct future investment towards renewables and away from fossil fuels and improve countries' energy security, supply-chain resilience and low-carbon competitiveness credentials.

To have maximum effect, these policy packages should be complemented by commitments to ensure that new low-carbon infrastructure is resilient to future climate impacts and increased pressure on major fossil fuel companies to reinvest recent windfall profits in renewables and carbon capture and storage (CCS).

### Box 2.1

#### Major clean energy policy initiatives and progress

The past year has seen major developments in climate and energy policy across the globe.

### **US Inflation Reduction Act**

This Act, passed in August 2022, is estimated to provide \$370 billion in investments to support American households, businesses and public bodies to develop and adopt low carbon solutions. Key elements of the Act include:

- **Renewables.** Tax credits for investing in renewables, battery storage and interconnection and production tax credits for renewable generation, battery storage and critical minerals processing. There are additional incentives for projects that meet prevailing wage and apprenticeship requirements and thresholds on the amount of US-manufactured materials used in their construction, and for projects that are located in historically coal-focussed communities.
- **Hydrogen.** Production tax credits for low-carbon hydrogen of up to \$3/kg for ten years. The full tax credit is reserved for the lowest emission projects (electrolysis with renewables) that also meet prevailing wage and apprenticeship requirements.
- **CCS and removals.** Carbon capture tax credits of up to \$85/tCO<sub>2</sub> for CCS and up to \$180/tCO<sub>2</sub> for Direct Air Capture with Carbon Storage. These amounts will be lower if the carbon is used and not stored.
- Electric vehicles. Tax credits of up to \$7,500 for the purchase of Electric Vehicles (EVs) for low and middle-income consumers. To be eligible for the full credit amount, the vehicle must be assembled in the US, meet domestic production thresholds for battery components and source battery minerals from the US or countries with which the US has a Free Trade Agreement. There are lower credits available for the purchase of second-hand EVs and higher credits available to fleet operators for electrifying their fleets.
- **Buildings.** Tax rebates of up to \$8,000 are available for households carrying out energy efficiency measures, with the full amount only available to low-income households. The Act also includes incentives for energy efficiency improvements to affordable housing and commercial buildings and tax deductions for installing heat pumps and rooftop solar. On the supply side, there are provisions for training programmes for installers and payments to contractors carrying out electrification measures.

#### **EU Initiatives**

The EU has come forward with multiple pieces of legislation that aim to deliver the EU's emissions targets, address the energy crisis and improve the bloc's low-carbon competitiveness.

• Fit for 55 package. The Fit for 55 package includes a number of updates to the EU Emissions Trading Scheme (EU ETS).

- Carbon Border Adjustment Mechanism (CBAM). The EU has now adopted the world's first CBAM. The CBAM will be gradually phased in from October 2023 with an initial focus on the sectors at highest risk of carbon leakage, such as cement and steel. The full system will apply from 2026 and will be accompanied by a phasing out of EU ETS free allowances.
- Aviation and shipping. The EU ETS will apply for intra-European flights (including departing flights to the United Kingdom and Switzerland) with free emission allowances gradually phased out to 2026.<sup>4</sup> From 2024, emissions from shipping will be phased into the EU ETS and will cover all emissions from 2027.<sup>5</sup>
- Green Hydrogen. The Innovation Fund derived from ETS revenues will hold auctions for the support of green hydrogen production, with the potential to kickstart EU growth in this industry.
- Buildings and transport. The EU will create a new emissions trading scheme to cover buildings, road transport and small emitters with a hypothecated Social Climate Fund to support the transition for low-income citizens.
- **REPowerEU.** This plan aims to reduce EU dependence on Russian fossil fuels and improve EU energy system resilience. The plan proposes increases in binding 2030 targets for renewable energy generation and energy efficiency, as well as efforts to accelerate planning processes for solar and wind projects and grow green hydrogen production this decade. The plan was accompanied by an 'EU Save Energy' communication that sets out how energy efficiency policy and household action can be combined to have significant impact. However, REPowerEU also includes plans to establish new gas and oil supplies through purchase agreements with exporting countries and investment in new Liquified Natural Gas (LNG) and oil import and pipeline facilities. These plans risk incentivising additional global fossil fuel production.
- Green Deal Industrial Plan (GDIP). The Commission has proposed the GDIP to shore
  up the EU's low-carbon competitiveness through a simplified regulatory landscape,
  streamlined funding processes, addressing skills gaps and maintaining open trade.
  This plan encompasses the Net Zero Industry Act (see above) that aims to fast-track
  permitting of clean energy projects and the Critical Raw Materials Act that aims to
  secure adequate access to minerals needed for green transition.

### **Renewables policy in China**

China released its 14th Five Year Plan in June 2022, committing to renewables meeting at least 50% of all additional electricity consumption from 2021-2025. Carbon Brief analysis of central and provincial government plans suggests that China is set to add at least 570 GW of wind and solar to its energy systems over this period if targets are met. Subject to actions taken on the running of coal plants to better accommodate this scale of renewables expansion it is suggested that China's emissions might peak up to five years earlier than the 2030 target.

Source: The White House (2022) Building a Clean Energy Economy: A Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action; World Resources Institute (2022) A Brief Summary of the Climate and Energy Provisions of the Inflation Reduction Act of 2022; Clean Air Task Force (2022) Carbon Capture Provision sin the Inflation Reduction Act of 2022; Resources for the Future (2022) Incentives for Clean Hydrogen Production in the Inflation Reduction Act; National Resources Defense Council (2022) A Consumer Guide to the Inflation Reduction Act; National Resources Defense Council (2022) A Consumer Guide to the Inflation Reduction Act; Berowers (2023) REPowerEU: affordable, secure and sustainable energy for Europe; European Commission (2023) The Green Deal Industrial Plan: putting Europe's net-zero industry in the lead; European Commission (2023) Carbon Border Adjustment Factsheet; Carbon Brief (2022) Will China's new renewable energy plan lead to an early emissions peak; Carbon Brief (2022) What do China's gigantic wind and solar bases mean for its climate goals?

# (b) The UK response to international policy shifts and the energy crisis

The UK has missed opportunities to respond to the energy crisis with ambitious climate and energy policy.

The Government has made some progress on low-carbon competitiveness but gaps remain. The UK policy response to the energy crisis has not matched the response of the US and the EU in scale or ambition. As explored in the rest of this report, much more must be done to accelerate domestic delivery in key sectors and comprehensively address the UK's low-carbon competitiveness to reduce risks of the UK falling behind other climate-progressive developed economies.

There are several factors that determine a country's low-carbon competitiveness, including policy landscape for low-carbon technologies, supply-chain resilience, investment environment, trade policy and domestic skills and expertise. The UK is strong on research and expertise, but the Government must provide greater policy certainty on low-carbon technologies to ensure it continues to attract investment and avoids being locked out of the development of key products and services required for the Net Zero transition as China, the US, the EU and others increase their market share.

There has been some progress on low-carbon competitiveness but more remains to be done:

- In 2022, the Government commissioned the Rt Hon Chris Skidmore MP to carry out the Independent Review of Net Zero (the Skidmore Review) to identify efficient and effective routes to delivering Net Zero in the UK. This review called for the Government to clarify its competitive advantage and green industrial policy and to provide long-term clarity for industries including hydrogen, biomass and carbon capture, utilisation and storage (CCUS).
- In March 2023, the Government published:
  - A Government response to the Skidmore Review.
  - A refresh of the 2022 Critical Minerals Strategy in July 2022, that launched a Task and Finish Group on Critical Minerals Resilience for UK Industry and referenced new critical minerals partnerships with South Africa and Canada.<sup>6</sup>
  - A consultation on policy measures to address carbon leakage, covering options including Carbon Border Adjustment Mechanisms and Mandatory Product Standards.<sup>7</sup>
  - The Green Finance Strategy, setting out steps to establish the UK as an international hub for low carbon transition finance and demonstrator of best practice in aligning of financial flows with climate and nature objectives.<sup>8</sup>
  - A 2022-2025 Delivery Plan for the 2021 Net Zero Research and Innovation Framework. This plan summarises government Net Zero research and innovation programmes with the aim of increasing private sector clarity on priority areas for investment.<sup>9</sup>
- A Memorandum of Understanding with the North Seas Energy Cooperation members (after forgoing membership after exiting the EU), opening up possibilities for joint renewables projects in the North Sea focusing on linking offshore wind with interconnectors.<sup>10</sup>

More must be done to establish incentives and policy certainty for potential low-carbon investors in the UK.

International policy comparisons demonstrate opportunities to both reduce emissions and cut household and business costs in the UK. Announcement of up to £20 billion of funding to support early deployment of CCUS and launch of the Track 2 of the CCUS Cluster Sequencing programme.

While these actions represent progress, they have been accompanied by delays to existing commitments and have not been complemented by a clear, comprehensive vision for the UK's place in a competitive global Net Zero future. Ambitious, decisive action has been shown in wind and nuclear, supported by ministerial leadership and effective stakeholder engagement; we now need to see this extended to other Net Zero-critical sectors. There is a competitive international landscape for green growth (Box 2.1) and strong policy signals are needed to compete with large economies and assure investors that the UK is an attractive place to develop and deploy low-carbon technologies.

To avoid being left behind in a race to the top, the UK should ensure that timely policy development and investor clarity in sectors such as CCS, hydrogen and engineered removals is prioritised. The Government must also utilise trade, diplomacy and research levers to develop the UK's supply chains and understand supply chain risks for key Net Zero industries.

The UK has particularly missed opportunities to respond to the energy crisis with policies that both reduce emissions and cut household and business costs – policies that other countries implemented to increase their energy security. There are substantial opportunities in home energy retrofit, public engagement and green choices, business energy savings and policies targeted at low-income households that the UK should seize to improve its domestic delivery and ease the impacts of the cost-of living crisis on UK households and businesses. Box 2.2 explores international examples of policies that have been introduced in response to the energy crisis to meet these objectives.
#### Box 2.2

Initiatives to reduce emissions and households and business costs

Energy Saving Trust and Green Alliance have carried out research for the CCC, identifying and analysing polices introduced in other countries in response to the energy crisis that aim to both cut costs and reduce emissions.

The project screened policies in other countries and produced detailed analyses of the following policies which provide useful examples for the UK: France's MaPrimeRénov' and Sobriété Énergétique, Canada's Greener Homes Initiative and Strategic Energy Management programmes, the Republic of Ireland's One Stop Shop, SME Support Scheme for energy audits and Reduce Your Use campaign, US Benchmarking and Building Performance Standards, public transport subsidies in Spain and Germany, California EV grants for low-income households and New York State's Inclusive Community Solar Adder.

Analysing these polices with respect to the UK's policy gaps produced the following insights:

- Home energy. England needs a comprehensive home energy retrofit scheme. Longterm funding to provide certainty for consumers and supply chains is a key success factor. Integration of support for heat pump installation and energy efficiency measures and whole building support that includes incentives for upgrading blocks of flats are also important aspects for the policy design.
- **Public engagement and green choices.** There is a need for a UK Government public engagement campaign that focuses on reducing energy demand. This should be aimed at both businesses and households and its effectiveness would be strengthened by combining informing 'quick win' bill-saving measures with programmes supporting longer-term actions.
- **Business energy.** A comprehensive and coherent strategy on business energy that covers a wide range of businesses from SMEs to energy intensive industries. Policy can help to embed energy and carbon management into decision making and there are gains to be made through making businesses aware of energy saving opportunities and, in some cases, requiring them to act on these.
- Low-income households. UK policy should place more focus on providing access to low-carbon technologies for low-income households. To avoid low-income groups being locked out of the cost savings that low-carbon technologies will increasingly provide, the Government should consider targeted support for the take-up of key technologies such as EVs.

Source: Energy Saving Trust and Green Alliance (2023) Climate policy that cuts costs: International policy comparison.

Over the past year, the energy crisis and extreme weather events such as the floods in Pakistan have highlighted the need for international cooperation that accelerates the transition to clean energy and builds a more sustainable, resilient world. While COP15 and COP27 reached agreement in a few landmark areas, progress has faltered on issues including fossil fuel phase out, adaptation action and climate finance.

This section will assess international climate and nature progress under five subsections:

- (a) COP27
- (b) Biodiversity COP15
- (c) Key climate moments in 2023
- (d) COP28
- (e) Financing the transition

# (a) COP27

COP27 saw momentum successfully gather around the need for the COP to address support needs for Loss and Damage and the launching of additional Just Energy Transition Partnerships (JETPs) but made slower progress on mitigation, adaptation and implementation of COP26 pledges. The key developments were:

- Agreement to establish a Loss and Damage fund. COP27 saw agreement to establish new funding arrangements for assisting developing countries that are particularly vulnerable to the adverse effects of climate change to address impacts which cannot or have not been adapted to. Though this only marks the beginning of a difficult process in agreeing the underlying detail, this agreement overcoming historically polarised positions nonetheless shows that the COP process can broker consensus and act as a forum for change.
- Limited progress on 2030 emissions reduction ambition. Despite agreement in the Glasgow Climate Pact for 2030 Nationally Determined Contributions (NDCs) to be brought in line with Paris temperature goals, near-term target ambition remained largely unchanged. Advances outside of the NDC process included announcement of the Vietnam JETP.
- Small steps on adaptation. Some progress was made on operationalising the Global Goal on Adaptation, but substantial questions about definitions and precise aims for the goal are still being discussed.
- **Renewed focus on finance.** The long-promised \$100 billion per year in climate finance from developed countries has still not been met. There was a broader focus on the availability of finance for emissions reduction and adaptation, as well as the speed and ease with which it can be accessed. Various proposals for improving this were discussed, including the reform of lending practices from international financial institutions (IFIs).

COP27 saw movement on Loss and Damage and JETPs but limited progress was made on NDC ambition, finance and adaptation. • Sectoral pledges begin to shift towards implementation. There was some progress against COP26 sector pledges. The Global Methane Pledge now has over 150 signatories.<sup>11</sup> The Forest and Climate Leaders' Partnership was established, building on the Glasgow Leaders Declaration on Forests and Land Use to bring together government and non-government actors to scale up action to protect, conserve and restore forests. The Accelerating to Zero Coalition was launched, building on the ZEV Declaration with over 200 signatories (countries, regions, cities and business including some vehicle manufacturers) committed to supporting a rapid transition to zero emission cars and vans.<sup>12</sup> With permanent structures and governance arrangements now decided, these initiatives should look to demonstrate tangible policy and implementation progress by COP28.

# (b) Biodiversity COP15

Human-induced climate change and biodiversity are inextricably linked. Climate change has caused major changes to ecosystems beyond that expected through natural climate variability.<sup>13</sup> Climate solutions have the potential to put biodiversity at risk (e.g. large-scale bioenergy) or help restore nature (e.g. nature-based solutions).<sup>14</sup> Biodiversity protection and enhancement can also deliver adaptation and mitigation co-benefits, such as forest and soil restoration. Conversely, destroying nature (e.g. deforesting the Amazon) can release huge amounts of stored carbon.

The Convention on Biological Diversity (CBD) COP15 saw agreement on key elements of the Kunming-Montreal Global Biodiversity Framework, including an overarching mission to halt and reverse biodiversity loss by 2030, together with targets and milestones relating to conservation, restoration and finance, amongst others.<sup>15</sup> Several targets under the Framework integrate climate aspects, such as minimising the impact of climate change on biodiversity and increasing ecosystem resilience through mitigation and adaptation.

# (c) Key international climate moments in 2023

The following international events and processes will need to build momentum for ambition and implementation and develop strong positions towards the annual UNFCCC COP summit in December.

- **G7 and G20.** The top ten GHG-emitting countries comprise two-thirds of global emissions.<sup>16</sup> High-emitting developed and emerging economies should use these fora to demonstrate progress in areas in which they have high impact such as the phase-out of fossil fuels and IFI reform. The 2022 UN Emissions Gap Report found that collectively the G20 is presently on course to fall short of their 2030 NDCs by 1.8 GtCO<sub>2</sub>e (central estimate).<sup>17</sup>
  - The recent Japan G7 reaffirmed commitments to Net Zero but did not advance on agreeing clear timelines for the phase-out of coal and backed investment in LNG as a temporary response to the invasion of Ukraine.<sup>18</sup>
  - The G20 under the Indian Presidency is building towards the Leaders' Summit in September which will be a key opportunity to corral the major economies to produce strengthened commitments that set the scene for COP28.
- **UNFCCC Bonn climate change conference.** The annual Bonn intersessional conference in June will undertake preparatory negotiations for COP28. Key

The Kunming-Montreal Global Biodiversity Framework represents progress on the integration of biodiversity and climate action.

The G7 and G20 are important fora for building momentum and demonstrating major economy commitment on issues such as fossil fuel phaseout.

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amongst these will be work on the first Global Stocktake (GST), which will assess the world's progress against the Paris Agreement's mitigation, adaptation and finance goals and identify the remaining gaps.

• UN General Assembly and Climate Action Summit. These summits should be used to progress discussions on early emerging priorities for COP28 and to act as a pledging push for countries to come forward with mitigation, adaptation and finance commitments.

# (d) COP28

COP28 in December hosted by the United Arab Emirates will be the culmination of international climate policy processes in 2023. As part of the conclusion of the GST, countries will be expected to produce solutions that address the gaps identified and carve a path back to limiting warming to as close to 1.5°C as possible (Figure 2.1).

Alongside on the agenda will be the operationalisation of the Loss and Damage Fund, and adoption of a framework for the Global Goal on Adaptation. In the cover text negotiations, there will be a major focus on strengthening the commitments on phasing out fossil fuels made at COP26 and repeated at COP27 to explicitly require phasing out of all emissions from all fossil fuels.



Source: Climate Action Tracker (2022) Warming Projections Global Update; IPCC, AR6 Scenario Explorer; CCC analysis.

Notes: The shaded ranges represent the upper and lower bounds of the scenarios that limit warming to a) 1.5°C with a >50% probability and b) 2°C with a >67% probability from the scenario database used by the IPCC Sixth Assessment Report. The dashed lines represent the medians of these ranges. Ranges for median end of century warming are +2.2°C to +3.4°C for the existing policies scenario, +1.9°C to +2.9°C for the NDCs only scenario ('2030 Targets only') and +1.5°C to +2.3°C for the NDCs and Net Zero targets (optimistic) scenario ('Optimistic scenario – Net Zero pledges'). Aggregation of greenhouse gas emissions is done using the global warming potential metric at time horizon of 100 years. Values from the IPCC 5th Assessment report are used.

COP28 will see countries come together to address gaps identified in the Global Stocktake.

Current NDCs and Net Zero targets have the possibility to limit warming to under 2°C, but this will require a step-change in emissions reduction in the near term. Significant improvements in the quantity and quality of financing are needed to support a rapid global transition.

### (e) Financing the transition

Financing is still a barrier to rapid transition, with developing countries unable to access adequate finance options despite holding many opportunities for impactful emissions reduction and adaptation action. A key issue is addressing the cost of capital developing countries face, which can be over three times that of countries that issue reserve currencies (such as the US, UK and Japan).<sup>19</sup> The 2022 Songwe-Stern report estimates that the global transition will require \$2.4 trillion of investment per year by 2030.\* The Energy Transitions Commission estimate that \$3.5 trillion in capital investment will be needed on average per year between now and 2050.<sup>20</sup>

The past year has seen some progress towards addressing these barriers, but there is an urgent need for faster action and the UK has potential to play a significant role (see Section 4 and the CCC 2022 COP27 report).<sup>21</sup> Key developments include:

- JETPs. Just Energy Transition Partnerships (JETPs) offer strong potential to blend public and private finance with a targeted focus on high-impact energy transitions. In 2022, partnerships with Vietnam and Indonesia were announced, and at COP27 the international group supporting South Africa's JETP endorsed South Africa's JETP Investment Plan. The ability of these partnerships to deliver financial support and emissions reductions has not yet been fully demonstrated; donors should not underestimate the complexities of these countries' energy transitions. There is a need to maintain concerted efforts to secure more detailed agreement and operationalise these deals.
- International Financial Institutions. The Bridgetown Agenda proposed a widespread reform of international financial institutions such as the World Bank and the International Monetary Fund (IMF) to increase affordable lending for developing countries to reduce their emissions and improve their ability to deal with climate impacts.<sup>22</sup> The Spring Annual Meetings this year saw some progress, with the World Bank Group proposing a set of measures that would boost its lending capacity by \$50 billion over the next decade and introducing new checks to ensure that all board-approved projects align with the goals of the Paris Agreement.<sup>23</sup> However, much remains to be done to improve the quantity and quality of finance available to low- and middle-income countries and to address debt vulnerability for developing countries dealing with adverse climate impacts.
- **Private finance.** Following the commitment by financial institutions representing over \$124 trillion of assets in the runup to COP26, financial institutions covering a further \$5 trillion in assets set Net Zero targets in the first half of 2022.<sup>24</sup> Ensuring the credibility of these commitments remains an important area for international cooperation. At COP27 the UN Secretary General's High Level Expert Group on the Net Zero Commitments of Non-State Entities published principles and recommendations that set out a clear process for ensuring that high ambitions on emissions reductions are both set and realised.<sup>25</sup>

<sup>\*</sup> The Independent High-Level Expert Group on Climate Finance led by Dr Vera Songwe and Lord Stern estimated that investment of \$1 trillion per year by 2025 and \$2.4 trillion per year by 2030 is needed to transform energy and agriculture systems, restore forests, land and water, and increase resilience in developing countries (excluding China).

The UK needs to take action to keep its role as an international climate leader.

The UK can influence global climate progress through domestic action on emissions reduction and adaptation, international policy and utilising UK convening power in international climate fora. As the UK transitions away from the influence it held as COP26 President and its experience negotiating as part of the EU, it will need to redefine and recommunicate its position to keep its role as an international climate leader.

There are important opportunities over the next year for the Government to act on the ambitions it has set out in its 2030 Strategic Framework. A cohesive, all-of-Government approach is needed to ensure that the UK makes the most of its capabilities in climate diplomacy, technical expertise and domestic delivery to shift the dial internationally. The UK should ensure that its international climate reputation is not undermined by perceived retreat from leading and convening climate discussions on the international stage and domestic policy decisions that contradict the UK's international messaging.

This section will cover priority areas for UK international climate action under two subsections:

- (a) UK international climate policy assessment
- (b) The UK as a climate leader

### (a) UK international climate policy assessment

The UK has set out a vision for its international climate and nature ambition in the 2030 Strategic Framework (see Box 2.3). The overall aim of the strategy is commendable; it is positive to see reaffirmation that the Government wants to deploy joined-up efforts using domestic levers such as trade, aid and finance to meaningfully contribute to global climate and nature goals. The Strategic Framework expresses a clear intention to maintain the UK's strong legacy in this space. However, over the coming year, more must be done to support the ambitions expressed in the document with detailed future actions. The intentions set out for trade are less ambitious and represent a missed opportunity to make effective use of trade policy to support climate action in the UK and help drive progress abroad.

Policies and commitments announced and implemented over the coming year will be the true test of the Strategic Framework. The Government should track policy progress against the aims of this document, acknowledging that both domestic and international policy decisions have potential to contribute to realising its 2030 vision. The CCC will look to assess progress against this Framework in future reports.

While the publication of the 2030 Strategic Framework demonstrates an increase in Government ambition across mitigation, adaptation and finance, substantial risks remain in the Government's delivery against their stated aims. Table 2.1 provides a summary and assessment of recent progress and what still needs to be addressed. Our assessment is based on the criteria outlined in Annex 1. The detailed recommendations are given in Annex 2 and in filterable and searchable tables on our website, with a reference provided to each unique recommendation ID within Table 2.1.

The 2030 Strategic Framework provides an overview of the Government's international climate ambition.

#### **Box 2.3** UK 2030 Strategic Framework

I

In March 2023, the UK Government released the 2030 Strategic Framework for International Climate and Nature Action. This is a cross-Government document that sets out the Government's strategic aims for contributing to global climate and nature challenges. The global vision the Government wishes to contribute towards achieving, the key global challenges to achieving this vision and the levers it plans to use to support these efforts are set out below.

Keep 1.5°C in r	each by	Build resilience	to current	and	Halt and rev	rerse global
halving global	emissions	future climate i	mpacts		nature loss	
		Global cl	hallenges			
Clean technologies across all sectors	Build resilience and adapt to climate impacts	Increase protection, conservation and restoration of nature	Strength internation agreemon and cooperc	en onal ents ition	Align global financial flows with climate and nature goals	Shift trade and investment to support s transition
		UK le	evers			
International partnerships	Finance	Trade & investme	ent	Expe dom lead	rtise & estic ership	Science, innovation and tech

Table 2.1 Policy scorecard fo	r UK international	climate action			
Theme	Ambition		Delivery	Overall assessment	
International overall assessment	Y		0	Ŷ	
Strategy	Y		0	0	
	<ul><li>Progress:</li><li>The UK Government published its 2030 Strategic Framework. This cross-Government strategy</li></ul>				
	sets out how the UK will capitalise on its domestic leadership and expertise and capability to contribute to halving global emissions, halting and reversing natu building resilience to climate impacts.				
	To be addressed:				
	<ul> <li>With the disbandment of the COP Unit there is a need to establish clear arrangements for coordinating international climate priorities across departments.</li> </ul>				
	<ul> <li>Clarity is new within the C Delays to th Climate Env recomment</li> </ul>	Clarity is needed on which minister will lead engagement on international climate (including within the COP process) and whether there will be a Ministerial Envoy for international climate. Delays to these announcements and the decision not to maintain roles such as the FCDO's Climate Envoy risk weakening diplomatic relationships ahead of a key COP (priority recommendation R2023-111).			
	<ul> <li>At COP27, the UK's positions on key issues were difficult to ascertain, especially when compared to more vocal delegations such as the EU and US. Communicating priority areas ahead of COP28 and the Global Stocktake would help the UK to shape its post-Presidency leadership. The Government should consider NDC best practice, fossil fuel phase-out, Loss and Damage financing arrangements, IFI reform, Voluntary Carbon Market standards and business engagement as possible areas for UK leadership (recommendation R2023-114).</li> </ul>				
	• The UK has not produced a comprehensive response to international policy developments such as the US Inflation Reduction Act and EU GDIP (recommendation R2023-172). Policy certainty, streamlined permitting and innovative funding mechanisms can all work to re- establish the UK as an attractive country for the development of green technologies and industries. Further delays to producing this response risk the UK falling behind other key players.				
	• The UK can play a visibly progressive role at key climate events throughout the year, not just at the COP. The G7, G20, UNGA and various climate action summits all provide opportunities for leader-level UK representatives to demonstrate climate as a top priority for the Government and to use its diplomatic capabilities to gather momentum behind key agendas such as fossil fuel phase-out.				
	• The 2030 Strategic Framework is relatively weak on setting a clear Government position on trade-climate interactions. A clear and strong position is needed to make sure that future trade arrangements do not run contrary to the Government's aims on climate and biodiversity, either in the UK or abroad (recommendation R2023-115).				
Mitigation	G until 2030	Y after 2030	0	0	
	Progress:				
	<ul> <li>The UK Government strengthened its 2030 NDC in advance of COP27. The recommunicat UK 2030 NDC met some of the CCC's 2022 Progress Report recommendations, such as</li> </ul>				

inclusion of COP26 sectoral pledges, but failed to meet others, like addressing the risks to Net Zero delivery posed by climate impacts.

- The UK played an important role in coordinating governments and finance institutions to reach agreement on JETPs with Vietnam and Indonesia in 2022.<sup>26,27</sup> These agreements can accelerate mitigation in countries with heavy coal use and strong potential for renewables.
- The UK has continued to lead and input into initiatives such as the Breakthrough Agenda, Mission Innovation, the Forest and Climate Leaders Partnership and the Accelerating to Zero Coalition, working with other governments and non-state actors to unlock a faster green transition.

#### To be addressed:

- Domestic delivery is essential for maintaining the UK's role as a climate leader. While announcements in the Carbon Budget Delivery Plan and Powering Up Britain reports are important steps towards delivering emissions reductions this decade, gaps remain to meeting the 2030 NDC. Meeting this target is critical to maintaining trust in the ability of the countrydetermined, bottom-up nature of NDCs to deliver on the Paris Agreement's temperature goal. The Government should strengthen existing plans and set out alternative options to mitigate the risk of not meeting the 2030 NDC (see Chapter 3).
- The UK Government should begin planning for its 2035 NDC to be announced by February 2025. A high-ambition, transparent NDC announced to timetable is an important opportunity for the UK to show its commitment to the COP process (recommendation R2022-230). The Government should also consult the public on the ambition level of the NDC (recommendation R2022-227). The CCC will offer its recommendation on the emissions goal for the 2035 NDC as part of its Seventh Carbon Budget advice.
- The UK's recent decisions on fossil fuel exploration and production have damaged its
  international reputation. Developments such as the approval of the Cumbria coal mine
  undermine the UK's reputation on energy transition and the legitimacy of its Glasgow Climate
  Pact commitments. These decisions can also limit the UK's credibility when encouraging other
  countries to end and avoid fossil fuel projects and pushing for fossil fuel phase-out in
  international discussions. (Recommendation R2023-195).
- The UK's action on methane is insufficient. The Government has not set out a UK-specific 30% reduction on 2020 levels by 2030 commitment to support the Global Methane Pledge and the Methane Memorandum brought forward high-level intentions rather than detailed plans for sectoral reductions. (Recommendation R2022-229).
- With uncertain prospects for further reform, continued membership of the Energy Charter Treaty (ECT) represents risks to both a timely climate transition and to the taxpayer. There is a strong case for the UK to reconsider its membership, noting the opportunities for potential agreements with other exiting parties that could limit residual risks associated with ECT sunset clauses (Box 2.4). (Recommendation R2023-110).

Finance	Y	0	Y		
	Progress:				
	<ul> <li>The Government has published its International Climate Finance Strategy. This document outlines the Government's priorities and principles for delivering the £11.6 billion of Internation Climate Finance (ICF) they have pledged to spend between 2021 and 2026.</li> <li>The Government has maintained its balance between adaptation and mitigation ICF spending.</li> </ul>				
	<ul> <li>The UK played an important role in coordinating governments and finance institutions to reagreement on JETPs with Vietnam and Indonesia in 2022, mobilising \$15.5 billion and \$20 b of public and private finance for each deal respectively.<sup>26,27</sup></li> </ul>				
	<ul> <li>The Government published establish the UK as an intern objectives.<sup>8</sup></li> </ul>	a new Green Finance Strategy in 2 ational leader in aligning of financ	2023, setting out actions to ial flows with climate and nature		

	To be addressed:					
	The use of Official Development Assistance (ODA) to meet domestic costs of refugee support has created pressure on international aid programming. Even if they are compensated for in future years, temporary cuts cause disruption to programmes and can make outcomes less effective. Transparency is needed about where cuts are likely to occur and to manage and communicate risks to the £11.6 billion ICF target being met, noting the damage that missing the target would cause to both climate and development outcomes and the UK's international reputation (recommendation R2023-113).					
	The UK could lead other could communicating its views on reform more generally. The U push for near-term progress the UK considers the global some emerging and develo climate vulnerable nations of	The UK could lead other countries by moving past general statements of support and communicating its views on specific measures covered by the Bridgetown Agenda and on IFI reform more generally. The UK should then use shareholder votes and diplomatic capital to push for near-term progress on these outcomes. When solidifying its position, it is important that the UK considers the global mitigation benefits of addressing the high costs of capital faced by some emerging and developing economies and the unsustainable debt burdens faced by climate vulnerable nations after extreme weather events.				
	<ul> <li>Developed countries will need to agree a new climate finance goal by 2025 within the COP process. The UK is well-placed to draw on the relationships built up through the COP Presidency to facilitate constructive discussions between Parties and identify potential landing zones on the level of the goal, how it is delivered and who contributes.</li> </ul>					
Climate impacts	Y	Y	Y			
	Progress:					
	<ul> <li>In Montreal in January 2023, agreement on the Kunming- the Global Ocean Alliance for Nature and People.</li> </ul>	In Montreal in January 2023, the UK played an important role in securing international agreement on the Kunming-Montreal Global Biodiversity Framework. The UK also established the Global Ocean Alliance and became the Ocean Co-chair of the High Ambition Coalition for Nature and People.				
	• At COP27, the Government that is spent on adaptation	At COP27, the Government announced that it would triple the international climate finance that is spent on adaptation (from £500 million in 2019 to £1.5 billion in 2025). At COP27, UK Export Finance (UKEF), the UK Government's export credit agency, announced that it would introduce Climate Resilient Debt Clauses in direct sovereign lending. These clauses provide the option for low-income and small island state governments to delay repayments when they experience severe climate-related shocks. UKEF was the first export credit agency to offer such provisions. <sup>28</sup>				
	<ul> <li>At COP27, UK Export Finance that it would introduce Clima clauses provide the option for repayments when they expense credit agency to offer such</li> </ul>					
	The UK Government pledge money will support the Glob launched by the G7 and the finance and disaster prepare	The UK Government pledged £120 million in support for disaster risk financing. Some of this money will support the Global Shield against Climate Risk initiative. The Global Shield was launched by the G7 and the V20 group of climate vulnerable countries to provide climate risk finance and disaster preparedness solutions that can be rapidly accessed in emergencies.				
	<ul> <li>The 2030 Strategic Framework expresses ambition to secure agreement on new funding arrangements for Loss and Damage. The UK's public support in this area following COP27 is positive and should be echoed in other areas of its negotiation position.</li> <li>To be addressed:</li> </ul>					
	<ul> <li>Risks to UK ODA programmin to the budget for internation the policy scorecard (recom</li> </ul>	Risks to UK ODA programming for adaptation and resilience have arisen from temporary cuts to the budget for international aid spending. Further detail is provided in the finance section of the policy scorecard (recommendation R2023-113).				
	<ul> <li>The UK can play an important future financing arrangement Transitional Committee to er potential to deliver for climatical</li> </ul>	nt role in UNFCCC processes aimin nts for Loss and Damage through unsure robust, detailed proposals are te vulnerable nations.	g to produce proposals on using its membership of the e brought to COP28 that have			
	• The UK can demonstrate be international setting through Plans, to encourage other c	• The UK can demonstrate best practice in communicating adaptation needs and plans in an international setting through UNFCCC Adaptation Communications and National Adaptation Plans, to encourage other countries to do the same.				
	Further steps are needed to mention of climate in the De Framework suggests coordin aware of their exposure to o	address climate risk in the UK's ove epartment of International Trade's nation is needed across Governme overseas climate risk. <sup>29</sup> There is also	erseas supply chains. The lack of Supply Chains Resilience ent to ensure all departments are a need for Government to			

encourage businesses to assess the climate risks affecting their supply chains with clear reporting standards and information.

 UK expertise on climate risk assessment and adaptation metrics can contribute to discussions on the Global Goal on Adaptation and to help increase national capabilities in other countries. The CCC will contribute to these efforts through the International Climate Councils Network (ICCN) Just Adaptation Working Group and international engagement on adaptation through UK PACT.<sup>30</sup>

### (b) The UK as a climate leader

The Strategic Framework sets out notable aims on the UK's ambition to contribute towards meeting international climate and nature goals. However, many of the actions underneath these ambitions focus on past policies and programmes with little detail on what will be done in future. In some areas, such as trade, there are almost no actions at all.

There has been a clear decline in profile for international climate issues in Government over the past year. Coupled with domestic policy decisions that clash with the UK's international messaging, such as the new Cumbrian coal mine, this represents a retreat from the strong leadership position established during the UK's COP Presidency. Overall, the UK has lost its clear global leadership position on climate action, although examples of leadership do remain such as research and international efforts on aviation and shipping.

The UK needs to redefine its role in the international climate space. Regaining its role as a clear climate leader following its COP Presidency will require concerted action in the following areas:

- **Domestic action.** The UK's ability to advocate for progressive international outcomes relies on a credible record on domestic delivery. Filling the policy gaps in the Carbon Budget Delivery Plan to meeting the 2030 NDC and developing alternative policy options for areas with substantial delivery risks (see Chapter 3) would demonstrate best practice and allow the UK to lobby other countries to do the same. Domestic decisions need to align with the ambition we encourage abroad and avoid repetition of reputation and leadership-damaging mistakes such as the approval of the new coal mine in Cumbria.
- **Keeping pace with global change.** As well as producing a policy response to measures such as the US Inflation Reduction Act and EU Green Deal Industrial Plan, the UK should reconsider its membership of outdated agreements such as the Energy Charter Treaty (Box 2.4) to ensure it is well placed to keep pace with the growing momentum of the low-carbon transition.
- **Negotiations.** The Government should set out its ministerial leadership arrangements and negotiating priorities well in advance of COP28, continue to advocate for the highest-ambition outcomes on mitigation, adaptation and support for developing countries and consider joining a progressive COP negotiating bloc. With COP28 expected to involve detailed discussions on the future role of fossil fuels, the UK should set out in advance a clear position on exiting oil and gas that avoids ambiguous references to, for example, hydrogen-ready infrastructures, and strengthen its language on this in all international climate fora including the G7 and G20.

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The UK has retreated from the climate leadership position it established during the COP Presidency.

The UK can lead on domestic delivery by addressing the remaining policy gaps for the 2030 NDC.

Membership of outdated agreements such as the Energy Charter Treaty risks slowing momentum on low-carbon transition.

The Government needs to present a clear plan and identify ministerial leadership for COP28.

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The UK can demonstrate leadership by delivering progress against existing JETP agreements.

The process of determining the UK's 2035 NDC should begin.

- **Delivering on international commitments.** The coming year has many opportunities for the UK to show leadership and help to deliver tangible progress against COP and CBD commitments on methane, forests and nature. Demonstrating progress against existing JETPs with South Africa, Vietnam and Indonesia is also vital for showing that this model of financing can deliver real world results.
- International sector ambition. The UK can continue to demonstrate leadership through supporting and coordinating increased ambition on emissions reductions for international aviation (through the International Civil Aviation Organization – ICAO) and international shipping (through the International Maritime Organisation – IMO). A notable opportunity for this will be the forthcoming revision of the IMO's long-term target in 2023. Further details on aviation and shipping are provided in Chapter 10 and Chapter 11 respectively.
- **NDC best practice.** The UK Government will need to begin the process of determining its 2035 NDC (Box 2.5).

#### **Box 2.4** Energy Charter Treaty explainer

The Energy Charter Treaty (ECT) is a legally binding international agreement that was developed to address barriers to cross-border energy cooperation in the early 1990s. The ECT established a framework for signatories to invest in energy assets in each other's countries and to trade and transport energy, underpinned by principles of both open competition and national sovereignty over energy resources. At the time of inception, the energy addressed in the treaty was mostly from fossil fuels. There are over 50 parties to the Treaty, currently including both the UK and the EU. Some of the investment protection elements of the ECT now pose a risk to climate progress in signatory countries. The Treaty includes a mechanism for Investor-State Dispute Settlement (ISDS) that allows investors to legally challenge signatory states if national legislation or regulation leads to depreciation of their energy investments. This provides a route for fossil fuel companies to sue governments for climate and energy policies that seek to phase out the use of fossil fuels. The Netherlands is currently facing a \$1.4 billion ISDS challenge over its phase-out of coal. These elements of the ECT represent risk to both a timely climate transition and to the taxpayer.

There have been multiple efforts to reform the ECT. The most recent round of reforms in 2022 produced UK carve-outs that remove protections for new fossil fuel investments and provisions to phase in carve-outs that remove protections for existing fossil fuel investments. Overall, these reforms do not provide sufficient protection. Firstly, they retain protections for new gas pipelines that are 'capable' of transporting renewable and lowcarbon gases (such as hydrogen) even if the pipelines are not being used for that purpose. Secondly, carve-outs for existing unabated gas investments will take at least ten years to come into force, leaving ample time for investors to launch claims. Thirdly, the recent reforms may face lengthy delays in coming into force due to Treaty ratification processes. This opens the door to investors frontloading their new investments to secure protections before carve-outs take effect. While further reform is technically possible, it looks increasingly unlikely given the number of climate-progressive parties signalling their intent to leave the ECT. Leaving the ECT does not fully remove risk as exiting parties will still be bound by a 20-year sunset clause for existing assets. However, as momentum gathers behind ECT exit, departing parties may come together to agree not to apply the sunset clause to each other. The Government should reconsider its judgement that the 2022 reforms bring the ECT into alignment with its Net Zero ambition and Paris Agreement commitments and strongly consider leaving the ECT, noting the opportunities associated with potential agreements with other exiting parties.

Source: Haut Conseil pour le Climat (2022) Report on the Modernisation of the Energy Charter Treaty; E3G (2022) Is the new Energy Charter Treaty Aligned with the Paris Agreement? A Reform That Still Falls Short; UK Government (2022) UK strengthens protections for taxpayers in energy treaty negotiations.

#### Box 2.5 Process for UK 2035 NDC

COP26 demonstrated that the timing of NDC announcements and having a critical mass of ambition was integral for increasing global mitigation ambition. The UK should be at the forefront of efforts to increase ambition again at COP30, using lessons learned from its COP26 Presidency.

The UK can also demonstrate leadership through its 2035 NDC by submitting a highambition and transparent NDC to the Paris Rulebook's timeline. This requests NDCs be submitted 9-12 months prior to that year's COP (held in November/December) so the UK Government should announce its 2035 NDC by February 2025 at the latest.

The CCC's Sixth Carbon Budget (2033-2037) analysis suggests emissions, including the UK's share of international aviation and shipping (IAS) emissions, should reduce by 78% on 1990 levels by 2035 (82% excluding IAS).

- As part of its forthcoming work on the Seventh Carbon Budget, the CCC will prepare 2035 NDC advice that considers both the emissions reduction required over the Sixth Carbon Budget period and the outcomes of the GST.
- This advice will also provide options for target ambition and will consider how IAS emissions could be reflected in the overall NDC, noting the inclusion of IAS in the Sixth Carbon Budget and UNFCCC emissions accounting rules.
- The UK must also demonstrate best practice when setting the NDC target based on the principles of transparency. This includes providing quantified estimated GHG savings that will achieve the target level and undertaking a comprehensive public engagement and/or consultation process.
- The Committee also recommended in our 2022 Progress Report that Government set out the governance and accountability structures for tracking progress against all UK NDC targets, noting the UK NDC is not in the scope of the Climate Change Act (2008) and therefore not accountable to Parliament.

Source: UNFCCC (2015) Paragraph 25, Decision 1/CP.21, Adoption of the Paris Agreement https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf

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# Chapter 3: Overall UK progress

# Policy and emissions

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#### Introduction and key messages

Our confidence in the Government's plans for meeting the UK's emissions reduction targets in the 2030s has decreased since last year. With little substantial progress, timelines are slipping. Urgent action is now needed to strengthen existing policies, fill policy gaps and develop alternative plans to mitigate the risk posed to the UK's international and domestic commitments. With the 2030 Nationally Determined Contribution (NDC) only seven years away, the next year will prove crucial for the UK Government to show how it will achieve this and demonstrate that outcomes are being delivered in all areas.

On the 30th of March this year, the Government published a suite of documents, aiming to map out its decarbonisation plans and how they align with economic growth and energy security in the UK.<sup>1,2</sup> The documents contained a summary of previous plans and a few new announcements, but nothing that significantly improved the overall picture. A key output was the <u>Carbon Budget Delivery Plan</u> (CBDP), laying out a set of decarbonisation policies and proposals. Most, but not all, of these have an associated quantification of how they contribute to the emissions reductions required to meet future targets. The CBDP provides a welcome and significant increase in detail and transparency. It was published in response to a High Court ruling that the Government's 2021 Net Zero Strategy (NZS) did not comply sufficiently with the Climate Change Act due to lacking this detail.<sup>3</sup>

In this and the following chapters, we discuss the UK's decarbonisation progress in the past year. We track progress against emissions reductions and a set of indicators and provide an assessment of policies and plans. Details on how we monitor progress are outlined in our accompanying <u>Monitoring Framework</u>.

Our key messages are:

- Emissions. UK greenhouse gas emissions were 450 MtCO<sub>2</sub>e in 2022, including the UK's share of international aviation and shipping, which is 46% below 1990 levels. This is an increase of 0.8% since 2021, but emissions remain 9% below pre-pandemic (2019) levels.
  - Emissions changes 2021 to 2022. Changes in the last year were mainly driven by transient differences in demand and temperature. There was an almost doubling of aviation emissions, due to the lifting of travel restrictions following the pandemic. Residential buildings emissions fell 16%, primarily due to mild winter months, with a smaller contribution from record high fuel prices reducing demand.
  - Emissions reduction needs to accelerate in all sectors outside of electricity supply, with the pace needing to almost quadruple over the next eight years. In agriculture and land use there has been no progress in reducing emissions in the last decade. Significant risks and policy gaps remain in these sectors.
- The Carbon Budget Delivery Plan has highlighted areas in which commitment may be lacking. As a result of last year's High Court ruling the Government has had to provide a firmer public commitment to its plans via the CBDP. This has resulted in some changes in approach and ambition, most notably the decision not to quantify potential emissions savings from reducing car-kilometres, and a reduction in ambition in the land use sector. Where possible, the emissions savings coming from unquantified plans should be estimated, even if they cannot be attributed on a policy-bypolicy basis.

- Our confidence in the UK meeting the Fourth Carbon Budget (2023-2027) has slightly increased in the last year. This is largely driven by an approximately 5% decrease on 2019 levels of vehicle-kilometres that appears to have reached a steady state, and increased confidence in the transition to electric vehicles in the short-term, as sales continue to grow.
- Our confidence in the UK meeting the 2030 NDC and the Sixth Carbon Budget (2033-2037) has decreased since last year. This is driven by a combination of delays in action leading to increased delivery risk and the extra detail in the CBDP allowing for a more thorough assessment. While we would expect policies to be less developed for targets further away in time, the NDC is now only seven years away.
  - There is an increase in the risk to emissions reduction from surface transport and electricity supply, predominantly due to delays in the zero-emissions vehicle mandate and the continued lack of a strategy for decarbonising electricity by 2035.
  - There have been more policy gaps identified in industrial electrification and resource efficiency; in agriculture and land, due to a lack of long-term funding and a more apparent reliance on the voluntary uptake of low-carbon measures; and in engineered removals due to delays in funding and guidance.
  - Significant risks identified last year remain for a number of areas including the decarbonisation of heat in homes, new nuclear capacity and conventional vehicles efficiencies.
  - With current plans, it is unlikely that the UK would achieve a reduction in methane emissions in line with the Global Methane Pledge of a 30% reduction in methane emissions compared to 2020 levels.
- Risk management and contingency plans. The Government's decarbonisation framework is currently missing coherent plans to mitigate the delivery risks to meeting the UK's 2030 NDC and the Sixth Carbon Budget. With the 2030 NDC only seven years away, it is vital they be developed in the next year. Risk management plans should:
  - Identify and begin to implement decarbonisation options beyond those quantified in the CBDP that could deliver an appropriate amount of additional emissions reduction on the required timescale. These should include empowering and incentivising the public to make low-carbon choices in how they travel and what they eat. Such measures also bring co-benefits for energy security and health. The plans should ensure there is sufficient time for policies to be implemented in a sensible, cost-effective and fair way.
  - Track indicators of progress against pathways consistent with the emissions reduction targets and establish governance structures for co-ordinating the implementation of additional alternative plans should things go off-track.

The rest of this chapter discusses progress in the following sections:

- 1. Progress in reducing UK emissions
- 2. Energy demand
- 3. Assessment of the UK Government's policies and plans
- 4. Mitigation of delivery risk and contingency plans

Emissions in the UK have been steadily falling in the last three decades and in 2022 were 46% below 1990 levels.

Emissions in 2022 were 0.8% higher than in 2021, remaining 9% below pre-pandemic levels in 2019.

The change in emissions in 2022 was driven by an almost doubling of aviation emissions balanced by a 16% decrease in emissions from residential buildings, due to mild winter months and high gas prices.

### (a) UK total territorial emissions

Emissions in the UK have been steadily falling in the last three decades and in 2022 were 46% below 1990 levels (Figure 3.1).\* The UK met its first two carbon budgets and is likely to have met its third, which ran from 2018 to 2022 (Figure 3.2).

**Emissions in 2021.** Emissions were 446.0 MtCO<sub>2</sub>e in 2021, 47% below 1990 levels. This was an increase of 4% from 2020, although they remained 10% below prepandemic (2019) levels (Figure 3.2).<sup>4</sup> The increase was driven by a partial rebound in surface transport emissions following the pandemic, an increase in emissions from electricity supply due to low wind speeds and nuclear outages, and higher heating requirements in residential buildings due to cold winter months. Emissions in agriculture increased due to an increase in combustion emissions (Figure 3.3a).

**Emissions in 2022.** A provisional estimate of 2022 emissions is 449.6 MtCO<sub>2</sub>e, an increase of 0.8% on 2021 levels, remaining 9% below pre-pandemic levels and 46% below 1990 levels (Figure 3.2).<sup>5</sup>

- Aviation emissions almost doubled in 2022 as the sector rebounded following the pandemic but remained 25% lower than in 2019 (Figure 3.4).
- Surface transport emissions increased by 3% but remain 8% below prepandemic (2019) levels (Figure 3.4), with some evidence that vehiclekilometres have reached a reduced steady state (see Chapter 4).
- There was a 16% decrease in emissions from residential buildings, predominantly due to milder than usual winter months in 2022 and the contrast to the cold winter months in 2021.
  - After adjusting for the effect of temperatures on heating requirements,<sup>†</sup> emissions from residential buildings fell by only 6% in 2022. This is likely to be driven by a behavioural response to the recordhigh gas prices (see Section 2 on energy demand).
  - Non-residential buildings emissions increased by 5% in 2022, after adjusting for temperatures. This was driven by increases in emissions in public buildings and there may be a contribution from an increase in office working following the pandemic (Figure 3.3b).

**The Third Carbon Budget (2018-2022).** Using the provisional estimate for 2022 emissions, total emissions over the Third Carbon Budget period were 2,327 MtCO<sub>2</sub>e. The Third Carbon Budget is set at 2,544 MtCO<sub>2</sub>e and the provisional data indicate that the UK has achieved it (Figure 3.2). A full assessment will be made in our 2024 Progress Report, when final emissions data for the period are available, with 2018-2020 emissions adjusted for net EU ETS trading.

<sup>\*</sup> All emissions values in this report use Global Warming Potentials from the IPCC's Fifth Assessment Report, without climate-carbon feedback effects (AR5-low).

<sup>&</sup>lt;sup>†</sup> Emissions are adjusted to account for year-on-year variations in temperature that lead to significant variations in actual emissions. The methodology is explained in our Monitoring Framework.

It is essential that an overachievement of the Third Carbon Budget is not banked as surplus emissions for the Fourth Carbon Budget.

The UK's territorial emissions have been falling steadily since 1990 and in 2022 were 46% lower. During this period the UK's GDP per capita has risen by 46%. It is essential that an overachievement of the Third Carbon Budget is not carried forward as surplus emissions for the Fourth Carbon Budget. An overachievement is not due to policy progress going ahead of schedule. Rolling over any surplus emissions would undermine the legal framework of the Climate Change Act and risk putting the UK off-track for Net Zero.



The UK achieved its first two carbon budgets and is likely to have achieved its third. The 2030 NDC and Sixth Carbon Budget are significantly more challenging.

# Figure 3.2 UK historical emissions, the Government's pathway and the UK's targets



Budget. Notes: (1) Emissions from international aviation and shipping (IAS) are included in historical emissions and the Carbon Budget Delivery Plan (CBDP) pathway and added to the NDC to allow for a direct comparison. (2) The CBDP projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (3) The annual pathway is an indication of emissions reduction. The UK does not have annual targets but the five-year carbon budgets and 2030 NDC must be achieved. (4) We have adjusted the Government's published CBDP pathway for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories. Emissions increased in 2021, driven mainly by increases in surface transport and electricity supply. Emissions in 2022 increased slightly by 0.8% due to an almost doubling of aviation emissions balanced by a 16% decrease in emissions from residential buildings.

# Figure 3.3 Change in UK emissions for key sectors (2020 to 2021 and 2021 to 2022)





Notes: Provisional 2022 estimates are not made for non-CO $_2$  greenhouse gases, so the change in 2022 agriculture emissions is not shown.

Emissions in transport fell during the pandemic and have since increased, but remained below pre-pandemic levels in 2022.

# Figure 3.4 Change in UK transport emissions (2019 to 2022)





# (b) Required pace of future emissions reductions

The rate of emissions reduction will need to accelerate quickly for the UK to meet its 2030 NDC and the Sixth Carbon Budget (Figure 3.5).

- Excluding emissions from aviation and shipping, which were significantly affected by the pandemic, emissions in 2022 were 408 MtCO<sub>2</sub>e, having fallen by 110 MtCO<sub>2</sub>e in the eight years prior to this (since 2014). This corresponds to a reduction of 2.9% per year on average.\*
- If we also exclude emissions from electricity supply, which have driven the bulk of the reductions over this period, emissions fell by only 36 MtCO<sub>2</sub>e to 360 MtCO<sub>2</sub>e over eight years, an average reduction of 1.2% per year. If the UK is to achieve its NDC, this will need to increase to 115 MtCO<sub>2</sub>e from 2022 to 2030 (an average annual reduction of 4.7%). The quantified plans in the CBDP projection leads to a reduction of 109 MtCO<sub>2</sub>e from 2022 to 2030, with the unquantified plans needing to make up the rest. The CBDP reduction corresponds to an average reduction of 4.4% per year, nearly four times the annual percentage reduction seen in recent years.
- Emissions reductions will need to accelerate in all sectors apart from electricity supply, where progress must be maintained (Figure 3.6).
  - Emissions reduction in the electricity supply sector over the last eight years has been driven by the phase-out of coal, growth in renewable

The rate of emissions reduction outside the electricity supply sector will need to accelerate quickly for the UK to meet its 2030 NDC and the Sixth Carbon Budget.

<sup>\*</sup> Average annual percentage reductions here and elsewhere in the report refer to a compound reduction, which is the average of year-on-year percentage reductions.

generation and reducing demand. From now on the sector needs to switch to phasing out unabated gas generation, while also keeping pace with growing electricity demand.

- Emissions reduction in surface transport has been driven by falling carkilometres following the pandemic. The rapid increase in electric vehicle sales has not yet resulted in major emissions savings, but these are expected to contribute a growing amount over the next few years.
- While there has been some limited progress in the buildings, industry, fuel-supply and F-gases sectors, the rate of reduction needs to accelerate by a factor of two or three. Most of these sectors carry significant delivery risks.
- There has been no progress in the agriculture, land use and waste sectors in the past eight years, with substantial reductions needed in the next eight years. The policies in these sectors carry significant delivery risk and, in some cases, plans are completely missing.

There has been no progress in the agriculture, land use and waste sectors in the past eight years, with substantial reductions needed in the next eight years. If the UK is to achieve its 2030 NDC, the rate of emissions reduction outside the electricity supply sector must almost quadruple.

# Figure 3.5 Change in UK emissions from 2014 to 2020 and required change from 2022 to 2030











Source: DESNZ (2023) Provisional UK greenhouse gas emissions national statistics 2022; BEIS (2023) Final UK greenhouse gas emissions national statistics: 1990 to 2021; DESNZ (2023) Carbon Budget Delivery Plan. Notes: (1) The Carbon Budget Delivery Plan (CBDP) projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (2) We have adjusted the Government's published CBDP pathway for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories.



Notes: (1) \*Provisional 2022 estimates are not made for non-CO2 greenhouse gases, so the change in 2022 land use, agriculture, waste and F-gas emissions are not shown and final 2021 emissions are used instead. (2) The Carbon Budget Delivery Plan (CBDP) projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (3) Sectoral emissions pathways are indicative only, they are not viewed by the CCC as sectoral targets. (4) We have adjusted the Government's published CBDP pathway for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories.

# (c) UK methane emissions

At COP26 in Glasgow, the UK signed up to the Global Methane Pledge: an international agreement to target a reduction of at least 30% in global methane emissions by 2030 compared to 2020 levels.<sup>6</sup> However, there is no UK-specific commitment to meet the Pledge at a domestic level and action in reducing methane emissions needs to be stronger (Chapter 2, recommendation R2022-229). The CBDP does not provide a breakdown by greenhouse gas of its emissions reduction pathway, so tracking progress towards the Pledge is difficult.

- Methane emissions come predominantly from agriculture and waste, with smaller contributions from fuel supply and land use (Figure 3.7).
- While methane emissions fell significantly from 2000 to 2015, driven by reductions in emissions from landfill waste and coal production in fuel supply, progress has stalled in recent years (Figure 3.7).
- In the six years from 2015 to 2021, methane emissions have fallen by an average of 0.9 MtCO<sub>2</sub>e (1.5%) per year. This will need to accelerate to 2.0 MtCO<sub>2</sub>e (4%) per year if the UK is to achieve a 30% reduction by 2030 (Figure 3.8).

The UK has no specific commitment to meet the Global Methane Pledge at a domestic level and action in reducing methane emissions needs to be stronger.

been no progress in the

Reductions in methane emissions are driven by the waste, agriculture and fuel supply sectors all of which have significant delivery risks. • In our Balanced Pathway,\* methane emissions fall by around 30% compared to actual emissions in 2020 by 2030. This is driven by reductions in waste, agriculture and fuel supply. The Government's ambition in all these sectors is less than in our Balanced Pathway, and Government plans all have significant delivery risks. This is particularly the case in agriculture where some plans are completely insufficient with a heavy reliance on voluntary uptake of measures (Chapter 9). It is therefore unlikely that the UK would achieve a 30% reduction in emissions by 2030 with current plans.

The UK Government needs to lay out clearly how it plans to achieve a 30% reduction and address the associated delivery risk (recommendation <u>R2022-229</u>).



Source: BEIS (2023) Final UK greenhouse gas emissions national statistics: 1990 to 2021; CCC (2020) The Sixth Carbon Budget; CCC analysis. Notes: We have adjusted our pathway to account for changes in the UK's emissions inventory methodology.

While methane emissions fell significantly from 2000 to 2015, driven by reductions in emissions from landfill waste and coal production in fuel supply, progress has stalled in recent years.

\* We have adjusted our Balanced Pathway to account for changes in the UK's emissions inventory methodology.

Since 2021 methane emissions have fallen by an average 1.5% per year. This will need to increase to 4.0% if the UK is to achieve the 30% reduction by 2030.



# (d) Emissions in Scotland, Wales and Northern Ireland

As in England, emissions in Scotland, Wales and Northern Ireland fell in 2020 and rebounded in 2021 due in part to increases in surface transport emissions as pandemic restrictions eased. There were also increases in emissions from residential buildings due to colder than usual winter months, and from agriculture in line with those in England. Emissions from surface transport and aviation remain below prepandemic 2019 levels across the UK.

- **Scotland.** Emissions in Scotland were 41.6 MtCO<sub>2</sub>e in 2021, 2% higher than 2020 levels but remaining 10% below pre-pandemic (2019) levels and 49.2% below 1990 levels, 49.9% using the GHG account, which is used to assess targets (Figures 3.9 and 3.10). Scotland therefore did not meet its 2021 annual target of a 51.1% reduction compared to 1990 levels\* (Figure 3.9).<sup>7,8,9</sup> Unlike the rest of the UK, emissions from industry and electricity supply (due to lower gas-fired generation) decreased in Scotland in 2021.
- Wales. In 2021 emissions in Wales were 36.3 MtCO<sub>2</sub>e, 7% higher than the previous year but 6% below pre-pandemic (2019) levels and 35% below 1990 levels (Figures 3.9 and 3.10). Wales achieved its 2020 interim target and its First Carbon Budget (2016-2020), with emissions reduction over the First Carbon Budget period mainly driven by the electricity supply and industry sectors.<sup>10</sup> The 2021 rise in emissions was driven by the electricity supply, industry and surface transport sectors. In 2021, electricity supply

\* This refers to the Scottish targets legislated in 2023 which were updated to ensure consistency with the latest change in international emissions reporting practices.

Like in England, emissions in Scotland, Wales and Northern Ireland fell during the pandemic in 2020 and rebounded in 2021. increased by more than the rest of the UK, with higher gas-fired generation (partly for export to England).

• Northern Ireland. Emissions in Northern Ireland were 22.7 MtCO<sub>2</sub>e in 2021, 5% higher than 2020 levels. This was 0.5% higher than pre-pandemic (2019) emissions and 23% lower than 1990 levels (Figures 3.9 and 3.10). The emissions increase in 2021 was driven by the surface transport, agriculture and electricity supply sectors.



In 2021 emissions in Scotland were almost half those in 1990 but Scotland missed its 2021 annual target. In Wales and Northern Ireland emissions reductions have been slower, although they sped up in Wales in the last five years.

Source: DESNZ (2023) Provisional UK greenhouse gas emissions national statistics 2021; BEIS (2023) Final UK greenhouse gas emissions national statistics: 1990 to 2021.

Notes: Scottish annual targets between 2020 and 2029 have been adjusted following the CCC's advice to align with the latest emissions estimation methodology. For example, the legislated 2020 target changed from a 56% reduction to 48.5% of baseline levels. This reflects the change in international emissions reporting practice. 2020 emissions were assessed by the Scottish Government against the old target of 56% (and using the old GHG inventory methodology). Historical emissions are shown using the 1990-2021 inventory. Targets in Scotland are assessed against the GHG account which reports slightly lower historical emissions in 2021, but the 2021 target was still missed.

Emissions in Scotland, Wales and Northern Ireland fell in 2020 and rebounded in 2021 with Northern Ireland's emissions back to pre-pandemic levels.

# Figure 3.10 Change in emissions in Scotland, Wales and Northern Ireland, 2019-20 and 2020-21



### (e) UK consumption emissions

While we report emissions primarily on a territorial basis, as this is how the UK's targets are measured, it is also important to consider overseas emissions from UK consumption. Consumption-based estimates cover emissions that occur as a result of UK consumption of goods and services, wherever those emissions happen globally. UK consumption emissions are higher than its territorial emissions (Figure 3.11), because emissions associated with imports exceed those from exports.

- Consumption emissions were 774 MtCO<sub>2</sub>e in 2019 (the latest available year for which data are available), a decrease of 2% from 2018 and 57% greater than territorial emissions in 2019.
- Since 1996, the first year for which data are available, consumption emissions have fallen by 14% (122 MtCO<sub>2</sub>e). This is a slower reduction compared to territorial emissions, which have declined by 39% (317 MtCO<sub>2</sub>e) over the same period.

Since our last progress report, the Government's statistics on consumption emissions have been revised upwards by an average of 8% over the time period (Figure 3.11). This is driven by a large upwards revision on the estimated emissions from imports (of around a quarter). This revision is a result of updated source data on trade flows and reflects the large associated uncertainty on these estimates. The CCC has made recommendations to the Government on improving the quality of its consumption emissions statistics, and on policies to reduce the climate impact of UK imports (recommendations R2022-007, R2022-012, R2022-013, R2022-157).

Consumption emissions decreased by 2% in 2019 and were 57% greater than territorial emissions in the same year. Since 1996 consumption emissions have fallen by 14%. This is a slower reduction than in territorial emissions.







Progress in reducing UK emissions: 2023 Report to Parliament

90 878 Total energy demand on a final-use basis in the UK has been steadily falling since its peak in 2005.

Total energy demand on a final-use basis in the UK has been steadily falling since its peak in 2005. This has been driven by a combination of the decline of energyintensive industries and increased efficiency of industrial processes, vehicles, and buildings. Recent years have seen significant changes in energy consumption patterns due to the pandemic and the energy crisis.

- Overall electricity and gas demand. At an economy-wide level, electricity demand fell to 273 TWh in 2022, a decrease of 4% compared to 2021, due to lower consumption in industry and residential buildings.<sup>11</sup> Gas demand fell by 7.5%, driven by a large reduction in residential buildings, as discussed below.
- Heat demand in buildings. Temperature-adjusted residential buildings emissions fell by 6% in 2022, significantly more than the annual average of 1% from 2010-2019. It is likely that this is due to the significant increase in gas prices in 2022. However, it is unclear whether these changes reflect shortterm behavioural decisions or more permanent shifts in residential energy demand, and what the balance is between improvements in efficiency (e.g. reducing boiler flow temperatures) and people having colder homes due to the unaffordability. While these effects primarily affected gas demand, as gas provides the large majority of UK heating, they will also have affected electricity demand.
- Energy demand from surface transport. Changes in surface transport emissions between 2019 and 2022 have been driven by changes in carkilometres during and following the pandemic, with only a marginal impact from the uptake of electric vehicles (Chapter 4, Figure 4.4). Prior to the pandemic, energy demand for surface transport had been fairly constant since 2010, with improvements in vehicle efficiencies offset by increases in total traffic and a trend towards larger, heavier vehicles.

In the November 2022 fiscal statement, the UK Government committed to a 15% decrease in final energy demand by 2030 compared to 2021 levels for the industry and buildings sectors.<sup>12</sup> While the CCC welcomes an explicit target for energy demand, the CCC's Sixth Carbon Budget analysis and the Government's NZS demonstrated that significantly greater ambition is feasible. Since these pathways were developed, high fossil fuel prices have demonstrated the costs of the Government's ongoing failure to provide stronger incentives to reduce demand and thereby lessen the UK's import dependence and consequent exposure to volatile international markets.

- At an economy-wide level, the NZS pathway achieves a demand reduction of 23% from 2021-2030. However, the CBDP's ambition for demand reduction within the quantified plans will be lower due to changes in performance assumptions for plug-in hybrids, and the exclusion of policies on modal shift in transport from the quantified plans.
- It is unclear whether the CBDP would meet the Government's 15% target for buildings and industry, because a sectoral breakdown has not been published.

The UK Government has committed to a 15% decrease in final energy demand by 2030 compared to 2021 levels for the industry and buildings sectors but greater ambition is feasible. The UK's overall energy demand fell by 1%, a modest reduction compared with Germany's 5%.

The UK's overall energy demand fell by 1%, a modest reduction compared with Germany's 5%.<sup>13,14</sup> The greater reduction in energy demand in Germany may have been driven in part by more proactive public engagement; the German Government launched an information campaign on energy savings in June 2022, whereas the UK's equivalent did not launch until late December.<sup>15,16</sup> This highlights a missed opportunity from Government to protect consumers from the impact of volatile prices, while driving deeper reductions in emissions.

The CCC has made a number of recommendations in this area across multiple sectors including surface transport, buildings, and industry (including recommendations <u>R2022-078</u>, <u>R2023-132</u>, <u>R2022-119</u>, and <u>R2023-170</u>).

The CBDP provides a welcome increase in detail and transparency in the Government's plans for decarbonisation.

These CBDP projections from quantified plans outperform the Fourth and Fifth Carbon Budgets but fall slightly short of the UK's 2030 NDC and the Sixth Carbon Budget.

The lower emissions reduction embodied in the quantified policies and plans compared to the Net Zero Strategy comes predominantly from surface transport.

## (a) The UK's Carbon Budget Delivery Plan (CBDP)

The CBDP provides a welcome increase in detail and transparency in the Government's plans for decarbonisation. It was published in response to a High Court ruling that the Government's 2021 NZS did not comply sufficiently with the Climate Change Act due to it lacking this detail. As a result of the ruling, the Government has had to provide a firmer public commitment to its plans, which has resulted in some changes in approach and ambition.

- The CBDP includes a set of quantified emissions savings with respect to projected baselines for most\* of its policies and proposals, leading to sectoral emissions projections for each carbon budget.
- These projections outperform the Fourth and Fifth Carbon Budgets but fall slightly short of the UK's 2030 NDC (with around 4% of the required emissions reduction unquantified) and the Sixth Carbon Budget (with around 2% unquantified),<sup>†</sup> even before any consideration to the risk of delivering these reductions (Figure 3.12). The pathway from the 2021 NZS committed to an overall path for emissions that outperformed all the carbon budgets and the NDC, thus enabling some contingency (Figure 3.12). The Government categorised some plans and proposals as unquantified in the CBDP and takes the position that these will close these shortfalls.
- The smaller emissions reduction embodied in the quantified policies and plans compared to the NZS comes predominantly from surface transport (Figure 3.13). This is due to a more realistic estimate of emissions from plug-in hybrid cars and a decision to remove most of the estimated emissions savings from reducing car-kilometres, that had been included in the NZS pathway. Last year's High Court ruling has required the Government to disclose and give a firmer public commitment to its plans and the Government made a decision not to include an estimate of these emissions savings. Where possible the emissions savings from unquantified plans should be estimated, even if they cannot be attributed on a policy-by-policy basis (recommendation R2023-056).
- Emissions reduction is also smaller in the buildings and land use sectors (Figure 3.13). For land use the relative reduction in ambition is substantial compared to the NZS, but changes to emissions accounting methodologies have resulted in slightly lower emissions in the CBDP pathway (Chapter 9).
- This is slightly balanced by lower projected aviation emissions, due to updated projections for demand growth (Figure 3.13).<sup>17</sup>

<sup>&</sup>lt;sup>\*</sup> In the electricity supply sector, and for the contribution of emissions reduction from devolved administrations in the agriculture, land use, waste and F-gases sectors, there is no breakdown given.

<sup>&</sup>lt;sup>†</sup> We have adjusted the CBDP land use baseline and pathway to account for changes in methodology between the 1990-2019 and 1990-2020 inventories, and removed some policies from the baseline so they can be assessed. Given these changes, the Government's pathway has a shortfall of around 4% to the NDC (as opposed to 8% published in the CBDP) and around 2% to the Sixth Carbon Budget (as opposed to 3% published in the CBDP).
The Carbon Budget Delivery Plan's quantified plans fall slightly short of the 2030 NDC and Sixth Carbon Budget, with the Government's position being that the unquantified plans will make up this shortfall.

## Figure 3.12 UK Government's projected emissions compared to the UK's targets





Source: DESNZ (2023) Carbon Budget Delivery Plan; BEIS (2021) Net Zero Strategy; CCC (2020) The Sixth Carbon Budget.

Notes: (1) The Carbon Budget Delivery Plan (CBDP) projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (2) We have adjusted the Government's published CBDP pathway and baseline for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories.



Quantified plans in the surface transport sector are lower in the Carbon Budget Delivery Plan than the projections in the Net Zero Strategy.

## (b) Assessment of policies and plans

In this section we determine the risks to the UK achieving its targets by assessing the quantified policies and plans in the CBDP, determining if they are credible and on track according to the criteria outlined in Annex 1. The unquantified policies that act as enablers for the transition are included in our assessment. However, it has not been possible to include the unquantified policies and proposals that are expected to contribute additional emissions savings, due to the lack of clarity in what they are expected to achieve.

We focus on the short- and medium-term targets up to the end of the Sixth Carbon Budget period (2037) and including the 2030 NDC. It is vital that the UK meets its NDC, both in terms of honouring its international commitments (Chapter 2) and in ensuring it is on track to achieve the Sixth Carbon Budget and Net Zero.

- **The Fourth Carbon Budget (2023-2027).** Our confidence in the UK achieving its Fourth Carbon Budget has increased slightly this year, due to a combination of policy progress and the pandemic and fuel prices affecting demand (Figure 3.14). Sufficient plans over this period are predominantly from renewable electricity generation and the transition to electric vehicles (Figure 3.15).
  - With sales of electric cars continuing to grow in the last year, our confidence in this transition in the short term has increased.
  - Vehicle-kilometres are approximately 5% lower than 2019 levels, which appears to be a steady state following the reductions during, and partial rebound since, the pandemic. This leads to a lower level of baseline emissions over this period. Vehicle-kilometres are likely to resume growing at the rate seen prior to the pandemic unless the Government develops a coherent plan with clear milestones to empower the public to make low-carbon travel choices.
  - Some details have been released on some land and agricultural policies across the UK, with farmers starting to take up the Environmental Land Management scheme in England. This leads to an increased confidence in the short term.
  - The CBDP projects a significant reduction in baseline buildings emissions over the entire Fourth Carbon Budget period due to projected high gas prices. This reduction is very uncertain and could be considerably smaller than projected. The projected savings are indicated in Figure 3.14 compared to projected emissions from the NZS to demonstrate the level of uncertainty.
- The 2030 NDC and Sixth Carbon Budget (2033-2037). Our confidence in the UK meeting both the 2030 NDC and Sixth Carbon Budget has decreased in the past year (Figures 3.14 and 3.16). This is driven by a combination of continued delays in action leading to increased delivery risk, the detail released in the CBDP enabling a more thorough assessment over the different time periods and the fact that emissions savings from certain policies were not quantified, most notably policies to empower the public to make low-carbon travel choices.

Our confidence in the UK achieving its Fourth Carbon Budget has increased slightly this year, due to a combination of policy progress and the pandemic and fuel prices affecting demand.

Our confidence in the UK meeting both the 2030 NDC and Sixth Carbon Budget has decreased in the past year.

- While we would expect policies to be less developed for targets further away in time, the NDC is now only seven years away. Our assessment shows a concerning picture for emissions reduction by 2030 (Figure 3.14 and 3.16a):
  - Credible plans exist for 25% of the required emissions reduction, with funding, enablers and timelines in place. This comes predominantly from policies for the zero-emission vehicle transition and renewable electricity supply policies, although the proportion of emissions reduction from these policies judged to be covered by credible plans has decreased this year.
  - There are some risks attached to 30% of the required emissions reduction, where changes are needed to mitigate delivery risk. There is a much larger proportion from renewable energy generation than last year in this category, predominantly due to the continued absence of a delivery strategy for the sector and increased delivery risks around planning, consenting and access to network connections. The proportion from the zero-emission vehicle transition has also increased, largely due to the delay of the zero-emissions vehicle mandate with risks remaining for policies to address price disparity in car charging, zero-emission vans and HGVs. There are also some risks associated with decarbonising new homes, and policies for industrial CCS and hydrogen.
  - There are significant risks attached to 23% of the required emissions reduction where plans are either under development without a clear timeline for next steps or need further work to mitigate a significant delivery risk. These come predominantly from the market-based mechanism for low-carbon heat in homes, afforestation, conventional vehicle efficiencies, sustainable aviation fuels as well as the necessary infrastructure, CO<sub>2</sub> storage sites and funding mechanisms for around half of the Government's ambition for engineered removals.
  - Plans are either completely missing or currently inadequate for 18% of the required emissions reduction. It is troubling that this is a larger proportion than last year. Policies to drive the electrification of industry are missing, despite the CBDP making it clear that decarbonising the sector relies heavily on the electrification of the steel industry. Plans are also missing for agricultural productivity and peatland restoration in the long term. The CBDP clarified the dependence on a voluntary uptake and highlighted a lack of long-term funding to support changes in land use. There are also significant policy gaps for energy efficiency in non-fuel-poor homes and plans to accelerate vehicle fleet turn-over. Confidence in plans for the remaining half of the Government's ambition for engineered removals required to meet the NDC has reduced this year as continued delays to funding and guidance means there may now be insufficient time for new projects to begin operating by 2030.
  - The remaining 4% of required emissions reduction is not covered by the quantified plans. The CBDP lays out unquantified policies and plans that are supposed to make up this shortfall.

It is troubling that a larger proportion of required abatement is assessed as either completely missing or inadequate than last year. Plans are credible or have only some associated risk for no more than around half the required emissions reduction for the 2030 NDC.

#### Figure 3.14 Assessment of policies and plans 500 Average annual emissions (MtCO,e) 450 400 350 300 250 200 150 100 50 0 CB4 average CB5 average CB6 average (2023 - 2027)(2028 - 2032)(2033 - 2037)Fuel price baseline reduction Credible plans Significant risks Some risks NZS pathway NDC (+CBDP IAS) CBDP pathway Insufficient plans -Carbon budget Baseline (with NZS buildings) • Baseline Source: DESNZ (2023) Carbon Budget Delivery Plan; DESNZ (2023) Energy and emissions projections: 2021 to 2040; BEIS (2021) Net Zero Strategy; CCC (2020) The Sixth Carbon Budget; CCC analysis. Notes: (1) This assessment uses Government plans listed in Annex B, Tables 5 & 6 of the Carbon Budget Delivery Plan (CBDP). See Annex 1 for the assessment criteria. (2) The baseline is an adjustment to the Government's CBDP baseline, with the impact of some policies removed so that they can be assessed. Refer to each sector chapter for additional notes on our methodology. (3) We have adjusted the Government's published CBDP pathway and baseline for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories.

(4) For comparability, the CBDP's emissions pathway for international aviation and shipping (IAS) has been added to the target values for CB4, CB5 and the NDC. (5) The CBDP projections include only the quantified plans.

Unquantified plans may lead to further emissions reductions.

Over the Fourth Carbon Budget period credible plans are mostly in the surface transport and electricity supply sectors.

## Figure 3.15 Assessment of policies and plans for the Fourth Carbon Budget for key sectors





BEIS (2021) Net Zero Strategy; CCC (2020) The Sixth Carbon Budget; CCC analysis. Notes: (1) This assessment uses Government plans listed in Annex B, tables 5 & 6 of the Carbon Budget Delivery Plan (CBDP). See Annex 1 for the assessment criteria. (2) The CBDP projections include only the quantified plans. Unquantified plans may lead to further emissions reductions (3) The baseline is an adjustment to the Government's CBDP baseline, with the impact of some policies removed so that they can be assessed. Refer to each sector chapter for additional notes on our methodology. (4) We have adjusted the Government's published CBDP pathway and baseline for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories. For the 2030 NDC and the Sixth Carbon Budget insufficient plans come predominantly from industry.

## Figure 3.16 Assessment of policies and plans for the NDC and Sixth Carbon Budget for key sectors







#### b) Sixth Carbon Budget (2033-2037)



Source: DESNZ (2023) Carbon Budget Delivery Plan; DESNZ (2023) Energy and emissions projections: 2021 to 2040; BEIS (2021) Net Zero Strategy; CCC (2020) The Sixth Carbon Budget; CCC analysis. Notes: (1) This assessment uses Government plans listed in Annex B, tables 5 & 6 of the Carbon Budget Delivery Plan (CBDP). See Annex 1 for the assessment criteria. (2) The CBDP projections include only the quantified plans. Unquantified plans may lead to further emissions reductions. (3) The baseline is an adjustment to the Government's CBDP baseline, with the impact of some policies removed so that they can be assessed. Refer to each sector chapter for additional notes on our methodology. (4) We have adjusted the Government's published CBDP pathway and baseline for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories. Government must act now to develop a set of alternative policies and plans to mitigate delivery risk to meeting the 2030 NDC and Sixth Carbon Budget. Our assessment of the policies and plans in the UK Government's CBDP have highlighted significant delivery risks and gaps in plans for around half the emissions reduction required to meet both the 2030 NDC and the UK's Sixth Carbon Budget (Figure 3.14). As well as strengthening existing policies and filling in gaps, the Government must act now to develop contingency plans, including a set of alternative policies to mitigate this delivery risk. If this is not done over the next year, there will be insufficient time to implement these alternative policies to cover shortfalls in current plans and policies (priority recommendation R2022-119).

The contingency plans should:

- Identify decarbonisation options beyond those in the CBDP and estimate the potential additional abatement that could be achieved on the required timescale. We discuss possible options below.
- Determine a timeline, considering how long it takes for the alternative policies to take effect. They should not be implemented as a last-minute emergency, but rather carefully planned to ensure they can be implemented in a sensible, cost-effective and fair way.

To facilitate the development of contingency plans, the monitoring of progress towards Net Zero needs to be improved:

- Indicators of progress should be tracked against pathways consistent with the required emissions reductions and presented more clearly to the public. Our Monitoring Framework contains many indicators that could be used for this purpose (recommendation R2023-058).
- Better governance structures are needed for monitoring this progress and coordinating the implementation of alternative options in sufficient time (recommendation R2023-151).
- In the annual public update on progress promised in the NZS (the Summary
  of Progress Against NZS Reporting Commitments in the powering up Britain
  Technical Annex), there was no comparison to required progress and no
  commentary on where things are off-track and how this will be
  addressed.<sup>18</sup>

We intend to develop our advice in this area, including quantifying uncertainties in emissions pathways in our work on advising the level of the Seventh Carbon Budget.

To better facilitate the development of contingency plans, the monitoring of progress towards Net Zero needs to be improved.

#### Alternative policy options will reduce delivery risk and bring significant co-benefits to the health of citizens.

## (a) Possible alternative policy options and their co-benefits

The quantified policies and plans in the CBDP for 2030 are 5.5 MtCO<sub>2</sub>e short of meeting the NDC. We have also identified 30.3 MtCO<sub>2</sub>e of the remaining required abatement as a policy gap, with completely insufficient plans, and a further 39.4 MtCO<sub>2</sub>e of the plans and policies as having significant risks (Figure 3.14).

We have quantified potential emissions savings from the following alternative options, that could be considered to close this gap (Figure 3.17):

## (i) Options included in the Government's unquantified policies and proposals

• Modal shift in surface transport. In the CBDP, only 2 MtCO<sub>2</sub>e emissions reduction is attributed to quantified policies that aim to reduce carkilometres in 2030. In the Government's NZS this was significantly higher, with an additional 6 MtCO<sub>2</sub>e attributed to modal shift, similar to the assumptions in our Balanced Pathway. Modal shift brings co-benefits due to more active lifestyles and reductions in air pollution and congestion. While the Government does include some additional unquantified policies for empowering and incentivising the public to make green travel choices, their exclusion from quantified plans makes it impossible to judge the extent to which they are expected to contribute to emissions reduction, so we discuss them here as alternative options. On assessing these plans, we identify significant risks and some insufficient plans if the targeted level of abatement is assumed to be the same as that in the NZS.

## (ii) Options we recommend for inclusion in the Government's main plans

- Phasing out sales of hybrid cars. If the Government were to ban the sale of plug-in hybrid cars as well as fossil-fuel cars by 2030 (recommendation R2023-141), with a corresponding reduction in hybrid sales prior to this, an extra emissions reduction of 2 MtCO<sub>2</sub>e in 2030 may be possible, with these emissions savings increasing further during the 2030s.
- Limiting aviation growth. The Government has no plans to limit growth in the aviation sector and relies heavily on nascent technologies (priority recommendation R2023-037). The Government's aviation pathway assumes a 70% increase in passengers by 2050 against 2018 levels, much higher than the 25% growth by 2050 in our Balanced Pathway. By 2030, the Government's pathway assumes an increase in passenger demand of 60% from 2022 actual demand levels,\* while our Balanced Pathway assumes demand will be 40% higher than 2022 levels. Limiting the rebound in aviation demand to the level in the Balanced Pathway would provide an additional 5 MtCO<sub>2</sub>e of abatement.<sup>+</sup> While international aviation emissions are not included in the NDC, emissions reductions in this sector are needed to be on track for the Sixth Carbon Budget.
- **Diet change.** The Government has set out no plans to support the public to shift to a lower-carbon diet (recommendation R2022-036). A shift to low-

<sup>†</sup> These calculations use the CCC's Sixth Carbon Budget Balanced Pathway assumptions on aviation fuel and efficiency changes.

<sup>\*</sup> Note that aviation emissions in 2022 were 25% below 2019 pre-pandemic levels.

carbon diets also brings co-benefits to the health of citizens. If meat and dairy consumption were reduced by 20% by 2030 as assumed in our Balanced Pathway, an additional emissions reduction of 5 MtCO<sub>2</sub>e could be possible. This option would also help with the reduction in methane emissions required by the Methane Pledge. This assumes low-carbon farming practices remain as they are today.

(iii) Additional options we recommend for consideration if progress is off track

- Increased innovation in diet. If changes in diet were to follow our Tailwinds scenario, which on top of the 20% reduction in meat and dairy by 2030 discussed above, has a significant contribution from lab-grown meat, an additional 2 MtCO<sub>2</sub>e of abatement could be achieved (on top of the 5 MtCO<sub>2</sub>e discussed above for diet change under the Balanced Pathway).
- Lower aviation demand. We have considered the potential savings that could be achieved by a 15% reduction in passenger numbers compared to 2018 levels by 2050, as modelled in our Tailwinds scenario. If the rebound in passenger demand from 2022 to 2030 were limited to a 21% increase, to reach the 2030 level of demand in Tailwinds, an additional 5 MtCO<sub>2</sub>e of abatement in 2030 would be possible (on top of the 5 MtCO<sub>2</sub>e from limiting aviation growth to that in the Balanced Pathway, discussed above).
- Buildings. Steps could be taken to speed up the decarbonisation of buildings. If emissions reduction followed our Tailwinds scenario for buildings, an extra 8 MtCO<sub>2</sub>e emissions reduction could be possible by 2030, driven by increased levels of behaviour change and energy efficiency in homes, and faster uptake of energy efficiency measures in non-residential buildings. There is further potential for emissions reduction from accelerated uptake of low-carbon heating (e.g. through retrofit of hybrid heat pump systems around existing boilers), but we have not quantified this potential.

Even with all these options included, there is insufficient additional abatement to make up the policy gaps we have identified. As well as developing additional plans, existing policies must be strengthened and risks must be reduced.

Developing contingency plans would significantly reduce delivery risk for the NDC, but current plans must also be strengthened.



BEIS (2021) Net Zero Strategy; CCC (2020) The Sixth Carbon Budget; CCC analysis. Notes: (1) The policy assessment uses Government plans listed in Annex B, tables 5 & 6 of the Carbon Budget Delivery Plan (CBDP). See Annex 1 for the assessment criteria. (2) The baseline is an adjustment to the Government's CBDP baseline, with the impact of some policies removed so that they can be assessed. Refer to each sector chapter for additional notes on our methodology. (3) We have adjusted the Government's published CBDP pathway and baseline for land use to account for methodological changes between the 1990-2019 and 1990-2020 inventories. (4) The CBDP projections include only the quantified plans. Unquantified plans may lead to further emissions reductions.

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## Chapter 4: Surface transport

# 105 MtCO<sub>2</sub>e, 23% of UK emissions in 2022

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### Introduction and key messages

Surface transport remains the UK's highest-emitting sector, contributing 23% (105 MtCO<sub>2</sub>e) of total UK emissions in 2022. The Government's Carbon Budget Delivery Plan (CBDP) indicates a reduction in surface transport emissions of 58% (61 MtCO<sub>2</sub>e) by 2035, compared to provisional 2022 emissions.<sup>1</sup> However, the CBDP reduces the quantified level of ambition compared to the previous Net Zero Strategy, in which residual emissions from surface transport in 2035 were around 14 MtCO<sub>2</sub>e lower (see Chapter 3).<sup>2</sup> There were two key changes driving this:

- The CBDP acknowledged new evidence showing that the carbon savings from plug-in hybrid (PHEV) cars are around three to five times lower in the real world than previously assumed.<sup>3</sup> This means that the carbon savings accrued from the adoption of PHEVs are substantially smaller by around 9 MtCO<sub>2</sub>e/year than in the Net Zero Strategy analysis. It is positive that this evidence has been incorporated into the modelling, and it emphasises the importance of prioritising battery-electric vehicles (BEV) over less efficient and less cost-effective PHEVs. The Government should use this evidence to justify either permitting only BEV sales or setting a very ambitious definition of 'significant zero-emission capability' when deciding what vehicles will be allowed to be sold in the period 2030-2035.
- Most policies that aim to support and incentivise the public to choose lower-carbon modes of transport have been removed from the quantified pathway – over 5 MtCO<sub>2</sub>e/year of abatement that had been attributed to modal shift from cars to more sustainable modes of transport is no longer quantified. While these policies are still referenced in the Government's plan, making a choice not to quantify them signals a lack of commitment to modal shift. A pathway that is almost exclusively technology-dependent is likely to be less cost-effective, entails higher delivery risk (see Chapter 3) and risks missing out on opportunities to realise co-benefits to society.

This reduction in quantified ambition in surface transport results in an abatement shortfall which will need to be made up to meet legislated carbon budgets. The CBDP outlines a range of additional policy options – including those to reduce demand or encourage modal shift – that could deliver further savings but have not been quantified in the delivery pathway. It will be important for the Department for Transport (DfT) to continue to develop and implement these rather than relying on other sectors or speculative technological advances to address this shortfall.

Our key messages are:

- **Emissions.** Surface transport emissions increased by 3% in 2022 as travel demand continued to rebound from the COVID-19 pandemic. Emissions remain 8% below 2019 levels, primarily due to lower levels of car demand, which appear to represent a new 'steady state'.
- Delayed policy progress. Policy progress over the past year has been slower than expected, as various key documents and decisions have been delayed. This increases delivery risk across the sector, both by directly delaying deployment and by squeezing regulatory development timelines, reducing the ability for policies to push for greater ambition and leading key regulatory proposals to include more flexibility. The Government must now proceed with urgency to get plans in this key sector back on track.
- Zero-emission vehicle markets. The market share of electric cars continues to increase ahead of our Balanced Pathway assumptions, and most

manufacturers are now committed to offering electric options across their product ranges. Electric van uptake has been less strong, although the industry's market outlook remains positive.

- Zero-emission vehicle policy. Delivering the 2030 phase-out of new conventional car and van sales is vital to meeting the UK's decarbonisation pathway. The final consultation on the zero-emission vehicle (ZEV) mandate, which will require manufacturers to sell a rising proportion of ZEVs on the way to this, was published in March. This is an important policy which will ensure that electric vehicle (EV) sales scale up at the rate required, and the Government should focus on finalising its implementation and addressing the key enablers which will allow it to succeed.
  - Although the inclusion of various flexibilities for manufacturers will likely slightly weaken its practical impact, the ZEV mandate remains a credible delivery mechanism. The Government must now work at pace to ensure that it is implemented from 2024 as planned.
  - There is an opportunity to build on this progress to develop regulations and enabling policies to drive forward the market for zero-emission heavy goods vehicles (HGVs). The Government and industry have identified this as an area where there could be both emissions and economic benefits from the UK being a global first-mover. Swift action is vital to realise these.
- Electric vehicle charging. The UK's EV charging network has expanded by almost one-third over the past year, although provision remains inconsistent across the country and there are concerns around reliability and cost. The rate of chargepoint deployment will need to more than double in the coming year and beyond to ensure charging provision keeps pace with EV uptake. This is vital if progress is insufficient, delayed or patchy, or if cost and reliability issues present barriers to use, it could undermine public confidence in the suitability of EVs and pose a serious risk to the achievement of the 2030 phase-out of new petrol and diesel vehicles.
- Conventional and hybrid vehicles. The Government's initial proposal for remaining sales of conventional and hybrid cars and vans to be subject to only flat emissions regulations risks missing an opportunity to incentivise manufacturers to reduce the size and weight of vehicles. Reducing vehicle sizes and weights could also be beneficial for EVs, where larger vehicles have higher embedded emissions and consume more electricity.
- Limiting traffic growth. The Government has made no progress on our recommendations on clarifying the role for car demand reduction and ensuring that key enablers (road-building decisions and taxation) are aligned to delivering this. While there have been some positive signs through the distribution of capability funding by Active Travel England, the introduction of the temporary £2 bus fare cap and the implementation of low-traffic neighbourhoods and low-emission zones by local authorities, these have been balanced by negative developments including delays to local transport plan guidance and cuts to the active travel budget.

In the rest of this chapter, we discuss progress in two sections:

- 1. Emissions and indicators of progress
- 2. Policy assessment

## 1. Emissions and indicators of progress



110 898 The CCC's monitoring map for surface transport (Figure 4.1) sets out the policies, enablers and required outcomes for a successful transition. This report focuses on 11 key indicators, with additional indicators available in the supplementary material presented alongside this report. Our <u>Monitoring Framework</u> documents the indicators we track and our approach for assessing progress.

**Emissions.** As the surface transport sector continues its rebound following the pandemic, it is too early to say whether overall emissions are on track relative to the Government's pathway (Figure 4.2a). Surface transport remains the highest-emitting sector in the UK, contributing 23% of UK GHG emissions in 2022.

- Provisional estimates suggest that emissions were 105 MtCO<sub>2</sub>e in 2022, up 3% from 2021, but still 8% lower than pre-pandemic levels (Figure 4.3).
- Demand changes resulting from the pandemic have been the principal driver of the nearly 10 MtCO<sub>2</sub>e reduction observed in total car emissions from 2019 to 2022, while the impact of changes in powertrain technology remains small but is growing as uptake of EVs increases (Figure 4.4).
  - The decrease in car travel compared to before the pandemic (see road transport demand indicators below) has resulted in a 6 MtCO<sub>2</sub>e reduction in total car emissions. This is around one-third of the demand-side emissions reduction required in our Balanced Pathway by the early-2030s. Further action to maintain these trends and build upon them, for instance through effective modal shift, is necessary.
  - At the same time, despite a significant increase in EV sales (see uptake of zero-emission vehicles indicators below), the share of EVs in the overall car fleet remains small at around 2%, which has translated to a 1 MtCO<sub>2</sub>e reduction in total car emissions. These savings will grow as EV uptake accelerates.
- Emissions from road freight (vans and HGVs) have increased by 4% since 2019, largely due to rapid growth in van usage, which has been evident since the early-2000s but accelerated during the pandemic.
- In the decade prior to the pandemic, there was no significant reduction in emissions. This was due to upward trends in both vehicle size and kilometres driven, which offset modest improvements in the efficiency of new vehicles. The trend towards larger vehicles has continued over recent years.

**Uptake of zero-emission vehicles** is continuing to increase for cars and vans. However, the overall size of the new vehicle market has remained suppressed due to supply-chain issues following the pandemic. The Government will need to track not just EV sales but also the total volumes in the fleet to ensure that these scale up at the pace required to reduce emissions (Box 4.1).

17% of new car sales were BEVs in 2022 (Figure 4.2b), four percentage points ahead of the CCC's pathway. Availability is also increasing in the used car market, with EVs growing from 0.7% to 1% of sales in 2022. Public perceptions continue to be strong, with over half of drivers who are considering buying a new car intending to choose an electric or hybrid option, while almost all manufacturers are expanding their ranges of models. But continued disruption in the new-car market and the prioritisation of sports utility vehicles (SUVs) pose concerns.

Surface transport emissions increased by 3% in 2022, but remain 8% below 2019 levels.

A reduction in car travel has been the main driver of the fall in surface transport emissions compared to 2019.

Electric car sales continue to grow, making up 17% of all new cars sold in 2022. The used market is also growing but remains small. SUV sales are growing rapidly within the electric car market. This trend needs to be reversed to reduce embedded emissions and grid impacts and improve vehicle affordability.

The rate of deployment of public chargepoints needs to accelerate rapidly and must address the current uneven distribution of provision.

The average reliability of public chargepoints has improved, but is still a long way off the dependable service that is needed.

- The overall new-car market in 2022 remained 30% smaller than in 2019.
   Early 2023 data suggest that the market is beginning to recover, although this appears to be driven as much by hybrids as by fully electric vehicles.<sup>4</sup>
- Recent analysis of the used car market found that the supply of used EVs available for purchase has risen by 270% and average prices have fallen by 15% in the past year.<sup>5</sup> Given that there are typically three to four times as many used car transactions as new car sales each year, it will be important for these trends to continue to widen access to the EV transition.
- SUV sales are growing rapidly within the electric car market, making up 44% of all new EVs in 2022 (Figure 4.5). This trend towards larger, heavier vehicles needs to be halted to lower the embedded emissions in vehicle production and reduce the demands on the electricity grid. Prioritising smaller vehicles would also benefit consumers by increasing the availability of cheaper EVs.
- Electric van sales (Figure 4.2c) are showing slower progress, with a market share of only 6% in 2022, and are significantly off track compared to the CCC's pathway. However, model availability is increasing and user research suggests that many van drivers are willing to make the switch.<sup>6</sup>

**Enablers of EV uptake.** While the fast uptake of EVs is promising, there are slower signs of progress for crucial enablers. In particular, public chargepoint deployment now needs to scale up more quickly.

- Charging infrastructure deployment was approximately in line with the CCC's pathway\* and the Government's target at the end of 2022 (Figure 4.2d). But these deployment trajectories require a rapid acceleration over the next year and beyond, which is not yet evident in data from the first quarter of 2023. This scale-up will be crucial to meet growing demand for charging, so it is too early to say whether this indicator is on track. Inconsistent provision, unreliability and cost also pose risks to user experience and must be addressed.
  - Charging infrastructure continues to be unevenly distributed across the UK (Figure 4.6). The bottom 20% of local authorities average just 20 public chargepoints per 100,000 population, compared to the national average of 55 and the top 20% at 133.<sup>7</sup> However, there are early signs of progress, with the charging networks in these bottom 20% authorities expanding by around 50% in 2022. This must be built upon to rebalance the existing regional inequality.
  - The proportion of chargepoints that are out-of-service has fallen from 7% to 5% this year, which is an improvement but still a long way off the dependable service that is needed.<sup>8</sup> Issues are most pronounced on the rapid network, with current average reliability of 92% substantially below the Government's 99% target.
  - Surveys of EV drivers highlight concerns about chargepoint reliability and pace of deployment.<sup>9,10</sup> Despite this, a majority find the

<sup>\*</sup> Our CCC pathway for charging infrastructure deployment is based on modelling that was conducted on a fiveyearly basis. Previously, the pathway was then based on a linear interpolation between these points. However, this year we have updated this to use an exponential interpolation approach instead, to better reflect the pace at which chargepoints will be needed as EVs become more widespread across the fleet.

experience of driving an EV more convenient than driving a conventional vehicle, for instance due to the ability for drivers with access to off-street or local on-street charging to recharge vehicles overnight or while visiting destinations, ready for use when required.

- Battery cell prices have seen a steady decline over recent years but increased in 2022 due to supply-chain disruptions, with the pandemic and the war in Ukraine seen as contributing factors. This indicator is slightly behind the CCC's pathway (Figure 4.2e).
- Sharply rising electricity prices have reduced the per-mile cost savings offered by EVs compared to fossil-fuelled vehicles (Figure 4.7). Savings remain strong for drivers able to charge through their domestic electricity supply, but trends are more concerning for those reliant on public charging infrastructure.
- While public sentiment towards EVs is positive (see Chapter 15), addressing risks to this such as chargepoint availability and reliability, vehicle wait-times and availability of affordable new and used models across all size and use categories will be important to sustain this progress.

**Conventional vehicle efficiency.** Improvements in engine technologies (e.g. hybridisation) are being offset by trends towards larger vehicle sizes (particularly SUVs (Figure 4.5)), which has led to average new internal combustion engine (ICE) cars and vans becoming less efficient over recent years (Figures 4.2f-g). The CCC's pathway and the Government's assumed baseline both entail the carbon-intensity of the new non-ZEVs that continue to be sold falling gradually this decade, but current trends are moving in the wrong direction.

**Road transport demand.** Alongside the uptake of EVs, measures to limit growth in road traffic are also crucial for decarbonising transport, and bring wider cobenefits such as improved air quality.

- The number of kilometres driven by road vehicles was 21% higher in 2022\* than in 2020 as travel restrictions were lifted following the pandemic (Figure 4.8), and seems to have reached a new steady state<sup>†</sup> which is around 5% below pre-pandemic levels. Studies have shown that rising fuel prices, increases in home-working and implementation of low-traffic neighbourhoods have all contributed to this reduction in overall demand.<sup>11,12,13</sup>
- Measures to reduce car demand are largely absent from the Government's CBDP quantified delivery pathway, so we are not able to compare this against any clear pathway showing Government ambition, only the wide assumption ranges used in DfT's Transport Decarbonisation Plan. Compared to the CCC's pathway (Figure 4.2h), car demand is currently on track although there is a significant risk that this will fall off track if pre-pandemic traffic growth trends resume. As highlighted in our 2022 Progress Report, without policy action to embed a reduction in the need to travel by car or grow the availability and attractiveness of alternative lowercarbon modes, traffic is likely to increase beyond the CCC's pathway.

<sup>\*</sup> This is based on provisional demand figures for the rolling 12-month period up to the end of Q3 2022 as final data for the whole of 2022 were not yet available at the time of writing.

<sup>†</sup> By this new steady state for road transport demand, we mean that the rebound in road vehicle-kilometres following the pandemic appears to have plateaued at a level around 5% below pre-pandemic levels. This is likely to resume growing at the rate it did before the pandemic unless policy interventions are introduced to limit traffic growth.

Energy price rises have reduced the per-mile savings offered by electric vehicles, but these savings remain strong for drivers able to charge at home.

Road transport demand seems to have recovered to a new steady state, around 5% below pre-pandemic levels.

Without policy action to embed reductions in the need to travel by car or increase the appeal of more sustainable modes, pre-pandemic traffic growth trends are likely to resume. • Total kilometres driven by vans and HGVs (Figure 4.2i-j) now exceed prepandemic levels and are slightly off track relative to the CCC's pathway. This reflects significant shifts towards home-delivery over the past decade, which accelerated during the pandemic, and is concerning given the slower uptake of electric vans (Figure 4.2c).

**Modal shift.** Switching to lower-carbon modes of travel, including active travel, public transport and shared mobility, is one important means of reducing car demand. There has been little progress on this to date, and concerns remain around public transport service provision, reliability and cost.

- The demand recovery in public transport has been slower than on the roads, and usage remains around 80-90% of pre-pandemic levels (Figure 4.8). This presents an ongoing challenge to service operators, making it difficult to deliver the service improvements that will be needed to deliver meaningful levels of modal shift.
- The share of passenger-kilometres travelled by public transport had been steadily rising until the mid-2010s, before declining slightly as service provision fell and prices rose and then falling sharply during the pandemic (Figure 4.2k). Concerns around service provision and reliability have been amplified by ongoing labour disputes, which means public transport may not present the appealing alternative to private car travel that is needed.
- From 2010-2021, bus and rail prices increased by 80% and 43% respectively, significantly faster than inflation (Figure 4.9). By contrast, the cost of car travel rose by just 27%. Spikes in fuel prices and Government interventions to limit further growth in fares have reduced this gap during 2022 and early-2023, but the cost comparison between public transport and driving remains significantly less favourable than a decade ago.
  - This disparity in cost is largely due to the combined effect of repeated freezes and cuts to fuel duty and above-inflation increases in bus and rail fares over this period, and undermines efforts to encourage healthier and lower-carbon travel.
  - The pandemic appears to have exacerbated this situation, with bus fares rising particularly steeply as operators struggled with low ridership.
  - Initiatives including the £2 bus fare cap and limiting rail fare increases below the prevailing rate of inflation helped to reverse the long-term trend of increasing real-terms costs of public transport in 2022.
- Cycling kilometres fell in 2021, but remained 16% higher than pre-pandemic levels. Similar trends are apparent for walking. In both cases, participation for leisure purposes appears to have increased compared to before the pandemic.<sup>14</sup>
  - Primary research by WSP, commissioned by the CCC, found that walking is the most preferred alternative mode for drivers who might be willing to reduce their car use.<sup>15</sup>
  - Place-based approaches that combine interventions that aim to reduce car use with those that make active travel more appealing, coupled with effective public engagement, will be key to realising this opportunity.

Concerns around public transport service provision and reliability are undermining the prospect of achieving meaningful modal shift.

Since 2010, public transport fares have increased considerably faster than the cost of car travel.

Increases in leisure participation in active travel during the pandemic could present an opportunity for promoting modal shift.

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Source: Refer to the Monitoring Framework, available on our website, for full documentation on the CCC's indicators, including historical data sources and data gaps.

Notes: (1) Sectoral emissions pathways are indicative only, they are not viewed by the CCC as sectoral targets. An indicator is on track if it is going in the right direction at an appropriate rate. This is determined by comparing the historical data to Government ambition or the CCC's recommended path and considering the wider contextual factors that may have a temporary impact (e.g. recovery from COVID-19). Government ambition is an umbrella term encompassing stated targets, projections, and modelling assumptions – and does not necessarily represent a formal commitment from the Government. (2) We have adjusted our Balanced Pathway to account for changes in the UK's emissions inventory methodology. (3) In charts (b-c), data from the Society of Motor Manufacturers and Traders' (SMMT's) car and van registrations reports have been used for 2022, as DIT statistics for that year had not yet been published at the time of writing. Similarly, 2022 figures in charts (h-j) use the provisional demand figures for the rolling 12-month period up to the end of Q3 2022 as full-year totals had not yet been published. (4) The Government's emissions pathway includes only quantified plans from the Carbon Budget Delivery Plan. Unquantified plans may lead to further emissions reductions. (5) The Government pathway in chart (d) shows the rate of infrastructure deployment that would be needed to keep pace with the projected share of EVs in the car and van fleet and meet the Government's minimum target of 300,000 public chargepoints by 2030. (6) In charts (h-j), vehicle-kilometres data for Great Britain has been scaled up based on the latest available comparison between demand in Great Britain and Northern Ireland (2014) to give whole-UK trends that can be compared with the CCC's Balanced Pathway. (7) In chart (k), National Travel Survey and Scottish Household Survey data have been used to convert DIT figures on carkilometres into estimates of passenger-kilometres travelled by car, which have been compared with DIT and ORR statistics

Surface transport emissions had been relatively flat since 1990 until the COVID-19 pandemic, when they fell steeply. They have since rebounded, but remain 8% below 2019 levels.



The emissions savings from the reduction in car-kilometres from 2019 to 2022 are more than five times as large as those due to the uptake of electric vehicles to date.





Source: DESNZ (2023) Provisional UK Greenhouse Gas Emissions National Statistics: 1990 to 2022; DfT (2022) Road Traffic Statistics; DfT (2022) Vehicle Licensing Statistics; CCC analysis. Notes: Data labels indicate the absolute change in car emissions. The columns show the estimated impact of various factors on these emissions changes: 'ZEV uptake' refers to the ZEV share of the total car fleet; 'Demand' refers to the distance travelled by car; 'Other' includes conventional car efficiency, uptake of hybrids, use of biofuels, more fuel-efficient driving styles and reductions in low-speed driving due to reduced congestion. A large portion of the increase in 'Other' in 2022 is due to the introduction of E10 bioethanol blending in standard petrol from September 2021. SUV sales are growing more quickly in the electric car market than among conventional vehicles.





Source: SMMT (2023) Vehicle Segmentation 2007-2022 (data provided for CCC Monitoring Framework). Notes: The two time series show the share of new car sales that are categorised as either 'Dual purpose' or 'Multi purpose vehicle' in SMMT's market segmentation, for all cars and for electric cars respectively.

Public charging infrastructure is distributed unevenly across the country. London is considerably ahead of most other areas.



Notes: Total column height indicates the number of chargepoints installed in each region per 100,000 population, with the orange sub-columns indicating the extent of network expansion in 2022. The UK Government target is calculated by dividing the minimum target of 300,000 public chargepoints in 2030 by the expected UK population.

Sharply rising electricity prices have increased the per-mile cost of driving an electric car. But costs remain lower than driving a petrol or diesel car.

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While road transport demand appears to have recovered to a new steady state, public transport recovery has been slower and usage remains around 10-20% lower than before the pandemic.



Bus fares have increased much faster than inflation since 2010, while the cost of driving has generally remained roughly in line with inflation.



A suppressed new-car market could slow the pace at which the overall fleet can transition to electric vehicles, even if market share targets are met.

#### Box 4.1 Impact of car market size on EV uptake

The market share of BEVs has been tracking ahead of our Balanced Pathway since it was first published in 2020, reflecting strong progress in both supply and demand. However, it is important to view this in the context of an overall new-car market that was suppressed by the pandemic and has remained restricted since as a result of global supply-chain issues (particularly semiconductor shortages). This means that the total number of BEVs entering the fleet over this period has been lower than was previously expected.

If these market challenges continue, then the market share targets set through the ZEV mandate will equate to fewer vehicles than had previously been expected, slowing the pace at which the overall fleet can transition to electric and potentially resulting in older, more-polluting vehicles remaining on the road for longer. This poses a risk to the delivery of the emissions pathways required.

This discrepancy is illustrated in Figure B4.1, which shows that even if the BEV market share continues to outpace both the CCC's and the Government's projections to end-2024 (left-hand chart), this will only result in the share of BEVs in the overall fleet roughly meeting the Government pathway and falling behind our own (right-hand chart).

It is still early in the roll-out, so the shortfall in terms of number of BEVs and the emissions impact of this are relatively small. However, this will grow quickly if the market does not recover as expected. This emphasises the importance of tracking not just the share of BEV sales, but also the proportion in the fleet to understand whether the assumed emissions savings are likely to be delivered. If they are not, then the Government will need to consider contingency measures, including incentives to encourage vehicle supply to the UK, increases to the targets within the ZEV mandate or measures to reduce car-kilometres.

There could also be positives for emissions reduction arising from the reduced market size, depending on how potential purchasers' attitudes evolve in the coming years:

- The reduced market size and the fact that the BEV market share is ahead of our pathway also mean that total sales of new conventional vehicles over recent years have been considerably lower than expected. This could reflect some consumers delaying vehicle purchases until BEVs are more affordable or better meet their needs. If this is the case, then it could present a substantial opportunity for the size of the BEV market to increase as the market recovers.
- If improvements to more sustainable alternative modes of travel enable drivers to decide they do not need to own a car (or need only one car rather than two), then this could lead to lower overall levels of car ownership, reducing both the emissions from car use and also the emissions embedded in vehicle production.



Source: CCC analysis of DfT vehicle sales data and SMMT market size forecasts.

Delays to key policies have increased delivery risks within our policy assessment for surface transport.

Policy progress in the surface transport sector over the past year has been slower than expected, with credible policies in place to meet only 38% of the required emissions reduction by the Sixth Carbon Budget period and delays to key policies increasing delivery risks (Figure 4.10, Table 4.1). Our assessment is based on the criteria outlined in Annex 1. Figure 4.10 is based on the revised quantified pathway presented in the Government's Carbon Budget Delivery Plan (CBDP), which is less ambitious than either the Net Zero Strategy or the CCC's Balanced Pathway. Further work is needed to develop coherent plans and measurable targets in areas of the sector that were not quantified in the CBDP – in particular measures to reduce car demand – to make up this shortfall. Table 4.1 provides a summary of recent progress and what still needs to be addressed, considering both the policy areas quantified within the CBDP and those that were omitted from that pathway. The detailed recommendations for this sector are given in Annex 2 and in filterable and searchable tables on our website, with a reference provided to each unique recommendation ID within Table 4.1.

The policy assessment in this report focuses on measures to reduce emissions, but the transport system must also be well adapted to future climate impacts. In the CCC's recent report: Progress in adapting to climate change – 2023 Report to Parliament, we set out a number of recommendations in this area. These include designating transport sector regulators with climate resilience remits, integrating minimum climate resilience standards into regulatory cycles and ensuring that changes to transport systems, especially electrification of road and rail networks, are resilient to climate impacts.



Notes: (1) This assessment uses Government plans listed in Annex B, tables 5 and 6 of the Carbon Budget Delivery Plan (CBDP). See Annex 1 for the assessment criteria. (2) The baseline is an adjustment to the CBDP baseline, with the impact of various baseline policies in the Energy and Emissions Projections, including early-market EV uptake and conventional vehicle efficiency, removed from the baseline so that they can be assessed.

Credible plans are in place to meet only 38% of the required emissions reduction by the Sixth Carbon Budget period.

It is important to ensure that

changes to transport systems are resilient to climate impacts.

Progress in reducing UK emissions: 2023 Report to Parliament

Table 4.1       Policy scorecard for surface transport							
Sub-sector	Delivery mechanism and responsibilities	Funding and other financial incentives	Enablers and barr overcom	in place iers ie	Timeline policies	for future	Overall assessment
Surface transport overall assessment	G	Y	0		Y		Y
Cars – zero-	G	G – early market*	Y –	0 –	Y –	0 -	G – early market
54% of abatement over		Y – mass market	market	and	and mass	market	Y – mass market
CB6 period		0 – late market		market	market		0 – late market
	<ul> <li>Progress:</li> <li>The Governme mandate in M flexibilities has that should en</li> <li>The propose sales being Z abatement if</li> <li>Despite its str of CO<sub>2</sub> credit that any ove system, redu performance credit use with</li> <li>The Autumn St rates for BEVs of vehicle excise UK's incentive vehicles is alre</li> <li>Following a pill £400 million of (LEVI) scheme for charging in</li> <li>Indicative fu on assessme bidding proce</li> <li>It is welcome of resource f important fo</li> </ul>	ent published its <u>final</u> arch 2023, following slightly weakened th sure sales of EVs scal d targets will ensure ZEVs (likely almost all required in the Gove ated opposition to su its alongside trading erperformance will be reacking ahead of ill be restricted to the <u>atement 2022</u> confir out to 2028 and anno duty from 2025. <sup>17</sup> An landscape for comp ady weaker than in r ot scheme which co funding for the full in . <sup>19</sup> This will support loo frastructure for reside nding allocations ha ants of need and prog cesses.	consultation several more e mandat e up out to that manu EVs) by 200 rnment's C uch flexibili within the e compension is targets. e first three med the e- ounced the alysis by Tr bany cars is many othe vered 19 lo cal authori ents without ve been do gress, a be eme alloccon help build sector inve	on impl paths of de e, it still rep o 2030. facturers of 30. This sho CBDP quar ties, DfT ho ZEV mand sated by u e to act a However, years of th xtension of at private ansport an s compare of Europea ocal autho tion of the ties in Engl ut off-stree leterminec ther appro-	ementing elay. <sup>16</sup> Alth presents a are require puld be suf htified path as included ate. These underperfo s a deliven it is good t he mandat f favourab purchases nd Environ trively stror n countries prities, DfT h <u>b Local Elec</u> land to de t parking. d for all tier pach than s	a zero-em ough the i credible p d to reach ficient to c way. d banking, flexibilities rmance el y floor with hat borrow re. le compai of BEVs wi ment rece ng, but tho s. <sup>18</sup> has recentl <u>ctric Vehic</u> velop and short-term funding, b	ission vehicle (ZEV) nclusion of various olicy mechanism a 80% of new car deliver the borrowing and use make it more likely sewhere in the aggregate wing and CO <sub>2</sub> ny car taxation Il become liable for ntly found that the it for private y allocated almost <u>competitive</u> implement plans authorities based competitive ut also £38 million s especially

<sup>\*</sup> The technology adoption curve describes the typical uptake of a new innovation. It divides consumers into five groups – innovators, early adopters, early majority, late majority and laggards – each of whom have differing propensity to adopt the technology. Risks to the roll-out are likely to become more pronounced as it reaches the later groups, which we have reflected by ascribing separate assessments for the early, mass and late stages of the market. Early market adoption covers the most positive consumer groups and reflects the EV uptake that is expected to occur in the Government's baseline scenario due to policies introduced to date without further policy development.

- The <u>On-Street Residential Chargepoint Scheme</u> (ORCS) has also received an additional £15 million of funding for 2023/24.<sup>20</sup>
- DfT and Motability collaborated with the British Standards Institute to <u>develop a new</u> <u>accessibility standard</u> (PAS1899:2022) for EV chargepoints, which was published in October 2022 and aims to support development of an inclusive charging network in the UK.<sup>21</sup>

#### To be addressed:

- The ZEV mandate must be implemented from January 2024 as planned. Time is tight and the Government will need to work quickly to do this (priority recommendation R2022-272).
- DfT's <u>cost-benefit analysis</u> showed that faster uptake of EVs, in line with our Balanced Pathway, would deliver substantially higher net benefits than the trajectories in the ZEV mandate.<sup>22</sup> Moreover, the industry already expects the 2024 target to be met this year prior to policy implementation. Therefore, DfT must proactively monitor delivery and explore opportunities to boost adoption beyond these targets alongside the implementation of the mandate to drive the sector forward. This monitoring approach should also track the sizes and types of vehicles entering the market and consider how to address the growing trend towards heavier, more resource- and energy-intensive vehicles (recommendation R2023-140).
- Affordability is a key issue in ensuring that all drivers can access the benefits of switching to EVs. Establishing a robust used EV market, ensuring sufficient supply of smaller, more affordable EVs and potentially targeted incentives could all play a role in this regard (Box 4.2). Favourable company car tax rates have been effective at incentivising EV uptake among commercial fleets – these can be expected to feed an increase in supply to the second-hand car market, although there are concerns about the upfront cost surplus and current reluctance of some dealerships to stock used EVs.<sup>23</sup>
- The Government must also ensure that vehicle manufacturing and supply is able to meet the requirements of the ZEV mandate in a sustainable manner.
  - The incentives offered through the US Inflation Reduction Act and the market clarity provided by the EU's recent 2035 commitment will increase competition for both vehicle supply and manufacture. In response to this, the UK Government must consider how to ensure that the UK is able to access a sufficient supply of vehicles, including through creating a supportive landscape for domestic EV supply chains and gigafactories. It should also consider how these and other levers can be used to rebalance the UK's supply of EVs towards smaller, more affordable and more resource-efficient vehicles.
  - Responses to the <u>first ZEV mandate consultation</u> highlighted support for requiring ethical and sustainable supply chains as a condition within the mandate.<sup>24</sup> This was not taken forward in part due to the difficulty in defining what might count as ethical and sustainable. DfT should work with supportive stakeholders to agree a definition and investigate ways (e.g. certification) of requiring this (recommendation R2023-142).
  - The Government should also consult on regulations requiring EV batteries sold in the UK to be recyclable, to ensure that raw materials are used efficiently and embedded emissions are minimised (recommendation R2022-275).
- Ensuring widespread availability of reliable, affordable and easy-to-use public chargepoints will be fundamental to enabling mass-market uptake of EVs (recommendations <u>R2022-277</u> and <u>R2022-286</u>).
  - DfT announced in 2022 that it intends to regulate to improve the <u>consumer experience at public chargepoints</u>, notably including a requirement for 99% reliability across the rapid network, mandating the consistent use of pence-per-kWh pricing and obliging a contactless payment option at all chargepoints above 8kW.<sup>25</sup> These regulations must now urgently be published and an appropriate enforcement regime implemented to share best practice and ensure compliance. DfT must also consider how it can improve reliability across the rest of the network (recommendations <u>R2022-279</u> and <u>R2023-144</u>).
  - Public chargepoint operators were included within the <u>Government's Energy Bill Relief</u> <u>Scheme</u>, which helped insulate drivers from the full extent of non-domestic energy price increases.<sup>26</sup> However, the cost of public charging has still risen faster than that of home charging over the past year.<sup>27</sup> We continue to recommend that the Government should look for opportunities to reduce this disparity, including by reducing VAT on some public charging (recommendation R2022-301).

	- In the CCC's report <u>Delivering a reliable decarbonised power system</u> , we recommended that the Government should create a Minister-led infrastructure delivery group to ensure enabling initiatives for energy infrastructure build are taken forward at pace. <sup>28</sup> Through this group, the Government, Ofgem, distribution network operators and local government should work together to develop a more straightforward and streamlined process for delivering new and upgraded grid connections. This will be important for enabling the timely opening of rapid charging stations and electrifying van and HGV depots (recommendation R2023-143).						
Vans – zero-	G	Y	0	Y	Y		
13% of abatement over CB6 period	<ul> <li>Progress:</li> <li>New van sales will (subject to the consultation process) be covered by a separate <u>ZEV</u> mandate, which will ensure that manufacturers are required to scale up EV sales in both the car and van markets and are not able to trade off overperformance in one to allow underperformance in the other.<sup>16</sup></li> <li>The final consultation proposes increasing uptake targets for vans, from 8% in 2024 and 52% in 2030 to 10% and 70% respectively, reducing the risk of manufacturers deprioritising development of vans or pushing hybrid technologies into this market.</li> <li>To be addressed:</li> <li>Electric van sales to date have been insufficient. The Government must monitor whether this market is scaling up at the rate needed and consider whether further support – through incentives or regulation – is required (recommendation R2023-140).</li> <li>The actions identified in the section above on zero-emission cars should all consider the implications on the van market in their implementation. In particular, infrastructure deployment plans must consider how to meet the charging needs of van drivers, which is a key concern that could hinder EV uptake.</li> </ul>						
HGVs – zero-	Y	G	Y	Y	Y		
10% of abatement over CB6 period	<ul> <li>The Government published the <u>Future of Freight Plan</u> in June 2022.<sup>29</sup> The plan set out a long-term vision for the sector, which included an ambition for achieving a Net Zero freight and logistics sector by 2050 and to support wider objectives around air quality and noise reduction. The plan also highlighted the need for certainty in future decarbonisation pathways and confidence the right infrastructure will be in place to accelerate the deployment of zero-emission technologies. Doing this could bring opportunities to the freight sector as a global first mover in decarbonisation.</li> <li>As committed in the Future of Freight Plan, the Government established a <u>Freight Energy Forum</u> to build confidence in the transition by undertaking a review of regulatory barriers to implementing new infrastructure for the freight sector.<sup>30</sup> This will feed into Ofgem's regulatory review and any future planning and incentive reform opportunities.</li> <li>DfT published <u>draft regulations</u> which will allow an increased weight limit for ZEVs and alternatively-fuelled vehicles.<sup>31</sup> This change means that these vehicle types will not be required to decrease their cargo weight to stay within weight limits, benefitting their commercial viability</li> </ul>						
	<ul> <li>DfT and Innovate UK launched a £140 million Zero-Emission Road Freight demonstration competition, which ran between August and October 2022, to kick-start the deployment of battery-electric and hydrogen fuel cell HGVs, including by developing the required business models to scale up deployment and infrastructure.<sup>32,33,34</sup> The competition aims to fund up to five projects to each deploy at least 25 battery-electric or hydrogen HGVs onto UK roads by 2025.</li> <li>A Hydrogen Transport Hub competition was launched in October 2022, with £20 million in funding for projects using hydrogen in transport in the Tees Valley.<sup>35</sup> The announcement included an additional £300,000 towards upskilling the local workforce. Winning bids were required to be ready to commence delivery of their projects by June 2023.</li> </ul>						

	To be addressed:							
	• T cc n n A b s s 1 1 • T C	<ul> <li>The Government has recognised the opportunities to the UK in being a first mover in this sector and increased its ambition in the CBDP, but the pace of policy development is not yet matching this. Although the Zero-Emission Road Freight demonstration competition closed more than six months ago, winning projects and next steps have not yet been announced. Alongside these trials, DfT should develop plans for how the transition to zero-emission HGVs will be enabled, including infrastructure plans and financial incentives for early movers (e.g. to support initial acquisition costs and depot charging installation costs) (recommendation R2023-146).</li> <li>The development for the ZEV mandate for cars and vans is tight and at risk of missing the Government's target start date. The Government should start the development of an</li> </ul>						
	c b (!	appropriate re been legislated recommenda	gulatory mechanism d to provide early me tion R2023-145).	n for HGVs as soon as arket certainty and c	the cars and vans Z avoid repeating these	EV mandate has e tight timescales		
Buses – zero-	Y		G	Y	Y	Y		
2% of abatement	Progre	ess:						
over CB6 period	• A †  z	Additional fund hrough DfT's <u>Z</u> ero-emission b	ding for five further lo ero-Emission Buses Re ouses. <sup>36</sup> Many will be	ocal transport authori <u>egional Areas</u> schem manufactured in Nc	ties has increased th le to almost £300 mill Irthern Ireland.	ne total allocation ion for up to 1,400		
	• T 	he Governme Centre of Exce	nt is delivering on its <u>Ilence</u> to share expe	commitment in the <u>t</u> ertise to drive forwarc	National Bus Strategy I a decarbonised bu	<u>/</u> to establish a <u>Bus</u> s sector. <sup>37,38</sup>		
	• T	he UK's first au	utonomous electric b	ous service began rur	nning in Oxfordshire i	n March 2023.		
	To be	addressed:						
	• The Government's response to the consultation on ending the sale of new non-ZEV buses now overdue. This should be published, and a comprehensive policy package to deliver developed, to provided certainty to manufacturers and operators.							
		·	,		·			
Conventional vehicles –	0	·	0	R	0	0		
Conventional vehicles – efficiency, hybrids and biofuels 16% of abatement over CB6 period	Progra	ess: DfT is consulting ans out to 203 emissions from and will deliver Decarbonisatio	O g on <u>proposed regul</u> 30. <sup>16</sup> The initial propo the new non-ZEV ve weaker emissions sc on Plan. <sup>39</sup>	R ations to cover rema sal is to require manu hicles that they sell a avings than had been	O ining sales of new no ufacturers to maintain t 2021 levels. This is lir n assumed in the <u>Tra</u>	O on-ZEV cars and n average CO <sub>2</sub> mited in ambition <u>nsport</u>		
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	research and development budget away from ZEV development. This scenario should adopted within the final regulations (recommendation R2023-147).							
	<ul> <li>A decision on how vehicle licensing regulations will apply during the period 2030-2035 has been deferred to later this year. The Government should use the evidence showing that real- world carbon savings from PHEVs are much lower than previously assumed and the expectation that PHEVs will be less cost-effective than BEVs by the late-2020s to justify either permitting only BEV sales or setting a very ambitious definition of 'significant zero-emission capability' (recommendation R2023-141).</li> </ul>							
Rail – efficiency	R 0 0 0 0							
and technology <1% of abatement over CB6 period	<ul> <li>Progress:</li> <li>DfT and Innovate UK ran a <u>First of a Kind innovation competition</u> in 2022 focusing on technology ideas to decarbonise the railway, awarding £5 million total to 24 innovators.<sup>41</sup></li> <li>Great Western Railway will begin a trial of a fully battery-electric train on the branch line between West Ealing and Greenford later this year.</li> </ul>							
	<ul> <li>Electrification work has started on the Wigan-Bolton line, with completion due in 2024. Preliminary work has also begun on electrification of the Transpennine Route and the Midland Mainline, although completion timescales are less certain and longer-term.</li> </ul>							
	To be addressed:							
	<ul> <li>The Government has not yet produced a plan for how its targets of removing diesel from passenger rail use by 2040 or achieving a Net Zero railway network by 2050 will be achieved. This is needed to ensure that funding commitments and network planning are appropriately directed and consistent with what will be required (recommendation R2022-283).</li> </ul>							
	• Only 2.2 km of track was electrified in 2021/22. <sup>42</sup> This is symptomatic of the current stop-start nature of network electrification, which is failing to deliver the infrastructure upgrades required. The plan should include establishing a rolling programme of electrification rather than planning and tendering each portion of track as a separate electrification project.							
Passenger transport –	R R O R R							
transport – reducing car travel No quantified abatement in the Government's delivery pathway	<ul> <li>Progress:</li> <li>In December 2022, DfT published updated National Road Traffic Projections (NRTP), which set out eight scenarios for future traffic growth out to 2060.<sup>43</sup> These now include two decarbonisation scenarios (Vehicle-Led and Mode-Balanced Decarbonisation). These scenarios will be incorporated into transport appraisal through new scenario-based marginal external cost assumptions within transport appraisal guidance (WebTAG).<sup>44</sup></li> <li>DfT is consulting on a revised National Policy Statement on National Networks, which aims to better factor environmental objectives into infrastructure decisions.<sup>45</sup> This long-overdue update is welcome and its emphasis on the importance of schemes taking 'all reasonable steps' to reduce lifetime emissions and taking into account the potential direct and indirect impacts of</li> </ul>							

(54%) supportive of the schemes that had been introduced in their areas.<sup>46</sup> A separate survey of the general public found majority (62%) support for making their local area into a 15-minute neighbourhood.<sup>47</sup>

•	The Welsh Government accepted the recommendations of its independent Roads Review,
	which included cancelling 31 of 48 road projects reviewed (and reconsidering the merit of a
	further six) on environmental grounds and introducing stringent tests that will only permit new
	road projects if they will meaningfully contribute to modal shift, reducing emissions and
	adapting to the impacts of climate change. <sup>48</sup> This is a welcome step which should contribute
	to reducing traffic growth.

#### To be addressed:

- Measures to reduce car demand whether through reducing the need to travel, modal shift or shared mobility – present an important opportunity to go beyond the Government's quantified pathways and reduce the risk of relying solely on rapid ZEV uptake. This can contribute to making up the shortfall on the UK's NDC and the Sixth Carbon Budget, but only if the development and implementation of a coherent set of policies begins urgently (priority recommendation R2022-119).
- To support local transport authorities in refreshing their local transport plans, DfT should issue guidance on what these should cover. In particular, this should include clear advice on how to plan for, calculate and deliver quantifiable carbon reduction. It is disappointing that this guidance, which was promised in the <u>Transport Decarbonisation Plan</u>, has not yet been published (recommendation R2023-149).<sup>39</sup>
- The strategic priority of Net Zero should mean that all scheme appraisals (including roadbuilding decisions) must explicitly consider the NRTP decarbonisation scenarios and assess the emissions impacts that they will generate. Where these are detrimental, there should be a requirement to develop mitigating actions to reduce these impacts (Box 4.3).
- At a UK level, various road-building projects have recently been pushed back due to fiscal headwinds. The Government should launch a more strategic review (similar to the Welsh Roads Review) to assess whether these projects are consistent with its environmental goals (recommendation R2023-148).
- The Government must produce plans to address the long-term fiscal issues relating to the decarbonisation of transport (recommendation R2022-292).
  - In response to the Transport Committee's inquiry in January, the Chancellor confirmed that the Government currently has no plans to consider road pricing.<sup>49</sup> Without such plans, the consequent absence of central leadership risks an inconsistent mix of local schemes (e.g. clean-air zones, low-emission zones, zero-emission zones) and large fiscal shortfalls. Options for how to address this, potentially including a cross-party working group as proposed by the <u>Campaign for Better Transport</u>, should be considered.<sup>50</sup>
  - It should also consider the role of fuel duty, which was frozen at <u>Budget 2023</u>, extending last year's 5p cut despite fuel prices being 8% lower than when it was introduced.<sup>51</sup> Not undoing this reduction which was billed at the time as being temporary and choosing not to uprate duty in line with inflation is estimated to cost £4.8 billion in 2023/24 and amounts to a Government subsidy for driving.<sup>52</sup> This money could have been used to support more sustainable modes.

Passenger transport –	0	0	0	R	0		
increasing car occupancy and shared mobility 1% of abatement	<ul> <li>Progress:</li> <li>The CBDP mentioned the possibility to reverse falling trends in car occupancy and bring the UK more in line with comparable countries, but there is no policy to deliver this yet.</li> </ul>						
over CB6 period	<ul> <li>DfT published its <u>evaluation of national e-scooter trials</u>, which included a finding that the proportion of users reporting replacing car journeys with e-scooter use rose from 12% to 21% over the course of the trial.<sup>53</sup></li> </ul>						
	The <u>ZEV mand</u> use in car club	ate consultation prop s. <sup>16</sup> This should help e	ooses to award addi expand the availabili	tional credits for ZEVs ty and use of shared	s that are sold for EVs.		

	To be addressed:						
	<ul> <li>In producing local transport plan guidance for local authorities, DfT should set out the role the shared- and micro-mobility can play in increasing connectivity and reducing emissions. Clear policy and funding streams should be developed to enable this (recommendation R2023-149)</li> <li>DfT should publish the Mobility as a Service Code of Conduct and develop funded policy building on this through which local authorities can deliver schemes to encourage greater use of car-, lift- and ride-sharing instead of single-occupancy private car travel.</li> </ul>						
	<ul> <li>The findings of the e-scooter trial evaluation should be used as the basis for developing policy for how they will be used as part of the future transport system.</li> </ul>						
	· · ·	,		· ,			
Passenger transport – modal	G	0	0	Y	Y		
shift to active	Progress:						
travel	• The second <u>C</u>	ycling and Walking Ir	nvestment Strategy v	vas published in July	2022. <sup>54</sup> It sets out		
abatement over CB6 period	the Governme trips by 2040, c	ent's ambition for ma along with quantified	king active travel a r interim targets and	natural choice for m governance arrange	ost shorter urban ements.		
	<ul> <li>Active Travel I schemes aime accompanied skills and cond</li> </ul>	England announced ed at improving local d by a <u>separate £33 r</u> ducting community e	a £200 million <u>fundin</u> active travel infrastr <u>million capability fund</u> ngagement to deve	g pot for local autho ucture. <sup>55</sup> It is positive d aimed at developi lop effective schem	<u>vrities</u> to bid into for to see this ng local authority es. <sup>56</sup>		
	To be addressed:						
	<ul> <li>In March 2023 allocated at <u>S</u> to just £100 mi previously agr</li> </ul>	, the active travel bu pending Review 202 Ilion over the remain eed funding settleme	udget received a sub 1, minus the £230 mill der of the period. <sup>57</sup> T ent ( <u>recommendatio</u>	ostantial cut, with the lion already allocate he Government mus <u>n R2023-150</u> ).	£700 million d, being reduced t restore the		
	<ul> <li>Active Travel England's initial funding allocations appear well thought through and there are some promising signs of progress. The Government should be looking to build upon these to allocate all local authorities long-term funding to develop and implement active travel plans. The substantial funding cuts will undermine its ability to do this.</li> </ul>						
	<ul> <li>DfT's local tran active travel s (recommended)</li> </ul>	nsport plan guidance chemes to help loca ation R2023-149).	e should share best-p I authorities to make	ractice on planning best use of this fund	and delivering ing		
Passenger	0	Y	0	0	0		
transport – modal							
transport No quantified abatement in the Government's delivery pathway	<ul> <li>In January 2023, the Government introduced funding to enable bus operators outside London to <u>cap fares at £2</u>.<sup>58</sup> This has since been extended to October, delivering an average saving of 80p per journey. Recent research shows that this has led to 11% of respondents using the bus more, with many of these choosing it instead of car travel.<sup>59</sup></li> </ul>						
	<ul> <li>Rail fare increases for 2023 were <u>capped</u> in line with increases in average earnings, rather than the usual RPI.<sup>60</sup> This halved the increase that would normally have occurred.</li> </ul>						
	<ul> <li><u>Budget 2023</u> committed to a second round of the City Region Sustainable Transport Settlements, totalling £8.8 billion over the period 2027/28-2032/33.<sup>51</sup> The objective of this investment – to improve public transport systems in city regions to match that in London – is a strong ambition and could help deliver modal shift, particularly if combined with measures to disincentivise car travel where viable alternatives are available.</li> </ul>						
	<ul> <li>Construction of sections of HS2 has been delayed (Phase 2a from Birmingham to Crewe by two years and the section from Old Oak Common to Euston by four to ten years) due to fiscal headwinds. This adds to previous negative coverage around changes to the extent of its routes within Northern England.</li> </ul>						
	To be addressed:						
	<ul> <li>The £2 bus fare should be man transport. This</li> </ul>	e cap has been succ de permanent and c should aim to make	cessful in limiting infla developed into a wid public transport more	tion and encouragin ler strategy to reduc e affordable relative	g modal shift. This e the cost of public to higher-carbon		
	modes, as well as 1 <u>R2022-282</u> ).	making ticketing	more joined up and	straightforward ( <u>rec</u>	ommendation		
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	<ul> <li>It is important that public transport operators are incentivised to increase demand for their services and to improve both provision and reliability.</li> </ul>						
	<ul> <li>The Government best support the</li> </ul>	t should work with se aims.	h operators to under	stand how regulator	y frameworks can		
	<ul> <li>Ongoing labour confidence in th perceptions of th</li> </ul>	disputes are cau e rail system. <sup>61</sup> It ne train as a relia	ising disruption to rail is important that the ble alternative to ca	services and risk und se are resolved to he r travel.	dermining public elp improve		
	<ul> <li>DfT's local transport plan guidance should set out what actions local authorities can take to improve local public transport systems. This should include identifying areas where collaboration can be beneficial and maximising synergies with other Government objectives such as levelling up. The ambition to improve public transport in towns and cities to London's standard must be embedded within this guidance and supported by appropriate funding and powers (recommendation R2023-149).</li> </ul>						
Freight transport –	R R		0	0	R		
reduction and	Progress:						
<ul> <li>The 2022 <u>Future of Freight Plan</u> included an ambition to support and promote r freight.<sup>29</sup> The plan reiterates the Government's commitment to support rail freigint.<sup>19</sup> The plan reiterates the Government's commitment to support rail freigint intention to set out priorities for the sector in the forthcoming Rail Network Enhore Pipeline. It also sets out an aim to facilitate the launch of new international rail developing a bespoke inland customs clearance model for rail freight termina</li> <li>The Great British Railways Transition Team (GBRTT), set up by the Government to improvements across the rail system, is developing a range of target options in Government's commitment to set a rail freight growth target. GBRTT published Evidence to understand how much freight demand could be met by rail, whice</li> </ul>					e mode shift in reight and an ahancements ail freight routes by nals. It to bring about is in response to the ed a <u>Call for</u> hich closed in		
	To be addressed:						
	<ul> <li>Van traffic has include has risen even more address this, with principal right of the second s</li></ul>	reased more tha re quickly since the particular focus o commendation R	n any other vehicle t he pandemic. The G n measures to facilite 2022-290).	ype over the past tw overnment must exp ate schemes that rec	venty years and lore options to duce freight traffic		
	<ul> <li>Continued growth at recent rates could make emissions reduction targets more difficult to meet and would also have implications for congestion and air quality, particularly in urban areas. We will continue to monitor van-kilometres as one of our indicators and consider the risks of continued growth in our future analysis.</li> </ul>						
	<ul> <li>The <u>Transport Decarbonisation Plan</u> pledged to explore the legalities and practicalities around traffic regulation and consolidation schemes that could reduce van and truck movements in urban areas, but this has not yet happened.<sup>39</sup></li> </ul>						
	Findings from the c freight growth targ	call for evidence let and there are	on rail freight have r no policies in place	not yet been taken fo to drive a shift from	prward to set a rail road to rail freight.		
Source: DESNZ (2023) Ca Notes: (1) See Annex 1 fa Delivery Plan, along with	rbon Budget Delivery Plan; BEIS r the assessment criteria. (2) Pe the adjustments we have appli	(2021) Net Zero Strate rcentage abatement red to allow us to asse	egy; CCC analysis. t figures refer to numbers fr ess policies included in the	om the quantified plans in baseline.	the Carbon Budget		

### Box 4.2

International approaches to supporting EV uptake in low-income households

Global sales of EVs have been increasing rapidly, with the latest outlook from the International Energy Agency increasing its 2030 forecast for the EV share of new car sales worldwide to 35%.<sup>63</sup> Major policy packages including the US Inflation Reduction Act and the EU Fit for 55 initiative, along with the UK's 2030 phase-out commitments, have played a role in pushing this market forward.

As the proportion of EVs in the UK and worldwide grows, there will be increasing opportunities to learn from both regional and international comparisons to understand approaches to dealing with issues specific to the later stage of the EV transition, such as growing second-hand markets and ensuring EVs are accessible to low-income households. Several such examples already exist:

#### Second-hand markets for EVs.

- **Domestic.** Until 2022, Transport Scotland offered interest-free loans of up to £30,000 for purchases of used BEVs. Over £18 million was loaned to Scottish consumers and businesses between the scheme's launch in 2020 and its closure.
- Netherlands. The Dutch Government has introduced a grant scheme that provides €2,000 for purchasing or leasing a used BEV. The grant is only available for cars that are kept for at least three years, originally cost between €12,000 and €45,000 and that have a range of at least 120 km. This is part of a wider scheme that also provides grant incentives for the purchase of new BEVs.
- France. In 2020, the French Government introduced a policy that provides one-time grants of €1,000 for the purchase or lease of used BEV cars or vans for non-commercial purposes. Eligible vehicles must be at least two years old and kept by the grant recipient for at least two years. This an extension of a grant scheme that previously applied only to new vehicles.
- **Germany.** In Germany, used BEVs are eligible for the same purchase grants as new EVs, currently worth up to €6,750 for a vehicle worth up to €40,000.
- United States. The Inflation Reduction Act introduced a \$4,000 tax deduction for purchasers of used BEVs worth up to \$25,000.

### Improving accessibility for low-income households.

- **Domestic.** Alongside the introduction of the ULEZ, London has launched a scrappage scheme offering residents in receipt of means-tested benefits cash grants of up to £2,000 to scrap non-ULEZ-compliant vehicles. Further savings are available if using this grant to buy a ULEZ-compliant replacement or various other sustainable transport alternatives through a partner retailer. Birmingham, Bristol and Scotland have also introduced similar means-tested scrappage schemes. The Scottish Government also funds ChargePlace Scotland, a network of free public chargepoints, which could be of particular benefit to households without private off-street parking.
- France. Larger grants are available towards BEV purchases for low-income households. In addition, the French Government has a policy that offers discounts on low-emission vehicles if an older and less efficient vehicle is traded in for scrappage. This policy offers the highest discounts when the older vehicle is traded in for an EV.
- **United States.** States including California, Oregon and Pennsylvania have grants for BEVs and PHEV sales to low-income residents. In California, low-income households can receive a rebate of \$7,500 for purchasing a BEV.

Source: CCC research into a (non-exhaustive) range of international and domestic policies designed to support used EV markets or improve access to the EV transition for low-income households.

#### Box 4.3

Road transport demand projections and transport appraisal

In December 2022, DfT published its latest National Road Traffic Projections (NRTP) out to 2060.<sup>64</sup> The NRTP scenarios (there are eight in total) represent the expected traffic volumes in DfT's Common Analytical Scenarios, which are a collection of modelling scenarios that are intended to allow decision-makers to assess the impact of transport schemes against a variety of possible futures. These scenarios are therefore important in determining how the transport system evolves, and it is vital that appraisal guidance makes clear the importance of ensuring that decisions taken are compatible with the sector's pathway to Net Zero.

There is substantial variation in traffic levels across the NRTP scenarios, which reflects the uncertainty in how the sector will develop over 40 years (Table B4.1). The NRTP represent an improvement on their predecessor, DfT's Road Traffic Forecasts from 2018, both methodologically and through explicit inclusion of two decarbonisation scenarios (Mode-Balanced Decarbonisation and Vehicle-Led Decarbonisation) that reach close to zero tailpipe emissions by 2050. It is important that these scenarios are consistently used within appraisals of transport schemes to ensure that compatibility with the sector's decarbonisation pathway is an integral part of decision-making.

- The Core scenario is based on only 'firm and funded' policies and as such does not take account of the UK's legislated carbon budgets and Net Zero commitment.
  - DfT has made clear that it sees this scenario as representing a 'common analytical comparator' to enable comparisons to be made between scheme impacts, and the department's analytical leadership has suggested that wording should make clear that it should not be seen as a 'most likely' scenario.<sup>65</sup>
  - Indeed, the aim should be for all policy decisions and scheme approvals to move the system away from this counterfactual and towards a vision consistent with costeffective decarbonisation.
- As well as using the Core scenario, DfT advises that scheme appraisals should also consider each scenario at least qualitatively and choose additional scenarios that are most in line with the scheme's strategic objectives for more detailed analysis.
- In light of the wider strategic importance of achieving Net Zero and the fact that transport is the UK's highest-emitting sector, it should be expected that all schemes that could impact on road transport demand should give detailed consideration to the decarbonisation scenarios. DfT should ensure this is clear in appraisal guidance.
  - The range of assumptions across the Mode-Balanced and Vehicle-Led Decarbonisation scenarios can be seen as reflecting uncertainty along the pathway to Net Zero.
  - Until the Government has developed a clearer vision for the quantified role of measures to reduce demand for private road transport in reaching Net Zero, the presumption should be that schemes that could impact on road transport demand should only progress if they would provide net societal benefit under both of these decarbonisation scenarios. Otherwise, there is a risk that decisions made today could lock in a dependency on higher-cost pathways and miss opportunities to realise co-benefits.
  - The similarity between traffic growth levels in the Mode-Balanced Decarbonisation scenario and our Balanced Pathway makes it likely that this will be the most costeffective of the decarbonisation scenarios. Recent research from the RAC Foundation found that measures to reduce car demand can also significantly lower the delivery risk around the Sixth Carbon Budget.<sup>66</sup> Without this, meeting these goals would require rapid progress on both BEV sales and the departure of older fossil-fuelled vehicles from the fleet.
- To further embed the new NRTP scenarios within transport appraisal, DfT plans to include marginal external cost assumptions consistent with each of the eight scenarios in the next update of the WebTAG databook. This will allow transport modellers to use costs that are consistent with the traffic levels and expected

makeup of the vehicle fleet in each scenario, ensuring that cost-benefit appraisals more accurately reflect the impacts of schemes under each scenario.

## Table B4.1

Changes in total car-kilometres in various CCC and NRTP scenarios relative to 2019

Source	Scenario	2030	2050
Sixth Carbon Budget	Widespread engagement	-7%	-12%
	Balanced Pathway	+3%	+10%
	Headwinds	+7%	+27%
National Road Traffic	Behavioural Change	-8%	-9%
	Mode-Balanced Decarbonisation	+5%	+11%
	Core	+10%	+22%
	Vehicle-Led Decarbonisation	+11%	+27%
Source: DfT (2022) National Ro	ad Traffic Projections; CCC analysis.		

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Our policy scorecards and policy assessment charts track the UK Government's progress and advise on what needs to be addressed in each sub-sector or policy area in order to meet the Government's targets. For the different sectors of the economy (Chapters 3-14) we have assessed the risks relating to the delivery of the Government's targets and scored them using the criteria in Table A1.

For cross-cutting enablers in Chapter 15 we use different criteria. For business and finance, innovation, public engagement, fair funding and affordability, and workers and skills, we have assessed the risks using the criteria in Table A2. We have done a similar exercise for scoring governance using the criteria in Table A3. For international policy and progress in Chapter 2, the assessment criteria is given in Table A4.

### Table A1

Scoring criteria for assessing policies and plans for each sector

	Delivery mechanism and responsibilities	Funding and other financial incentives	Enablers in place and barriers overcome	Timeline for future policies	Overall assessment
Credible plans (G)	Proven delivery mechanism that covers all the important elements in the sector	Combination of public funding and plans to encourage private funding is credible	Plans consider enablers, such as governance, fair funding, public engagement, and workers & skills; potential barriers are overcome	Appropriate timelines are given for future decisions and policy development	Credible plans with funding, enablers and timelines in place
Some risks (Y)	Mostly based on proven delivery mechanism, but missing a small number of key elements	Combination of public funding and plans to encourage private funding are credible, but some risks remain	Plans consider some, but not all, of the enablers and/or some barriers remain	Timelines are proposed for some future decisions and policy development, but questions remain	Some adjustment to plans may be needed to mitigate uncertainties and delivery or funding risks
Significant risks (O)	Some plans based on proven mechanism, but several key elements are missing	Some funding commitments but unclear where a significant part of the funding will come from	Plans do not address significant key enablers and barriers	Plans provide only partial indication of the timeline for future decisions and policy development	Plans under development and/or further work needed to enact policies and overcome uncertainties and delivery or funding risks
Insufficient plans (R)	No comprehensive plan or strategy; or plan/strategy missing most key elements	Unclear where the bulk of funding will come from; not yet considered incentives to address these	Plans give negligible consideration of the enablers and barriers	Plans do not indicate when gaps will be filled, or when future decisions will be made	Plans are either missing, clearly inadequate, or lack funding, and new proposals are needed

Table A2         Scoring criteria for assessing policies and plans – for cross-cutting enablers					
	Ambition and timelines of proposals	Delivery mechanisms (including funding and incentives)	Overall assessment		
Credible plans (G)	Appropriate ambition and timelines for emissions reduction and future decisions and policy development are given	Proven delivery mechanism that covers all the important elements; the combination of public funding and plans to encourage private funding is credible	Credible plans with funding and timelines in place		
Some risks (Y)	Suitable ambition and timelines for some future decisions and policy development are given, but questions remain	Mostly based on proven delivery mechanism but missing a small number of key elements; combination of public funding and plans to encourage private funding are credible, but some risks remain	Some adjustment to plans may be needed to mitigate uncertainties and delivery or funding risks		
Significant risks (O)	Plans provide only partial indication of the timeline for future decisions and policy development, and ambition is insufficient	Some plans based on proven mechanism, but several key elements are missing; some funding commitments but unclear where significant part of the funding will come from	Plans under development and/or further work needed to enact policies and overcome uncertainties and delivery or funding risks		
Insufficient plans (R)	Plans do not indicate whether or when gaps will be filled, or when future decisions will be made	No comprehensive plan or strategy, or plan/strategy missing most key elements; unclear where the bulk of funding will come from; not yet considered incentives to address these	Plans are either missing, clearly inadequate, or lack funding, and new proposals are needed		

Table A3         Scoring criteria for assessing policies and plans – for governance					
	Current structures and processes	Mechanisms and timelines for overcoming barriers	Overall assessment		
Credible plans (G)	Coordinating structures and governance processes are proven to be effective and expected to be suitable to enable delivery of the actions required	Suitable mechanisms and appropriate timelines have been established to improve existing structures and processes	Credible plans with funding and timelines in place		
Some risks (Y)	Coordinating structures and governance processes have potential to be effective, but are currently missing and/or unproven in a small number of key elements	Mechanisms and timelines are proposed to improve existing structures and processes, but questions remain	Some adjustment to plans may be needed to mitigate uncertainties and delivery or funding risks		
Significant risks (O)	Coordinating structures and governance processes are at least partially in place, but several key elements are missing and/or unproven	Plans provide only a partial indication of what mechanisms and timelines will be used to improve existing structures and processes and/or how these will address key barriers	Plans under development and/or further work needed to enact policies and overcome uncertainties and delivery or funding risks		
Insufficient plans (R)	Coordinating structures and governance processes are missing most key elements	Plans do not indicate how or when gaps will be filled, or when future decisions will be made	Plans are either missing, clearly inadequate, or lack funding, and new proposals are needed		

Table A4         Scoring criteria for assessing policies and plans – for international					
	Ambition	Delivery	Overall assessment		
Credible plans (G)	Appropriate ambition and timelines for domestic and international policy are given and communicated	Decisive public action in the UK and abroad that delivers against expressed strategic aims and contributes to international climate progress	Appropriate ambition that is clearly defined and communicated and backed up by public action		
Some risks (Y)	Suitable ambition and timelines for some future decisions given, but ambition in some areas is lacking or uncertain	Some evidence of positive public action that delivers against strategic aims on international climate; action has been delayed or is missing in some areas	Ambition is supported by delivery, but gaps remain in both areas		
Significant risks (0)	Plans provide only partial indication of the timeline for future decisions and ambition is insufficient	Some evidence of positive public action against international climate aims, but several examples of contradictory or regressive developments	Significant risks to UK international climate progress posed by gaps in ambition and delivery or contradictory and regressive developments		
Insufficient plans (R)	Plans do not indicate whether or when gaps will be filled, or when future decisions will be made	No positive action being taken; UK developments on international climate do not reflect its stated aims or contribute to global progress	Ambition is unclear or insufficient and delivery does not contribute to international climate progress		

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The CCC's departmental recommendations set out the steps required by each Government department and other key bodies to stay on track to meeting the UK's climate targets. This year, we present 300 recommendations, over half of which were carried forward from our previous progress report.

Recommendations are carried forward if they are not fully achieved, or if they require ongoing action. Where a recommendation is carried forward, the wording is updated to reflect any changes in context.

The tables contain only the recommendations where the given department has primary responsibility. We include recommendations for Scotland, Wales and Northern Ireland, but only those with priority status; there are more detailed recommendations made in country-specific reports. The CCC has also made recommendations on adapting to climate change in our recent <u>progress reports</u> <u>on adaptation</u>.

We have introduced unique ID numbers to make it easier to identify individual recommendations. These ID numbers also highlight the year in which the recommendation was first made (starting from 2022).

The recommendations are <u>available in filterable tables on our website</u>, along with our assessment of progress on recommendations made last year.

# 1. Recommendations for Cabinet Office and Number 10

ID	Sector	Recommendations for Cabinet Office and Number 10	Timing
R2022-087	Buildings: Public buildings	Ensure that public-sector organisations (including those not captured by Greening Government Commitments) have the resources required to reduce energy use and emissions from their buildings in line with Government targets. Monitor progress across the public sector, enabling organisations which are underperforming to be identified and put measures in place to help those organisations which are failing to meet targets. <b>Primary responsibility: CO &amp; Number 10</b> Supporting actors: DESNZ; Defra	2023
R2022-143	Cross-cutting: Governance	Ensure that all policies, funding and delivery mechanisms are properly aligned to the pace of transition required and work together constructively towards Net Zero, for example through introduction of a Net Zero test. <b>Primary responsibility: CO &amp; Number 10</b> Supporting actors: DESNZ; HMT; Scotland; Wales; N. Ireland	Ongoing
R2022-144	Cross-cutting: Governance	Extend the delivery of climate skills training across the Civil Service, wider public sector and local authorities. Consider what wider supporting skills (e.g. delivery, coordination, legal, financial) will be needed in the public sector to enable effective delivery of the transition to Net Zero and climate risk management. <b>Primary responsibility: CO &amp; Number 10</b> Supporting actors: DESNZ; Scotland; Wales; N. Ireland	Ongoing
R2023-152	Cross-cutting: Governance	Review and improve processes for collaboration with the devolved administrations, including by working together to identify opportunities for synergies between UK and devolved delivery plans. <b>Primary responsibility: CO &amp; Number 10</b> Supporting actors: DESNZ; Scotland; Wales; Northern Ireland	Ongoing

# 5. Recommendations for DfT

ID	Sector	Recommendations for the Department for Transport (DfT)	Timing
Priority: R2022-272	Surface transport: Electric cars and vans	Confirm the details of the ZEV mandate in regulation. As set out in the consultation, this should impose targets on manufacturers that are at least as ambitious as those in the Transport Decarbonisation Plan and should drive consistent growth in sales of EV cars and vans through the 2020s to meet the 2030 phase-out date. <b>Primary responsibility: DfT</b> Supporting actors: Scotland; Wales; Northern Ireland	Q1 2023 Overdue
Priority: R2023-037	Aviation: Demand	No airport expansions should proceed until a UK-wide capacity management framework is in place to annually assess and, if required, control sector GHG emissions and non-CO <sub>2</sub> effects. A framework should be developed by DfT in cooperation with the Welsh, Scottish and Northern Irish Governments over the next 12 months and should be operational by the end of 2024. After a framework is developed, there should be no net airport expansion unless the carbon-intensity of aviation is outperforming the Government's emissions reduction pathway and can accommodate the additional demand. <b>Primary responsibility: DfT</b>	H1 2024
R2023-140	Surface transport: Electric cars and vans	Establish proactive monitoring mechanisms for delivery against the ZEV mandate, to enable early identification of areas where further supporting policy measures may be needed to address shortfall risks or harness opportunities to boost delivery. <b>Primary responsibility: DfT</b> Supporting actors: Scotland; Wales; Northern Ireland	Q1 2024
R2023-142	Surface transport: Electric cars and vans	Work with supportive stakeholders to agree a definition of what a sustainable and ethical EV supply chain should look like, and investigate ways (e.g. certification) of requiring this for vehicles sold in the UK. <b>Primary responsibility: DfT</b> Supporting actors: DBT	Q1 2024
R2022-277	Surface transport: Electric vehicle charging infrastructure	Continue to support widespread deployment of charging infrastructure, ensuring that deployment rates accelerate in line with the trajectory required to deliver a minimum of 300,000 public chargepoints by 2030. <b>Primary responsibility: DfT</b> Supporting actors: DESNZ; Ofgem	Ongoing
R2022-286	Surface transport: Electric vehicle charging infrastructure	Review and strengthen rapid charger rollout plans on the major road network out to 2035, to ensure that drivers have the confidence that they can find reliable, available chargepoints as EV uptake grows. Primary responsibility: DfT Supporting actors: DESNZ; Ofgem	Ongoing

ID	Sector	Recommendations for the Department for Transport (DfT)	Timing
R2022-279	Surface transport: Electric vehicle charging infrastructure	Enact legislation requiring better reliability, accessibility, interoperability and ease-of-use at public chargepoints, as committed to in the Government response to the consultation on the consumer experience at public chargepoints. <b>Primary responsibility: DfT</b>	Q1 2023 Overdue
R2023-144	Surface transport: Electric vehicle charging infrastructure	Monitor reliability across all public chargepoints, beyond just the rapid network that will be covered by the 99% target, and consider how to intervene to increase this if it does not improve. <b>Primary responsibility: DfT</b>	2024
R2023-146	Surface transport: Zero-emission HGVs and buses	Produce an infrastructure strategy that sets out how the transition of heavy-duty vehicles to ZEVs will be enabled. The strategy should consider options for depot charging, en-route ultra-rapid charging and hydrogen refuelling infrastructure. <b>Primary responsibility: DfT</b>	2024
R2023-145	Surface transport: Zero-emission HGVs and buses	Once the ZEV mandate regulations for cars and vans are implemented, begin consulting on an appropriate regulatory mechanism for delivering the ZEV transition for heavy-duty vehicles including HGVs and buses. <b>Primary responsibility: DfT</b>	2024
R2023-147	Surface transport: Conventional vehicle efficiency	Increase the ambition of the proposed CO <sub>2</sub> -intensity regulations for new non-zero-emission cars and vans, by ensuring that manufacturers are incentivised to reduce vehicle sizes and are not subject to perverse incentives that could restrict the availability of small EVs. <b>Primary responsibility: DfT</b>	2023
R2023-141	Surface transport: Conventional vehicle efficiency; Electric cars and vans	Set out an ambitious definition of 'significant zero-emission capability' to cover which cars and vans will be permitted to be sold between 2030-2035, ideally allowing only fully electric vehicles. <b>Primary responsibility: DfT</b>	2023
R2022-283	Surface transport: Public transport	Publish a comprehensive plan setting out how the Government's target of removing diesel passenger trains from the railway by 2040 and achieving a Net Zero rail network by 2050 or earlier will be achieved. <b>Primary responsibility: DfT</b>	2022 Overdue
R2023-149	Surface transport: Car demand	Publish guidance to local authorities on what should be covered in local transport plans to deliver on the priorities set out in the Transport Decarbonisation Plan. This should include consistent guidance on how to quantify the emissions reductions that these measures can be expected to deliver as well as long-term clarity on what funding streams will be available to implement plans. <b>Primary responsibility: DfT</b> Supporting actors: DLUHC	2023

ID	Sector	Recommendations for the Department for Transport (DfT)	Timing
R2023-148	Surface transport: Car demand	Conduct a systematic review of current and future road-building projects to assess their consistency with the Government's environmental goals. This should ensure that decisions do not lock in unsustainable levels of traffic growth and develop conditions (which can be included in the Roads Investment Strategy 3 process and beyond) that permit schemes to be taken forward only if they meaningfully support cost-effective delivery of Net Zero and climate adaptation.	2023
		Primary responsibility: Dfl	
R2022-282	Surface transport: Public transport	Prioritise delivery of a new, transparent public transport fare structure that offers more affordable and reliable travel, ensuring fairness in relation to more carbon-intensive choices, and a more interlinked public transport system between operators.	Q1 2023 Overdue
		Primary responsibility: DfT Supporting actors: HMT	
R2022-290	Surface transport: Freight demand	Work with the freight industry to design and implement pilot schemes to explore approaches to reducing van and HGV usage in urban locations.	2022 Overdue
		Primary responsibility: DfT	
R2022-301	Surface transport; Electricity supply	Take action to reduce the cost of local public charging for drivers who do not have access to private off-street parking to make it more comparable to charging at home. This should include reducing VAT on residential public charging.	Q1 2023 Overdue
		Primary responsibility: DfT Supporting actors: HMT	
R2023-116	Aviation: Efficiencies	Confirm when the Jet Zero Strategy will undergo its first five-yearly review and begin work in 2023 to understand what policy framework or mechanism would need to be in place for additional measures within the sector to be rapidly deployed in the late-2020s if the Government is not on track to meet its aviation pathway. These measures could include demand reduction policies.	2024
D0000 117	Autotiona		2024
K2U23-117	Demand	aviation ticket types (e.g. business, first class, economy class), and demand for private flying, to help understand how demand-side measures could reduce the carbon intensity of flying.	2024
		Primary responsibility: DfT	
R2022-046	Aviation: Sustainable aviation fuel	Ensure the Sustainable Aviation Fuel Mandate is legislated in time for it to become operational by the start of 2025, with a strong set of criteria for the fuels included in the mandate. Primary responsibility: DfT	2024

ID	Sector	Recommendations for the Department for Transport (DfT)	Timing
R2023-118	Aviation: Sustainable aviation fuel	The Sustainable Aviation Fuel mandate should include provisions to ensure that eligible fuels do not have a harmful non-CO <sub>2</sub> impact relative to conventional jet fuel and that the minimum GHG emissions saving threshold is sufficiently ambitious to ensure the Government's aviation emissions reduction trajectory is reached. The threshold should be increased over time to ensure high future emissions savings while upholding stringent fuel eligibility standards.	2024
		Primary responsibility: Dri	
R2023-119	Aviation: Sustainable aviation fuel	Build contingency measures into the Sustainable Aviation Fuel Mandate to prepare for the possibility of constrained domestic and global Sustainable Aviation Fuel feedstock and import supply throughout the 2020s and 2030s that does not overly rely on the SAF mandate buy-out mechanism.	2024
		Primary responsibility: DfT	
R2022-056	Aviation: Sustainable aviation fuel	Without allowing it to delay the implementation of the Sustainable Aviation Fuel Mandate, consider whether including high-quality greenhouse gas removals into the mandate could be a more effective way of reducing emissions for the industry, particularly in the short term (e.g. up to 2030), before more scalable forms of SAF (e.g. synthetic fuels) are widely commercially available.	2024
		Primary responsibility: DfT	
R2023-120	Aviation: Zero emission aircraft	Outline the role zero-emission aircraft will play in the Government's aviation decarbonisation pathway after 2030 and how Government will provide an enabling environment (regulation, infrastructure, public acceptance) for these new technologies.	2024
		Primary responsibility: DfT	
R2022-048	Aviation: Offsets and removals	Commit to a policy on the UK ETS/Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) interaction as soon as possible, ensuring it is sufficiently environmentally stringent and that no credits from CORSIA are used for flights currently covered by the UK ETS unless and until they can satisfy strict eligibility criteria (equivalence, additionality, permanence, sustainability). The interaction should avoid double-compliance.	2023
		Primary responsibility: DfT	
R2022-053	Aviation: Non-CO2 emissions	Start monitoring non-CO <sub>2</sub> effects of aviation - including through the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) for eligible aeroplane operators - and set a minimum goal of no further additional warming after 2050 from non-CO <sub>2</sub> effects, research mitigation options and consider how best to tackle non- CO <sub>2</sub> effects alongside UK climate targets without increasing CO <sub>2</sub> emissions.	2023
к'20'2'2-050	Cross cutting	continue innovation and tunding for aircraft efficiency measures, hybrid, full electric and hydrogen aircraft development and airspace modernisation.	Ungoing
		Primary responsibility: DfT	

ID	Sector	Recommendations for the Department for Transport (DfT)	Timing
R2022-054	Aviation: Cross-cutting	Use the ICAO General Assembly to protect, strengthen and extend Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) such that all residual emissions in 2050 are covered by near-permanent, sustainable greenhouse gas removals. Commit to increasing the number of airlines opting in and, if strengthening it is not possible, push for an additional policy for countries willing and able to commit to a higher standard of carbon removal for aviation than exists through CORSIA.	Q3 2022 Overdue
		Primary responsibility: DfT	
R2023-104	Aviation: Skills	Identify current and future skill gaps in the aviation workforce and address them to ensure the right skills are developed and available in the sector to help achieve aviation decarbonisation.	Ongoing
		Primary responsibility: DfT Supporting actors: DfE	
R2022-049	Aviation: Efficiencies	Continue to monitor seat occupancy over the period to 2027, during recovery from the COVID-19 pandemic, to ensure that the sector either returns to prior occupancy levels or routes are adjusted to account for low occupancy rates. Consider regulating aircraft occupancy standards if the trends do not return to pre-pandemic levels by 2024. <b>Primary responsibility: DfT</b>	Ongoing
R2022-051	Aviation:	Continue innovation and show support for sustainable aviation fuel	Onaoina
	Sustainable aviation fuel	technologies, including research into non-CO <sub>2</sub> effects. Also, estimate the impact of different sustainable aviation fuel options on other countries' emissions and the opportunity costs for UK land use.	
		Primary responsibility: DfT	
R2022-268	Shipping: Low-carbon fuel	Embed the Course to Zero response into the next update of the Clean Maritime Plan. This should present a credible plan for how the trajectory to Net Zero will be delivered. Primary responsibility: DfT	2023
R2022-270	Shipping:	Publish the outcome of the Course to Zero consultation. This should	2022
	Demand: Low-	aim to set an ambitious trajectory to Net Zero for the domestic	Overdue
	carbon fuel	Primary responsibility: DfT	C VOI GUO
R2022-267	Shipping:	Commit to the UK's first clean maritime cluster(s) operating at	2022
	Low-carbon fuel	commercial scale (supplying at least 2 TWh/year of zero-carbon fuels) by 2030 at the latest.	Overdue
		Primary responsibility: DfT Supporting actors: DESNZ	

ID	Sector	Recommendations for the Department for Transport (DfT)	Timing
R2023-135	Shipping: Low-carbon fuel	Provide support and incentives to drive private-sector investment in low-carbon maritime fuels, engine technologies, and storage facilities. For example, this should include support and incentives to better understand the viability of different low-carbon fuels such as the sustainability of supply and carbon emissions for methanol. These should enable low-carbon fuels to expand to 42% of total domestic shipping fuel use by 2035 to match the deployment assumptions in the CBDP.	2024
		Primary responsibility: DfT	
R2022-266	Shipping: Efficiency and electrification	Build upon the summary of responses to develop a plan on the use of shore power and electric recharging infrastructure at all of the UK's major ports. This should include identifying roles and responsibilities for delivery and providing support and incentives to drive investment.	Q1 2023 Overdue
		Primary responsibility: DfT	
R2023-134	Shipping: Efficiency, zero- emission vessels and electrification	Establish a Centre for Smart Shipping (CSmart) as promised in the Technology and Innovation in UK Maritime report (part of Maritime 2050 Route Map). The centre should increase the adoption of technology in the UK maritime sector and work on developing a UK legislative framework for autonomous vessels, incorporating the as yet unpublished results from their 'Future of transport regulatory review: maritime autonomy and remote operations' consultation which closed in November 2021. Any new framework for autonomous vessels should include consideration of low-carbon fuels and operations.	2024
		Primary responsibility: DfT	
R2022-265	Shipping: Demand	Build upon the proposals for the UK Emissions Trading Scheme and the UK MRV regulations to explore options for an activity-based measure of UK shipping emissions. This should include exploring the benefits of changing the emissions accounting approach for international shipping, to ensure that a fair share of emissions for voyages to and from the UK are captured within the UK's inventory even if vessels refuel in other jurisdictions. <b>Primary responsibility: Dff</b> Supporting actors: DESNZ	2023
R2022-271	Shipping:	Continue to report on progress in identifying green shipping corridors	2023
	Low-carbon fuel	and the actions to implement them, as agreed within the Clydebank Declaration. An annual report should be published ahead of COP28. <b>Primary responsibility: DfT</b>	
		Supporting actors: CO & Number 10	
R2022-263	Shipping: Demand; Low- carbon fuel	Take a leadership role in pushing for inclusion of a 2050 Net Zero target within the 2023 update of the International Maritime Organisation's initial greenhouse gas strategy. <b>Primary responsibility: DfT</b> Supporting actors: CO & Number 10	2023

ID	Sector	Recommendations for the Department for Transport (DfT)	Timing
R2023-060	Cross-cutting: Data	Work with other departments and the ONS to fill the data gaps identified in the CCC's Monitoring Framework (http://www.theccc.org.uk/publication/ccc-monitoring-framework), with a focus on those the CCC have flagged as high priority.	Ongoing
		Primary responsibility: DfT Supporting actors: ONS	

# 19. Recommendations for the Scottish Government (priority only)

ID	Sector	Recommendations for the Scottish Government (priority only)	Timing
Priority: R2022-332	Surface transport: Car demand	Publish a detailed strategy, building on the Route Map consultation of 2022, setting out how the Scottish Government will achieve a 20% reduction in car-kilometres by 2030 and deliver 20-minute neighbourhoods. This should include both investment in more sustainable modes of travel and measures to reduce the attractiveness of driving. Primary responsibility: Scotland	2023
Priority: R2022-338	Surface transport: Electric vehicle charging infrastructure	Develop an implementation plan to deliver the Scottish Government's vision for the public EV charging network. This should ensure the EV transition works for all road users in Scotland and accelerates in line with EV uptake, delivering 6,000 chargepoints by 2026 and approximately 24,000 chargepoints by 2030. <b>Primary responsibility: Scotland</b>	2023
Priority: R2022-336	Surface transport: Public transport	Deliver the public transport fares review outlined in the Route Map. This should consider: prioritising delivery of a new, transparent fare structure that offers more affordable and reliable travel, ensuring fairness in relation to more carbon-intensive choices, and a more interlinked public transport system between operators. <b>Primary responsibility: Scotland</b>	H1 2023
Priority: R2022-384	Buildings: Non-residential buildings	Consult on and finalise plans for delivering energy efficiency improvements and low-carbon heating in non-residential buildings. These should include clear target dates for meeting standards. Consider the role of targets that look beyond EPCs to more reliable measures of performance and emissions reductions, and clarify whether Scotland will be part of the UK performance-based rating scheme for non-residential buildings. <b>Primary responsibility: Scotland</b>	H1 2023
Priority: R2022-388	Buildings: Progress monitoring and data	Publish the delayed monitoring and evaluation framework for the Heat in Buildings Strategy, or expand the set of indicators in the annual climate change plan monitoring reports. Include clear indicators for deployment of energy efficiency measures, heat pumps, and low-carbon district heating, across residential and non- residential buildings. Use the development of the framework to identify data gaps and make plans to address them. Track implementation and its costs and use this information in updates to the Strategy. <b>Primary responsibility: Scotland</b>	2023
Priority:	Buildings:	Publish developed plans to deliver energy efficiency improvements	H1 2023
R2022-383	Residential buildings	and low-carbon heating in residential buildings, aligned with Scotland's ambitious targets. This will require a combination of incentives and regulation, including using tenancy and ownership changes as trigger points for change. Policies should also factor in the UK Government's proposals for a market-based mechanism for low-carbon heat.	

ID	Sector	Recommendations for the Scottish Government (priority only)	Timing
Priority: R2022-406	Agriculture & land use: CAP reform	Provide detail on how post-CAP agricultural subsidies and schemes	H1 2023
		Primary responsibility: Scotland	
Priority: R2022-356	Agriculture & land use: Forestry	Ensure that funding and incentives are set at the correct level to meet the Scottish Government afforestation target of 18,000 hectares per year by 2025 <b>Primary responsibility: Scotland</b>	Ongoing
Priority: R2022-348	Aviation: Aviation demand	The Scottish Government should Implement the Air Departure Tax (ADT) as soon as possible. Once implemented, use the tax to address price imbalances between aviation and alternative, lower- emissions forms of surface transport (e.g. rail) to encourage modal shift. Also consider other policy levers, such as information provision, to encourage a reduction in the number of flights taken.	2023
Dei e eite e	Wester	Cat aut further datail an actions and implementation timeling to	111 0000
R2022-329	Energy from Waste / Incineration	ensure all recommendations from the incineration review can be delivered. This should include explaining how the projected residual waste capacity gap in 2025 will be managed whilst ensuring commitments to end the landfilling of biodegradable waste are met.	11 2023
		Primary responsibility: Scotland	
<b>Priority:</b> R2022-400	Waste: Energy from Waste / Incineration	Work with the UK Government to develop a policy and funding framework to retrofit existing EfW plants with CCS from the mid- 2020s, and ensure any new EfW plants are all built 'CCS-ready'. <b>Primary responsibility: Scotland</b>	2023
Diatha			
R2022-402	Cross-cutting: Delivery	Net Zero. This should involve publishing more details on the assumptions that underpin these pathways and how the abatement set out in the Scottish Climate Change Plan update will be achieved by planned policies, setting out the quantified abatement expected to be achieved by each policy. Primary responsibility: Scotland	2023
Priority:	Cross-cutting:	Map out interdependencies between reserved and devolved	2023
R2022-403	Governance	economic sectors, and use the results to identify significant risks to the delivery of Net Zero and construct a plan to manage them. Primary responsibility: Scotland	
Priority:	Cross-cutting:	In parallel with the Convention of Scottish Local Authorities, address	2023
R2022-410	Governance	the question of what aspects of Net Zero central and local government are responsible for and how these will be coordinated. As well as sharing local best practice, this should lead to a clearer shared understanding of roles and responsibilities which can be communicated across local government.	
		<b>Primary responsibility: Scotland</b> Supporting actors: DLUHC; Wales; N. Ireland	

# 20. Recommendations for the Welsh Government (priority only)

ID	Sector	Recommendations for the Welsh Government (priority only)	Timing
<b>Priority:</b> R2023-020	Surface transport: Car demand	Develop and publish a full delivery plan for how to realise the ambition of reducing per-person car demand by 10% by 2030. This should include consideration of how measures that limit car usage will interact with those that enable more sustainable modes.	H1 2024
		Primary responsibility: Wales	
<b>Priority:</b> R2023-018	Surface transport: Electric cars and vans	Monitor EV uptake in Wales and assess whether there are opportunities for further policies and incentives to drive adoption forward more quickly than through the ZEV mandate alone. This should consider opportunities to maximise emissions savings and deliver co-benefits for Welsh people.	Ongoing
<b>Priority:</b> R2023-039	Buildings: Buildings decarbonisation	Develop a detailed plan for decarbonising buildings and reaching Net Zero targets, incorporating data from Local Area Energy Plans. The plan should include estimates of investment requirements and yearly targets for deployment of low carbon heating and energy efficiency measures. It should identify policy areas which are under Welsh Government control and those which require coordination with the UK Government.	2024
		<b>Primary responsibility: Wales</b> Supporting actors: UK	
<b>Priority:</b> R2023-112	Buildings: Fuel poor homes	Fully assess the level of investment required to decarbonise fuel poor homes and make long-term plans for delivering the funding required.	H1 2024
		Primary responsibility: Wales	
<b>Priority:</b> R2023-041	Buildings: Public buildings	Fully assess the level of investment required to decarbonise public buildings and make long-term plans for delivering the funding required.	H1 2024
		Primary responsibility: Wales	
Priority:	Buildings:	Fully assess the level of investment required to decarbonise social	H1 2024
R2023-040	Residential buildings	required. Evaluate the cost effectiveness of retrofitting social housing to reach an EPC 'A' rating, and review the proposed target.	
		Primary responsibility: Wales	
Priority:	Industry:	Continue to work with the UK Government on industrial	Ongoing
R2023-027	Business	decarbonisation in Wales, formally requesting some specific support measures, including for the adoption of CCUS and hydrogen in the South Wales Industrial Cluster.	
		Primary responsibility: Wales	
<b>Priority:</b> R2023-131	Electricity supply: Networks; Renewables	Work closely as part of a Minister-led infrastructure delivery group, and in conjunction with the new Electricity Networks Commissioner, to ensure enabling initiatives for energy infrastructure are taken forward at pace and necessary policy changes are implemented in	2023

ID	Sector	Recommendations for the Welsh Government (priority only)	Timing
		Wales, to deliver a decarbonised and resilient power system by 2035. Wales's spatial planning regime should adequately balance local impacts on natural capital with the need for sufficient electricity network capacity, delivered in a timely fashion, to accommodate expansion of renewable electricity generation capacity in line with UK Government targets and Welsh Government ambition.	
		Primary responsibility: Wales	
<b>Priority:</b> R2023-034	Agriculture & land use: CAP reform	Urgently address the funding gap for new land management actions in the farmed landscape for the year 2024, between the Glastir Scheme ending in late 2023 and the new Sustainable Farming Scheme beginning in 2025, to ensure delivery does not lose momentum.	Q3 2023
		Primary responsibility: Wales	
<b>Priority:</b> R2023-054	Agriculture & land use: Forestry	Implement a strategy to address non-financial barriers to achieve annual tree-planting rates of at least 4,500 hectares/year in Wales by 2030, rising to 7,500/year by 2035.	H1 2024
		Primary responsibility: Wales	
Priority: R2022-043	Agriculture & land use: CAP reform	Provide detail on how post-CAP agricultural subsidies and schemes in Wales will target incentives and delivery for climate mitigation alongside wider environmental goals such as climate change adaptation and biodiversity.	2022 Overdue
		Primary responsibility: Wales	
<b>Priority:</b>	Waste:	Set out policies or support to capture methane emissions from landfill sites, in addition to improving the monitoring of emissions.	H1 2024
		Primary responsibility: Wales	
Priority: R2023-005	Waste: Strategy	Set out how Wales's pathway for reducing emissions in the waste sector will be achieved - including policies, funding/investment needs and provision, and any dependencies or implications for other UK nations.	H1 2024
		Primary responsibility: Wales	
Priority:	Waste:	Set ambitious recycling targets for 2030 and beyond, improving on the 70% target for 2025.	H1 2024
R2022-327	Waste prevention	Primary responsibility: Wales	
Priority:	Cross-cutting:	Publish a transparent and quantified link between policies and milestones, and the emissions reduction they correspond to in the	2022
R2022-199	Governance	sectoral pathways set out in the Second Welsh Carbon Budget.	Overdue
		Primary responsibility: Wales	
Priority: R2023-029	Cross-cutting: Governance	Work with local authorities to develop an agreed framework of what aspects of Net Zero central and local government are responsible for and how these will be coordinated. This should lead to a clearer shared understanding of roles and responsibilities which can be communicated across local government. <b>Primary responsibility: Wales</b>	2023

# 21. Recommendations for the Northern Ireland Executive (priority only)

ID	Sector	Recommendations for the Northern Ireland Executive (priority only)	Timing
<b>Priority:</b> R2022-295	Surface transport: Electric vehicle charging infrastructure	Support the deployment of public chargepoints across Northern Ireland, to address the issue that Northern Ireland currently has the fewest EV chargepoints per capita of any of the UK nations. <b>Primary responsibility: N. Ireland</b>	Ongoing
Priority: R2022-108	Buildings: Strategy	Publish the Decarbonising Heat Consultation and follow on with a coherent, long-term strategy for heat and energy efficiency in Northern Ireland's homes and other buildings; encompassing regulatory, policy and funding commitments to facilitate delivery. <b>Primary responsibility: N. Ireland</b>	2023
Priority: R2023-067	Agriculture & land use: Peatlands	Northern Ireland should formalise its 2021 - 2040 draft peatland strategy. This should include policy and delivery mechanisms to conserve and restore Northern Irish peat soils under both land and agricultural use. <b>Primary responsibility: N. Ireland</b>	2024
Priority: R2022-315	Waste: Infrastructure	Publish an assessment of residual waste treatment capacity needs through to 2050, consistent with meeting committed and prospective recycling and waste reduction targets, expected resource efficiency improvements and ending the landfilling of biodegradable waste by 2028 at the latest. The findings of this review should inform future incineration/EfW capacity decisions and consider the feasibility of phasing out waste exports by 2030. <b>Primary responsibility: N. Ireland</b>	2022 Overdue

# June 2023

Progress in reducing emissions 2023 Report to Parliament

Climate Change Committee 1 Victoria Street Westminster SW1H OET

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CL2.18

## Appendix CL2.18

## BS EN 17472 lifecycle stages



**BSI Standards Publication** 

Sustainability of construction works — Sustainability assessment of civil engineering works — Calculation methods

bsi.



Figure 5 — Display of modular information for the different stages of civil engineering works' assessment

CL2.19

## Appendix CL2.19

## Transport Decarbonisation Plan





Department for Transport

# Decarbonising Transport

A Better, Greener Britain



### **Cover Images**

- 1 DAF LF Electric RHD
- 2 Living Streets
- 3 Nissan charging
- 4 London cycle path
- 5 Metrodecker EV in York. Image courtesy of City of York Council / First Bus

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## **Decarbonising Transport: A Better, Greener Britain**

#### Foreword from the The Rt Hon Grant Shapps MP, Secretary of State for Transport

Transport decarbonisation is a dull way of describing something much more exciting and far-reaching.

Because transport is not just how you get around. It is something that fundamentally shapes our towns, our cities, our countryside, our living standards, our health, and our whole quality of life. It can shape all these things for good – or for bad.

Bad is spending longer and longer stuck in traffic. It's the huge increase in rat-running down roads which were never meant for it. It is millions of people literally, if slowly, being poisoned by the very air they breathe. Every one of these things also contributes to climate change.

And decarbonisation is not just some technocratic process. It is how we fix some of that harm. It is how we make sure that transport shapes the country and the economy in ways that are good. It's about taking the filth out of the air and creating cleaner, quieter, healthier places. It's about a second, green, industrial revolution, creating hundreds of thousands of new, skilled jobs, in some of the proud towns and cities that were the cradle of the first one.

It's not about stopping people doing things: it's about doing the same things differently. We will still fly on holiday, but in more efficient aircraft, using sustainable fuel. We will still drive on improved roads, but increasingly in zero emission cars. We will still have new development, but it won't force us into high-carbon lifestyles.

Because of the pandemic, some of it is happening faster than we expected. Homeworking has changed traditional commuter and shopping trips, probably for ever. Videoconferencing has changed business travel. These things, in themselves, will save thousands of tonnes of carbon – but they also create new challenges, such as a further rise in already proliferating delivery vehicles on the roads. This plan includes clear actions to cut delivery traffic and make it low-carbon, including harnessing new technology and 'last-mile' delivery consolidation.

Our major transport infrastructure programmes were designed before the pandemic. We want to understand how changing patterns of work, shopping and business travel might affect them. For that reason, among others, our Integrated Rail Plan, to be published in due course, will describe how HS2, Northern Powerhouse Rail and other major projects will deliver benefits for passengers, including carbon savings more quickly and effectively than under the original proposals, which would have left the North and Midlands – and the environment – waiting twenty years for any major improvement. And for the same reason, as new demand patterns become clearer, we will also review the National Policy Statement which sets out the government's policies on the national road network.

Our ambitious roads programme reflects – and will continue to reflect – that in any imaginable circumstances the clear majority of longer journeys, passenger, and freight, will be made by road; and that rural, remote areas will always depend more heavily on roads. That is why our plan to decarbonise motor transport, the most ambitious of any major country, is so vital. In November, we announced that new diesel and petrol cars and vans would no longer be sold from 2030, and that all new cars and vans must be fully zero emission at the tailpipe from 2035, a plan that is only possible now we are no longer members of the EU. Alongside this document, we have published our consultation on ending the sale of all non-zero emission HGVs from 2040, with lighter HGVs from 2035. I can also commit to consulting on setting phase out dates for all non-zero emission road vehicles, with 2040 as a backstop, setting a path to a time when every vehicle on the roads will be zero emission.





But we cannot, of course, simply rely on the electrification of road transport, or believe that zero emission cars and lorries will solve all our problems, particularly for meeting our medium-term carbon reduction targets to 2035. Road traffic, even on pre-pandemic trends, was predicted to grow by 22 percent from 2015 to 2035 – much of it in cities, where new roadbuilding is physically difficult and disadvantages communities.<sup>1</sup> We cannot pile ever more cars, delivery vans and taxis on to the same congested urban roads. That would be difficult for the roads, let alone the planet, to tolerate. As we build back better from the pandemic, it will be essential to avoid a car-led recovery.

As I said in "Decarbonising Transport: Setting the Challenge" in March last year, we must make public transport, cycling and walking the natural first choice for all who can take it. Many journeys are short, could be done differently – and were done differently, in the very recent past. Even ten years ago, for instance, more children walked to school. We want to reduce urban road traffic overall. Improvements to public transport, walking and cycling, promoting ridesharing and higher car occupancy, and the changes in commuting, shopping and business travel accelerated by the pandemic, also offer the opportunity for a reduction or at least a stabilisation, in traffic more widely. That will benefit everyone, drivers included. We know we can do this because it is happening already. In the sixteen months since March 2020, we have published ambitious policies to transform England for cycling and walking. More than 300 cycling and walking schemes have already been installed, many more are on the way, and we have clear evidence that, where they are done properly, they work and are popular. Cycling rose by 46 per cent last year, a greater rise than across the whole of the previous 20 years and easily the biggest increase in post-war history. With £2 billion of new funding, we have put our money where our mouth is.

We have published plans to fundamentally reshape our bus network along public service lines, with £3 billion of new money, lower and simpler fares, thousands of zero emission buses, and more priority lanes. Again, these are the same policies that in London and other cities have brought about clear modal shift.

We have created Great British Railways to own and control the rail system in the public interest, to make services easier to use and to grow the network. We will build on the huge acceleration of electrification we've already seen since 2010, and will shortly announce further electrification schemes. Rail is currently the only means of transporting heavy goods in a low-carbon way using existing, proven technology through electrification. Our electrification programme also, therefore includes relatively short stretches of track that can significantly increase the amount of electrically hauled rail freight and unlock new electric freight paths. With electrification, plus batteries and hydrogen, we can achieve a net zero emission rail network by 2050.

Over the last twenty years, in real terms, the cost of motoring fell by 15 per cent. Over the same period the cost of rail fares went up by over 20 per cent and bus and coach fares by over 40 per cent.<sup>2</sup> Gradually, we will change this. Starting with buses outside London, we want simpler, cheaper, often flat fares that you can pay with a contactless card, with daily and weekly price capping across operators. We must make buses and trains better value and more competitively priced.

For most of us, changing how we travel may be a blend, not a binary – it's about using cars less, not giving them up completely. You'll still keep a car for some journeys – or maybe borrow one from a car club – but you'll also have an electric bike to get you to the station, perhaps take it on the train and ride it off the other end, doing the door-to-door journey in a different way. If your commute isn't possible at all by public transport, you might instead use a new app to find someone in the same industrial estate you can share a car with, cutting costs and parking hassle. Some big employers are already doing this to save hundreds of car journeys a day. These kinds of advances in technology can create new ways for people and goods to move around. Car clubs, ridesharing and mobility credit schemes can all reduce emissions on our roads. Levelling-up means that all parts of our United Kingdom, urban and rural, will benefit from the investment and policies in this plan.

We must also do better at joining up our transport, decarbonisation, and planning goals in both urban and rural areas. Too many new developments – not just by housebuilders, but by public-sector bodies – are difficult to reach without a car. But if we do development in a greener way, and if we join it to existing places, we can make it lower-carbon, lower-emission and lower-traffic – and more acceptable to local communities. We will also support local areas to decarbonise by linking local infrastructure funding to solutions that cut emissions – aligning billions of pounds of investment to our net zero mission.

Air travel may represent only seven per cent of UK greenhouse gas emissions - far lower, of course, since the pandemic - but it gets a great deal more than seven per cent of the political attention in this debate.<sup>3</sup> International connectivity is a vital part of Global Britain, and everyone should continue to have access to affordable flights, allowing them to go on holiday, visit family, and do business. But as the aviation sector recovers, a process likely to take several years, it must do so in a lower-carbon way. We have committed to including international aviation, and shipping, in our Sixth Carbon Budget, and propose to set a highambition CO<sub>2</sub> emissions reduction trajectory for it from 2025 to 2050 against which we will measure progress. Our Jet Zero consultation, published alongside this plan, sets out how in more detail. And our Jet Zero Council will build on British leadership in sustainable aviation fuels to deliver truly guilt-free flying. The UK is already the home of the world's first hydrogen aircraft and we have set ourselves the objective of flying the first zero emission flight across the Atlantic.

Some, I know, see change as unwelcome. But transport in this country, and every other country, is always changing, and always has changed. Our job is to ensure that it changes for the better, not the worse. Many things in our lives which we would now be appalled by, we once saw as utterly normal: adulterants in our food, rooms filled with cancer-causing smoke, dead rivers full of waste, lead in petrol. I believe that the struggle for decarbonised transport, clean development and clean air is as important as the struggle for clean water was in the 19th century. This plan sets out how we will achieve it.

Gut Sums

The Rt Hon Grant Shapps MP Secretary of State for Transport

## Summary of commitments

#### Part 2a Decarbonising all forms of transport

#### Increasing cycling and walking

We will deliver the Prime Minister's bold vision for cycling and walking investing £2 billion over five years with the aim that half of all journeys in towns and cities will be cycled or walked by 2030

We will deliver a world class cycling and walking network in England by 2040

## Zero emission buses and coaches

We will deliver the National Bus Strategy's vision of a transformed bus industry and a green bus revolution

We will consult on modernising the Bus Service Operators' Grant in 2021

We will support delivery of 4,000 new zero emission buses and the infrastructure needed to support them

We will deliver the first All-Electric Bus Town or City

We are consulting on a phase out date for the sale of new non-zero emission buses We will consult on a phase out date for the sale of new non-zero emission coaches

#### **Decarbonising our railways**

We will deliver a net zero railway network by 2050, with sustained carbon reductions in rail along the way. Our ambition is to remove all diesel-only trains (passenger and freight) from the network by 2040

We will deliver an ambitious, sustainable, and cost-effective programme of electrification guided by Network Rail's Traction Decarbonisation Network Strategy

We are supporting the development of battery and hydrogen trains and will deploy them on the network as we decarbonise. We will also use technology to clean up diesel trains until they can be removed altogether

We are building extra capacity on our rail network to meet growing passenger and freight demand and support significant shifts from road and air to rail

We will work with industry to modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys We will improve rail journey connectivity with walking, cycling and other modes of transport

We will introduce a rail freight growth target

We will incentivise the early take up of low carbon traction for rail freight

## A zero emission fleet of cars, vans, motorcycles, and scooters

We will consult on regulatory options, including zero emission vehicle mandates, to deliver petrol and diesel phase out dates for new vehicles

We have published a zero emission cars and vans delivery plan

We will continue to support demand for zero emission vehicles through a package of financial and non-financial incentives

We will consult this year on a phase out date of 2035, or earlier if a faster transition appears feasible, for the sale of new nonzero emission powered two and three wheelers (and other L category vehicles)

We will deliver an action plan this year to build new UK opportunities for zero emission light powered vehicles

We will lead by example with 25% of the government car fleet ultra low emission by December 2022 and 100% of the government car and van fleet zero emission by 2027

We will ensure the UK's charging infrastructure network meets the demands of its users We will support and nurture innovation in the UK automotive sector

We will invest £15 million in 2021/22 to help address the backlog in traffic signal maintenance to improve traffic flow and reduce emissions

We will review the National Networks National Policy Statement

### Accelerating maritime decarbonisation

We will plot a course to net zero for the UK domestic maritime sector, with indicative targets from 2030 and net zero as early as is feasible

We will consult on the potential for a planned phase out date for the sale of new non-zero emission domestic vessels

We will assess how economic instruments could be used to accelerate the decarbonisation of the domestic maritime sector

We will accelerate the development of zero emission technology and infrastructure in the UK

We will consult this year on the appropriate steps to support and, if needed, mandate the uptake of shore power in the UK

We will extend the Renewable Transport Fuel Obligation (RTFO) to support renewable fuels of nonbiological origin used in shipping Internationally, the UK will press for greater ambition during the 2023 review of the International Maritime Organisation Initial Greenhouse Gas Strategy and urge accelerated decarbonisation

We will ensure we have the right information to regulate emissions, and to judge the effectiveness of the steps we are taking in the UK and at the IMO

### Accelerating aviation decarbonisation

We will consult on our Jet Zero strategy, which will set out the steps we will take to reach net zero aviation emissions by 2050

We will consult on a target for UK domestic aviation to reach net zero by 2040

We will consult on a target for decarbonising emissions from airport operations in England by 2040 We are supporting the development of new and zero carbon UK aircraft technology through the Aerospace Technology Institute (ATI)

We will fund zero emission flight infrastructure R&D at UK airports

We will kick-start commercialisation of UK sustainable aviation fuels (SAF)

We will consult on a UK sustainable aviation fuels mandate

We will support UK airspace modernisation

We will further develop the UK Emissions Trading Scheme to help accelerate aviation decarbonisation

We will work with industry to accelerate the adoption of innovative zero emission aircraft and aviation technology in General Aviation

We will aim to agree an ambitious long-term global emissions reduction goal in the International Civil Aviation Organization by 2022

#### Part 2b Multi-modal decarbonisation and key enablers

## Delivering a zero emission freight and logistics sector

We are consulting on phase out dates for the sale of all new non-zero emission HGVs

We will demonstrate zero emission HGV technology on UK roads this year

We will stimulate demand for zero emission trucks through financial and non-financial incentives

We will support efficiency improvements and emission reductions in the existing fleet We will support and encourage modal shift of freight from road to more sustainable alternatives, such as rail, cargo bike and inland waterways

We will take forward measures to transform 'last mile' deliveries

#### **Delivering decarbonisation** through places

We will support decarbonisation by investing more than £12 billion in local transport systems over the current Parliament, enabling local authorities to invest in local priorities – including those related to decarbonisation such as reducing congestion and improving air quality

We will drive decarbonisation and transport improvements at a local level by making quantifiable carbon reductions a fundamental part of local transport planning and funding

We will publish a Local Authority Toolkit in 2021, providing guidance to support local areas to deliver more sustainable transport measures

We will embed transport decarbonisation principles in spatial planning and across transport policymaking

We will create at least one zero emission transport city and four industrial 'SuperPlaces'

We will complete our review of how to best represent decarbonisation measures in transport business cases and appraisals

## Maximising the benefits of sustainable low carbon fuels

We will increase the main Renewable Transport Fuels Obligation (RTFO) target

We will introduce petrol with up to 10 per cent ethanol (E10) as standard petrol in September 2021

In cooperation with stakeholders, we will review the role of fuels with higher biocontent starting this year and explore potential measures to remove existing market barriers for use in certain compatible vehicles

We will seek to maximise the use of low carbon fuel in aviation and maritime as detailed in other relevant commitments elsewhere in this plan

We will develop a strategy for low carbon fuels, from now until 2050, to set a clear signal about the government's vision for the sector

## Hydrogen's role in a decarbonised transport system

The UK Government will publish an overarching Hydrogen Strategy in summer 2021, which will focus on the increased production of hydrogen and use across the economy, including for transport

We will invest £3 million in 2021 to establish the UK's first multi-modal hydrogen transport hub in Tees Valley

## Future transport – more choice, better efficiency

We will take action to increase average road vehicle occupancy by 2030

We will publish guidance for local authorities on support for shared car ownership and shared occupancy schemes and services

We will support car clubs to go fully zero emission

We will consult on a Mobility as a Service Code of Practice

We will use national e-scooter trials to understand their environmental impact, safety, and mode shift potential to evaluate whether they should be legalised

We will reduce the barriers to data sharing across the transport sector

We have launched a new annual statistical release and guidance about transport's impact on the environment and support its use by third parties

We will explore the introduction of a new sustainable travel reward scheme supported by businesses, community organisations and charities We will support transport providers to develop communications campaigns that encourage mode-switch and sustainable transport behaviours

We will encourage and support UK businesses to lead the way in taking action to reduce emissions from their employees' travel journeys through "Commute Zero"

We will identify specific opportunities for decarbonisation through innovation in rural areas in the upcoming *Future of Transport: Rural Strategy* 

We will help build a skilled workforce for the future of transport

#### Supporting UK research and development as a decarbonisation enabler

We will coordinate transport's investment in R&D, collaborating with key stakeholders through our Transport Research and Innovation Board (TRIB)

We will update our Areas of Research Interest (ARIs) and publish our new DfT Science Plan by summer 2021

## Introduction

The UK is a climate leader: the first major economy to set legally binding carbon budgets, amounts by which greenhouse gas emissions must come down, and by when. We were the first major economy to legislate to end its contribution to climate change. By law the UK's emissions must now be net zero by 2050.<sup>4</sup>

Over 130 other nations have now set ambitious net zero targets. Now we all need to deliver.

In November, the UK will host the 26th United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) in Glasgow. At this meeting, potentially one of the most important events in recent history, almost every country in the world will be represented. They will decide whether to deliver, and whether humanity takes what many believe to be its last best chance to get runaway climate change under control. As the president and host of the conference, the UK's own intentions and commitments will significantly affect the chances of an ambitious global deal.

Transport is the largest contributor to UK domestic greenhouse gas (GHG) emissions, responsible for 27% in 2019.<sup>5</sup> International aviation and shipping are not included in this figure. Domestic GHG emissions from transport have been broadly flat for the last 30 years, even as those of other sectors have declined. Better engine efficiency has been made up for by increasing numbers of journeys; the growth of electric and hybrid vehicles has been made up for by the growth in diesel and petrol SUVs. We must deliver a step change in the breadth and scale of our ambition on transport emissions to reach net zero. The measures we use to decarbonise transport must also deliver the vast wider benefits available during this change, improving air guality, noise, health, reducing congestion and delivering high-quality jobs and growth for everyone right across the UK. The need to limit global warming to well below 2°C and to pursue efforts to limiting to 1.5°C means the UK Government is committed to moving as far, and as fast, as possible. This is about the pace of change as well as the destination.



#### UK domestic transport emissions 2019<sup>6</sup>

15

"Decarbonising Transport: Setting the Challenge", published in March 2020, brought together existing work to reduce emissions across all forms of transport, and for the first time laid out the scale of the additional reductions needed to deliver transport's contribution to legally binding carbon budgets and delivering net zero by 2050.<sup>7</sup>

Sixteen months on, this plan sets out how we will deliver those emissions reductions and the associated benefits that will be realised from it across the UK. We have engaged extensively with a large range of stakeholders to inform development of this Plan including through virtual workshops, written contributions, online feedback, and the Net Zero Transport Board.

#### Stakeholder engagement

over 300 written submissions and evidence on measures needed to decarbonise transport.

Over **7000 responses** received through a public Online Feedback Opportunity.

#### 8 workshops with 49 local government representatives.

Supported by an online survey for local authorities.



#### **59 virtual policy workshops** on our six key strategic priorities

with knowledge experts, innovators, businesses, NGOs and civil society representatives.



#### Formed the Net Zero Transport Board

(NZTB) which is a Ministerial-led external advisory board providing independent, objective and impartial advice on transport decarbonisation to the Department for Transport. Given the rate of technological advancement and uncertainty in the precise mix of future zero emission solutions, and the probability of significant changes in travel behaviour over the years ahead, this plan cannot precisely plot each individual step to fully decarbonising transport modes over the next 30 years. It does however set out a series of actions and timings that will decarbonise transport by 2050 and deliver against carbon budgets along the way. The government has committed to stretching carbon reduction targets up to the end of the Sixth Carbon Budget in 2037 and by 2050. As the largest emitting sector, transport will need to make a sizeable contribution if these targets are to be met. Depending on progress in the sector at some points this may require additional targeted action (such as steps to reduce use of the most polluting cars and tackle urban congestion) to enable these targets to be met. We will regularly review progress against our targets, continue to adapt and take further action if needed to decarbonise transport. We will publish our progress and review our pathway at least every five years.

#### COP26

The threat of climate change demands a step change in both the breadth and scale of ambition globally, as well as domestically. In November 2021, the UK will host the UN's annual climate change conference, COP26, in Glasgow, where the UK's leadership in tackling climate change, including in transport, will be showcased on a global stage.<sup>8</sup>

The UK will continue to work with all to increase climate action, build resilience and cut emissions. We will bring together governments, cities, industry, businesses, and civil society to deliver shared high ambition and accelerate the shift to zero carbon transport.<sup>9</sup>

Four other documents are published alongside this strategy – the Jet Zero Consultation, the non-zero emission HGV Phase-Out Consultation, our Green Paper on a New Road Vehicle CO<sub>2</sub> Emissions Regulatory Framework for the United Kingdom and the Rail Environment Policy Statement. This plan, and the other documents we publish today, are a beginning, not an end. They are part of a series of policy announcements – including further announcements on transport – in the run-up to COP26 and beyond. These will include an overarching net zero strategy covering all sectors of the economy. It will set out government's vision for transitioning to a wholly net zero economy and how we intend to make the most of the new opportunities for growth and employment it brings to all parts of the UK.

#### Structure of this document

**Part 1** presents our path to net zero transport in the UK, the wider benefits it can deliver, and sets out the principles that underpin our approach to delivering it.

**Part 2** sets out our commitments and the actions needed to decarbonise transport.

#### Scope

This plan considers GHG emissions produced from use of the UK's transport system – which are aligned with statistics on transport GHG emissions by source category. Modelling of future emissions is on this basis (excluding military aviation and shipping). Low carbon fuel emissions are generally reported as zero emission (except where there are fossil elements) in line with carbon budget accounting rules.<sup>10</sup>

GHG emissions from associated infrastructure, such as stations, ports and airports are not included in modelling, but are covered in the relevant sections of the document. Emissions associated with transport construction are out of scope of this document but are considered elsewhere (see below). GHG emissions associated with power generation and distribution for transport are considered in the Energy White Paper.<sup>11</sup>

Our detailed plans to enhance resilience to climate change risks across road, rail, ports, and aviation are contained in the UK's National Adaptation Programme.<sup>12</sup> The transport sector is well represented in the organisations reporting under the Adaptation Reporting Power. Under this power key organisations report on the steps they are taking to prepare for climate change, and the current list includes strategic airport operators, harbour authorities and road and rail organisations.

As the UK Government is responsible for a number of policies and programmes which affect transport sectors across the UK and internationally, some aspects of this plan apply to the UK as a whole. In other areas, where transport policy is devolved and responsibility rests with the Scottish Government, Welsh Government and Northern Ireland Executive, the proposals in this plan apply to England only. As the Transport Decarbonisation Plan is implemented we will continue to consider the views of stakeholders from across the United Kingdom. We will engage closely with devolved administrations in delivery of the Plan, respecting areas of devolved competency, as we jointly work towards our shared goals of decarbonising transport across the UK and achieving net zero UK-wide. Leadership and climate action at a local level is also crucial. The vast majority of all transport journeys are local. We will continue to collaborate with local authorities and other regional bodies to identify and support local solutions across the UK.

#### Managing whole life carbon in transport infrastructure

Alongside this plan, the Department for Transport (DfT) has initiated a Carbon Management Programme to embed an integrated system for managing whole life carbon of infrastructure projects at a portfolio level. The framework will include capital carbon, i.e. emissions associated with the creation or major modification of an infrastructure asset and be guided by the principles of PAS 2080 – the foremost industry-wide standard for carbon management.

This change programme will support high level decision making and project development within the Department to ensure transport plays its fullest role in the economy reaching net zero. It will guide DfT's Arm's Length Bodies' existing and future plans for carbon management and be delivered in close collaboration with key initiatives and partners, such as the Transport Infrastructure Efficiency Strategy. This is complemented by wider government efforts to reduce emissions from construction, as set out in the National Infrastructure Strategy and Construction Playbook. Reducing the embodied emissions associated with transport, for example, the materials used in construction and the manufacture of vehicles, is being informed by the Industrial Decarbonisation Strategy, and Defra's upcoming review of the End-of-Life Vehicles Regulations. In Defra's 2021 Waste Prevention Programme, government also set out plans to explore means of increasing reuse, repair and remanufacture, in addition to design considerations such as light weighting, to further reduce waste and emissions in respect of road vehicles.

#### Impacts of COVID-19 and our response to the pandemic

COVID-19 has had an unprecedented impact on transport use, travel patterns and the transport sector as a whole. Total trips have dropped significantly. More recently road transport use appears to be returning to pre-pandemic levels, but public transport usage is still to regain these levels.



Figure 1: Transport usage by selected modes since March 2020<sup>13</sup>

Last year, we commissioned research (see Part 2) to understand the impact of COVID-19 on current and future travel choices. It now seems likely some of the necessary short-term changes brought about by the pandemic, including the rise of home working, could remain for the longer-term and could become permanent shift in travel habits. This has created additional uncertainty for projecting forward transport usage and potential carbon emissions.

It seems highly unlikely that the demand, patterns, timings, and modal choices of transport users across all forms of transport will simply return to those of 2019.

As we build back greener and better from COVID-19, we will make our economy more sustainable and resilient, and design in measures to deliver cleaner air and cut congestion. We have seen an increase in cycling and walking as a result of the pandemic and want to further embed and encourage more sustainable travel habits. While the reduction in use of public transport has been a short-term necessity, we want to ensure a speedy return to public transport and to support a growth in patronage as our rural areas, towns and cities return to life. As described below, we will review our strategic planning policy on national transport networks in the light of changes caused by the pandemic and the policies in this plan.





#### Part 1

## Our path to net zero transport





Part 1 Our path to net zero transport

**1a** 

## Vision: Clean transport is better transport





#### Much of the change needed to deliver net zero for the transport sector is already underway and makes sense even without the global imperative of climate change.

Decarbonisation will deliver fundamentally better transport, for everyone, every day.

It will make it faster and more efficient, as well as cleaner, and provide huge wider benefits including increased reliability and better connectivity.

There is strong public support for action to remove transport's emissions. Ending transport's damaging contribution to climate change will create better places for us to live and work in, with quieter and less congested streets. Changing the way, we travel has the power to improve the health and wellbeing of the nation.

This is also a huge industrial opportunity, a once in a generation chance to increase economic growth and future prosperity – using electricity, green hydrogen, sustainable low carbon fuels and pedal power – to invest in new jobs across our country.

The need for urgent action on carbon emissions is a catalyst to accelerate these changes and deliver better transport, a cleaner local environment, and modernise our economy.

Decarbonisation requires a rethink of how we invest in transport, technology, and skills. One example is hydrogen, fundamental to achieving net zero in heavy transport applications and a major industrial opportunity. The UK's existing strengths and expertise along its value chain makes us well placed to generate significant quantities of green hydrogen from renewable electricity. Through bold initiatives such as our world first 'hydrogen transport hub' in the Tees Valley,<sup>14</sup> we can now expand our innovation and infrastructure to create critical mass in its production and use.

#### Tees Valley 'Hydrogen Transport Hub'

Tees Valley 'Hydrogen Transport Hub' brings together government, industry, and academia to focus our future hydrogen research and development, real world testing and demonstrations. The hub will act as a living lab to understand green hydrogen's role in transport decarbonisation, and in the coming year residents of Tees Valley are likely to see the number of hydrogen powered vehicles in the local area increase, as small-scale pilots are launched as part of the Hub's first year of activity. A masterplan for the hub has been published which sets out a vision and a blueprint for the infrastructure and types of trials required to deliver against that vision.<sup>15</sup>



On our roads, the wholesale decarbonisation of vehicles has begun – there are already over 175,000 fully zero emission vehicles in the UK – registrations increasing threefold in 2020 on 2019 – and a further 198,000 plug-in hybrid vehicles.<sup>16</sup> We have announced that the sale of new petrol and diesel cars and vans will be phased out by 2030, and all new cars and vans will be fully zero emission at the tailpipe from 2035.

This plan expands our commitments to reduce and remove the use of fossil fuels from road transport, and to set achievable but ambitious phase out dates for every type of new fossil fuelled road vehicle. When complete, we will have addressed the single biggest contributor to UK transport carbon emissions and eliminated all tailpipe emissions of other pollutants.

Despite the progress we have made at national and local levels, transport remains one of the largest sources of air pollution in the UK, and poor air quality could cost health and social care services in England  $\pounds5.3$  billion by 2035.<sup>17</sup>

Taking forward measures to clean the air around us, and decarbonise transport, will save lives and improve health. There will still be particulate emissions associated with road, rail, tyre, and brake wear, and we are working to tackle those too, but the toxic by-products of burning hydrocarbon fuels will be eliminated from the roadside and rail.

Zero emission roads will be significantly and noticeably quieter. Over half the UK population is exposed to daytime noise levels above recommended limits,<sup>18</sup> resulting in negative impacts on health estimated to cost  $\pounds$ 7 billion –  $\pounds$ 10 billion per annum.<sup>19</sup> Zero emission vehicles – extremely quiet at low, urban speeds – will help address this. Reducing vehicle noise and toxic tailpipe pollution will transform streets and communities blighted by traffic pollution. This will support levelling-up and help reinvent high streets as enjoyable places to live, work, visit and spend leisure time.

Zero emission vehicles have far fewer moving parts than their petrol and diesel counterparts. They are easier and cheaper to maintain, and far more efficient to run. While these benefits will be attractive for the private car owner, they could be transformative for the commercial fleets, freight, logistics, bus, and taxi industries.

Over time, the use of zero emission vehicles will become cleaner still as the use of renewable energy in the UK's electricity mix continues to increase – the carbon intensity of the grid reduced by over 40 per cent in the last five years alone.<sup>20</sup> We are confident the grid can handle the increasing demand from transport and elsewhere – with the market already bringing forward investment in further generation.

A decarbonised transport network does not simply mean changing how we power our vehicles. It means we can make better use of limited road space for all users, and provide more mobility options, especially for short journeys that dominate UK travel.



We cannot simply believe that zero emission cars and lorries will meet all our climate goals or solve all our problems. They will not, particularly in reaching the medium-term Sixth Carbon Budget targets. By its mid year of 2035, the industry body the SMMT estimates that 46% of cars on the roads could be zero emission under a central scenario; percentages for goods vehicles will be lower still.<sup>21</sup> Another risk, until the electricity grid is fully decarbonised, is that carbon savings from electric vehicles are to a partial extent offset if people drive them more. Nor, of course, will zero emission vehicles reduce other harms, such as congestion or road danger, at all.

As well as decarbonising private and commercial road vehicles, therefore, we must increase the share of trips taken by public transport, cycling and walking. We want to make these modes the natural first choice for all who can take them. We want less motor traffic in urban areas. Improvements to public transport, walking and cycling, along with the changes in commuting, shopping and business travel accelerated by the pandemic, also offer the opportunity for a reduction, or at least a stabilisation, in traffic more widely.

Increasing car occupancy and encouraging public transport use are two measures that can immediately cut transport's carbon emissions. They will help tackle chronic road congestion, freeing up road space for those with no alternative but to drive.

And as more of our short journeys (43 per cent of all urban and town journeys are under 2 miles) are cycled or walked, so the carbon, air quality, noise and congestion benefits will be complemented by significant improvements in public health and wellbeing.<sup>22</sup>

Nearly a third of UK children and over 60 per cent of UK adults are overweight or obese, resulting in direct costs to the NHS of over £6 billion a year and wider costs estimated at over £27 billion.<sup>23</sup> Transport has a fundamental role to play in changing this, including through incentivising GPs to prescribe cycling, and by building cycle facilities in towns with poor health. Schemes to enable more people to cycle and walk more often also provide high value for money against investment.<sup>24</sup>

Millions more people are walking and cycling following COVID-19, and progress has already been made towards our target that active travel should make up at least half of all journeys in towns and cities by 2030. Last July, backed by £2 billion of new funding, our "Gear Change" White Paper and new design standards set a new level of ambition for cycle schemes. More than 300 cycling and walking schemes have already been delivered on the ground. Polling and the recent local election results have consistently shown that they are supported by the public, and court challenges to them have failed. Thanks in part to these schemes,



millions of new people have found the confidence to get cycling. Cycling on roads has risen by 46 per cent in the last year, the biggest rise in post-war history and possibly ever.<sup>25</sup> In the next few weeks, we will set out further policies to cement the growth of cycling and ensure that its success continues. We recognise that some traffic reduction measures are contentious, so we will also require more rigorous consultation on them, typically proper polling, so that the views of communities are fairly reflected.

Buses are the easiest, quickest, and cheapest way to improve public transport. Our National Bus Strategy, this March, charted a new path towards: lower, simpler fares, more frequent buses, services which are easier to understand and use, more bus priority lanes and thousands more zero emission buses. This will be backed by £3 billion of new funding over the current Parliament. Local authorities have been asked to submit Bus Service Improvement Plans by this October, with the improved networks taking shape from April 2022.

The benefits of decarbonisation do not stop with roads. Rail is already the greenest form of motorised transport, with almost 38 per cent of the network electrified and more to come. In May, the Williams-Shapps Plan for Rail set out our strategy to grow the network, make it easier to use, and simpler and cheaper to run. Electrified trains are faster, quicker to accelerate, more reliable and much cheaper to run. There will also be a role for new traction technologies, like battery and hydrogen trains, on some lines where they make economic and operational sense. We will achieve net zero greenhouse gas emissions from trains by 2050, transforming rail journeys within a generation.

And for those areas of transport where the technology pathway to zero emissions is not yet certain, such as aviation and maritime, the same message applies: the move from 20th century, hydrocarbon-based combustion technologies to clean zero carbon ones will deliver a whole host of additional benefits and new opportunities. With global action underway the race is on to lead these sectors. Our R&D support coupled with our drive to decarbonise transport, will put the UK at the forefront.

Across every form of transport, decarbonisation and growth will go hand-in-hand. The technologies cleaning up transport on land are transferring to our waterways and skies. And the bolder the UK is in its leadership, the greater the opportunities for our world leading science, technology, engineering, and business communities. That is why we will consult on the feasibility of domestic waterways and domestic air travel being net zero emission in advance of the economy wide 2050 target. And the imperative to decarbonise brings with it a host of other benefits, including new business models, new modes, increasing levels of autonomy, far better integration, and a blurring of the distinction between traditional forms of transport, as well as public and private travel coming together to offer greater choice and flexibility about how and when to travel from place to place.

Data remains a key enabler. Providing better data and information for example to commuters means they can make better decisions about their regular journeys.

Goods and services will reach us more quickly through an integrated and digital network, that is not just clean, but increasingly automated and better equipped to meet user demands. Truly embracing digital technology throughout will keep businesses competitive, the sector resilient and empower users.

Our vision for decarbonised transport not only sets a path to net zero emissions; it is also a vision for a transport system fundamentally better in every way, improving journeys, encouraging growth and opportunity, and boosting the health of the nation.

Fundamentally better means transformational changes, but, whilst challenging, this is not impossible. The government has a clear role to play, but we cannot and should not deliver this vision alone. Success will require us working in partnership with the public, industry, business, and academia; and our world-class scientists, engineers and entrepreneurs put us in the best position to lead the world in this transition.

The challenge now is to deliver it at pace not just to achieve the necessary cuts in the UK's greenhouse gas emissions, but also to allow the entire country to access the huge wider benefits that will accompany it.



## The current transport system places wider costs on society, that we are seeking to address<sup>26</sup>



#### **Air pollution**

Costs to health and social care could reach **£5.3 billion** by 2035

#### **Climate change**

The Stern review estimated the overall costs of unmitigated climate change to be equivalent to 5-20% of global GDP

each year



#### Noise

It's estimated that the annual social cost of urban road noise in England is **£7 to 10 billion** 



#### **Health and obesity**

The UK-wide NHS costs attributable to **overweight and obesity** are projected to reach **£9.7 billion by 2050**.

#### £49.9bn

With wider costs to society estimated to reach **£49.9 billion** per year.

## In thinking of how to decarbonise transport, we also look to address these challenges<sup>27</sup>

#### **Air quality**

Projections in this Plan will deliver significant benefits from improving air quality. These have been estimated at up to **£9 billion** over the period 2020 to 2050.

#### **Reducing emissions**

1,800 MtCO₂e

Over the period from 2020 to 2050 this Plan could deliver from **1,300–1,800 MtCO<sub>2</sub>e** savings, getting transport on a pathway to net zero.

Other co-benefits can include creating better places to live in, reduced congestion, air pollution and noise, and increased reliability and affordability – delivering better transport for everyone.

**کمکر** Health

£8.2bn

Physical inactivity costs the NHS up to **£1 billion** per annum, with further indirect costs of **£8.2 billion** – active travel can reduce that.

#### Jobs and growth

Decarbonising transport will lead to thousands of jobs being created in transport related green industries. The production of zero emission road transport vehicles has the potential to support **72,000 jobs**, worth up to **£9.7 billion GVA** in 2050.



Part 1 Our path to net zero transport

1b

# How will we deliver this? Our themes to 2050





1.

## **Strategic Priorities**

Accelerating modal shift to public and active transport

- 2. Decarbonising Road Transport

- Public transport and active travel will be the natural first choice for our daily activities.
- We will have a cohesive, widely available, net zero public transport network designed for the passenger
- We will use our cars differently and less often, with new technology helping reduce our carbon footprint
- We will phase out all new nonzero emission road vehicles, from motorbikes to HGVs, by 2040\*
- Delivered by a world leading regulatory framework and support packages, leading the global race to zero emission road transport
- We will ensure infrastructure will not be a barrier to the zero emission transition



- We will decarbonise our freight system, pioneering new zero emission technologies with mass scale demonstrators for HGVs
- Increasing amount of freight will shift from road and air to more sustainable modes, with digital solutions and data sharing optimising efficiency
- The last mile will be decarbonised and places will have the logistics solutions best suited to their specific needs

4.

5.

6.

Our strategic priorities reflect the themes and view of the future we will pursue to decarbonise our transport system before 2050. These were set out in Decarbonising Transport: Setting the Challenge last year and remain valid as we recover from the COVID-19 pandemic.

UK as a hub for green transport technology and innovation



- We will lead the modern industrial revolution through UK transport, becoming the internationally recognised leader in green technology, innovation, science and research
- We will harness the opportunities from green innovation and technology to drive UK productivity growth and create new jobs

Place-based solutions to emissions reduction

- By 2050 every place in the UK will have its own net zero transport network
- We will reform the way local transport infrastructure is funded to drive decarbonisation at a local level
- All places will have the ability to take bold action to decarbonise transport, to radically change how people travel and level up the UK

Reducing carbon in a global economy



- UK aviation will meet net zero by 2040\* and UK shipping by 2050
- We will ensure the impact of aviation on the environment is significantly reduced and by 2050, zero emission ships will be commonplace globally
- We will continue to lead international ambition, cooperation and collaboration

#### **Priority 1: Accelerating modal shift to public and active transport**

Increasing the share of journeys taken by cycling and walking does not rely on any technological breakthrough, delivers a host of co-benefits and is fundamental to any good local transport plan. With better quality infrastructure through high quality road design, dedicated routes, and networks, and enabling people to access cycles, people will feel safer and more confident walking and cycling for more and more short journeys.

A cohesive, integrated, and affordable net zero public transport network, designed for the needs of the passenger, will empower users to make sustainable end-to-end journeys and enable inclusive mobility. Zero emission buses will link communities with each other, town centres and the wider transport network. A modern, net zero rail network will connect the country and regions, serving commuters, holiday-makers and business travellers alike with a faster, cleaner, and more reliable rail service fair for all. We must make buses and trains better value and more competitively priced. Starting with bus fares outside London we want simpler, cheaper flat fares that you can pay with a contactless card, with daily and weekly price capping across operators. Affordable fares and season ticket caps will continue to be protected on the railways.

Where the car remains attractive for longer journeys, it will face competition from high-speed decarbonised rail and zero emission coaches offering affordable alternatives.

Embracing new ways of sustainable travel, such as e-cycles and other emerging technologies, will create opportunities for more people to travel this way and foster new alternatives for journeys too time consuming, or too long, to previously walk or cycle. Innovation is driving this change fast, with new operating models transforming traditional transport services.

#### **Priority 2: Decarbonisation of road vehicles**

The technology transformation kick-started in cars and vans will happen in all road transport. A fleet of fully zero emission road vehicles will remove the source of 91% of today's domestic transport GHG emissions.<sup>28</sup> Ambitious phase out dates for the sale of new non-zero emission vehicles, from scooters and motorcycles to 44 tonne trucks will be underpinned by a new, world-leading, regulatory framework and a package of support for drivers and vehicle manufacturers, as set out in the Prime Minister's Ten Point Plan for a Green Industrial Revolution last year.

Infrastructure will be no barrier, instead an opportunity for new energy business models to thrive, helping drivers and businesses reduce their bills. An extensive network of charging and refuelling infrastructure for all vehicles will enable the transition, meeting consumer demand, so drivers can embrace the technology and realise the benefits.

Low carbon fuels will continue to play a crucial role in maximising carbon savings from road vehicles during the transition, whilst increasingly being required in other transport modes such as aviation and maritime. As demand for existing petrol and diesel blends decreases, these fuels will continue to support the decarbonisation of older road vehicles (and in niche applications with limited alternatives), including by increasing the low carbon fuel content where possible and in the longer term low carbon fuels that are net zero.

#### Priority 3: Decarbonising how we get our goods

The UK will scale-up and roll-out new technology across the sector, including hydrogen, embracing innovation and capitalising on new industrial opportunities, as well as making best use of existing zero emission technologies and fuels. UK-based innovators will scale up and export efficient business models, creating regional and global leaders.

A shift to zero carbon modes of transporting goods and services, including greater use of rail and domestic maritime, will make our freight system net zero before 2050. Greener and more efficient, this will provide wider environmental benefits for everyone.

By 2030, larger zero emission road freight vehicles will be on our roads in increasing numbers. The last mile will be largely decarbonised through new delivery models, supported by accurate data and digital innovations driving greater efficiencies.

By the 2030s, HGVs will be increasingly zero emission and cities will have the logistics solution that best fits them, allowing places to become more people-centred while still delivering goods rapidly and reliably. Short stretches of electrification will significantly increase the amount of electrically hauled rail freight. By 2050 all rail freight will be net zero, and we will have increased the capacity to move more goods by rail.

#### **Priority 4: Place-based solutions**

Every place in the UK will have its own net zero emission transport network before 2050, serving the unique needs of its communities. Sustainability will be at the heart of levelling-up. People everywhere will feel the benefits – villages, towns, cities, and countryside will be cleaner, greener, healthier, and more prosperous and pleasant environments in which to live, work and enjoy.
Radical change will come from empowering and supporting local leaders, harnessing the strengths and expertise of local authorities, mayoral combined authorities, Sub-National Transport Bodies, the devolved administrations and local interest groups, all of whom have a crucial part to play.

Local authorities will have the power and ambition to make bold decisions to influence how people travel and take local action to make the best use of space to enable active travel, transform local public transport operations, ensure recharging and refuelling infrastructure meets local needs, consider appropriate parking or congestion management policies, initiate demand responsive travel, as well as promoting and supporting positive behaviour change through communications and education.

We will better coordinate local transport funding by engaging local areas about their investment priorities in the round, achieving key objectives such as decarbonisation through better strategic planning and more joined up infrastructure projects.

# Priority 5: UK as a hub for green transport, technology, and innovation

The UK will play a leading role in this modern-day industrial revolution consolidating our position as an internationally recognised leader in green technology, science, and research. Green innovation will support UK productivity growth, increasing access to markets and skills, creating new jobs and trade. This will be underpinned by clear R&D programmes and support to demonstrate, test, and evaluate innovations in the real world.

The UK will seize the unique opportunities driven by advances in data science and artificial intelligence to transform the way people, goods and services move. Leading the global race to zero emissions will maximise our economic advantages and attract new investment (particularly in automotive battery production) and jobs in the UK.

The UK can also lead the deployment of wider future of transport technologies enabling the development of mobility as a service solutions that can reduce car dependency and drive a shift onto a better-connected multimodal transport system. Ridesharing and cycle hire schemes, car clubs, on-demand buses and ride hailing will all provide choice, increasing flexibility and reducing reliance on private vehicles.

#### Priority 6: Reducing carbon in a global economy

UK aviation and shipping will achieve net zero emissions by 2050. Ahead of that, our domestic lead will act as a showcase to the world and bolster our call to action internationally, where cooperation and collaboration through the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), will continue to be vital to decarbonise these industries.

The UK will significantly reduce the impact of aviation on the environment through a combination of new aerospace technology such as electric and hydrogen aircraft, development and commercialisation of sustainable aviation fuels, operational efficiencies, and market-based measures. By continuing to build our capability and investing in R&D in the early 2020s, the UK will empower innovation in the sector.

The UK will play an important role in the development and deployment of zero emission maritime technology, particularly where we have significant market share and can build on domestic expertise to capture early market share, such as small craft. Through demonstration at scale in the 2020s of the safety and reliability of technology, the UK maritime industry will sail ahead on a clear trajectory to net zero emissions before 2050.



Part 1 Our path to net zero transport

> 1c The impact of this plan on transport's emissions



### **Decarbonising Transport GHG projections for UK domestic emissions**

Projections of UK domestic transport GHG emissions out to 2050 based on the policies and ambitions laid out in this plan are provided below alongside an updated baseline trajectory (based on current government policy). This plan provides transport a credible, deliverable pathway to net zero GHG emissions by 2050, as well as delivering transport's contribution to demanding carbon budgets along the way.

Our projections present a range of possible outcomes, but all show significant reductions to 2050. Ultimately, this depends on how quickly zero emission technologies, fuels and efficiency measures are deployed, as well as the impacts of our policies to increase the numbers of journeys made by cycling and walking and on public transport. There are uncertainties on future travel behaviour from changes in how we work and travel, increased connectivity, better technology, and COVID-19.

In our decarbonising transport projections, lower bound emissions for land transport reach zero by 2050. This could be driven by a natural decline in petrol and diesel vehicle use as those markets, and associated infrastructure provision, decline over time. However, reaching the point of actual zero emissions may require additional measures beyond those identified here to support the final transition to fully zero emission surface transport. Similarly, additional measures beyond those identified in this plan may also be required for domestic aviation and domestic shipping. Projecting emissions out to 2050 is inherently uncertain, and technology, behaviour and policy development will continue to evolve. This is why we have committed to the next transport decarbonisation plan within five years, to ensure transport is on the correct pathway to achieve net zero.

As can be seen in the chart there is a wide range of uncertainty around our current projections. Over time, we will continue to develop and refine the range of policies and proposals set out in this plan to ensure that the transport sector fufils its contribution to our legally binding climate targets.





\* Historic emissions are from published Her Majesty's Government (HMG) GHG statistics. Our projections are produced using a range of models, including the National Transport Model (road transport), and Traction Decarbonisation Network Strategy (rail), and Aviation model, adjusted for decarbonising transport measures. The shipping baseline and projections are based on the latest analysis by the CCC (https://www.theccc.org.uk/publication/sixth-carbon-budget/), which drew on research commissioned by DfT. Given the emerging nature of zero emission shipping fuels, the projections should be interpreted as possible scenarios for meeting the net zero goal that the government has announced for the UK maritime sector rather than estimates of the impact of specific policies. Baseline forecasts are not consistent with the 2019 BEIS Energy and Emission Projections (EEP), as these use different methodologies. Where feasible, uncertainty in projections reflects uncertainty on policy design, GDP, fuel prices, trip rates, and historic volatility in emissions. The range in the policy line declines as we move out to 2050, due to a higher proportion of zero emission vehicles. Transport emission projections exclude military aircraft and shipping.

### **Decarbonising Transport GHG** projections including international aviation and shipping

Alongside removing emissions from domestic transport, the government is committed to cutting emissions from international aviation and shipping. In April, we announced the formal inclusion of international aviation and shipping emissions in our carbon budgets, starting from the sixth carbon budget in 2033.

Combining projections for domestic emissions with those for international aviation and shipping show that transport emissions will continue to fall to 2050. Where positive emissions remain in transport sectors these will need to be offset by negative emissions elsewhere across the economy.

However, with the right investment and the emergence of new zero emission technologies, it could be possible to go further and faster, and the government is keen to maintain an open dialogue with stakeholders on the potential for achieving even deeper cuts in the GHG emissions from international aviation and shipping.

As an example of this, our Jet Zero Consultation, published alongside this plan, will seek views on the potential developments that could bring down the international aviation sector's share of transport's overall GHG emissions, and how the government can most effectively support the realisation of these opportunities.

We will continue to develop and refine the range of policies and proposals set out in this plan to ensure that the transport sector fulfils its contribution to our legally binding climate targets





### Figure 3: Decarbonising Transport domestic and international transport GHG emission projections, versus the baseline\*

\* See figure 2 note for details of general approach and models used for domestic transport GHG projections. International shipping projections are also based on the latest analysis by the CCC. International Aviation modelling comes from the Aviation model. In line with the CCC's recommended method for including international shipping and aviation emissions in the sixth carbon budget, the projections for international shipping and aviation emissions are based on 'bunker fuel sales', which is the approach currently used for UNFCC reporting, and represent the estimated emissions from fuel sold in the UK for use in international shipping. We will keep the measurement approach to the UK's international shipping emissions under review, and consider the appropriateness of fuel or activity based measures. Where feasible, uncertainty in projections reflects uncertainty on policy design, GDP, fuel prices, trip rates, and historic volatility in emissions. Transport emission projections exclude military aircraft and shipping.



#### Part 2

# The plan in detail: commitments, actions, and timings





Part 2 **The plan in detail:** commitments, actions, and timings

**2**a

# **Decarbonising all forms of transport**

















We will invest **£2 billion** over 5 years to deliver a bold future vision for cycling and walking, making it the natural first choice for many journeys



### By 2030

We will aim to have **half** of all journeys in towns and cities cycled or walked



### By 2040

We will have a world class cycling and walking network in England

#### **Co-benefits:**

#### Congestion





# Air quality



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Cycling and walking can help us tackle some of the most challenging issues we face as a society, not just climate change, but improving air quality, health and wellbeing, addressing inequalities, and tackling congestion and noise pollution on our roads. Increased levels of active travel can improve everyday life for us all.



### **Benefits of cycling and walking**<sup>30</sup>

#### Health

Physical inactivity costs the NHS up to **£1 billion** per annum, with further indirect costs calculated at



#### Congestion

The new east-west and north-south cycle routes in London are moving **46% of the people** in only **30% of the road space** 



#### Wellbeing

20 minutes of exercise per day cuts risk of developing depression by 31% and increases productivity



#### Local businesses

Up to **40% increase** in shopping footfall by well-planned improvements in the walking environment



#### **Environmental and air quality**

By 2050, future active travel spending is expected to deliver

£20–100m

savings from air quality improvements alone and provide opportunities to improve green space and biodiversity.

#### **Climate change**

Mode shift to active transport is one of the most cost-effective ways of reducing transport emissions



#### **Economy**

Bike manufacture, distribution, retail and sales **contributes £0.8 billion** per year to the economy and **supports around 22,000 jobs**.



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In July 2020 the Prime Minister launched ambitious plans to boost cycling and walking, with a vision for half of all journeys in towns and cities to be walked or cycled by 2030. The 33 commitments set out in 'Gear Change' are our plan to achieve this and are supported by a £2 billion package of new funding for active travel over five years – the largest ever investment in cycling and walking.<sup>31</sup>

#### Zero emission transport city

We announced in Gear Change that we would work with a small or medium-sized city to create a zero emission transport system, with extensive cycle lanes, an all-electric (or zero emission) bus fleet, and a ban on nearly all petrol and diesel vehicles in the city centre, with deliveries made to consolidation hubs and the last mile being done by cargo bike or electric van. We will make a further announcement about this shortly.

Bikes do not need to replace a whole car journey. Cycling facilities, such as safer bike routes and more bike parking, will make it easier for people to cycle to their local railway station or high-frequency bus route, giving the same door-to-door travel as a car. E-bikes make it possible to cycle for longer journeys than conventional bikes.

#### Cycling and Walking Investment Strategy

Targets for delivery for 2025:

- Double cycling from 0.8 billion stages in 2013 to 1.6 billion stages in 2025, where cycling activity is measured as the estimated total number of cycle stages made each year;<sup>33</sup>
- Increase walking to 300 stages per person per year in 2025, where walking activity is measured as the total number of walking stages per person per year;<sup>34</sup> and
- Increase the percentage of children that usually walk to school, from 49% to 55% of children aged 5 to 10 in 2014 in 2025.  $^{\rm 35}$



Journeys below five miles represented 58% of all private car journeys in 2019 and provide the biggest opportunity for switching short car journeys to cycling and walking offering the potential to reduce the 68MtCO<sub>2</sub>e of current car emissions.



Journeys below two miles represented 43% of all urban and town journeys in 2019<sup>32</sup>



Our plans to deliver the necessary carbon reductions:

#### Commitment

We will deliver the Prime Minister's bold vision for cycling and walking investing £2 billion over five years with the aim that half of all journeys in towns and cities will be cycled or walked by 2030

Through 'Gear Change' government has committed to improve the safety and quality of our streets and enable people to cycle and walk more. This includes:

- The delivery of thousands of miles of safe, continuous, direct routes for cycling in towns and cities, physically separated from pedestrians and volume motor traffic.
- Creating a new funding body and inspectorate "Active Travel England" to enforce the standards and raise performance generally. This will include becoming a statutory consultee on planning applications for developments above a certain threshold and ensure that every adult and child who wants it can be trained to cycle confidently and safely.<sup>36</sup>
- Supporting the creation of more school streets. This will enable more children to walk and cycle to school safely by closing streets to through traffic and introducing parking restrictions at school pick-up and drop-off times. This will be supported with further investment in cycle training and behaviour change programmes to support cycling and walking to school including Bikeability training and Walk to School Outreach.

#### **E-Cycle Extension Fund**

We are providing £1.48 million to nine local authorities through the E-Cycle Extension Fund to enable the increased use of e-cycles (including adapted e-cycles) within their areas with a particular focus on hard-to-reach groups. Pilots range from hire schemes to long term loans and try before you buy schemes and will inform the development of the national e-cycle support programme outlined in the Prime Minister's Cycling and Walking Plan.<sup>37</sup>



#### Over £200m was provided to local authorities

through the Active Travel Fund between August and November 2020.

Over 400,000 cycle repair vouchers were issued.



The updated Cycle Infrastructure Design Guidance published in July 2020 provides advice on the design of cycle infrastructure to support high quality, safe schemes, which will attract people of all demographics who want to cycle.



#### Commitment

# We will deliver a world class cycling and walking network in England by 2040

This will be achieved by delivering comprehensive cycling and walking networks in all large towns and cities and widespread delivery of measures to enable cycling and walking in local areas such as school streets and cycle training delivered to all children and adults that want it. We will enable behaviour change through targeted personal incentives, such as GP prescribing, existing tax reliefs and rewards programmes.

Overcoming the known barriers to cycling (which centre around road safety concerns, lack of infrastructure and lack of confidence) and walking will provide a significant potential for growth in active travel. There is clear evidence that the provision of segregated cycle lanes and other measures such as low-traffic neighbourhoods drives significant increases in cycling and – after an initial period of adjustment – reductions in motor traffic, both locally and more widely. If cycling and walking are made safer and more pleasant, more people who previously drove choose to cycle and walk, particularly for short trips.



Schemes can reduce the **number of people driving** their children to school by **up to a third** and reduce casualties<sup>38</sup>



#### Promoting walking in primary schools

Government has invested £4.6 million between 2016 and 2021 to encourage and enable more children to walk to school. Travelling to education is the most common single purpose of walking journeys but there is huge potential to increase the proportion of children walking to school.

Living Streets, with support from the Department for Transport, has been running the Walk to School Outreach (WTSO) project since 2017. It does so mainly through behaviour change interventions delivered in schools, including WOW, Living Streets' year-round walk to school challenge, and by influencing local infrastructure decisions. An evaluation carried out at the end of March 2019 shows that walking rates increased by 38% among new WTSO project schools and increased walking rates were sustained in existing schools in 2018 to 2019. This represents around 4 million new walking trips and 1.3 million fewer school run car journeys in that year with total vehicle miles reducing by around half a million.<sup>39</sup>



The figure above presents a range for the potential increase in active travel stages in England due to future spending above the  $\pounds 2$  billion already committed. Each journey comprises one or more stages, with a new stage beginning where there is a change in the mode of transport. The range accounts for uncertainty in future investment and scale of behaviour change.<sup>40</sup>

The carbon saving from people shifting from car to active travel depends on various factors including the proportion of active trips replacing car journeys, the lengths of walking and cycling trips and the uptake of ultra-low and zero emission vehicles. Of these factors, the first two will depend in part on the level of uptake of e-cycles.

Increased walking and cycling is projected to reduce car GHG emissions in England by 1–6 MtCO<sub>2</sub>e between 2022 and 2050.<sup>41</sup> Higher GHG reductions could potentially be achieved with complementary traffic restraint measures, making active travel relatively more attractive.

Spending on active travel typically offers at least high value for money and provides a highly cost-effective approach to reduce GHG emissions. Improvements to health typically represent some of the largest benefits from increased active travel. By 2050, future active travel spending is projected to prevent around 50– 130 thousand premature deaths and reducing work absence by around 50–140 million days.<sup>42</sup> Further announcements on cycling and walking will be made later this summer.



Many children do not get enough exercise. But rates of walking to school have declined in recent years, causing significant pollution and danger to children outside schools. It has come about partly because of a vicious circle – more people driving their children to school increases parents' concerns about road safety, in turn resulting in yet more people driving their children to school. We are trying to break this circle.

Dozens of school street schemes have been introduced since the COVID-19 pandemic, where roads around schools are closed to motor traffic at school times. According to Hackney Council, which helped pioneer the concept, its first four school streets reduced traffic around the schools concerned by an average of 68 per cent, cut vehicle emission pollution at the schools by 74 per cent and increased the number of children cycling to school by 51 per cent.<sup>43</sup> We will introduce many more of these schemes. Part 2 **The plan in detail:** commitments, actions, and timings

# Zero emission buses and coaches<sup>44</sup>

















#### 2021

We have published our National Bus Strategy, Bus Back Better, to improve bus services and increase patronage.

We have begun the consultation process on ending the sale of new non-zero emission buses Government investment of **£3 billion** for buses in England outside London We will support at least **4,000** new zero emission buses

Zero Emission Bus

#### **Co-benefits:**

#### Congestion



#### Jobs & growth



**Air quality** 



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#### Buses and coaches have a crucial role to play in transport achieving net zero and driving the green transformation. We must increase the share of journeys taken by public transport – particularly in congested areas.

As noted earlier, COVID-19 has caused a relatively large reduction in demand for public transport, and car use has recovered more quickly. To avoid the worst effects of a car-led recovery, we need to not only shift those additional journeys back quickly, but by making radical improvements to local public transport as normal life returns we can encourage even more people to complete even more of their journeys by public transport.

During the pandemic the role of buses at the centre of the public transport network has become clearer than ever – that is why we have provided significant emergency state support of over  $\pounds 1$  billion to ensure these vital services can continue.



Bus operators have invested significantly in new cleaner and greener electric and hydrogen buses in recent years, supported by government initiatives such as the Low and Ultra-Low Emission bus schemes benefitting many local areas.<sup>46</sup> However, there is much more to do. Only 2 per cent of England's local operator bus fleet is zero emission today – so it is vital that we go further faster.<sup>47</sup>

Bus operators share our ambitions to achieve a zero emission bus fleet. Several have committed to purchase only ultra-low or zero emission buses from 2025.48

In addition to the wider co-benefits zero emission buses can bring, we would expect zero emission buses to achieve long term operating cost savings, which can be reinvested in more frequent services, lower fares, and other improvements for passengers.



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Our plans to deliver the necessary carbon reductions:

#### Commitment We will deliver the National Bus Strategy's vision of a transformed bus industry and a green bus revolution<sup>49</sup>

Bus Back Better, the National Bus Strategy for England, was published in March 2021. It sets out how we will make buses more frequent, more reliable, more comprehensive, easier to understand and use, better co-ordinated and cheaper – improving appeal for the bus user and non-bus user – to dramatically increase passenger numbers and reduce congestion and carbon emissions. Partially based on a version of the policies which achieved significant modal shift to public transport in London and backed by £3 billion of transformative funding, its central aim is to get overall patronage back to pre-COVID 19 levels, then to exceed it, by making buses a practical and attractive alternative to the car for more people.

It specifies that bus services should be better integrated with other modes of transport – with more bus routes serving railway stations and improved integration with cycling and walking routes and networks – and provides a roadmap to decarbonise. The strategy also outlines that on key radial routes there should be significant investment in bus priority.

#### Commitment We will consult on modernising the Bus Service Operators' Grant in 2021

The National Bus Strategy includes a commitment to review the existing Bus Service Operators Grant (BSOG)<sup>50</sup> funding stream, which is a discretionary grant paid to eligible English bus operators outside of London to help them recover some of their fuel costs. One of the key objectives of this review is to ensure that the funding stream is aligned with government priorities, in particular, benefitting the environment. The take up of zero emission buses is crucial to improving the carbon footprint of the sector, and the inbalance between the existing support provided to diesel buses through BSOG against that provided to zero emission buses needs to be addressed. Given the government's commitments to deliver 4,000 zero emission buses, we plan to increase the rate at which the BSOG green incentive can be claimed for zero emission buses to 22p per km, ahead of the wider review in order to help the government meet these commitments and accelerate the take up of zero emission buses.

We will consult on a proposed new funding regime to take a holistic approach targeted at the delivery of the policies in this plan, and other specific benefits; growing patronage, increasing efficiency, improving the environment and securing modal shift from the private car.

#### Commitment

#### We will support delivery of 4,000 new zero emission buses and the infrastructure needed to support them

As announced by the Prime Minister the government will support the introduction of 4,000 zero emission buses and the infrastructure needed to support them.

This will be the single largest investment ever made in zero emission buses, representing the replacement of nearly 12 per cent of England's local operator bus fleet.<sup>51</sup> It will support the market for zero emission buses and is expected to provide a boost to UK bus manufacturing, helping to secure thousands of green manufacturing jobs and apprenticeship opportunities across the country, including in Scotland, Northern Ireland and the north of England. We will consider both battery electric and hydrogen fuel cell buses when rolling out the 4,000 zero emission buses.

In 2021-22 we will invest up to  $\pounds$ 120 million in zero emission buses through the Zero Emission Bus Regional Areas scheme, which could support the introduction of up to 500 zero emission buses and the infrastructure needed to support them. This is in addition to  $\pounds$ 50 million provided through the All-Electric Bus Town or City scheme, which will support up to 300 zero emission buses, and over 100 zero emission buses supported by previous green bus funding schemes.

### Buses on demand

In lower-density, often rural, areas, not served or barely served by conventional buses, we will support new forms of provision, such as demand responsive travel in smaller vehicles. These service innovations may be how we improve evening and Sunday services in places which currently lack them, integrated with conventional buses during the day. As part of the Better Deal for Bus Users, we have invested £20 million through the Rural Mobility Fund to trial demand responsive bus services in 17 rural and suburban areas across England. Some of these will use zero emission vehicles.

# Commitment We will deliver the first All-Electric Bus Town or City

The All-Electric Bus Town and City scheme will demonstrate what can be achieved when there is a real commitment to move all buses in a place to electric zero emission.

In March 2021, the government announced that Coventry had been selected as the winner of the All-Electric Bus Town or City Scheme. The West Midlands Combined Authority has been awarded £50 million to replace the entire local operator bus fleet in Coventry with electric buses. This funding will support the introduction of up to 300 electric buses and the charging infrastructure needed to support them.





#### York's Zero Emission Park and Ride fleet

York has one of the largest electric bus fleets in the country. Working together, City of York Council and First Bus have introduced 33 electric buses for the city's park and ride service. These electric buses were introduced with funding support from the UK Government's Low Emission Bus Scheme and Green Bus Fund. In 2017 City of York Council secured £3.3 million from the UK Government to introduce 21 electric double decker buses and vehicle charging infrastructure. These new buses began operating in July 2020 and are estimated by First Group to save 1.6 million kilos (1,600 tonnes) of  $CO_2$  emissions every year.<sup>52</sup> They joined an existing fleet of 12 electric buses, part funded by the UK Government's Green Bus Fund, to form the UK's largest zero emission park and ride bus fleet.

#### Commitment

# We are consulting on a phase out date for the sale of new non-zero emission buses

We have begun consulting on an appropriate date to end the sale of new non-zero emission buses and on the introduction of the appropriate supporting policy and regulatory framework. An initial consultation closed on 11 April 2021 and there will be a further consultation later this year.

#### Commitment

# We will consult on a phase out date for the sale of new non-zero emission coaches

For longer distance travel, coaches offer a greener alternative to private cars. We will consult on a phase out date in due course for the sale or purchase of new non-zero emission coaches. The coach industry faces different challenges to decarbonisation from the bus industry and we want to understand the barriers the sector faces as well as the opportunities.





### Figure 5: Decarbonising Transport bus and coach GHG projections, versus the baseline\*

The figure above shows our projections for GHG emissions from buses and coaches, for a baseline scenario based on firm and funded policies, and for policy scenarios including the ambitious policies listed above alongside savings from low carbon fuels. This shows emission reductions starting immediately from the deployment of zero emission buses, which can get bus emissions on a pathway to net zero. Part 2 **The plan in detail:** commitments, actions, and timings



# **Decarbonising** our railways<sup>53</sup>















#### Between now and 2050

Great British Railways will deliver a programme of further electrification, together with use of battery and hydrogen trains, to enable a zero carbon railway

#### 2021

The WIlliams-Shapps Plan for Rail has set out a transformation in rail, encouraging a shift to cleaner, greener journeys

#### 2020s-2030s

City Station

Policies will incentivise the take up of low carbon traction by rail freight operators.

Freight Operating Companies will use more electric and low carbon traction. Investing in High Speed rail and extra capacity on our network will support modal shift to rail

#### **By 2040**

Ambition for all

By 2050

The rail network will be net zero

be removed from the network by 2040

diesel-only trains to

.....

#### Congestion



### **Co-benefits:**

Jobs & growth



#### Air quality



73

#### Commitment

#### We will deliver a net zero rail network by 2050, with sustained carbon reductions in rail along the way. Our ambition is to remove all diesel-only trains (passenger and freight) from the network by 2040

Rail is already a green mode of transport for passengers and goods with 38 per cent of our track already electrified.<sup>54</sup> This is a great starting point, but there is still a lot to do and we will need to use all options available to us to decarbonise the rest of the network.

As we stated in the recent rail white paper, the Williams-Shapps Plan for Rail, electrification – a proven, existing technology – is likely to be the main way of decarbonising the majority of the network.<sup>55</sup> Electrification does not merely decarbonise existing rail journeys; it has a clear record of attracting new passengers to rail, the so called "sparks effect", thus also decarbonising journeys previously done by road. We will also pursue options for electrifying the remaining diesel pockets of the third-rail network. Further electrification schemes will be announced shortly.

The rail freight market has changed significantly over the last twenty years, with a shift from the dominance of coal to intermodal and construction traffic flows.<sup>56</sup> The geography of rail freight has subsequently changed, with the consolidation of rail freight on already partially electrified routes. This means that relatively short stretches of new infill electrification could allow a significant rise in the electric haulage of freight. We will pursue such electrification to maximise the benefits gained from rail freight.

We will exploit newer technologies such as hydrogen and battery trains. By deploying the most appropriate technology for each route across the network we will continue to improve rail's performance, providing more reliable services for users that offer significantly lower running costs.

Network Rail, working with a wide group of rail industry stakeholders, has developed its Traction Decarbonisation Network Strategy (TDNS) with recommendations on which technology to deploy on each route. We will use TDNS to guide our work with partners across the rail sector to deliver an affordable, deliverable programme to fully decarbonise our railway.

# One in every

travelled in England in 2019 was by rail, but the government wants to increase this in the future by making our railways even better.<sup>57</sup> The Williams-Shapps Plan for Rail promises to bring together responsibility for the whole system under a single organisation: Great British Railways. Great British Railways will be responsible for identifying the right technology for the right part of the network, delivering the necessary infrastructure, and commissioning the right train services, ensuring net zero emissions from the railway by 2050.

Great British Railways will also improve how the railway is run, with trains on time, simple fares and a railway that is more accessible for all. Making rail travel easier, simpler, and better integrated, including through improving journey connectivity with walking and cycling and other services, will encourage a shift to cleaner travel.

The Plan for Rail will encourage more freight onto rail from roads, reducing emissions. We will support this by providing the right conditions for the rail freight industry to grow with better coordination, modern contracts, and new safeguards.

Long-term government investment in rail can stimulate regeneration and support employment opportunities, as well as helping to meet our global climate goals, through projects such as electrification of existing lines. For example, the Integrated Rail Plan (IRP) will set out how best to deliver and sequence HS2, Northern Powerhouse Rail and other major rail schemes. In the last three years, we have completed almost



of electrification in England and Wales.<sup>59</sup>

#### Commitment

#### We will deliver an ambitious, sustainable, and costeffective programme of electrification guided by Network Rail's TDNS

Removing diesel trains reduces air and noise pollution, brings lower operational costs, and improves performance. Further electrification will allow removal of diesel passenger trains and will enable the rail freight industry to invest in new electric locomotives. Our sustained programme will present opportunities to develop supply chain capacity, support highly skilled, specialised long-term employment opportunities in overhead line electrification, and reduce costs. This programme will help level up the UK, bringing greater benefits to currently unelectrified areas outside London and south-east England.

We will announce further electrification projects shortly, ensuring the lessons of previous schemes are learned and that individual projects deliver value for money.<sup>58</sup>

TDNS estimates that by 2050,

### **97%**

of emissions could be removed given the assumed levels of electrification, hydrogen and battery technologies.<sup>60</sup>
#### Commitment

#### We are supporting the development of battery and hydrogen trains and will deploy them on the network as we decarbonise. We will also use technology to clean up diesel trains until they can be removed altogether

Battery and hydrogen trains will be considered alongside electrification as we decarbonise each currently unelectrified rail line. We will always deploy the most suitable technology for each rail line considering technology capability and value for money. On less intensively used lines, battery and hydrogen trains are likely to deliver lower whole life costs than electrification. Until the railway can be fully decarbonised, we will encourage reductions in carbon and pollutant emissions through improved efficiency of existing diesel trains.

DfT's Rail Innovation Programme funds "First of a Kind" competitions to develop and demonstrate existing technology for use on the railway. The programme is providing a further £9 million support for projects in 2021/22, with 'Low emissions and a greener railway' one of three themes. Through the First of a Kind competitions we have already provided nearly £3 million funding for projects developing new traction technologies, including £750,000 for HydroFLEX, both for the first UK mainline testing of a hydrogen train and making this technology passenger ready.<sup>61</sup>





#### **HydroFLEX**

Supported by £750,000 in grant funding from DfT's 'First of a Kind' competitions, and following almost 2 years' development work and a £7 million investment by both Porterbrook and the University of Birmingham, HydroFLEX was the first-ever hydrogen-powered train to run on the UK mainline on 29 September 2020.<sup>62</sup> Unlike diesel trains, hydrogen-powered trains do not emit harmful gases, instead using hydrogen and oxygen to produce electricity, water and heat. The team are now developing the first prototype production version of HydroFLEX and the supply chain to support the technology in the future. The ground-breaking technology behind the trains will also be available by 2023 to retrofit current in-service trains to hydrogen, helping decarbonise the rail network and make rail journeys greener and more efficient. The map below shows the recommendations of Network Rail's Traction Decarbonisation Network Strategy for technology deployment to decarbonise the unelectrified railway based on existing technology capability. It will be updated as technology develops.

#### Figure 6: TDNS technology deployment recommendations



#### Commitment

#### We are building extra capacity on our rail network to meet growing passenger and freight demand and support significant shifts from road and air to rail

We are committed to the construction of new lines to meet growing demand for rail travel. The government is already getting on with building HS2 Phase One and 2a, which will create 170 miles of new electrified track between London, Birmingham and Crewe by the early 2030s.63 In line with the Prime Minister's announcement in February 2020, the Integrated Rail Plan, to be published in due course, will set out how we will do the later stages of HS2, and Northern Powerhouse Rail, differently to deliver benefits for passengers, including carbon savings, sooner. HS2 will operate as a high capacity, high-frequency inter-city service, on dedicated lines. By building HS2 and running intercity train services on the new line, HS2 will free up train paths and platforms across the heavily congested West Coast Main Line for additional local, cross-country and commuter services and will provide additional passenger capacity on the East Coast and Midland Mainlines.

HS2 will be an integrated part of Great Britain's future rail network, unlocking benefits for passengers across the country. When combined with other major rail schemes, this will encourage even more people to make journeys by rail.

By taking some long distance passenger trains off the southern part of the West Coast Main Line, HS2 will also release spare capacity, some of which could support our commitment to expand opportunities for rail freight operators to grow and develop.

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### Passenger services

#### Commitment

#### We will work with industry to modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys

The Williams-Shapps Plan for Rail has set out a transformation in how people will pay for their journeys in the future to encourage a shift to rail and more cleaner, greener journeys. On long distance routes, flexible pricing will improve choice, offer simple options for passengers and enable cheaper fares at quieter times. This will end sudden price jumps for peak time trains and reduce the number of empty services. We will preserve affordable 'walk up and go' fares. On shorter-distance routes, we will increasingly move to contactless ticketing to improve convenience for passengers.

#### Commitment

# We will improve rail journey connectivity with walking, cycling and other modes of transport

Greater provision of walking and cycling routes to and from stations will be introduced to support healthier greener journeys after the pandemic. Secure cycle storage, cycle/e-cycle hire, dedicated car-pooling parking spaces, and electric vehicle rental points and charge points will be significantly expanded, including at smaller stations. In 2021/22 we will spend a further £2 million to improve cycling access to stations and increase sustainable journeys by installing cycle racks, security systems, ramps, and cycle paths through the Cycle Rail Scheme, building on the £40 million provided since 2012. Ensuring better integration with other local transport services through Local Transport Plans will transform stations into joinedup mobility hubs within local and regional transport networks. As rail ticketing and fares systems are updated, we will consider opportunities for facilitating integrated electronic ticketing with buses. More bus routes and demand-responsive services should serve railway stations for easy connections between modes, and bus services should be timed to connect with trains.

We will increase the amount of space for bikes on trains wherever practically possible, particularly on popular leisure routes, and will make it easier to reserve bike spaces online and without reservations on emptier trains. All future trains will include more bike space relevant to the markets served. We will continue to restrict bikes on peak-hour commuter trains, where the space is needed for passengers.



#### **Cycling Rail Scheme in Ashford**

The Cycle Rail grant scheme aims to promote economic growth, improve journeys, and encourage environmentally friendly transport to cut carbon. The scheme improves cycling access to stations and increases sustainable journeys by funding installation of cycle racks, security systems, ramps and cycle paths. Through the scheme we have provided more than £40 million funding since 2012 to create over 22,000 new parking spaces and other features, spread across more than 200 stations UK-wide. Cycle Rail funding has enabled the construction of a new cycling hub at Ashford International station, providing secure bike parking for 96 bikes and freely-available parking for a further 220. Prior to commuting changes as a result of the pandemic, there were around 300 to 350 bikes parked at Ashford International station on typical weekdays, compared to around 100 bikes earlier in the decade.<sup>64</sup>

### **Freight services**

The rail freight market has been transformed over the past quarter century, from largely moving coal and steel to now moving construction goods, containers, and food supplies. Freight trains reduce road congestion, connect markets over long distances and are much less carbon intensive than road freight. The Williams-Shapps Plan for Rail sets out the government's commitment to supporting a growing, innovative, modern rail freight market that can maximise rail's potential to deliver cleaner, greener freight journeys.

# Commitment **We will introduce a rail freight growth target**

As initially set out in the Williams-Shapps Plan for Rail, we are committed to introducing a rail freight growth target for all areas of the network DfT oversees, to encourage the continued growth of rail freight. Rail freight trains currently emit around a quarter of the CO<sub>2</sub> emissions of HGVs per tonne mile travelled.<sup>65</sup> Great British Railways will also have a statutory duty to promote rail freight.

We are investing in the growth of rail freight: we are investing in the rail network for freight, building on the £235 million of investments made in Control Period 5 (2014-2019), supporting the development of an expanded network of Strategic Rail Freight Interchanges, and continuing to fund grants that support the modal shift of freight to rail.<sup>66</sup> The £20 million (2021/22) for Mode Shift Revenue Support and Waterborne Freight Grant schemes supports the carriage of freight by rail and water on routes where road haulage has a financial advantage. These grants help to remove around 900,000 HGV loads off the road each year.<sup>67</sup>

A rail freight growth target will help provide private operator investment confidence and galvanise action across local partners and industry. We will work closely with industry partners to develop the target.

#### Commitment

# We will incentivise the early take up of low carbon traction for rail freight

The emissions benefits of network electrification can only be delivered by using compatible electric locomotives. Around 90 per cent of in-use freight rolling stock is diesel-only.<sup>68</sup> Short "infill" electrification projects could quickly deliver benefits and enable rail freight operators to immediately switch services over to electric traction. This would reduce costs as electric locomotives cost less to operate and could also reduce journey times as electric traction provides quicker speeds and better reliability than diesel fuelled services. By filling in electrification gaps to key ports and terminals, we can open new opportunities for electric, cleaner, greener rail freight journeys. As freight electrification is rolled out further, additional electric locomotives will be required to supplement those already available.

We will develop further interventions, in partnership with industry, to help freight operating companies have the confidence they need to invest in replacing current rolling stock. Those companies making the early moves will have real commercial opportunities to meet customer demand for lower carbon services. As we develop potential policy interventions, we will ensure rail freight maintains its competitiveness with road freight, and that interventions represent value for money for the taxpayer. In 2019/20, the rail freight industry resulted in around





#### **Reducing emissions with stop-start technology**

Freight Operating Companies have taken multiple steps to lower their emissions, including by fitting 'stop-start' technology in their diesel locomotives to reduce carbon, air quality, and noise emissions when idling. Stop-start technology is a system that automatically turns the engine off and on to minimise engine idling when stopped. We continue to work with the rail freight industry, the Rail Safety and Standards Board and Innovate UK to look at how best to progress options on research, development, and innovation to reduce emissions from rail freight. Through the 2021 First of a Kind competition, we are providing nearly £2 million in funding for five projects that will reduce harmful emissions from rail freight.



Figure 7: Decarbonising Transport rail GHG projections, versus the baseline\*

The figure above shows our projections for GHG emissions from rail, for a baseline based on firm and funded policies, and for a Decarbonising Transport policy scenario including the ambitious set of rail policies listed above. This shows rail following a pathway which can achieve net zero emissions by 2050.



Part 2 **The plan in detail:** commitments, actions, and timings

# A zero emission fleet of cars, vans, motorcycles, and scooters<sup>70</sup>



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of 2019 domestic GHG emissions from **cars and taxis** 







Up to **£8bn GVA supported** in 2050 from zero emission vehicle manufacture



Up to **60,000 jobs** supported in 2050 from zero emission vehicle manufacture







Early 2020s

Up to **£2.8 billion** investment will support the transition to zero emission vehicle technology, including through incentives, charging infrastructure and R+D support



A new road vehicle regulatory regime will be introduced to help deliver the commitment to end the sale of new petrol and diesel cars and vans and ensure significant progress to reduce emissions is made along the way

### We will remove all emissions from road transport

**2030** We will end the sale of new petrol and

diesel cars and vans

All new cars and vans must be **100%** zero

emission at the tailpipe

2035

2035

All new L-category vehicles to be fully zero emissions at the tailpipe\* 2040

End the sale of all non-zero emission HGVs

There were almost **400,000** plug-in electric vehicles on the UK's roads at the end of 2020 and over one in seven cars sold so far in 2021 had a plug.

There are nearly **25,000** publicly available charging devices. This includes nearly **4,500** rapid devices.

Jobs & growth

\*subject to consultation





**Co-benefits:** 

Noise

Air quality



1037

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Removing tailpipe emissions from cars and vans is fundamental to decarbonising transport, as they were responsible for almost a fifth (19%) of the UK's total domestic greenhouse gas emissions in 2019.<sup>71</sup> From 2030 we will end the sale of new petrol and diesel cars and vans, 10 years earlier than previously planned, and from 2035 all new cars and vans must be zero emission at the tailpipe. Between then, new cars and vans will only be able to be sold if they offer significant zero emission capability.<sup>72</sup>

Zero emission motorcycles and other powered two wheelers are an efficient and clean form of mobility that can reduce congestion, improve urban air quality and reduce noise – we will take forward measures to remove these emissions, including consulting on a date to end the sale of new non-zero emission motorbikes, ensuring we support the development of new industrial opportunities for the UK.

Motorists are making the switch to electric vehicles in record numbers to take advantage of lower running and maintenance costs, a quieter and more enjoyable driving experience as well as instant torque giving drivers an immediate response.

There are now over half a million electric plug-in cars registered in the UK with nearly one in seven cars sold so far in 2021 having a plug, making it one of the largest global fleets.<sup>74</sup>

Government had already committed £1.5 billion between April 2015 to March 2021 to support the early market and remove barriers to electric vehicle ownership.<sup>75</sup> It has pledged a further £2.8 billion package of measures to support the switch to clean vehicles. This includes up to £1 billion to build an internationally competitive electric vehicle supply chain at pace and scale in the UK.<sup>76</sup> The first £500 million of support will be delivered over the next four years through the Automotive Transformation Fund. Securing investments in battery cell manufacturing – gigafactories – is a priority, alongside investments related to motors, drives, power electronics and fuel cells. It also includes £1.3 billion to accelerate the roll out of charging infrastructure and £582 million for plug in vehicle grants.<sup>77</sup>

#### Zero emission vehicles – delivering jobs and levelling up our country

Investment in the development of the UK's electric vehicle supply chain could create 40,000 extra jobs across the country by 2030, including in our Midlands and North East England manufacturing heartlands.<sup>73</sup> We are already seeing progress. In July 2021 Nissan and Envision AESC announced that they are creating a North East England electric vehicle manufacturing hub and the UK's first large scale gigafactory in Sunderland. This investment will deliver highquality green jobs in the area as well as manufacturing batteries to power future generations of electric vehicles made in the UK. This was followed by Stellantis in July 2021, announcing that its first dedicated EV factory in Europe will be at Ellesmere Port, Cheshire. The investment will transform Stellantis' existing car plant so that from 2022 it will produce a new electric van.

Despite significant early progress, action is needed to go further, faster. The market for battery electric vehicles and the necessary charging infrastructure is growing fast, but the barriers of vehicle price and supply, infrastructure provision, and the consumer experience of using that infrastructure, need to be addressed.

Alongside this document the government has published a 2035 Delivery Plan to reach our target phase out dates for cars and vans. This sets out our ambitious set of commitments and funding streams to decarbonise cars and vans, into a single document. It outlines key timelines and milestones for how we will continue to tackle barriers to zero emission motoring. Battery electric car registrations increased almost threefold in 2020, compared to the same period in 2019;<sup>78</sup> charging infrastructure is more prevalent than ever with nearly 25,000 public charging devices, including more than 4,500 rapid devices – one of the largest networks in Europe.<sup>79</sup>



#### Figure 8: Distance from the nearest public EV charging device across the UK



The map above shows the distance from the nearest public EV charging device across the UK.

The government is supporting the market-led development of a charging infrastructure network to meet drivers' needs. This will ensure motorists can charge wherever they need to – at home, at work, on longer journeys and make sure our towns and cities are ready for the transition. Preparing the UK for our zero emission future will support manufacturing, supply chain and electrical installation jobs right across the UK.

A driver is never more than 25 miles away from a rapid (50 kilowatt) chargepoint anywhere along England's motorways and major A roads.<sup>80</sup>

#### **Electric Vehicle Batteries**

We are keen to create a circular economy for electric vehicle batteries to maximise the economic and environmental opportunities of the transition to zero emission vehicles. That is why we are supporting the innovation, infrastructure, and regulatory environment for a UK battery recycling industry. The £330 million Faraday Battery Challenge is tackling the technical challenges of reusing and recycling battery components, with an aim of making them 95% recyclable by 2035, up from 10-50% today.<sup>81</sup> We are supporting research to develop UK battery recycling infrastructure. The 2009 Waste Batteries Regulations bans the disposal of EV batteries to landfill or incineration and battery producers are obligated to take back EV batteries free-of-charge and treat them at approved facilities.<sup>82</sup>

The right regulatory framework will be needed for both vehicles and infrastructure to secure our long-term ambitions. Vehicle end of sale dates have not been set in regulation, as this was not possible under EU legislation. Since 1 January 2021 manufacturers have been subject to a GB-only regulatory regime<sup>83</sup> and, outside the EU, we now have the opportunity to regulate in a manner that better suits the UK. The Green Paper on a New Road Vehicle CO<sub>2</sub> Emissions Regulatory Framework for the United Kingdom published alongside this plan will consider both overall fleet efficiency and the path to delivering the move to 100 per cent ZEV sales for cars and vans, and consider options including zero emissions vehicle mandates. It will take into account the UK market, ensuring we can secure the right outcomes to meet our domestic goals, while also supporting interim carbon budgets and the UK automotive sector.

Providing consumers with affordable options for zero emission vehicles is essential to ensure sufficient uptake. We are already seeing the upfront cost of electric vehicles drop, and we expect this to continue as batteries become cheaper and the production of vehicles is scaled up. However, in some cases, it can already be cheaper to own an electric vehicle today due to the lower refuelling and maintenance costs. The government will continue to grow its R&D ecosystem to reduce the costs of batteries and develop cost-effective and sustainable solutions for EVs. We are also supporting investment in mass manufacturing to provide economies of scale and reduce the cost of electric vehicles to the consumer. As most motorists buy their vehicles second-hand, developing this market will be crucial in driving mass ownership. We are helping to develop the second-hand market for electric vehicles through a framework of supportive policies such as tax incentives and grants for chargepoint infrastructure. Our incentives for buying new EVs will also help increase supply to the second-hand market.

In terms of vehicles on the road today, low carbon fuels are the primary driver of carbon savings from the existing fleet – we will ensure that ambitious proposed increases to the Renewable Transport Fuel Obligation targets, as set out in section on 'Maximising the benefits of sustainable low carbon fuels', can be delivered sustainably and lead to genuine carbon savings.

The government has committed to stretching carbon reduction targets up to the end of the Sixth Carbon Budget in 2037 and by 2050. As the largest emitting sector transport will need to make a sizeable contribution if these targets are to be met. And emissions from car and van use is the largest component of total transport emissions. Depending on progress in the sector at some points this may require additional targeted action (such as steps to reduce use of the most polluting cars and tackle urban congestion) to enable these targets to be met. We will regularly review progress against our targets, and continue to adapt and take further action if needed.



#### Readying our energy system

The electricity system will have to expand to enable the mass uptake of EVs. government analysis estimates that electrifying the UK car and van fleet could increase electricity generation in 2050 by approximately 20% (65TWh–100TWh) relative to a system with no EVs. The Energy White Paper sets out the policy framework to ensure that there is sufficient investment to power the EV transition, and robust and proven market mechanisms are in place to ensure that supply will meet demand. In addition, smart charging could help reduce the impact on generation capacity and network reinforcement required by shifting charging demand to off-peak times, and the government will regulate to ensure that all new home and workplace chargepoints have smart capability by the end of this year.

We recognise that enabling the EV transition is not just about generating enough electricity it is also about ensuring that consumers can connect to the grid in a timely and convenient way. For smaller connections, such as a domestic household installing one chargepoint, the existing electricity supply is often sufficient. However, for larger connections where multiple chargepoints are installed, such as at depots or in car parks, a new or upgraded connection may be required to cope with the new demand, and this can sometimes create a need for wider network reinforcement works. Through regulation by Ofgem, network operators must ensure that they provide connecting customers with the cheapest option that meets their requirements. Ofgem is currently reviewing the ways charges are allocated and has recently published a consultation proposing that all network reinforcement costs should be socialised across electricity bill payers, rather than falling on the individual connecting customer. This should often reduce the costs of connecting EV chargepoints to the network.<sup>84</sup>

Our plans to deliver the necessary carbon reductions:

#### Commitment .

#### We will consult on regulatory options, including zero emission vehicle mandates, to deliver petrol and diesel phase out dates for new vehicles

To deliver our ambitious plan to end the sale of new petrol and diesel cars and vans in 2030 we are consulting on the design of a new domestic regulatory regime for road vehicles CO<sub>2</sub> emissions, including the possible introduction of a zero emission vehicle (ZEV) mandate, as recommended by the Climate Change Committee.<sup>85</sup> A ZEV Mandate establishes sales percentage targets that must be met by vehicle manufacturers, requiring to them to sell a certain proportion of zero emission vehicles. Manufacturers earn credits for selling ZEVs, rather than the targets being monitored directly, so manufacturers can meet their target either by earning credits through the sale of ZEVs, or from buying excess credits from manufacturers that have overperformed against their own target.

The Green Paper on a New Road Vehicle  $CO_2$  Emissions Regulatory Framework for the United Kingdom, published alongside this Plan, sets out the options which include developing the fuel efficiency and  $CO_2$  emissions regulations already in place, or using ZEV sales targets alongside  $CO_2$  regulation. We will seek to define the 'significant zero emission capability' (SZEC) that all new cars and vans will be required to deliver between 2030 and 2035. Regulatory certainty alongside the targeted government support set out in the Prime Minister's Ten Point Plan for a Green Industrial Revolution can drive new investments in technology and the supply chain to meet the needs of the UK market.1<sup>86</sup>

These measures will establish a regulatory framework that could subsequently be applied to all forms of road vehicle. Over time, regulation will support decarbonisation of the UK's entire road vehicle fleet as well as making sure that significant reductions in carbon emissions from conventional vehicles are delivered along the way.

# Sales of all new non-zero emission road vehicles will be phased out by 2040

- Cars and vans (under 3.5t): all new cars and vans required to have significant zero emissions capability from 2030 and 100% zero emissions at the tailpipe from 2035.
- Heavy Goods Vehicles (above 3.5t): sales of all new medium sized trucks (up to and including 26t) to be zero emissions from 2035, with the heaviest (above 26t) zero emission by 2040\*
- Powered two wheelers: all new motorcycle sand scooters to be fully zero emissions at the tailpipe from 2035\*
- We are consulting on dates to end the sale of new non-zero emission buses
- We will consult on a phase out date for the sale of new non-zero emission coaches

\*Subject to Consultation

#### Commitment

# We have published a zero emission cars and vans delivery plan

To give greater clarity on the pathway to the phase out dates for industry, we have published a 2035 Delivery Plan. This plan brings together all of our committed funding streams and measures for decarbonising cars and vans, in one place. It outlines our key timelines, milestones and how we intend to monitor progress, which will be reported on an annual basis. We will conduct a review of progress towards the phase out dates by 2025, with a view to taking corrective action if required to ensure they are met.

#### Commitment

#### We will continue to support demand for zero emission vehicles through a package of financial and non-financial incentives

To support drivers and industry make the transition to zero emission vehicles, government has put in place a package of measures that includes:

- £582 million for plug-in car, van, taxi, and motorcycle grants until 2022-23, reducing ZEV purchase prices for consumers.
- Green number plates for zero emission vehicles were introduced in December 2020.<sup>87</sup> The plates increase visibility of the rapidly growing number of clean vehicles on our roads and help local authorities deliver new policies, such as zero emission zones.
- Favourable company car tax rates for zero emission cars out to 2025, zero emission cars and electric vans pay no vehicle excise duty, and a nil rate of tax is applied to zero emission vans within the van benefit charge.

#### Commitment

We will consult this year on a phase out date of 2035, or earlier if a faster transition appears feasible, for the sale of new non-zero emission powered two and three wheelers (and other L category vehicles) Zero emission powered light vehicles are a clean and efficient way of getting around and can reduce congestion, air, and noise pollution from transport. While cars and vans outnumber motorcycles on UK roads, motorcycles are an important and sizeable vehicle population, with 1.4 million licensed in 2020 and we do not want to see them remaining fossil fuelled as the rest of the vehicle fleet cleans up.<sup>88</sup>

#### Commitment

# We will deliver an action plan this year to build new UK opportunities for zero emission light powered vehicles

Innovation in urban logistics and personal mobility can generate substantial industrial opportunities for the UK, as the world transitions to greener transport systems. The opportunities for zero emission light powered vehicles (ZELPV) are enormous. We will build on our existing support in this segment, such as with the plug-in motorcycle grant, to benefit urban logistics and wider mobility and look to grow a new UK industrial supply chain. We will use Zemo Partnership's strategic partnership with the Motorcycle Industry Association (MCIA) to stimulate and coordinate activity in this area and publish options to develop this at national and local level this year.

#### Commitment

We will lead by example with 25% of the government car fleet ultra low emission by December 2022 and 100% of the government car and van fleet zero emission by 2027

Government will ensure one in four of the central government car fleet is ultra low emission by 2022 and achieving a fully zero emission car and van fleet by 2027. Government is leading the way here, going further and faster and again demonstrating that ZEVs are credible for fleet users across the UK.

#### Zero emission light powered vehicles

Powered light vehicles are two, three and four wheeled passenger or cargo vehicles. They are smaller and lighter than many other vehicle types and so can have a significant impact on urban transport systems, particularly when used in place of other forms of low occupancy vehicles. Their size also makes them complementary to increased public transport use and the growth of cycling and walking infrastructure.

# Decarbonisation in the wider public sector

Many local authorities and the wider public sector are also taking action to decarbonise their own fleets. For example, NHS England, as part of their "Net Zero National Health Service" plan has set a long-term commitment that 90% of the NHS fleet must use low, ultra-low and zero emission vehicles by 2028, and pledged to go beyond this with the entire owned fleet of the NHS eventually reaching net zero emissions. The Mayor of London's Environment Strategy commits that all new cars and vans, including response vehicles, in the GLA group (encompassing Transport for London, the London Fire Brigade and the Mayor's Office for Policing and Crime, among others) must be zero emission capable from 2025.<sup>89</sup>

#### Commitment

# We will ensure the UK's charging infrastructure network meets the demands of its users

The government has helped fund the installation of over 190,000 private chargepoints in homes and business across the country.<sup>90</sup> In terms of the public network, the market, supported by government, has provided almost 25,000 chargers<sup>91</sup> with more than 4,250 of these being rapid chargers. We are committed to working with industry to accelerate the pace of rollout further and we are investing £1.3 billion over the next four years.

We welcome the acceleration of private investment, illustrated by recent announcements from Gridserve (committing to upgrading their Electric Highway network), bp pulse (expanding their network replacing legacy chargers) and Motor Fuel Group (investing £400 million to install 2,800 high powered chargers by 2030<sup>92</sup>). As this market begins to flourish, we will increasingly focus government efforts on putting in place a policy and regulatory framework that supports increased investment and competition whilst meeting the needs of consumers.

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We are introducing a range of regulatory and other measures to ensure the charging network meets users' needs:

- To support motorists making longer journeys in EVs, the government's £950 million Rapid Charging Fund will invest in upgrading grid capacity at service areas across motorways and A-roads. By 2035 we expect to support the roll-out of 6,000 ultra-rapid chargepoints across the strategic road network.
- For those households unable to charge at their home, the On-Street Residential Scheme supports local authorities in installing EV infrastructure on-street and in public car parks. The scheme has been enhanced in response to local authority feedback, to increase the funding available per chargepoint and remove the maximum project size cap. We have committed £20 million for 2021/22.
- A new £90 million Local EV Infrastructure Fund, opening in 2022, will support the rollout of larger on-street charging schemes and rapid charging hubs across England, meeting a broader range of consumer needs.
- Given the crucial role that local authorities must play in supporting the roll-out of charging, and to navigate the complexities involved, we will publish an EV infrastructure guide for local authorities later this year.
- For properties with dedicated off-street parking, the Electric Vehicle Homecharge Scheme will provide funding towards the cost of a chargepoint and its installation. From April 2022, we will shift the focus to supporting leaseholders, renters and those living in flats. Our Workplace Charging Scheme will provide funding for EV chargepoints at workplaces and is being extended to small and medium sized enterprises and charities.
- The process and cost of connecting charging infrastructure to the electricity network can be a major barrier to roll-out. We are working with Ofgem and others to make getting new connections as timely, efficient, and affordable as possible. Through its 'Access and Forward-Looking Charges Review', Ofgem is consulting on whether more, or all, of the costs associated with a new connection could be socialised across energy bill payers, reducing the costs for the connecting customers.
- We plan to regulate later this year for all new-build residential and non-residential buildings with an associated parking space to have a chargepoint.
- We also plan to regulate this year on measures to improve the consumer experience of public charging. We will open up public chargepoint data; improve the reliability of the network; streamline the payment methods offered to drivers; and increase pricing transparency.

• We will regulate later this year to ensure charging infrastructure is smart, to help delay or reduce the need for new electricity generation or network infrastructure investment, reducing costs for all bill payers.

The government's plans for EV infrastructure are set out in more detail in the 2035 Delivery Plan and, later this year, we will publish an EV infrastructure strategy, setting out our vision for infrastructure rollout, and roles for the public and private sectors in achieving it. This will ensure there is sufficient infrastructure provided at the pace required, and that consumers needs are met.

# Vision for the rapid chargepoint network in England

Key stats:

**By 2023,** working with Highways England, we aim to have at least 6 high powered, open access chargepoints (150–350 kilowatt capable) at motorway service areas in England, with some larger sites having as many as 10–12.

**By 2035,** we expect around 6,000 high powered chargepoints across England's motorways and major A roads.

#### Commitment

# We will support and nurture innovation in the UK automotive sector

Government has a longstanding programme of support to help transform the automotive sector to zero emission vehicles and has built a globally recognised R&D ecosystem. With industry, almost £1.5 billion has been invested through the Advanced Propulsion Centre and Faraday Battery Challenge to research, develop and commercialise low carbon and zero emission automotive technologies.<sup>93</sup>

As announced as part of the Prime Minister's Ten Point Plan for a Green Industrial Revolution, nearly £500 million of funding for the Automotive Transformation Fund (ATF) will be made available in the next four years to invest in capital and R&D projects to build an internationally competitive electric vehicle supply chain.<sup>94</sup> This is part of the up to £1 billion committed by the government to ensure that the UK takes advantage of this once in a generation opportunity.<sup>95</sup> The ATF will help to secure an internationally competitive supply chain for the future, supporting the 149,000 existing jobs in automotive manufacturing, including clusters of activity in the Midlands and North East.<sup>96</sup>

We are also investing nearly £80 million through the Driving the Electric Revolution (DER) programme to accelerate the capability and growth of the Power Electronics, Machines & Drives (PEMD) supply chain in the UK. This is cross-sector programme, spanning from automotive to rail and robotics to industrial processes, and is a key building block to deliver the technology required to achieve net zero targets by 2050.

Support available includes collaborative R&D (c.£40 million), Industrialisation Centres across the country (c.£30 million) and retraining and upskilling (c.£6 million).<sup>97</sup>





#### **R&D: Gridserve**

Investment in R&D is key to our mission of putting the UK at the forefront of the design, manufacture and use of zero emission vehicles. These technologies can help deliver our transport decarbonisation goals and anchor economic activity across the UK. That is why the Office for Zero Emission Vehicles (OZEV) has invested £400 million in a series of R&D competitions supporting innovation and developing vehicle and charging infrastructure technologies.

Our £40 million On-Street, Wireless and Catalysing Green Innovation Programmes include £5.4 million (£7.5 million total project cost) support for the UK's first Electric Forecourt in Braintree, Essex.<sup>98</sup> This first-ofa-kind demonstrator makes electric vehicle charging as easy as using a petrol station and could pave the way for a national network, helping address concerns around electric vehicle (EV) charging. The development is 100 per cent renewably sourced, thanks to a solar canopy and on-site battery storage, which reduces emissions and helps to balance demands on the grid. The Braintree site has 24 ultra-rapid charging bays with additional facilities including convenience retail, healthy eating and an 'airport-style' lounge with access to high-speed internet.

Our 'On-street' R&D competition set out to deliver low-cost, scalable charging solutions for EV owners and the 8 million dwellings in England without access to offstreet parking.<sup>99</sup> Projects include: utilising spare energy capacity in Virgin Media's existing broadband network assets (e.g. green telephone cabinets) to charge an EV; lamppost charging solutions; and retractable chargepoint devices to reduce street clutter.

#### Commitment

# We will invest £15 million in 2021/22 to help address the backlog in traffic signal maintenance to improve traffic flow and reduce emissions

Investment in the national traffic signal asset is needed to maintain an effective traffic management system. Traffic signal controls are essential for managing congestion, delay, and emissions, but these operations are undermined by poorly maintained detection systems and out of date traffic management plans.

£15 million of investment in 2021/22 will help highway authorities to make their signals working effectively again. Investing in the maintenance of this essential asset will not only improve emissions but also enable new technologies and data systems that will support the delivery of a digital and connected road network.

Figures over the page show our projections for GHG emissions from cars and vans, for a baseline based on firm and funded policies, and for a Decarbonising Transport policy scenario including the ambitious set of car and van policies listed above, alongside savings from modal shift and low carbon fuels policy. Both cars and vans show the potential for relatively fast reductions in emission ahead of 2050, due to current efficiency measures, and the ability to build on the existing deployment of zero emission vehicles.

#### Commitment

#### We will review the National Networks National Policy Statement

In 2019, our roads handled 88 per cent of all passenger travel by distance, the vast majority of it by car or van. Even doubling rail use across the country would only reduce this proportion to 75 per cent, assuming that overall demand did not rise. The roads also carry more than three-quarters of freight traffic, and of course nearly all pedestrian, cycling, bus and coach journeys.

Continued high investment in our roads is therefore, and will remain, as necessary as ever to ensure the functioning of the nation and to reduce the congestion which is a major source of carbon. Almost half of our £27 billion programme for England's strategic roads, though often described as for roadbuilding or capacity expansion, is in fact for renewing, maintaining and operating the existing network, or for funds to improve safety and biodiversity, deliver active travel schemes and tackle noise or pollution. In the coming years, our ambitious and accelerating plans to decarbonise all road traffic, described elsewhere in this document, will transform roads' impact on greenhouse gas emissions.

We have always said, however, that we must ensure the road network meets today's demands, not those of the past. In the last eighteen months, fundamental changes have occurred in commuting, shopping, and business travel, which before the pandemic made up 30 per cent of all road journeys by distance, and a much higher proportion at the times and places of greatest pressure.<sup>100</sup> Trends already underway in homeworking, online shopping, and videoconferencing, all of which had reduced trip rates even before the pandemic, have dramatically increased, and seem unlikely to be fully reversed. Against that, though, must be set the effects on road demand of the hopefully temporary move away from public transport during the crisis; of increases in delivery traffic; and potentially of increases in driving when electric and autonomous vehicles become common.

The current National Policy Statement (NPS) on National Networks, the government's statement of strategic planning policy for major road and rail schemes, was written in 2014 – before the government's legal commitment to net zero, the Ten Point Plan for a Green Industrial Revolution, the new Sixth Carbon Budget and most directly the new, more ambitious policies outlined in this document. While the NPS continues to remain in force, it is right that we review it in the light of these developments, and update forecasts on which it is based to reflect more recent, post-pandemic conditions, once they are known.

As we said in last November's 10 Point Plan, as we move forward with the transition to zero emission vehicles, we will need to ensure that the tax system encourages the uptake of EVs and that revenue from motoring taxes keeps pace with this change, to ensure we can continue to fund the first-class public services and infrastructure that people and families across the UK expect.

Figures 9 and 10 show our projections for GHG emissions from cars and vans, for a baseline based on firm and funded policies, and for a Decarbonising Transport policy scenario including the ambitious set of car and van policies listed above, alongside savings from mode shift and low carbon fuels policy. Both cars and vans show the potential for relatively fast reductions in emission ahead of 2050, due to current efficiency measures, and the ability to build on the existing deployment of zero emission vehicles.



\* Historic emissions are from published GHG statistics. Future car and van emissions are modelled the using the National Transport model and adjusted for Decarbonising Transport measures. Uncertainty bands around projections reflect uncertainty on the form of final policy and uncertainties on future demand for road transport – related to future trends in travel, uptake of connected and autonomous vehicles, fuel prices, GDP growth, and historical volatility. Carbon savings are driven by Decarbonising Transport policies and ambitions. The range of uncertainty in emissions projections falls in the policy line as the proportion of miles by zero emission vehicles increases. From 2040 the lower end of policy projections includes emission reductions from speculative scenarios to get emissions to zero.





Part 2 **The plan in detail:** commitments, actions, and timings



# Accelerating maritime decarbonisation<sup>101</sup>







MtCO<sub>2</sub>e domestic and international emissions in 2019







Around **£17bn GVA supported,** by helping future proof the UK maritime sector







Decarbonisation of UK shipping has the potential to significantly reduce emissions of NOx, SO<sub>2</sub> and PM2.5

### 2021

We will consult on how Government can support the wider deployment of shore power

### 2021

We will explore establishing a UK Shipping Office for Reducing Emissions, building on the success of the £20 million Clean Maritime Demonstration Competition and on our experience in other modes.

### 2021

We will assess how economic instruments could be used to accelerate the decarbonisation of the domestic maritime sector.

Bv 2050

or earlier if possible,

the maritime sector

will achieve net zero

### 2022

In the review and refresh of our Clean Maritime Plan, we will establish ambitious indicative targets for the domestic maritime sector and plot a 'Course to Zero' to accelerate decarbonisation

### 2022

We will consult upon the potential for a planned phase out date for the sale of new non-zero emission domestic vessels

### 2023

6H2

Lead global efforts to secure greater ambition in the IMO's 2023 revision of its Climate Change Strategy

\*Estimated emissions for UK international shipping represent the estimated emissions from fuel sold in the UK for use in international shipping



### **Co-benefits:**

#### Air quality



#### Jobs & growth



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#### Maritime is an important challenge for decarbonisation. It reaches from small recreational crafts through to the vessels that serve as the backbone of international trade, and relies on shoreside infrastructure to service, support and facilitate operations.

Although shipping represents a relatively carbon efficient mode for transporting freight today,<sup>102</sup> in 2019 UK domestic shipping emitted more greenhouse gases in total than rail and bus transport combined.<sup>103</sup>

The sector has begun to decarbonise, but with new technologies now reaching the stage of demonstration and initial deployment – we must increase the pace to enable significant fleet-wide emissions reductions in the 2030s. Shipping can achieve net zero through a transition to alternative fuel powered vessels using energy from low or zero emission sources (such as ammonia produced from hydrogen created using green electricity or with the use of carbon capture and storage) or highly efficient batteries, as well as integration of ports into our decarbonised energy network and supplying the fuels of the future.<sup>104</sup>

Our ports and harbours have a role to play in achieving net zero, by decarbonising their own operations, deploying green, alternatively powered tugs, pilot boats and port equipment from cranes to straddle carriers and reachstackers. They are critical parts of the wider transport network and will need to act to support the decarbonisation of their customers in the maritime, road and rail freight sectors, as well as the passengers travelling to and from our ferry terminals.

We are firmly committed to achieving net zero in maritime as soon as we can, and there is evidence that the sector may be able to achieve net zero earlier than 2050 with modelling undertaken for the Department for Transport suggesting such a transition may be possible in the 2040s.<sup>105</sup> As set out below, we will actively explore the possibility of achieving early decarbonisation.

The UK maritime sector is important to the UK, and is estimated to have directly supported around 220,000 jobs in 2017. The sector touches on every part of our coast, from the very north of Scotland through Northern Ireland, Wales and England and we have a proud tradition of the sea and seafarers across the country, and many businesses both large and small that provide jobs. Driving forward maritime decarbonisation is an opportunity to revitalise our ports and coastal communities across the UK, and one which we must take. In decarbonising our maritime sector, we can also leverage our investments to gain a larger share of the global market for clean maritime technology. This is a pivotal opportunity to futureproof and grow UK industry and create jobs right across the UK.



# Victoria of Wight – a highly efficient combined diesel electric drive ferry

Wightlink's newest vessel, Victoria Of Wight, entered into service in 2018 on the Portsmouth – Fishbourne crossing from the mainland to the Isle of Wight. Costing £30 million to build and capable of carrying almost 1,200 passengers, the hybrid energy flagship has a combined diesel electric drive, with significantly reduced emissions compared to similarly sized ships giving immediate benefits to air quality and lower greenhouse gas emissions.<sup>106</sup> Victoria of Wight is 17% more energy efficient than the design it replaced, in part due to the battery system and the higher efficiency options that unlocks, and in part due to having been designed from the keel up to reduce energy use and recover waste heat. The ship has a 408kWh battery array onboard, to supplement four high efficiency marine diesel engines. It uses the batteries to balance the load of the engines, keeping them at an efficient load point and reducing both emissions and noise when arriving at berth.<sup>107</sup> Our plans to deliver carbon reductions include:

### Clear targets for getting to net zero

#### Commitment

#### We will plot a course to net zero for the UK domestic maritime sector, with indicative targets from 2030 and net zero as early as is feasible

We will establish, following public consultation in 2022, an ambitious 'Course to Zero'. This consultation will explore the technical, operational and policy options available for government to accelerate decarbonisation in this sector to achieve net zero by no later than 2050 or earlier if possible.

Following consultation, we will establish ambitious indicative targets for the domestic maritime sector recognising that we have ground to make up, covering 2030 and onwards. These targets will guide the design and enable us to measure the success of future policy interventions.

We will embed this course in our Clean Maritime Plan (CMP), as part of a planned review and refresh which is due to start in 2022 and include within the CMP the long term interventions needed to achieve full decarbonisation.<sup>108</sup>

### Maritime Research and Innovation UK (MarRI-UK) – Clean Maritime Programme

As part of the work of MarRI-UK, we provided targeted funding to ten small, high value projects considering the issue of decarbonisation. The public funding (totalling £1.4 million) was invested following competitive tendering in projects across the country to support small businesses, research organisations and the wider maritime sector in meeting the challenge of decarbonisation.<sup>109</sup> The programme included projects to develop new fully electrical engines for small crafts, to demonstrate a small fully electric ferry in operation, to test the use of advanced fuels such as ammonia, use data analytics to optimise vessel operations, trial the development of an innovative new biofuel and support the testing and deployment of advanced battery systems. The success of this programme has helped support the government taking further action through the ongoing Clean Maritime Demonstration Competition.

#### Commitment

#### We will consult on the potential for a planned phase out date for the sale of new non-zero emission domestic vessels

Following the conclusion of the current Clean Maritime Demonstration Competition and the Course to Zero consultation, we will consult in mid-2022 upon the potential for long term decarbonisation to be accelerated through carefully designed, well signposted measures to phase out the sale of new, non-zero emission domestic vessels, building on the experiences of the steps being undertaken today in other modes of transport.

This work will focus on vessel types where near-term technical solutions are becoming available (for example electrification) as well as considering the longer-term deployment of advanced fuels such as ammonia and hydrogen.

### Accelerating decarbonisation

#### Commitment

#### We will assess how economic instruments could be used to accelerate the decarbonisation of the domestic maritime sector

Building on the work undertaken in Maritime 2050, the Clean Maritime Plan, and the Department's published research, we will further investigate the use of economic instruments to drive sectoral decarbonisation.

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#### Commitment

# We will accelerate the development of zero emission technology and infrastructure in the UK

We have recently launched a £20 million funding package – the Clean Maritime Demonstration Competition (CMDC) – to support and accelerate research, design and development of zero emission technology and infrastructure solutions for maritime and accelerate decarbonisation. The CMDC will run for a year from March 2021 and will provide support to projects that contribute to both reducing emissions in the near term and demonstrating how the sector can transition to net zero operations.

We will explore the establishment of a UK Shipping Office for Reducing Emissions (UK-SHORE). This is a dedicated unit within the Department for Transport focused on decarbonising the maritime sector. UKSHORE will build on the success of the CMDC, delivering a suite of interventions inspired by our experience with decarbonising other transport modes, looking at programmes such as the Office for Zero Emission Vehicles and the Future Fuels for Flight and Freight Competition.

UK-SHORE aims to transform the UK into a global leader in the design and manufacturing of clean maritime technology. Government will continue to engage with industry to consider how the establishment of this programme in cooperation with UKRI and Innovate UK could unlock the necessary industry investment in clean maritime technologies , tackling supply and demand side barriers as well as developing infrastructure and consumer confidence..

#### Commitment

# We will consult this year on the appropriate steps to support and, if needed, mandate the uptake of shore power in the UK

Plugging in domestic and international vessels while in port and ensuring charging capacity is provided for the roll out of electric ships has the potential to quickly reduce greenhouse gas and pollutant emissions from the ports and shipping sector.

Shore power has a role to play in immediately reducing emissions from vessels visiting ports, and is an option that is likely to be 'low/no regrets' as vessels utilising the less energy dense alternatives will look to plug in where they can. Research undertaken by both industry and government has highlighted significant existing barriers including the cost of infrastructure (both in ports and for national grid connections) and a lack of clarity about long term levels of demand from vessels.

We will consult in winter 2021 on how government can support the wider deployment of shore power, including consideration of regulatory interventions, for both vessels and ports, that could drive deployment as we transition to a net zero world, and bring forward appropriate measures.

Commitment

# We will extend the Renewable Transport Fuel Obligation (RTFO) to support renewable fuels of non-biological origin used in shipping

We consulted in March 2021, on a potential expansion of the RTFO to include some advanced maritime fuels in order to support their deployment.<sup>110</sup> The RTFO mandates that a certain proportion of road fuel must be from a sustainable renewable source. Maritime fuels currently have no equivalent system, which we aim to change. We recently announced that we will make renewable fuels of non-biological origin used in shipping eligible for incentives under the RTFO.<sup>111</sup>

# Working internationally to deliver emissions reductions

Commitment

Internationally, the UK will press for greater ambition during the 2023 review of the International Maritime Organisation Initial Greenhouse Gas Strategy and urge accelerated decarbonisation

International Shipping Emissions fall under the remit of the International Maritime Organization (IMO), the United Nations Specialized Agency with responsibility for shipping. The IMO agreed its initial strategy for GHG emissions in 2018 committing to cut emissions by at least 50% by 2050, compared with 2008 levels, and to phase them out completely as soon as possible this century.<sup>112</sup> The IMO will review its strategy in 2023 and as set out in the recent G7 Climate and Environment Communique<sup>113</sup> the UK will be seeking to increase ambition to ensure that international shipping plays its part in delivering decarbonisation.

We will promote close alignment with the Paris temperature goals and challenge the international community to deliver on the IMO initial strategy commitment to 'phase out' emissions from the international sector as soon as possible.

# Commitment

# We will ensure we have the right information to regulate emissions, and to judge the effectiveness of the steps we are taking in the UK and at the IMO

We will review, and if appropriate amend, the operation of the UK's existing monitoring, reporting and verification system for greenhouse gas emissions from international shipping, to ensure it is fit for purpose and delivering the information we need to decarbonise the maritime sector.

We will keep the measurement approach to the UK's international shipping emissions under review and consider the appropriateness of fuel or activity-based measures.

Additionally, we will consider how similar information can be collected for the domestic fleet, in order to provide a better evidence base for future policy interventions.

The figure shows our projections for GHG emissions from domestic and international shipping, for a baseline based on firm and funded policies, and for Decarbonising Transport policy scenarios consistent with net zero. There is significant uncertainty at present surrounding the optimal trajectory for reaching net zero shipping emissions – based on the latest available evidence from the CCC. Our figure illustrates several potential net zero consistent GHG emissions trajectories that shipping could follow. Decarbonising Transport GHG projections show the opportunity for large emissions reductions in the long term from the deployment of zero emissions fuels in shipping. However this may not reflect the full range of pathways and the government will seek further views on how best to reach net zero by 2050 as part of the consultation process outlined above.

#### We will include the UK international aviation and shipping emissions in the Sixth Carbon Budget

The government has set the Sixth Carbon Budget to include the UK's share of international aviation and shipping emissions, as recommended by our independent climate advisors, the Climate Change Committee (CCC). This allows those emissions to be accounted for consistently with other emissions included within the Sixth Carbon Budget.<sup>114</sup>

# Figure 11: Decarbonising Transport domestic and international shipping GHG projections, versus the baseline\*



\* Historic emissions are from published GHG statistics. The baseline and projections are estimated from CCC CB6 analysis (https://www.theccc.org.uk/publication/sixth-carbon-budget/), which drew on research commissioned by DfT to inform the Clean Maritime Plan. These have been adjusted to account for the historic volatility of domestic and international shipping emissions, and the CCC's assumptions about the impacts of COVID-19 have been removed for consistency with other sectors. Given the emerging nature of zero emission shipping fuels, these projections should be interpreted as possible net zero-consistent scenarios rather than estimates of the impact of specific policies. In line with the CCC's recommended method for CB6 and UNFCC reporting, the projections for international shipping emissions represent the estimated emissions from fuel sold in the UK for use in international shipping.

Part 2 The plan in detail: commitments, actions, and timings

# Accelerating aviation decarbonisation<sup>115</sup>







MtCO<sub>2</sub>e domestic and international emissions in 2019







over £85bn added to the economy through the ATI programme supported by UK government



over **73,000** high value jobs have been supported through the ATI programme supported by UK government



250–430 MtCO<sub>2</sub>e savings from 2020 to 2050 (domestic and international)



We will support R&D to develop transformative green aviation technology

# 2021

We will consult on our Jet Zero strategy including, getting domestic aviation in the UK to net zero by 2040

# 2021

We have run a Sustainable Aviation Fuel (SAF) industry competition and set out our plans for a UK SAF blending mandate to accelerate the production and use of sustainable aviation fuels in the UK





We will work internationally and aim to agree an ambitious long-term global emissions reduction goal in the International Civil Aviation Organization 2025

We will mandate the supply or use of sustainable aviation fuels



# **Air quality**



# Jobs & growth





# Decarbonising aviation is one of the biggest challenges across the global economy. The technological requirements to provide the power to propel aircraft the distances required far outstrip those for equivalent land-based transport.

This, plus a projected increase in passenger numbers, and the need for global coordination, means that decarbonisation will require a consistent, long-term effort from government and industry, both in the UK and internationally. Through these efforts, we are determined to meet this challenge and are committed to UK aviation achieving net zero by 2050.<sup>116</sup>

UK aviation has grown significantly since 1990, with passenger numbers increasing threefold to reach 296 million in 2019.<sup>117</sup> Aviation has been one of the sectors most severely impacted by COVID-19. While we expect air travel to recover, the speed of recovery and longer-term impact of COVID-19 on the aviation sector are uncertain. However, by 2050 the Climate Change Committee (CCC) expects the sector to be the second largest contributor to UK GHG emissions unless significant action is taken.<sup>118</sup>

We are already taking decisive action. Last year we launched the Jet Zero Council, a pioneering partnership between the government and the aviation sector to fast-track zero emission flight and the production of sustainable aviation fuels (SAF) in the UK. This was supported by an initial £21 million investment in SAF and R&D into airport infrastructure upgrades for zero emission flight.<sup>119</sup> Earlier this year we also launched the UK Emissions Trading Scheme (ETS) which will be the world's first net zero carbon cap and trade market.

# The Jet Zero Council

The Jet Zero Council is a partnership between industry and government that brings together senior leaders in aviation, aerospace, and academia to drive the development of new technologies and innovative ways to cut aviation emissions. Its aim is to deliver zero emission transatlantic flight within a generation. The Council is considering how to: develop and industrialise clean aviation and aerospace technologies; establish UK production facilities for SAF and commercialise the industry; and develop a coordinated approach to the policy and regulatory framework needed to deliver net zero aviation by 2050. The government will continue to work closely with industry on our Jet Zero ambition and provide information in a transparent and timely manner. Internationally, the UK plays a lead role, for example in developing and securing agreement to Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) – the first scheme to address CO<sub>2</sub> emissions globally across a single sector.<sup>120</sup> The UK will be one of the earliest participants in the scheme, and recently implemented the monitoring, reporting and verification provisions in the UK.<sup>121</sup> We aim to implement the offsetting provisions for CORSIA by April 2022.

What's more, the UK Emissions Trading Scheme already covers emissions from domestic flights, flights from the UK to the European Economic Area and flights between the UK and Gibraltar. In 2019, these flights made up 44 per cent of all commercial flights to and from UK airports.<sup>122</sup>

This is just the start. Alongside this publication, we are publishing a consultation on Jet Zero – a draft strategy to reach net zero aviation by 2050. Delivering this will require ambitious action across a number of key areas: the development of new zero emission aircraft, accelerating the supply and uptake of SAF, modernisation of our airspace and airports, and the development of trusted and verifiable markets to offset residual emissions. Information also needs to be made available to consumers which allows them to choose the most sustainable routes and travel providers when planning and undertaking their journeys. We need rapid progress in each of these areas to put aviation onto a credible and sustainable pathway to achieving net zero.

As the sector emerges from COVID-19, we need to be very clear about where it will need to get to by 2050 and the years leading up to it. The Prime Minister's Ten Point Plan for a Green Industrial Revolution made clear that this is an opportunity to build back better and align our economic recovery with our environmental commitments.<sup>123</sup> Through our plan and draft Jet Zero strategy, not only will aviation reach net zero by 2050, but we will look to move even sooner in certain areas such as domestic aviation and airports.

And whilst the focus of this plan is on the UK's emissions, there's a bigger prize within our grasp in aviation: the chance to reach an ambitious long-term global agreement on reducing all international aviation emissions. This remains a key area of focus as our international leadership can help deliver much greater emissions reductions and help reduce the risk of carbon leakage<sup>124</sup> and competitive distortions that could undermine our domestic approach.

#### UK Emissions Trading Scheme (ETS)

On 1 January 2021 the government established a UK Emissions Trading Scheme (UK ETS) to replace the UK's participation in the EU Emissions Trading System (EU ETS).125 The UK ETS covers emissions from the UK's power sector, heavy industry and aviation, and puts a cap on the greenhouse gases that businesses can emit, which will decrease over time.



#### ZeroAvia: The world's first hydrogen fuel cell powered flight

On 23 September 2020, the world's first hydrogen fuel cell powered commercial-grade aircraft, a Piper M-class six-seater, completed a full flight including taxi, take-off, circuit and landing at Cranfield Airport. The flight also showcased local hydrogen production onsite at the airport through electrolysis, showing a full zero emission ecosystem. Supported by £15 million of government funding as part of the Aerospace Technology Institute's programme, ZeroAvia is working on scalingup its hydrogen technology for use on a 19-seater aircraft, securing up to 300 design jobs and 400 manufacturing jobs in Cranfield, Warwick and Orkney.<sup>126</sup> Through our zero emission aircraft programme of work, we will help prepare airports and airfields to handle these new forms of aircraft.<sup>127</sup> Further details on our plans to decarbonise aviation will follow in our Jet Zero strategy.

Our plans to deliver the necessary carbon reductions:

# **Clear targets for getting to net zero**

Commitment

## We will consult on our Jet Zero strategy, which will set out the steps we will take to reach net zero aviation emissions by 2050

The strategy will set out our approach to accelerating efficiency improvements of aircraft, airports and airspace, positioning the UK as a global leader in zero emission flight and SAF, and will explore how we can support consumers to make more sustainable travel choices when flying.

#### Commitment

# We will consult on a target for UK domestic aviation to reach net zero by 2040

Following the CCC's recommendation, we will consider whether UK domestic aviation should aim to achieve net zero earlier than the UK's share of international aviation emissions, which could support our wider ambitions by driving innovation and early technology adoption in the UK.

# Commitment -

# We will consult on a target for decarbonising emissions from airport operations in England by 2040

Airports represent a small but material share of emissions from aviation. Several airports including Manchester and Gatwick have already achieved carbon neutrality;<sup>128</sup> and many are now setting more ambitious targets, including Bristol, which is aiming for net zero emissions by 2030.<sup>129</sup> We will consult on introducing an ambitious target across all airports.

# Accelerating decarbonisation

#### Commitment

# We are supporting the development of new and zero carbon UK aircraft technology through the Aerospace Technology Institute (ATI) programme

The ATI Programme provides  $\pounds150$  million of funding per year, matched by industry, for mid-stage collaborative R&D projects from 2013 to 2026.<sup>130</sup>

This includes the ATI led FlyZero study – the first essential step in setting out a detailed plan for how the UK might best contribute to a zero emission aircraft by 2030.<sup>131</sup> As of May 2021, 327 R&D projects valued over £2.9 billion involving 352 unique organisations (including 218 SMEs) have been supported by the UK Government through the ATI Programme.<sup>132</sup>

## Commitment

# We will fund zero emission flight infrastructure R&D at UK airports

We will invest £3 million in 2021/22 through the Zero Emission Flight Infrastructure programme to accelerate R&D into infrastructure requirements at airports and airfields to handle new forms of zero emission aircraft.<sup>133</sup> This will help UK airports and airfields to adapt more quickly to handle these exciting new technologies.

## Commitment

# We will kick-start commercialisation of UK sustainable aviation fuels (SAF)

SAF are expected to play a key role in decarbonising aviation. We are putting in place a comprehensive policy framework that could enable greater SAF uptake than is accounted for within the CCC's Balanced Pathway if the market develops quickly.<sup>134</sup> We have recently launched the £15 million Green Fuels, Green Skies competition<sup>135</sup> to support the production of SAF in the UK, building on the success of the Future Fuels for Flight and Freight Competition.<sup>136</sup> We will invest £3 million to establish a SAF clearing house, the first of its kind announced in Europe, to enable the UK to certify new fuels, driving innovation in this space.

## Commitment

# We will consult on a UK sustainable aviation fuels mandate

In 2021 we will consult on a SAF mandate to blend greener fuels into kerosene, which will create market-led demand for these alternative fuels. With government support for the emerging industry, we want to position the UK as a market leader, capturing significant environmental and economic benefits from the emerging global SAF market, potentially worth up to £1.5 billion per annum for the UK economy by 2040.<sup>137</sup>





#### **Sustainable Aviation Fuels**

Both DfT and industry research has highlighted the potential benefits the UK SAF sector could bring to the entire UK, including up to 11,500 jobs in the next few decades.<sup>138</sup> Our Future Fuels for Flight and Freight Competition (F4C) has received applications from and awarded funding to projects located in areas across the country. With SAF plants already planned in Immingham, Port Talbot and Ellesmere Port, it is clear there is an opportunity to develop these areas further and help them transition to more sustainable fuels production. Our SAF programme of work, boosted by the new £15 million Green Fuels, Green Skies competition, will look at ways to scale up the domestic SAF sector and ensure it can bring about environmental and industrial benefits to the country.

# Commitment We will support UK airspace modernisation

We will support airspace modernisation to deliver quicker, quieter, and cleaner journeys, alongside annual carbon savings of up to 0.6 MtCO<sub>2</sub>e (based on 2019 figures), for the benefit of those who use and are affected by UK airspace. The CAA's updated Airspace Modernisation Strategy, due to be consulted on later in 2021, will provide further detail. Meanwhile, the government is providing up to £5.5 million funding in the years 2020/21 and 2021/22 to ensure the programme remains on track through the global pandemic.

Airspace modernisation has the potential to deliver a reduction in planes queueing in holding stacks over the UK and allow more efficient flight paths to be optimised. These changes will help to bring emissions reductions and potential noise benefits to those living underneath flightpaths, as well as reduce delays.

# Commitment We will further develop the UK Emissions Trading Scheme (ETS) to help accelerate aviation decarbonisation

We will look to improve the system for aviation, for example by reviewing the sector's free allocation in line with the commitment to a net zero consistent ETS cap trajectory, exploring whether to expand the pollutants covered, and determining how the UK ETS will interact with the global offsetting scheme for aviation, CORSIA.

## Commitment

## We will work with industry to accelerate the adoption of innovative zero emission aircraft and aviation technology in General Aviation

General Aviation refers to the operation of non-scheduled commercial and leisure flights. The sector encompasses a wide range of aircraft and types of flying including private and business flights, flight training, emergency services and medical transfer services. The government has published the General Aviation Roadmap which states our support for encouraging the adoption of new technology in the sector.<sup>139</sup>

# Working internationally to deliver emissions reductions

Commitment

We will aim to agree an ambitious long-term global emissions reduction goal in the International Civil Aviation Organization by 2022

A long-term climate goal for international aviation through the UN International Civil Aviation Organization (ICAO), which is consistent with the global temperature goals of the Paris Agreement, remains a top priority.<sup>140</sup> We will build on the success of CORSIA to negotiate for the adoption of an ambitious goal by ICAO's next Assembly in 2022.

A globally co-ordinated, sector-based approach to tackling international aviation emissions reduces the risk that these emissions simply move to other jurisdictions in response to individual countries taking unilateral action. Our focus therefore remains on international action to address emissions from this inherently international sector, alongside bold domestic action.



Figure 12: Decarbonising Transport aviation GHG projections, versus the baseline\*

\* Historic emissions taken from published UK GHG statistics. Emissions projections taken from the DfT Aviation model. The baseline represents no further policy intervention above that which is already in place. Uncertainty bands have been added, based on historic volatility within aviation emissions, to reflect uncertainty surrounding future emissions. GHG savings are driven by fuel efficiency improvements, uptake of sustainable aviation fuels, introduction of zero emission aircraft, and the impact of a carbon price on demand. Positive emissions in 2050 will be offset to ensure that transport achieves net zero.

The figure above shows our projections for carbon emissions from UK aviation (domestic and international). The baseline reflects a counterfactual scenario with no further policy intervention (no carbon price or uptake of sustainable aviation fuels, and only a low annual fuel efficiency improvement of 0.5%).<sup>141</sup>

The policy projection is based on illustrative scenarios that have been produced for the Jet Zero Consultation. These scenarios reflect the range of potential pathways to net zero for aviation, depending on how different technologies and their costs develop over time. The scenarios are based on 2017 forecasts of passenger demand and therefore do not take into account the potential long-term impact of COVID-19 on aviation demand. The upper bound of the projection broadly reflects a continuation of current trends, including annual efficiency improvements of 1.5% and moderate uptake of SAF (5% of total aviation fuel usage in 2050) and the application of a universal carbon price to all flights. The lower bound is a speculative scenario with some zero carbon aircraft and a very high uptake of sustainable aviation fuels (75% of total aviation fuel usage in 2050) - the feasibility of this will depend on the availability of sustainable feedstocks, blending limits and the extent to which costs fall in future. Any residual emissions in 2050 will be offset to ensure that aviation reaches net zero.

# Offsetting

Residual emissions from the aviation sector will need to be offset by credible, verifiable and demonstrable additional offsets that would see an equivalent amount of carbon removed from the atmosphere. Our Jet Zero Consultation will consider how existing market-based mechanisms such as the UK ETS and CORSIA, as well as innovative greenhouse gas removal technologies, can address residual emissions.

# **Carbon Offsetting in Transport**

Carbon offsetting enables individuals and organisations to compensate for any emissions they cannot avoid or reduce by ensuring an equivalent amount of emissions is reduced or removed elsewhere. These emissions savings are generated through the implementation of a wide variety of projects, which range from planting trees and installing solar panels, to technologies which can capture and store atmospheric carbon, such as BECCS and DACCS. To meet net zero across the economy, any residual greenhouse gas emissions in 2050 must be offset. This includes any remaining emissions from transport. In 2019, the government ran a call for evidence on Carbon Offsetting in Transport,<sup>142</sup> including asking for views on whether travel providers

should be required to provide offsets. Many respondents, from a wide range of organisations, suggested that government should focus on direct emissions reductions, and not on offsetting. Some respondents did support offsetting, while noting that it should only be used while the sector also attempts to reduce its own emissions, and not as an alternative. As set out in this document, our primary aim is to reduce and eliminate emissions wherever possible, and having considered responses to the call for evidence, the government does not consider it appropriate at this time to introduce a requirement for travel providers to offer offsets. This position will be kept under review to ensure it reflects the latest developments in technology and offsetting schemes.

Part 2 **The plan in detail:** commitments, actions, and timings

**2**b

# Multi-modal decarbonisation and key enablers





Part 2 The plan in detail: commitments, actions, and timings

















# 2021-22

# 2021

**£20 million** to support the Mode Shift Revenue Support and Waterbourne Freight Grant Schemes Consult on phase out dates for the sale of new non-zero emission HGVs

# 2021

**£20 million** investment in Zero Emission Road Freight Trials



# 2035

End sale of new non-zero emission HGVs (under 26t)\*

# 2040 ~~

End sale of new non-zero emission HGVs (above 26t)\*

\*subject to consultation

#### Jobs & growth





**Co-benefits:** 

**Air quality** 



# Freight and logistics encompass everything involved in the movement of goods, from the largest trucks on our roads to local deliveries, as well as freight carried by rail, water and air. The vast majority of freight is moved by vehicles on our roads. Removing these emissions requires the development and deployment of clean technologies, as well as the use of more sustainable forms of transport, many of which are already available including cargo bikes and rail.

The transition to zero emission technology is already underway for small commercial vehicles. The next decade will see rapid progress and investment in zero emission technology options for larger heavy goods vehicles (HGVs), alongside deployment of supporting infrastructure and increasing demand from businesses. Decarbonising the last mile will create cleaner, more liveable places and there is scope for greater use of artificial intelligence and data tools in the freight sector. This could improve efficiency and cutting emissions, particularly for the many small operators in a fragmented industry. A more integrated, efficient, and sustainable delivery system could also encourage freight to shift from both road and aviation to rail, reducing congestion and emissions.

Our freight sector is critical to our economic wellbeing, ensuring the flow of goods along our supply chains are reliable and efficient. Government is considering its wider approach to the freight sector through its Future of Freight programme. The strategy will describe the government's long-term vision for the freight sector across a range of indicators, including decarbonisation, and provide a policy route map to achieve that vision. The government will take forward work on the strategy throughout 2021.

# Domestic freight transport, by mode: 2019<sup>144</sup>

Goods moved (billion tonne kilometres)



Our plans to deliver the necessary emissions reductions:

#### Commitment

# We are consulting on phase out dates for the sale of all new non-zero emission HGVs

The European truck manufacturers' association, ACEA, has already pledged to end the sale of fossil fuelled HGVs by 2040. We are consulting on ending the sale of new non-zero emission HGVs by 2035, for vehicles 26 tonnes and under, and 2040, for vehicles over 26 tonnes. We are proposing two different dates to encourage the faster uptake of zero emission technology in smaller vehicles, where this product is already reaching the market. Emissions savings may be modest initially but will ramp up considerably as new technologies come to market and operators refresh their vehicle fleets.

#### Phase out dates for new non-zero emission Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs):



and 100% zero emissions at the tailpipe from 2035

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HGVS (above 3.5t and up to and including 26t) End the sale of new non-

zero emission HGVs in this category **by 2035**, or earlier if a faster transition seems feasible\*

HGVS (above 26t) End the sale of all new non-zero emission HGVs by 2040, or earlier if a faster transition seems feasible\*



The Green Paper on a New Road Vehicle CO<sub>2</sub> Emissions Regulatory Framework for the United Kingdom will establish a regulatory framework to deliver these phase out dates and ensure emissions reductions from conventional vehicles along the way.



## Electric HGVs creating manufacturing jobs in the UK

Leyland Trucks, a PACCAR company and the UK's largest HGV manufacturer, recently announced the zero emission DAF LF Electric, coming to market this year. This 19-tonne, fully electric distribution truck has a range of 174 miles on a single charge and can complete a rapid recharge from 20% to 80% in 60 minutes. For urban distribution, this will allow the truck to charge during a driver's rest break. The truck is also designed to power auxiliary equipment such as a refrigeration unit or a crane. The LF model is in addition to the heavier CF Electric, up to 37 tonnes, suitable for interurban, supermarket, and waste collection. Leyland Trucks manufactures the full line of DAF models and is based in Lancashire, employing over 1,000 people in the UK.<sup>145</sup>

#### Commitment

# We will demonstrate zero emission HGV technology on UK roads this year

Given uncertainty about which zero emission technology is most suitable for decarbonising long-haul HGVs, we are investing £20 million this year to support industry to develop cost-effective, zero emission HGVs and refuelling infrastructure across the UK. This includes designing electric road system and hydrogen fuel cell trials, developing technology and UK supply chains, and providing funding to demonstrate and prove real world applications of emerging battery electric trucks.<sup>146</sup>

In line with advice from the Climate Change Committee, turning designs into full trials will inform decisions on the best route to a fully zero emission UK road freight sector, particularly the roll out and location of the necessary supporting infrastructure.<sup>147</sup>

## Commitment

# We will stimulate demand for zero emission trucks through financial and non-financial incentives

Zero emission trucks are already entering the market, particularly in the medium sized categories undertaking urban and regional deliveries. They are suitable for a range of duty cycles and operations but currently have a higher upfront price than diesel equivalents. We have committed to a package of measures to accelerate the deployment of new zero emission HGVs and realise early carbon savings:

- We have provided £582 million to continue the plug-in grants until 2022–23, including support for the plug-in truck grant. The plug-in truck grant reduces the purchase price of zero emission commercial vehicles for consumers. Grant rates for eligible trucks are set at 20% of the purchase price, with up to £25,000 of funding available for the largest HGVs.
- As part of the HGV phase out date consultation, we are consulting on whether to increase maximum vehicle weights for alternatively fuelled and zero emission trucks. This would offset the additional weight from the use of batteries and/or hydrogen storage tanks, increasing their commercial viability and attractiveness to operators.

## Commitment

# We will support efficiency improvements and emission reductions in the existing fleet

Government will continue to use a range of measures to cut emissions from the existing HGV fleet in advance of zero emission alternatives becoming mainstream.

- We will use the Energy Saving Trust's online Freight Portal, to showcase the commercial benefits of improved fuel and logistical efficiencies, including information on available technologies, training and advice which operators can adopt to save time and money while reducing their emissions.<sup>148</sup>
- We will build on the initial work of Zemo Partnership and others in identifying zero emission solutions for transport refrigeration units and auxiliary power units, producing an action plan for their identifying the technologies available, barriers to introduction, and opportunities.
- The Renewable Transport Fuel Obligation will continue to support the use of sustainable low carbon fuels in road vehicles. To increase emissions savings, we will explore the potential to increase the biocontent in fuels for use in compatible vehicles, for example through the use of higher blends of biofuels or drop-in fuels. More details can be found in the section on 'Maximising the benefits of sustainable low carbon fuels'.
- Government has committed to maintaining the fuel duty differential up to 2032, subject to review in 2024, to encourage the use of biomethane and other gaseous fuels that create carbon savings compared to fossil fuels.<sup>149</sup>



# TRAILAR: Combining solar technology with commercial vehicles

TRAILAR is a novel transport innovation that utilises solar technology integrated with commercial vehicles to reduce emissions, fuel and maintenance spend. The technology is applicable to trucks, trailers, refrigerated vans, buses, waste collection vehicles and electric vehicles. The TRAILAR systems can be fitted to new vehicles whilst in production or retrofitted to existing vehicles, both providing a quick return on investment. The advanced onboard system telematics provides endusers data on emission and fuel savings, together with operational insights such as GPS tracking, fleet utilisation and battery conditions.<sup>150</sup>

## Commitment

## We will support and encourage modal shift of freight from road to more sustainable alternatives, such as rail, cargo bike and inland waterways

This will be supported by a package of policies including:

 Investing in the capacity and capability of the rail network for freight, including on projects like the upgrade to the key freight corridor between Southampton and the Midlands.<sup>151</sup> HS2 will release a significant amount of spare capacity on the southern part of the West Coast Main Line, some of which could create opportunities for freight operators to grow and develop.

- The Mode Shift Revenue Support <sup>152</sup> and Waterborne Freight Grant Schemes<sup>153</sup> which will continue to incentivise modal shift and help to remove around 900,000 HGV loads off the road each year.<sup>154</sup>
- Introducing a rail freight growth target to encourage the continued growth of this sector. The modal shift of freight from road to rail would not only lead to a reduction in GHG levels, but also reduce congestion and noise pollution. Further details about this commitment can be found in the section on 'Decarbonising our railways'.
- Our 'last mile' package of measures which will support more sustainable freight alternatives in urban areas.



## Modal shift to rail - Tesco

Tesco is working to decarbonise its operations and become net zero by 2035. Decarbonisation of transport is a key element of this and the business has recently invested £5 million into their rail network to move freight from road to rail. Their freight trains radiate out from their distribution centre in Daventry, in the Midlands, and connect their depots across country. They have a number of new services planned giving further countrywide coverage enabling more HGVs to be removed from the roads. Together, Tesco estimates the service takes 72,000 HGV journeys off the road each year and saves around 24,000 tonnes of CO<sub>2</sub> emissions.<sup>155</sup> In addition Tesco is also committed to electrifying their distribution fleet and encouraging customers to make the shift to electric, through their extensive rollout of EV charge points at their largest stores across the UK.<sup>156</sup>

#### Commitment

# We will take forward measures to transform 'last mile' deliveries

Reforming last mile deliveries has the potential to create healthier and more liveable places. We are committed to transforming the last mile into an efficient and sustainable delivery system. Whether it's new vehicles like e-cargo bikes or improvements to the logistics system, this area is ripe for innovation which offers benefits on top of decarbonisation. Our policies include:

- We will work with industry, academia, and other stakeholders to understand how innovation in the Category L sector can benefit the UK delivery market.
- We are reviewing the Traffic Regulation Order (TRO) legislative framework and will consult on improvements that could deliver near-term carbon savings by reducing the number of vehicle movements later in 2021. New technology and smarter regulation offer significant opportunities for reducing high-carbon delivery traffic, including dynamic kerbspace and delivery management and road and non-road based zero emission logistics solutions. The DfT's Future of Transport programme is investing in pathfinder projects in this field and reviewing if enabling legislation is required.
- We will research the legal and practical issues around compulsory consolidation centres setting the groundwork for future pilots. Pilots will seek to ensure that the majority of urban deliveries are consolidated and transferred to zero emission vehicles for the last mile.
- Parts of some cities are served by as many as 50 waste management and delivery companies, with multiple pickups from businesses on the same street and large numbers of delivery vehicles duplicating trips. Voluntary projects in areas such as Mayfair, in the West End of London, which aim to reduce the number of suppliers, have brought about significant reductions in commercial vehicle traffic. We will pilot allowing some local authorities to franchise certain delivery and waste management services. This will help them to better co-ordinate the number of deliveries and waste collections in certain areas, enabling competition and choice while reducing the number of operators and vehicle movements.

- We will work across government to consider more opportunities for the joint collection of household and nonhousehold municipal waste. As well as increasing access to services and reducing costs, combined collections of both non-household municipal waste and household waste could offer environmental benefits such as fewer waste disposal journeys along streets where there are both homes and nonhousehold municipal waste producers.
- Measures to improve air quality and accelerate the transition to a low emission economy are supported by the £880 million NO2 Programme.<sup>157</sup> This will result in the implementation of Clear Air Zones in a number of local areas, which will help accelerate the turnover to less polluting and zero emission vehicles, encourage vehicle retrofitting to reduce pollutants, and drive work with local businesses to reduce vehicle mileage by consolidating deliveries or using e-cargo bikes.

## Urban freight consolidation – Solent Mobility Zone<sup>158</sup>

Through the Future of Transport programme, the Department of Transport is funding research to promote the development of macro and micro consolidation in the Solent Mobility Zone – encompassing Hampshire County Council, Portsmouth & Southampton City councils and the Isle of Wight. These projects will identify how freight flows and urban space can be adapted to enable more sustainable deliveries and gather data on the impact of freight consolidation on the carbon footprint and congestion impacts of last-mile deliveries. Successful implementation of freight consolidation and zero emission last mile solutions in the Solent region could be replicated in other areas of the UK to help reduce congestion and emissions.



Figure 13: Decarbonising Transport HGV GHG projections, versus the baseline\*

\* Historic emissions are from published GHG statistics. Future HGV emissions are modelled using the National Transport model, adjusted for Decarbonising Transport measures. The uncertainty bands around projections reflect uncertainty on the form of final policy and uncertainties on future demand for road transport – related to future trends in travel, uptake of connected and autonomous vehicles, fuel prices, GDP growth, and historical volatility. Carbon savings are driven by Decarbonising Transport policies and ambitions. The range of uncertainty in emissions projections falls in the policy line as the proportion of vkms by zero emission vehicles increases – this modelling assumes successful implementation of zero emission HGVs for all categories of HGV.

The figure above shows our projections for GHG emissions from HGVs. The baseline is based on firm and funded policies. The Decarbonising Transport projection includes the ambitious set of policies listed above, alongside savings from low carbon fuels policy. This shows emissions starting to fall quickly as we move past 2030 on a trajectory where emissions by 2050 could get to zero. Although all road transport emissions savings are subject to uncertainty, the exact rate of zero emission HGV deployment is particularly uncertain since the preferred zero emission technology for some HGV segments is yet to emerge.



Part 2 The plan in detail: commitments, actions, and timings



#### Local transport infrastructure funding reform

We will reform the way local transport infrastructure is funded to drive and deliver decarbonisation at a local level. We will embed transport decarbonisation principles in spatial planning and across transport policy making to ensure that new development is designed in a way that promotes sustainable travel choices.

We will create at least one zero-emission transport city and four industrial 'SuperPlaces'.

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# At least **£12bn** to support local delivery of transport decarbonisation

By investing at least **£12 billion** in local transport systems over the current Parliament, we will support measures to reduce emissions at a local level, through the levelling up fund, active and public travel funding, intra-city settlements, and EV charging infrastructure.

#### Toolkit of guidance to support local authorities

We will publish a toolkit of guidance and information later this year, to support local authorities in planning and delivering measures to reduce carbon emissions from transport, recognising the important role local areas will play. We will complete our review of how to best represent decarbonisation measures in transport business cases and appraisals to ensure that decision outcomes are aligned with Government's ambitious vision to decarbonise transport by 2050.

Health



# **Co-benefits:**

# **Air quality**



#### Congestion





There is no uniform approach to decarbonisation and each place in the UK has its own unique role to play in ensuring that the UK meets its target of net zero by 2050. For transport, local and regional level organisations are often best placed to make the decisions that will deliver the practical changes required, as well as ensuring local communities and businesses are engaged.

We have already seen many improvements that this place-based approach can achieve. These include supporting levellingup across the UK, reducing congestion in areas where it is a barrier to productivity, bringing extra capacity to greener public transport, improving health and wellbeing by making places more pleasant to live and work in and supporting jobs to deliver our future transport needs.

With strong local leadership and ambition these benefits will be felt by everyone, everywhere. The government will continue to support such an approach through policy, regulation and guidance, and by encouraging strategic coordination and sharing of best practice across authority boundaries. This will help local areas and regions identify and shape the vision of their net zero futures.

We are committed to reforming future local transport funding to better support local leaders to deliver their priorities and achieve key objectives, including decarbonisation and levelling-up.


# Examples of place-based solutions to decarbonising transport across the UK

Government has committed almost £16 million of Active Travel funding to **Greater Manchester**, enabling a further 24 miles of permanent cycling and walking routes in addition to the 55 miles of routes that will be created by December 2021.

> Green hydrogen produced from curtailed wind in North Antrim will supply the fuel at Northern Ireland's first hydrogen fuelling station in Belfast.

Transport for Wales is expanding its demand responsive "fflecsi" bus service in north west Pembrokeshire. The service can adjust its route to pick up and drop off passengers and has the potential to transform public transport services in rural areas.

Didcot Garden Town is an ambitious project to create a green community supporting the building of 15,000 homes and 20,000 new jobs, designed to encourage people to choose sustainable modes of transport.

> Plans are being drawn up for a network of up to 50 **"mobility hubs" across Plymouth** to encourage the use of electric bikes and cars, including in the most deprived neighbourhoods.



The Orkney Islands are home to a series of innovative hydrogen vessel projects and are an internationally recognised centre of excellence for renewable energy, advanced fuels and island decarbonisation.

Aberdeen has developed a cluster of hydrogen activity with two publicly accessible hydrogen refuelling stations and one of the largest and most varied fleets of hydrogen vehicles in Europe.

The **Tees Valley Combined Authority**, in partnership with the UK based **e-scooter company, Ginger**, was the first pilot region to **test the rental of e-scooters** as a zero emission alternative to conventional public transport for shorter trips.

**Coventry** has been announced as the **UK's first all-electric bus town or city**, with £50m to fund up to 300 electric buses and charging infrastructure.

**Milton Keynes** has England's highest ratio of **electric vehicle public charging devices** outside of London, with 133 devices per 100,000 people. The City's Electric Vehicle Experience Centre is the UK's first brand neutral centre dedicated to electric vehicles.

Since the Mayor of London launched the world's first **Ultra Low Emission Zone** (ULEZ) in 2019, it has had a **significant impact on reducing the number of older more polluting vehicles** that enter London's central zone.

As part of the **£28m Solent Transport Future Transport Zone project, a drone delivery service is being trialled** to transport medical supplies from the mainland to St Marys Hospital on the Isle of Wight, taking delivery vehicles off local roads. Our plans to deliver the necessary carbon reductions include:

#### Commitment

We will support decarbonisation by investing more than £12 billion in local transport systems over the current Parliament, enabling local authorities to invest in local priorities – including those related to decarbonisation such as reducing congestion and improving air quality

This investment will be delivered through existing funding streams where decarbonisation sits alongside other core government objectives, in order to support local delivery of transport decarbonisation:

- £5 billion of new funding to overhaul bus and cycle links for every region outside London to level-up local transport connections throughout the country.<sup>159</sup>
- The £4.8 billion Levelling-Up Fund will invest in infrastructure that improves everyday life across the UK, including upgrading local transport, regenerating town centres and high streets and investing in cultural and heritage assets. Within the local transport theme, proposals are requested for schemes that will reduce carbon emissions, improve air quality, cut congestion, support economic growth, and improve the experience of transport users. The fund will invest in a range of local projects across the UK, including public transport and active travel infrastructure.<sup>160</sup>
- Funding for City Region Sustainable Transport Settlements: a £4.2 billion investment in the transport networks of eight city regions across England starting in 2022–23.<sup>161</sup> This will support these city regions to improve intra-city transport and deliver the government's transport ambitions, including decarbonisation. £50 million of resource funding has been provided to city regions in 2021/22 to support the development of their plans.<sup>162</sup>

• £20 million of funding is available to local authorities in 2021-22 through the On-Street Residential Chargepoint Scheme (ORCS), to support the costs of installing chargepoint infrastructure for residents without off-street parking.163 DfT funds the Energy Saving Trust (EST) to provide expert advice and support to local authorities throughout the ORCS application process. Local authorities in England can also take advantage of EST's Local government Support Programme, which offers free, impartial support on developing and delivering EV strategies. Government has also committed a further £90 million for local authorities to fund local EV charging infrastructure. This will support the roll out of larger, on-street charging schemes and rapid hubs in England.<sup>164</sup>

#### Commitment

#### We will drive decarbonisation and transport improvements at a local level by making quantifiable carbon reductions a fundamental part of local transport planning and funding

Local Transport Plans (LTPs)<sup>165</sup> are existing statutory requirements that set out holistic place-based strategies for improving transport networks, proposed projects for investment and, ultimately, lay out how key objectives will be achieved. Going forward, LTPs will also need to set out how local areas will deliver ambitious guantifiable carbon reductions in transport, taking into account the differing transport requirements of different areas. This will need to be in line with carbon budgets and net zero.



We will support local areas by providing guidance on designing sustainable transport solutions through LTPs. Having quantified plans in place will ensure that every place understands the level of ambition required to reduce emissions and ensure that this ambition can be translated into action. We also want to facilitate collaboration between areas, similar to that between Coventry and its surrounding areas in the case study below, and cross regional work led by Sub-National Transport Bodies.

For future local transport funding, we will transition to a state where this is conditional on local areas being able to demonstrate how they will reduce emissions over a portfolio of transport investments through LTPs, which will become a focus of engagement between central and local government about future funding. We are also committed to designing future funding opportunities in a way that minimises local burdens and costs and will engage closely with local areas to plan for this transition.

While we work toward revitalised LTPs, we will continue to ensure that existing committed investments achieve emissions reductions. To enable this, local investment plans will need to commit to certain measures. The approach taken to this will depend on the funding stream and its associated assessment criteria for allocating funding. For example, Gear Change sets out the government's ambition to create cycle and walking corridors and the Bus Back Better National Bus Strategy sets out how access to bus transformation funding will require publication of Bus Service Improvement Plans and local commitment to bus franchises or partnerships.

#### The role of Sub-National Transport Bodies

Seven Sub-National Transport Bodies (STBs) cover all of England, apart from London, and support the government's aims to level-up the country. STBs are by their nature spatially focused, and bring together stakeholders in each region, representing local government and business. STBs can support the government's decarbonisation objectives by joining up local plans across a wider geography, to capitalise on economies of scale and ensure coherence across local authority borders.

Government tasks each STB with developing a transport strategy for their region – a framework for a place-based approach which helps government identify transport schemes to invest in. As part of this, the STBs are working to turn national priorities into actionable plans for their region. Every STB is developing a strategy to decarbonise the transport system, which is rooted in the opportunities and needs of their region. England's Economic Heartland (EEH) STB co-ordinates this workstream and help share best practice across STBs to enable long-term sustainable connectivity in all types of communities across England.



## Working together to decarbonise Coventry and the surrounding areas

Coventry City Council is committed to reducing its emissions and driving the shift toward a low carbon economy whilst continuing to meet the housing, transport, and other needs of the city. There are already a range of innovative initiatives being developed in and around Coventry to achieve this and deliver a wide range of benefits including job creation, improved public health, more green space, and improved accessibility.

Coventry City and Dudley Councils are collaborating to help establish the West Midlands as a world-class business investment location by developing Very Light Rail (VLR) technology in the UK.

The Coventry VLR (CVLR) programme aims to create an affordable integrated urban VLR system that comprises a light weight, low cost vehicle and innovative trackform. The low cost means it can be implemented at scale, thereby driving significant mode shift to a low carbon mode, with an ambition to achieve zero carbon by using 100% renewable energy to power the system.

Coventry City Council are taking a 'total system' approach looking at last mile solutions (e.g. e-scooters) and the creation of mini transport hubs. Autonomous operation of VLR is also being explored as a means of allowing a higher frequency of operation to further drive mode shift. The first VLR route for Coventry will link the rail station, city centre, and University Hospital, and the Council's ambition is to have an operational section in place by late 2025. Ultimately, the Council plans to link the first route to a City Linking Energy and Network Hub (CLEAN Hub); a hub of innovative, low carbon transport and energy technology, providing infrastructure and services that support the decarbonisation and growth of the local and regional economy, and support the UK's national transition to net zero by 2050. It is expected that the affordable VLR system will be commercially available to other towns and cities across the UK and globally, thus enabling significant modal shift and reduction in emissions nationally.

The Dudley programme will deliver a new, national innovation centre and test track facilities at Castle Hill, in Dudley, where VLR technology, including CVLR, will be tested and improved for future implementation. The Council is also working with Transport for West Midlands on the Mobility Credits pilot programme which will give Coventry residents with an older, polluting car the chance to exchange their vehicle for mobility credits. The credits could be spent on bus and rail travel, as well as new transport modes such as car clubs or bikeshare schemes.

#### Commitment

#### We will publish a Local Authority Toolkit in 2021, providing guidance to support local areas to deliver more sustainable transport measures

As of February 2021, over 70 per cent of local authorities had declared the urgent need to act on the causes and impacts of climate change.<sup>166</sup> To support turning these declarations into action plans to reduce GHG emissions from transport, government will publish a toolkit of guidance and information to help local authorities build business cases, develop innovative sustainable transport policies, secure funding and deliver measures on the ground.



- Demand Responsive Transport
- Promoting zero emission car clubs
- Cycling infrastructure and encouraging active travel
- Behaviour change through communications
- Encouraging car / ride sharing

- Space reallocation
- Greater use of existing planning powers allowing for the implementation of low carbon transport i.e. spatial planning
- Best practice implementation of mobility hubs and transport hubs

Reducing the

need to travel



#### Measures considered for inclusion in the **Transport Decarbonisation Toolkit** for local authorities, which will be published later this year

ULEZ Charging schemes

- Parking policies more broadly e.g. park and rides
- Congestion charging
- Emissions zones



#### Decarbonising the vehicle fleet

- Ultra Low and zero emission buses
- EV infrastructure and incentives
- Freight / e-cargo bikes
- Decarbonisation of LAs' own fleets, and requiring contractors to use zero emission vehicles

These measures have been the result of continued engagement with local authorities and Sub-National Transport Bodies to understand their existing challenges in reducing transport emissions.

## In some areas, local authorities have encouraged changes in travel behaviour with charging schemes

In some areas, local authorities have decided that charging schemes can provide fair and efficient mechanisms for reducing congestion and emissions while also raising additional funding to support greener public transport. A range of options are open to local places, including congestion charging and Low and Ultra Low Emission Zones (LEZs and ULEZs). A number of areas are choosing to introduce Clean Air Zones, with the specific objective of reducing Nitrogen Dioxide concentrations to within legal levels in the shortest time possible.<sup>167</sup>

In London, income from the Congestion Charge, LEZ and ULEZ is spent on improving transport in line with the Mayor's Transport Strategy. Although it has been difficult to distinguish between COVID-19 impact and ULEZ impact in 2020, in January 2020, after its first ten months of operation, the ULEZ had a significant impact on air quality, with an observed increase in the rate at which older vehicles were removed from the fleet, or replaced, above the normal churn.<sup>168</sup>

Government has already published a Clean Air Zone Framework to support those local authorities implementing these zones in line with legal obligations, and through the LA Toolkit, we will provide further guidance and information to help places design and implement wider schemes which consider how private vehicles are used.<sup>169</sup>

#### Commitment

## We will embed transport decarbonisation principles in spatial planning and across transport policymaking

The government wants walking, cycling or public transport to be the natural first choice for journeys. Where developments are located, how they are designed and how well public transport services are integrated has a huge impact on whether people's natural first choice for short journeys is on foot or by cycle, by public transport or by private car. The planning system has an important role to play in encouraging development that promotes a shift towards sustainable transport networks and the achievement of net zero transport systems.

Traffic issues have often caused opposition to housebuilding. There is a legacy of developments that give people few alternatives to driving, are difficult to serve efficiently by public transport and are laid out in ways which discourage walking and cycling. Developments which are planned to minimise car use, promote sustainable transport choices, and are properly connected to existing public transport could help make new building more publicly acceptable. The National Planning Policy Framework (NPPF) makes clear we already expect sustainable transport issues to be considered from the earliest stages of plan-making and development proposals, so that opportunities to promote cycling, walking and public transport are pursued.<sup>170</sup> Planning policies should already provide for high quality cycling and walking networks and supporting facilities such as cycle parking (drawing on Local Cycling and Walking Infrastructure Plans). The NPPF also outlines that new developments should promote sustainable transport, taking opportunities to promote walking, cycling and public transport. However, while many local plans already say the right things, they are not always followed consistently in planning decisions. Developments often do little or nothing meaningful to enable cycling and walking, or to be properly and efficiently accessible by public transport. Sometimes they make cycling and walking provision worse. We can and must do better.

Last summer, the government set out its vision for a new and improved planning system in the Planning for the Future White Paper, a vision to make good on the government's pledge to build back better, build back faster and build back greener. The White Paper set out how the planning system is central to our most important national challenges, including combating climate change and supporting sustainable growth.

A reformed planning system can assist in achieving the ambition of a zero emission transport future. The planning reforms will provide an opportunity to consider how sustainable transport is planned for and importantly how it is delivered to support sustainable growth and drive more sustainable use of our existing built environment e.g. planning for new development around existing transport hubs, for all developments to be easily and safely accessible and navigable by foot and cycle, and to make existing cycling and walking provision better. Through good design and proper consideration of the needs of our communities, we can better connect people, making communities more accessible, inclusive, safe, and attractive as well as promoting the principles of 20-minute neighbourhoods.<sup>171</sup> We are working with the Ministry of Housing, Communities & Local government and the Local government Association to place cycling, walking and public transport provision at the heart of local plan making and decision taking for new developments. In doing so, we recognise the particular challenges faced by rural and remote areas in this regard, and will work, including through the upcoming Future of Transport: Rural Strategy, to ensure policies recognise differing geographies.

Gear Change committed to establishing a new body, Active Travel England (ATE), to promote cycling and walking. One of its functions will be as a statutory consultee within the planning system to press for adequate cycling and walking provision in all developments over a certain threshold, and to provide expert advice on ways in which such provision can be improved. Work on this is underway and we expect the body to be established this year. ATE will be a strong and clear voice, championing the delivery of sustainable transport and active travel options across the country and securing better outcomes within the planning system both in terms of plan making and decision taking.

The National Model Design Code sets out a process for developing local design codes and guides, with supporting design guidance on movement and public spaces including streets. It outlines an expectation that development should consist of a well-connected network of streets with good public transport and an emphasis on active travel modes including walking and cycling. Building on this, we will also ensure that an updated Manual for Streets aligns with these principles and is routinely used for plan making and decision taking to secure better outcomes for our streets and public realm. These documents can play a key role in delivering high quality, accessible, secure and safe cycle storage. We will work with Active Travel England and other key stakeholders to ensure that the importance of securing high quality cycling and walking provision is embedded within the planning system.

We recognise that the government has a role in helping Local Planning and Highways Authorities to better plan for sustainable transport and develop innovative policies to reduce car dependency. We need to move away from transport planning based on predicting future demand to provide capacity ('predict and provide') to planning that sets an outcome communities want to achieve and provides the transport solutions to deliver those outcomes (sometimes referred to as 'vision and validate'). We will continue to work with MHCLG to identify how we can best support local authorities to develop innovative sustainable transport policies as part of the planning process, how this can be used to better assess planning applications, and better monitor local transport outcomes to deliver on our ambitions for sustainable transport use.

Achieving these ambitions will require a long-term collective effort across government, local authorities, communities, businesses, and developers. We are exploring with MHCLG how the planning system can be designed to facilitate better collaboration and planning for growth across local authority boundaries, with all key stakeholders involved, to ensure that we align that growth with both strategic and local infrastructure delivery to make good on our manifesto commitment to put infrastructure first and drive growth sustainably. The public sector, too, must play its part. Too many recent developments by bodies such as the NHS, including many new hospitals, have been on out-of-town sites which are difficult to reach by public transport. As well as generating car traffic (and difficulties with parking), such sites are inherently less inclusive to patients who cannot drive. Future developments must be more accessible to public transport, walking and cycling. Schools, colleges and universities also have a part to play in encouraging sustainable transport to and from their sites. It is imperative that we provide real modal choice to and from these institutions, to ensure the next generation are healthier, more active and more likely to maintain sustainable travel behaviours.

From our recent experiences of the COVID-19 pandemic as well as in the commitments in this plan, it is clear that we have the opportunity to change the way we think about movement and to challenge our behaviours. With technological advances and our changing needs for goods and services, it is imperative that we also create a planning system that is capable of supporting innovation in the way we travel and the way we process, move and distribute our goods more sustainably.





## Chelmsford Garden Community: From planning principles to innovative and sustainable transport proposals

Chelmsford Garden Community (CGC) is one of government's recognised garden villages and has received support and financial backing from the Garden Communities Programme. Situated northeast of Chelmsford, it will eventually provide around 10,000 new homes and significant employment areas to support a new community of up to 30,000 people.<sup>172</sup> The design will be underpinned by the Town and Country Planning Association's Garden City philosophy<sup>173</sup> and Chelmsford City Council's Spatial Principles contained within its adopted Local Plan<sup>174</sup>.

These principles will ensure that it will be highly sustainable on all levels, designed as connected, walkable neighbourhoods. Walking and cycling trails will link the things that people generally access on a day-to-day basis such as green areas, leisure facilities, primary schools, shops, and employment opportunities, all within 15 minutes' walk or 5 minutes cycling distance. Measures such as regular travel guidance, free cycling lessons, and gift vouchers have already doubled pedestrian and cycling journeys in the past four years.

The first phases of the CGC called Beaulieu and Channels are being built and already include an express bus service. In June 2019, 54% of households at Beaulieu received one year's free travel on the bus service, and research shows that as a result, the recorded trip rates for the private car are 30.2% lower than originally modelled in the morning peak and 16.2% lower in the evening peak.<sup>175</sup> In addition, Chelmsford's Local Plan policies require new car sharing schemes and an electric vehicle charging point for each new home.

While future development at CGC will still need servicing space and some on-plot parking, they are already planning ahead to when self-driving and autonomous vehicles might reduce the use of private cars and render these obsolete, and how parking spaces might then be reclaimed as community or private space.

#### Commitment

## We will create at least one zero emission transport city and four industrial 'SuperPlaces'

We will establish at least one zero transport emission city. We will set out shortly further details of how we intend to take forward the commitment in the Prime Minister's 2020 Cycling and Walking Plan for England<sup>176</sup> to work with at least one small or medium-sized city which wants to create a zero emission transport system.

As set out in the Prime Minister's Ten Point Plan for a Green Industrial Revolution<sup>177</sup> we will also create four world-leading industrial 'SuperPlaces' in areas such as the North-East, the Humber, North-West, Scotland and Wales, that will unite clean industry with transport and power.

#### Commitment

#### We will complete our review of how to best represent decarbonisation measures in transport business cases and appraisals

We are reviewing the evidence base for measuring the carbon impacts of schemes in transport business cases and appraisals to ensure that decision outcomes are aligned with government's ambitious vision to decarbonise transport.

Impacts on carbon must be accurately assessed in transport appraisal and presented with prominence to decision-makers. The value government places on changes in carbon emissions is regularly reviewed to ensure an approach which is fit for purpose and based on the latest scientific evidence. In particular, the existing approach to carbon valuation is currently under review in light of recent changes in the UK's GHG emissions reduction targets. Following this, BEIS is expected to publish updated carbon values for use in policy appraisal later this year, which we will reflect in DfT appraisal guidance and tools at the earliest opportunity in order to give scheme promoters time to prepare to include the updated values in a full appraisal.

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In interim guidance issued in July 2020, the Department updated the vehicle mix forecasts to be used in appraisal using the latest evidence and based on current policies.<sup>178</sup> These reflect updated modelling assumptions, including the introduction of new tighter CO<sub>2</sub> emissions standards for cars, vans and HGVs to be implemented in 2025 and 2030, new sales figures showing a further decline in sales of diesel cars compared to 2018, and updated consumer choice modelling of the take-up for ultra-low emissions vehicles, which collectively have resulted in updated electric vehicle and fuel efficiency forecasts. These were incorporated into further updates to guidance, issued in May 2021, as part of a broader set of changes associated with the TAG Route Map, which will be made definitive in July 2021.<sup>179</sup>

Furthermore, we are reviewing Transport Appraisal Guidance to reflect the enhanced assessment of carbon that projects are required to undertake, which includes consideration of capital carbon.

#### Light Rail - an existing zero emission choice

Light rail schemes can be transformational for highly populated areas bringing societal, economic, and environmental benefits to our cities by connecting communities to jobs, hospitals, and leisure activities.

There are currently eight electric-powered light rail systems in England, encouraging greater use of public transport, further reducing total carbon emissions, and tackling congestion.

Between 2010 and 2018, passenger journeys on Greater Manchester Metrolink increased by 128 per cent. Over the same period, they increased by 94 per cent on Nottingham Express Transit (NET). Investments in NET formed part of a wider package to reduce private car activity and encourage public transport use; traffic volumes in Nottingham grew by 30% less than the England average.<sup>180</sup>

As we look to build back greener, Light Rail has the potential to be an environmentally

sound local transport solution in its own right. West Yorkshire's Mass Transit Vision<sup>181</sup> highlights the potential for attracting inward investment and growth through providing access to previously underdeveloped or less well-connected areas.

Recognising the importance of light rail, now and in the future, the government has provided more than £200 million of revenue support since April 2020 to Light Rail networks through the Revenue Grant and Restart Grant support schemes.<sup>182</sup> This funding has ensured that light rail services continued to run throughout the pandemic, enabling essential journeys such as those made by NHS staff and other key workers.

In 2019, the government conducted a call for evidence on how to better use and implement light rail and other rapid transit solutions in cities and towns. The Department is incorporating insight and analysis from the Call for Evidence to inform future policy.



Part 2 The plan in detail: commitments, actions, and timings

## Maximising the benefits of sustainable low carbon fuels

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Throughout the 2020s, we will seek to identify additional measures to maximise GHG savings from the use of low carbon fuels and increasingly encourage uptake in sectors where they will be required in the long term, including aviation and maritime.



2021

We will amend the Renewable Transport Fuel Obligation (RTFO) to increase the main target in the period up to 2032

## 2022

We will develop a strategy for low carbon fuels, from now until 2050, to set a clear vision for the sector

\*Projections for jobs and GVA are based on those for the sustainable aviation fuels (SAF) sector as SAF is expected to make up a large proportion of the low carbon fuel mix by 2040.

### **Co-benefits:**

Jobs & growth



#### Low carbon liquid and gaseous fuels – predominantly biofuels deployed in road transport – deliver about a third of all domestic transport carbon savings under current carbon budgets.<sup>184</sup> Our overall strategy is to deploy low carbon fuels across the transport sector in a way that achieves maximum greenhouse gas savings.

The availability of sustainable raw materials for low carbon fuels is however limited, with increasing demands from other sectors. It is therefore important to prioritise the use of low carbon fuels for modes with limited alternatives to liquid and gaseous fuels, such as aviation. To be genuinely "net zero", the use of most low carbon fuels will need to be combined with carbon capture and storage. Their limited air quality benefits (when used in internal combustion engines) also need to be considered.

In the short term, low carbon fuels will continue to be an available and flexible resource to deliver immediate emissions savings in all road vehicles. The medium-term need is expected to shift to long-haul HGVs in the road sector with increasing demand also from aviation and maritime which are likely to need the largest proportion of low carbon liquid or gaseous fuel in the longer term.

Sustainable low carbon fuels offer major industrial benefits. Given the location of many UK production plants and the economic benefits they can provide, this industry is well-suited to support efforts to reduce regional disparities. There is a genuine strategic opportunity for the UK to be a global leader in low carbon fuel production, including SAF and renewable hydrogen. Our ambitious policy will encourage technology and infrastructure developments, expansion of existing plants and the building of new plants across the UK.



An estimated

## 5.4 MtCO<sub>2</sub>e were saved in 2019 by

displacing fossil fuels with low carbon fuels, which is

#### equivalent to taking 2.5 million

cars off the road. In 2019, low carbon fuels accounted for approximately **5%** of total UK fuels by volume, of which **2/3** were made from waste materials, such as used cooking oil, fatbergs, food waste or road side grass.<sup>185</sup>

#### Supporting the UK's low carbon fuels market and industry

Since 2008, our Renewable Transport Fuel Obligation (RTFO) has incentivised the supply of low carbon fuels for road vehicles and non-road machinery with a mandate that creates demand and compensates for their higher production costs compared with fossil equivalents. We have led the way to ensure our measures are governed by strict sustainability criteria, discourage supply of fuels that do not offer significant GHG savings compared to fossil fuels and avoid uptake of low carbon fuels beyond sustainable levels. The RTFO sets an annual obligation on fuel suppliers to supply a certain share of renewable fuels – with the overall target currently set to increase from 10.1% of total transport fuel in 2021 to 12.4% in 2032 and then remaining at that level. Increasing RTFO targets can help achieve higher carbon savings, provided they are met with genuinely sustainable fuels. A particular concern is that the production of biofuels can lead to direct or indirect land use change such as deforestation. Targets therefore need to be set carefully, with appropriate enabling measures to deliver genuine GHG savings and address constraints around sustainability and feedstock availability.<sup>186</sup>

Our plans to deliver the necessary emissions reductions:

#### Commitment We will increase the main Renewable Transport Fuels Obligation (RTFO) target

Alongside this document, we have published the government response to a recent consultation, setting out our plan to increase the RTFO main obligation by five percentage points, increasing it from 9.6 per cent in 2021 to 14.6 per cent in 2032.<sup>187</sup> This is estimated to achieve additional carbon savings of up to 20.8 MtCO<sub>2</sub>e over this period.<sup>188</sup> We have committed to implement other proposals set out in that consultation, including updating the sustainability criteria; making recycled carbon fuels (RCFs) produced from waste materials eligible for incentives; and extending support to renewable fuels of non-biological origin (RFNBOs) used in maritime, rail and non-road mobile machinery.

The 'development fuels' sub-target, which incentivises specific fuels of strategic importance, is already set to increase from 0.5 per cent in 2021 to 2.8 per cent by 2032. We will review this target as part of the statutory RTFO review due to be published in 2023.

#### Commitment

## We will introduce petrol with up to 10 per cent ethanol (E10) as standard petrol in September 2021

On 25 February we announced that E10 would become the standard petrol. E10 can reduce GHG emissions from a standard petrol car by around 2 per cent. Combined with the RTFO target increase above, this could result in additional carbon savings of 0.7-0.8 MtCO<sub>2</sub>e per year, equivalent to removing 350,000 additional vehicles from our roads.<sup>189</sup> Introducing E10 will provide a significant boost to the UK ethanol industry and farmers, predominantly based in the north-east of England where it will secure jobs and encourage further investment.

#### Commitment .

#### In cooperation with stakeholders, we will review the role of fuels with higher biocontent starting this year and explore potential measures to remove existing market barriers for use in certain compatible vehicles

Achieving higher carbon savings from low carbon fuels in the short to medium term depends on the supply and uptake of drop-in fuels and higher blend biofuels for compatible vehicles. The RTFO already provides basic support for any biofuel, irrespective of what level it is blended with fossil fuels, as well as additional incentives for drop-in fuels. However, further measures might be needed to make use of opportunities to increase the use of higher blends and drop-in fuels, such as those discussed in a recent study on use in heavy duty road vehicles.<sup>190</sup>

#### Commitment

#### We will seek to maximise the use of low carbon fuel in aviation and maritime as detailed in other relevant commitments elsewhere in this plan

As highlighted in the relevant sections, measures to promote low carbon fuels are being considered for aviation and maritime, where there is likely to be a market for as much sustainable low carbon fuel as can be produced and used in the UK well past 2050. We will explore how cross-modal policies, including the RTFO, can continue to support this process and determine measures to increase sustainable supply of these specialised fuels. The increased use depends on the rapid development of new advanced low carbon fuels, predominantly from waste feedstocks, during the 2020s.

#### Commitment

#### We will develop a strategy for low carbon fuels, from now until 2050, to set a clear signal about the government's vision for the sector

We will work with stakeholders to develop a longer-term strategy for low carbon fuels, reflecting the opportunity to evolve the UK industry to meet decarbonisation challenges across transport sectors. We will start engagement on this strategy this year to develop a common understanding of the transition ahead, its opportunities and risks, and identify what additional policy measures may be required to encourage uptake and use across transport modes to 2050. This will be published in 2022.

The strategy will also look at how carbon savings from low carbon fuels could be maximised in a sustainable manner while making the most of new fuels and technologies. The carbon savings delivered in practice will depend on a range of factors, including the rate of road vehicle electrification and how supply and demand for different low carbon fuels may change over time.

The strategy will set out the likely transition from road to other transport sectors, the size of the opportunity for UK industry, the ways in which this transition could be supported, and interactions with other sectors such as heat and chemicals.

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#### **Advanced Biofuels Demonstration Competition**

Launched in 2014, the Advanced Biofuels Demonstration Competition (ABDC) was created with the aim of supporting innovative projects that turn low value wastes into high value fuels. The ABDC successfully supported the construction of two cutting edge plants in the UK: Nova Pangaea Technologies in Teesside, awarded £4.5

million for demonstrating their forestry wastes to ethanol process; and Advanced Biofuels Solutions in Swindon, which received £11 million for a first-of-a-kind waste gasification plant. This support has proved crucial as the projects embark on the next stages of their commercial development and contribute to innovation in the sector.

#### Low carbon fuels

Fuels that can provide GHG savings compared to fossil fuels on a life-cycle basis under the RTFO.

#### **Renewable fuels**

Fuels made from biomass and renewable electricity

#### **Biofuels**

Fuels made from biomass (incl. wastes, residues, crops), e.g. bioethanol, biodiesel, biogas.

- Renewable fuels of Non-Biological Origin (RFNBO),
  e.g. hydrogen produced via electrolysis using renewable electricity, fuels made from renewable hydrogen and carbon dioxide.
- + Recycled Carbon Fuels produced from fossil waste

Note: Fuels listed are those considered to be able to deliver substantial carbon savings compared to fossil fuels and are currently supported under the RTFO or under consideration for support."



Part 2 **The plan in detail:** commitments, actions, and timings

## Hydrogen's role in a decarbonised transport system

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# Hydrogen is a key strategic component to fully decarbonising the UK's economy.

The UK has strengths and expertise along the hydrogen value chain, particularly though our science and innovation ecosystems, supported by a long history of gas technology development and an integrated national network. We are well positioned to lead on the production of green hydrogen with significant technical expertise in electrolysers from world leading companies such as ITM Power, and the potential to generate significant quantities of renewable energy from offshore wind. We are home to world leading fuel cell powertrain companies such as Ceres Power and Arcola, and parts suppliers such as Johnson Matthey. Our unparalleled access to carbon capture and storage sites is an enabler for the production of blue hydrogen.

In transport, our focus is on the use of genuinely 'green' hydrogen, maximising its opportunities so that it can play a full part in our renewable energy system. Use of renewable hydrogen is already incentivised under the RTFO. Hydrogen is likely to be most effective in transport in areas 'that batteries cannot reach', where energy density requirements or duty cycles, weight and volume restrictions and refuelling times make it the most suitable green energy source.

Our dedicated R&D funding and support is now focussed on rail, maritime, aviation and heavy road freight: sectors where there is not yet a proven 'winning' technology, where hydrogen offers in-use advantages and the largest global market potential. We want to maximise its potential alongside electrification on trains, buses, and coaches.

#### Commitment

#### The UK Government will publish an overarching hydrogen strategy in summer 2021, which will focus on the increased production of hydrogen and use across the economy, including for transport

Progressing the UK's hydrogen economy means rapidly expanding our existing expertise, and infrastructure to create a critical mass and overcoming barriers to production and use. There are areas across the UK with access to the necessary skills base, a range of potential customers (industrial, domestic, transport), as well as ready access to renewable electricity to make quick headway. Hydrogen transport hubs unite transport with industry and energy sectors and can be used to drive local industrial strategies, levellingup, and local benefits. They accelerate technology development, test at scale providing better understanding of operational costs, and enable the benefits to be felt by users sooner.

#### Commitment We will invest £3 million in 2021 to establish the UK's first multi-modal hydrogen transport hub in Tees Valley

Our first hub launched last year in Tees Valley and has £3 million of funding this year to enable hydrogen for transport to develop alongside its application in the industrial, energy and other sectors. The hub is bringing together government, industry, and academia to focus our future hydrogen research and development, real world testing and demonstrations. A hub masterplan has identified options in the Tees Valley, as well as providing a blueprint for the creation of hubs in other areas across the UK.<sup>191</sup>

The funding will kick-start activity across the region, supporting collaborative R&D pilot projects and pop-up trials that demonstrate hydrogen technology solutions across transport modes and forge new industry and academic partnerships.



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The Holyhead Hydrogen Hub aims to build a pilot hydrogen plant to support the decarbonisation of the heavy goods vehicle and maritime markets on the Isle of Anglesey (Ynys Môn). The emerging design for the pilot plant aims for an initial capability to produce 400kg of hydrogen per day. Over the medium-term, the project intends to scale up and expand into electrolytic ('green') hydrogen production. The region's favourable natural and physical resource endowments and position as a cross-border multimodal transport corridor mean it is well-placed to test, develop and apply this strategically important net zero technology.

The proposal speaks to the UK Government's intention to explore how hydrogen can play a key role in decarbonising a range of sectors and it will provide £4.8 million, subject to business case and other relevant approvals, to support the construction of the pilot project. The project, led by a local development agency, Menter Môn, has received additional development funding from the Welsh Government.<sup>192</sup>



Part 2 **The plan in detail:** commitments, actions, and timings



## Future transport – more choice, better efficiency



Future transport - more choice, better efficiency

#### We will take action to increase average road vehicle occupancy by 2030.



### 2021 2021 2021 Supporting car clubs to We will establish a Providing places, business go fully zero emission and people with accurate Commute Zero programme carbon emissions data 000 2021-2022 202 We will explore the introduction of a new sustainable Providing guidance for local travel reward scheme supported by businesses, authorities to support shared car community organisations and charities ownership and shared occupancy **Co-benefits:** Jobs & growth **Air quality** Congestion



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# Embracing new technology, shared mobility and using data to drive change

#### Zero emission technology will help deliver net zero and offers some early opportunities to deliver a lower carbon, better, transport system in parallel.

Technology is already driving radical changes in transport, with profound implications for users and businesses from digital connectivity, artificial intelligence, automation, and data innovation. By better understanding people's different needs and preferences, including motivations for, and barriers to, using these technologies, we can encourage changes in behaviours and more sustainable travel to increase the pace of decarbonisation.<sup>193</sup>

Our Future of Transport programme fosters the development and deployment of technology, ensuring the benefits are spread to all areas of the UK.<sup>194</sup> It targets emissions cuts from new and existing mobility services and encourages modal shift.

Innovation to reduce emissions is not limited to technology. Actions taken by businesses and other organisations to make journeys more efficient, such as organising car sharing, are not the product of recent advances in technology. We want to harness and share the best ideas, provide clear data on the carbon emissions, and remove any barriers preventing organisations from reducing their emissions. The commitments in this section can help deliver all the co-benefits set out in the plan. They can also directly help tackle congestion by supporting fewer overall car and other vehicle trips, supporting better journeys for all road users.

## **Shared mobility**

Shared mobility services can decarbonise and decongest our transport network, offer an alternative to traditional mass transit, and provide new forms of transport for the first and last mile connecting to public transport.

#### Shared ownership/access

This includes formal and informal sharing or access to a vehicle. Examples include:

- **Back to base and one-way car clubs:** (also known as car-sharing) where electronic systems are used to provide customers unattended access to cars for short-term rental, often by the hour.
- **Peer-to-peer sharing:** where privately-owned vehicles are mediated through an app to organise the booking, allowing individuals to rent out their private cars on a short-term basis.

## Shared occupancy/shared at the point of use

This includes the formal and informal sharing of rides in privately owned vehicles between unlicensed drivers and passengers who share a common or similar route. Examples of business models include:

- **Ridesharing/lift sharing (with known people):** the co-ordinated matching up of rides between travellers. The driver offers a ride and is only recompensed the equivalent expenditure for that journey
- Ride-pooling (with unknown people): services where users book a ride, usually through an app or digital platform, which they are prepared to share with an unknown third party.

#### Demand Responsive Transport in the West Midlands

The Transport for West Midlands £20 million Future Transport Zone is testing a range of innovative mobility services in real-life environments at scale. As part of the trials, the 'West Midlands Bus on Demand' service began operation in April. Through this service, consumers can book a ride in the West Midlands On Demand app by inserting a pick-up and drop-off location. Consumers are then matched with other passengers heading in the same direction. It is operating in the surrounding areas of the University of Warwick, including Kenilworth, Warwick Parkway, Leamington Spa and the Wellesbourne campus, and is aimed as those who commute to the University Campus but are not near to a bus stop.<sup>195</sup>

#### Commitment

# We will take action to increase average road vehicle occupancy by 2030

Increasing road vehicle occupancy can significantly reduce carbon emissions as well as directly help tackle congestion when it displaces otherwise additional road vehicle journeys. Data from the 2019 National Travel Survey shows that the average occupancy rate is 1.55 across cars and vans, and when looking at commuting trips, this rate is only 1.14. In England, 62 per cent of trips are taken by lone drivers, which has been stable since 2002.<sup>196</sup> Most commuting trips by car are taken by lone drivers.

Increasing the occupancy rate is not straightforward but has the potential for very significant carbon savings. For instance, increasing car occupancy from 1.55 to 1.7 could save nearly 3Mt of carbon a year by 2030 – roughly equivalent to that currently emitted from all buses in a year. An increase to 1.6 could save nearly 1Mt a year by 2030.<sup>197</sup>

Increasing average commuting car occupancy by 10 per cent could save as much carbon as doubling passenger rail use. Recognising that not all commuter journeys will be switchable to public or active transport, new tools and online platforms offer the opportunity for a step change in improving car occupancy.

We will integrate measures to encourage shared occupancy within the commitments outlined below. We are continuing to build our evidence base to understand the barriers and potential policies to increase the uptake of shared mobility and will work with industry and local authorities to understand where further action can be taken.

#### Commitment

#### We will publish guidance for local authorities on support for shared car ownership and shared occupancy schemes and services

Guidance will benefit both local authorities and industry by enabling the sharing of best practice, evidence, and evaluation of different schemes. Local authorities will be able to pool resources, particularly regarding the evidence base supporting local decision making about the provision of car club infrastructure.

It will provide examples of best practice of the use of car clubs and ride sharing within local authority fleets and will be published within our Local Authority Tool Kit as set out in the section on 'Delivering decarbonisation through places'.



#### **Enterprise car club partnership with Highlands Council**

In 2018, the Highland Council in northern Scotland developed a partnership with Enterprise which aimed at providing council employees with access to Enterprise car club and pool car rental vehicles in order to reduce the number of journeys that they travelled in private cars. Since the partnership began, Enterprise car club and pool car rental has contributed to an estimated 649 tonne reduction in  $CO_2$  emissions in the Scottish highlands by transferring grey fleet mileage onto their fleet of hybrid and electric vehicles. This fleet of 60 vehicles is located across 21 highland council offices, and the majority of vehicles are plug-in hybrids which are available to book by the hour or by the day by employees who would previously use a personal car. Along with the 37% reduction in carbon emissions since 2018, there has also been a 28% drop in business mileage and a reduction in business travel costs of over £900,000.<sup>198</sup>
## Commitment **We will support car clubs to go fully zero emission**

As car club fleets tend to contain newer vehicles, they can lead the transition to zero emission vehicles. Successful car clubs with zero emission vehicles could support users to choose zero emissions should they buy a vehicle in the future.

The Office for Zero Emission Vehicles (OZEV) will continue to provide a platform for discussion with local authorities and industry to encourage the sharing of information and learning. Best practice and lessons learned will be fed into the Local Authority Toolkit.

#### New services and modes

Beyond shared mobility, we are starting to see the emergence of new business models, which have the potential to make lower carbon journeys easier.

#### Commitment

#### We will consult on a Mobility as a Service Code of Practice

Mobility as a Service (MaaS) is the integration of different forms of transport with information and payment functions into a single mobility service. These platforms can make mass transit and active journeys more convenient for people through streamlining planning and payment. A new Code of Practice will signal the UK's intent for MaaS to shape the transport outcomes we want. To help consumers choose lower carbon journeys, this guidance will look to encourage inclusion of carbon data for each route offered.

#### Commitment

#### We will use national e-scooter trials to understand their environmental impact, safety, and mode shift potential to evaluate whether they should be legalised

Since July 2020, e-scooter trials have launched in 32 regions across England . Evaluation is underway and a key area of focus will be on the nature of mode shift e-scooters achieve. This will help us to understand the potential impact on transport emissions and air quality.

#### **E-scooter trials**

250	Bournemouth	400	Somerset West & Taunto	n
900	Buckinghamshire	350	South Somerset	
900	Cambridge and Peterborough	400	Staffordshire	
450	Cheshire West & Chester	300	Sunderland	
80	Copeland	900	Tees Valley	
2,050	Derby and Nottingham	7,500	West Midlands	
3,125	Essex	8,700	West of England (WECA	)
250	Gloucestershire	1,000	York	
100	Great Yarmouth			
400	Kent			
2,500	Liverpool			
19,800	London		Ó	*The number of e-scooters depicted are those
1,300	Milton Keynes			approved by the Department for Transport
1,600	Oxfordshire			for deployment and do not reflect what may
1,050	Newcastle			actually be in operation. These figures are
250	Norfolk			accurate as of June 2021.
3,400	North and West Northamptonshire		-07	
1,000	North Devon	<b>V</b>		
250	North Lincolnshire			
400	Redditch			
600	Rochdale	<b>9</b>		
550	Salford			
250	Slough			9
3,250	Solent	•		•
		0		0

### Data

The UK is a world leader in open data and the sector can thrive through decarbonisation. Data is the foundation for designing effective policy interventions that support the decarbonisation of the transport system. Better data can provide new policy and operational insights, drive new products and services and 'nudge' people towards lower emission journeys.

Commitment We will reduce the barriers to data sharing across the transport sector

For the benefits of data to be unlocked, data needs to be shared. That is why we have been working closely with the transport sector in developing a Transport Data Strategy (TDS) to help overcome the barriers to data sharing and use, improving the discoverability, accessibility and quality of data.

In the recent consultation to improve the consumer experience at public chargepoints, we proposed opening public electric vehicle chargepoint data, to help consumers locate chargepoints, understand whether they are in use and promote greater choice when deciding where to charge. Accessibility and availability of this data will not only provide consumers with better information to encourage the shift to zero emission vehicles but will also support local authorities and distribution network operators to identify where installation is required. This consultation closed on 10 April, with regulations expected in the second half of 2021.<sup>199</sup>

We will look to support the growth of the UK transport data industry and continue to fund innovation projects and support their effective deployment and implementation.

#### **Bus Open Data Service**

Bus operators are now legally required to openly publish passenger information, including timetables, fares and location data to the Bus Open Data Service through the Public Service Vehicles Open Data Regulations 2020.<sup>200</sup> Data consumers can access these data, without restrictions on use or disclosure, to create journey planning applications, products and services to enable passengers to easily plan journeys, find best value tickets and receive real time service updates offering seamless journeys on the public transit network regardless of where they live, work or travel.

#### Commitment

#### We have launched a new annual statistical release and guidance about transport's impact on the environment and support its use by third parties

We recently published a new annual statistical release drawing together various data sources on transport's impact on the environment and guidance explaining the detail of estimating greenhouse gas emissions for different modes and journeys.<sup>201</sup> We encourage third parties to use our methodology. Data consumers can use these data, without restrictions on use or disclosure, for journey planning applications, products and services enabling users to plan green journeys.

This publication features transport environment statistics in a clear and transparent way, presenting cross-modal comparisons and focusing on metrics for future monitoring. These statistics will help transport users understand how the emissions from their journeys are changing over time.





#### **Transport for West Midlands**

The West Midlands has invested heavily in the passenger information it offers to citizens. Transport for West Midlands (TfWM) is one of the UK's largest transport authorities. The authority is responsible for a region encompassing the cities of Birmingham, Wolverhampton, and Coventry, with a population of 2.9 million people and delivers 326 million passenger journeys a year.

To improve customer experience and increase public transport usage, TfWM has invested significantly in the provision of accurate passenger information. Timetable and location data for bus, tram and rail needs to be delivered to journey planning applications, websites and third-party developers, to 1,800 real-time information displays at bus and tram stops and rail stations, alongside multi-operator printed timetables and mapping at all 12,200 bus stops in the region. To increase the coverage of real-time information, TfWM has invested to ensure that smaller operators are able to openly provide location data feeds. This location data from the individual buses is then aggregated and transformed into reliable arrival time predictions data as a single feed or single source of truth which is then made available through a range of passenger facing applications such as Google Maps, Apple Maps and Citymapper, and at stops and stations through digital signage. TfWM is working with bus operators to bring all bus operator information into a single app for customers in the region.<sup>202</sup>

### **Encouraging lower carbon choices**

Public perceptions and attitudes need to be built into the heart of transport to deliver options that meet people's needs and encourage more sustainable travel choices. By doing this we can promote a shift in behaviour and change how transport is used in the future.

#### Commitment

#### We will explore the introduction of a new sustainable travel reward scheme supported by businesses, community organisations and charities

We will explore the feasibility of a travel reward scheme that utilises peer-driven motivation and encourages individuals to switch to, or continue to use, sustainable modes of travel. We are currently undertaking research in the area and aim to set out plans for piloting next year, before potentially bringing the scheme online in 2024.

The scheme will look to champion both technological innovation and behavioural science, working with businesses to encourage the public to make use of existing transport infrastructure and services. Through app-based software, transport users would receive points for journeys made using sustainable modes of transport, collaborating with friends, peers, and colleagues to earn rewards as a collective. Once a group has met their points target, individuals in the group can choose from a wide range of rewards provided by private sector partners including goods and discounts from national and local retailers and service providers.

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#### **Encouraging sustainable travel**<sup>203</sup>

Long term motivation to continuing choosing sustainable travel is **enhanced by social norms**; people are encouraged when they know others are switching too.

DfT Deliberative Research found that incorporating social elements

to interventions like low traffic neighbourhoods and group cycle training could enable people to enjoy benefits beyond the environment.



#### Commitment

We will support transport providers to develop communications campaigns that encourage mode-switch and sustainable transport behaviours Working alongside transport providers, we will look to influence more sustainable travel behaviours by providing advice and guidance on the messages that are most effective in driving behaviour change towards use of sustainable transport. Research suggests the most persuasive factor in transport mode-switch decisions are stories of others who have made similar switches.<sup>204</sup> This work will explore the narratives and messaging that are most effective in encouraging the use of public transport and sustainable travel in a post-COVID 19 world.

#### Commitment

#### We will encourage and support UK businesses to lead the way in taking action to reduce emissions from their employees' travel journeys through "Commute Zero"

Commuting accounts for around one in five car journeys in the UK, with vehicle occupancy 26% lower than for car journeys as a whole.<sup>205</sup> If we could reduce single occupancy commuting journeys by 10%, this could have the potential to save 500,000 tonnes of  $CO_2$  a year.<sup>206</sup>

To help support this, we will work with large employers in the public and private sectors on measuring and reporting on their total and average commuting emissions. This will build on the current consultation on strengthening the Energy Savings Opportunity Scheme<sup>207</sup> which runs to 28 September, and proposes to develop a methodology to reduce carbon emissions from staff commuting as part of the option to add a net zero element to energy audits by all large UK businesses. We will also bring Ministers and the UK's biggest employers together to share best practice.

This will lead to a Commute Zero programme which will convene and work with leading companies and large employers to research, support and encourage long-term changes to employee travel habits and support the take-up of lower carbon commuting, such as public and active transport, and carsharing initiatives, including a pilot commuter census survey and demonstrator projects.

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#### Liftshare

Liftshare is a social enterprise that has worked with over 700 of the UK's largest employers to reduce the number of single occupancy vehicles on our roads. With an online community of over 1 million members, it is estimated that Liftshare members have saved over 1 billion car miles by sharing their commutes.<sup>208</sup> Members include Tesco, which provides special parking and other incentives for ridesharers at its Hertfordshire headquarters. A third of the site's staff now share their car commute, reducing the number of cars driving there by 700 a day. Liftshare recently launched a sister brand – Mobilityways – with a renewed mission to make Zero Carbon Commuting a reality. Mobilityways provides software tools to make it simple for employers to evidence, track, plan and reduce their commuter emissions. The innovation underpinning it is ACEL<sup>©</sup> – the first ratings system to provide organisations a simple way to benchmark and understand their Average Commuter Emissions Level.

#### Behaviour change research

Climate Change Committee (CCC) analysis indicates that 59 per cent of emissions reductions to reach net zero will involve some form of societal behaviour change.<sup>209</sup> Behavioural science is important in encouraging people to make more sustainable choices and to align policy with society's values.<sup>210</sup>

In July 2020, the DfT commissioned deliberative research to understand the complexities and drivers of current and sustainable travel behaviour, the impact of COVID-19 and what interventions will encourage people to travel more sustainably.<sup>211</sup> The COM-B model of behaviour change was used to analyse the findings.<sup>212</sup>

This research has revealed multiple opportunities to change travel behaviour, but that travel decisions are driven primarily by convenience and cost, not environmental concerns. This means to be competitive with the car, public and active travel options must be easy, accessible, reliable, and affordable.<sup>213</sup>

#### What did our deliberative research find?

To make people feel capable of change:

- **Try before you buy** schemes (e.g. for new modes of transport like e-cycles) create the understanding and ability needed to use alternatives. Try before you buy lowers the cost barriers to entry and prompts action by allowing people to test whether alternatives suit them and their lifestyles before making any long-term commitments.
- Linking environmental impact and travel choices more explicitly, such as through journey planning apps that include carbon emissions information for different modes of transport, could be a good first step towards people considering sustainable transport options in the future.

To provide opportunity for change:

- A gradual transition to more sustainable modes over a number of years was felt by participants to be more realistic, both in terms of enabling the relevant infrastructure to be updated and developed and in terms of their own behaviour, allowing them to plan and prepare for changes to their lifestyles and routines.
- Addressing negative perceptions of cycling and cyclists and broadening the image of who can be a cyclist, by making cycling more accessible and aspirational to a wider group of people, would help to break down current social barriers to uptake.
- Increasing the visibility of electric vehicle (EV) infrastructure to make them appear more widespread, such as through green number plates, and visible charging infrastructure, clearly signposts to the public that this technology is ready for them today.

To motivate people to change:

- Address the safety concerns of cycling and make it feel safer for a wider group of people by ensuring that cycle lanes are continuous, well-lit, and separated from traffic.
- Focus on leisure journeys as a first step, including introducing cost incentives, as these behaviours are far less habitual and less entrenched, allowing people to try alternatives when decisions can be more considered and less time pressured.
- Highlight the social and community benefits that accompany decarbonisation initiatives, such as Low Traffic Neighbourhoods' (LTNs) role in enabling safe spaces for children to play. This appeals to a wider set of motivations and engages a broader audience.

#### Youth panel

Alongside the core research, a broad sample of 11–18 year-olds were engaged with to understand their travel experiences, their attitudes towards the environment and how transport factors into this. The research found that the environment was more top of mind in this age group compared to older age groups, and that they were surprised to learn how much transport contributed to carbon emissions. This made them feel it was important for individuals to take responsibility and to travel more sustainably. When thinking about future transport, young people became excited about new technologies and the possibilities these will bring.

#### Commitment

#### We will identify specific opportunities for decarbonisation through innovation in rural areas in the upcoming Future of Transport: Rural Strategy

While some technological change in transport is happening first and fastest in urban areas, there are different opportunities in rural areas that require different solutions. DfT research found that people living in rural areas were less receptive to exploring non-car travel modes due to having limited alternatives.<sup>214</sup> The Future of Transport: Rural Strategy will focus on enabling technologies that could help improve mobility in rural areas while reducing car dependency. There could be a significant role for liftsharing in this space.

#### Midlands Connect Rural Mobility Toolkit

In 2020, Midlands Connect produced a 'Rural Mobility Toolkit'. The toolkit provides a framework for discussions with local communities around how transport innovation, such as ride sharing, mobility hubs and automated vehicles can meet their community mobility needs, while addressing broader concerns such as decarbonisation.<sup>215</sup>

#### Commitment

### We will help build a skilled workforce for the future of transport

For the UK to become a world leader in shaping the future of transport, it is imperative that the UK has a workforce capable of developing, procuring, implementing and operating (and scaling up) mobility solutions in a manner that maximises the acceptance and benefits derived from them. As noted in the Prime Minister's Ten Point Plan for a Green Industrial Revolution last year, we will create hundreds of thousands of new jobs by investing in pioneering British industries and ensuring a skilled workforce is in place to deliver net zero.<sup>216</sup>

#### Green Jobs Taskforce

To ensure we have the skilled workforce to deliver net zero and our Ten Point Plan, we launched the Green Jobs Taskforce in November 2020, working with business, skills providers, and unions, to help us develop plans for new long-term good quality, green jobs by 2030 and advise what support is needed for people in transitioning industries. The Green Jobs Taskforce will focus on a wide range of challenges in delivering skilled workers for the UK's transition to net zero including:

• Ensuring we have the immediate skills needed for building back greener;

- Developing a long-term plan that charts out the skills needed to help deliver a net zero economy;
- Ensuring good quality green jobs and a diverse workforce, and;
- Supporting workers in high carbon sectors, ahead of net zero.

The taskforce concluded its work this spring and will feed into the Net Zero Strategy being published later this year.<sup>217</sup> Government is already working to ensure people can access the skills they need for the jobs of the future, including through our Apprenticeships, Skills Bootcamps, Traineeships, T-Levels, and the forthcoming National Skills Fund – to help us grow future talent pipelines and deliver the skilled individuals we will need. The Lifetime Skills Guarantee will help people train and retrain at any stage of their lives and so develop the skills most valued by employers. With help from the Green Jobs Taskforce, we will ensure that these programmes can be directed to support net zero, and to identify where the evidence tells us we might need to go further or faster. Starting this year, we are providing £2.5 billion for a new National Skills Fund (NSF). The NSF aims to fund the skills needed for the economy of the future and help people retrain and upskill into better more productive jobs, including those opportunities provided by the green recovery and net zero.218





Part 2 **The plan in detail:** commitments, actions, and timings

### Supporting UK research and development as a decarbonisation enabler





We'll use R&D to build on the world leading expertise of UK business and academia, maximising opportunities for growth, new exports and create hundreds of thousands of high quality jobs



Government has committed to increasing total R&D investment to **2.4%** of GDP by 2027, making it central to a green recovery and transition to net zero



Current public investment in transport decarbonisation R&D topped **£1.5 billion** 



Our Areas of Research Interest (ARIs) will set out transport's core science, research and innovation priorities and needs over the coming years. We will also publish our new DfT Science Plan by Summer 2021



#### Decarbonisation of the transport system is a complex, interdisciplinary problem with technologies at different stages of development and market readiness. Successful deployment of solutions is shaped by lifecycles, behaviour and meeting user needs.

Global innovation and R&D are the keys to achieving our decarbonisation goals by ensuring there is a pipeline of solutions and the continuous development of new ideas. These will help us accelerate change by unlocking new green technologies, cutting the overall cost of decarbonisation, delivering system level efficiencies, and helping us deliver the levels of social and behavioural transformation needed.

Government has committed to increasing total R&D investment to 2.4% of GDP by 2027 and signalled that R&D is central to a green recovery and the transition to net zero.<sup>219</sup> We will ensure the UK remains the best and leading place in the world for scientists, researchers and entrepreneurs to innovate and through government's vision for R&D will cement Britain's reputation as a global science superpower.<sup>220</sup>

In transport, we use R&D to build on our expertise to maximise opportunities for growth, new exports and create hundreds of thousands of high-quality jobs. R&D will inform future policy and investment decisions and help us scale-up and transfer solutions to other parts of the UK and sectors of the economy.

The complexity of net zero requires a joined-up and coordinated government R&D portfolio delivering solutions for the system as a whole, as well as the evidence needed to inform decisions to deliver significant carbon reductions year on year. R&D cannot operate successfully in a silo, so it is critical that we engage with others who intersect and sometimes overlap with our transport decarbonisation agenda. For example, we are using our space applications and expertise to support decarbonisation. This includes using satellites to monitor the environment and enable connected and autonomous vehicles, and transformational technologies enabling lower emission flight using thermal management. Some also help tackle climate change beyond their uses in space, such as the development of battery cooling systems for electric vehicles, facilitating faster charging times, longer battery life and extended range.

#### Commitment

#### We will coordinate transport's investment in R&D, collaborating with key stakeholders through our Transport Research and Innovation Board (TRIB)

Government's current investment in transport decarbonisation R&D exceeds £1.5 billion. Continued strategic coordination of investment in R&D will remain critical to realising our decarbonisation ambitions. We will work closely with UK Research and Innovation (UKRI) and other research and innovation funders to deliver joint programmes ensuring the academic, SME and innovation community are aware of our challenges and can work with us, our stakeholders and industry to solve these.

TRIB coordinates innovation and R&D in transport building on our close working relationships within the R&D sector, including EPSRC, ESRC and Innovate UK, the Royal Academy of Engineering, Royal Society and Professional Engineering Institutions, such as the IET, the ATI and University Groups such as UTSG.

### Transport Research and Innovation Board

Our Transport Research and Innovation Board (TRIB) brings together the leaders of major R&D funders in the transport sector including from DfT's Arm's Length Bodies, to provide strategic coordination to transport R&D, ensuring that activities and investments are aligned with R&D priorities in transport and coordinated across the sector. TRIB will help identify, prioritise and coordinate the delivery of R&D across organisations and transport modes and support the developing, testing and scaling of transport solutions through demonstrator projects and living labs.

Understanding our future integrated energy system is crucial to be sure that the energy vectors and fuels needed to decarbonise transport modes are available where needed, at the scale required, are 'genuinely' green, from a resilient supply and are available at a cost transport can reasonably bear. Much of this is coordinated through the Net Zero Innovation Board, Hydrogen Advisory Council, and pan-government R&D Board on which the Department's Chief Scientific Adviser sits.

### Current public investment in R&D for transport decarbonisation<sup>221</sup>

Assessment undertaken by the Transport Research and Innovation Board (TRIB)



#### Focussing and prioritising our R&D investments

We commissioned Mott MacDonald to consider what technology R&D needs to take place to reduce and remove direct emissions from the UK's domestic transport sector by 2050. They produced seven roadmaps considering future progress of candidate technologies and recommended research and innovation interventions needed over the next five to ten years. Their analysis for each mode in regard to technological progress is illustrated overleaf.

These roadmaps demonstrate that R&D needs to be prioritised around those transport modes where there are currently no clear technology or deployment pathways. This is particularly the case for hard to decarbonise heavier modes across HGVs, aviation and maritime. These are the areas where we are committing critical R&D seed funding over the next year, initiatives which will set the course to deliver longer-term solutions.

#### Commitment

### We will update our Areas of Research Interest (ARIs) and publish our new DfT Science Plan by summer 2021

Our updated ARIs sets out the Department for Transport's research and evidence needs over the coming years to academia, industry and other funders of research and innovation.<sup>222</sup> Decarbonisation is one of the largest themes within the ARIs. The Science Plan sets how we will engage and catalyse activity in the research base, support innovation from concept through to commercialisation, as well as the supporting governance and plans to deliver it.



# **Unlocking green finance**

Delivering the transition to zero emission transport requires major investments in every mode. As set out in this plan, this government has and will continue to invest billions of pounds to deliver the emissions reductions required. However, at every stage, this needs to be combined with green private finance, building on the world leading expertise of UK businesses to both effectively drive the transition and allow those businesses to fully grasp the opportunities from decarbonisation.

Across transport, there are already huge private investments taking place from EV chargepoints to zero emission flight. We have clear plans to bolster this through strategic public funding in transport innovation to trial and deploy new technologies that galvanise private sector investment, such as through investing  $\pounds$ 3 million in the Tees Valley Hydrogen Transport Hub,  $\pounds$ 20 million in trials of zero emission heavy goods vehicles, and  $\pounds$ 20 million to support zero emission technology and infrastructure solutions for maritime.

We also support the conditions for investment through removing barriers and reducing uncertainty. At the highest level, net zero and the plans set out in this document show a clear direction to zero emission travel, underpinned by clear targets in every area of transport. Since the announcement that from 2030 we will end the sale of new petrol and diesel cars and vans, and from 2035 all new cars and vans must be zero emission at the tailpipe, we have seen several major auto manufacturers bring forward new, earlier, zero emission intentions. We believe that this plan will help drive such announcements and associated investments across the transport sector.

This is then complemented by tackling practical barriers, such as those affecting the rollout of the necessary charging infrastructure, as set out in the section on 'A zero emission fleet of cars, vans, motorcycles and scooters', in order to support major private investments. This work is supported by the government's wider green finance plans. One of core objectives of the new UK Infrastructure Bank, headquartered in Leeds with £22 billion of financial capacity, is to help tackle climate change. The government will also issue its first sovereign green bonds (or 'green gilts') and NS&I's retail Green Savings Bonds under the Green Financing Framework published on 30 June.<sup>223</sup> These financing instruments will help support projects that reduce emissions including in transport. The inaugural green gilt is expected to issue in September. The UK's green taxonomy will provide common scientific definitions for environmentally sustainable economic activities, including transport. This will facilitate financing for low-carbon transport and ensure transparency regarding the impact of firms' activities in the sector.

We will continue to work with organisations such as the Green Finance Institute, seed funded by the UK Government and the City of London Corporation, to build on this work, identify and remove barriers and ensure the optimal conditions for investments to deliver net zero transport.

#### Views from the Green Finance Institute: The role of finance

Whilst finance is critical, it is not the panacea. In an effective ecosystem, finance should not be the blocker to decarbonisation and for this reason, the Green Finance Institute has established the Coalition for the Decarbonisation of Road Transport, to bring together industry experts, policymakers and finance practitioners to identify and unlock the barriers to investment in decarbonising transport and co-create the solutions required to overcome these.

Achieving the goals of the Transport Decarbonisation Plan will require considerable investment from both the public and private sector. Whilst the investment required is vast, it is important to remember that it is not one singular quantum of money, but pragmatic pockets of investment targeted towards different segments of the transport sector, requiring different solutions and financial innovations. There is consistent growth in demand for Environmental, Social and Governance investments from UK investors, with more than €2.2 trillion of UK assets under management today.<sup>224</sup> Unlocking this commercial capital for green transport and infrastructure has to be a key focus when designing cohesive government policy.

Early adoption of electric vehicles on UK roads has been strongly supported by government funding. Via mechanisms such as OZEV grants and Local Authority budgets to fund the rollout of charging infrastructure and to narrow the gap between the purchase price of electric vehicles and their ICE counterparts. As we approach price parity, the role of private sector finance will grow, and innovative financial mechanisms may be required to ensure all members of society can access clean, green transport.

The Green Finance institute was established in 2019 as a direct response to a key policy recommendation made by the industryled Green Finance Taskforce to the UK Government in March 2018.<sup>225</sup>

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This is in addition to the savings that the current RTFO will already deliver over the same period. According to published BEIS data (reference below), this is currently expected to be 67MtCO2e. This estimate is provided for scale only. Modelling assumptions for the BEIS Energy and Emissions Projections are based on existing policies and plans and are not identical to analysis undertaken for this Plan, which accounts for the new measures set out in the document.

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