



# Phase 2b Western Leg Information Paper

## E26: Climate change adaptation and resilience

This paper outlines how the combined impact of the Proposed Scheme and potential climate change on the receiving environment and community has been assessed. It also outlines how the Proposed Scheme's resilience and capacity to cope with potential climate change impacts has been assessed.

It will be of particular interest to those potentially affected by the Government's proposals for high speed rail.

This paper was prepared in relation to the promotion of the High Speed Rail (Crewe - Manchester) Bill. Content will be maintained and updated as considered appropriate during the passage of the Bill.

If you have any queries about this paper or about how it might apply to you, please contact the HS2 Helpdesk in the first instance.

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## 1 Introduction

- 1.1 High Speed Two (HS2) is the Government's scheme for a new, high speed north-south railway, which is being taken forward in a number of phases. Phase One will connect London with Birmingham and the West Midlands. Phase 2a will extend the route from the West Midlands to Crewe. The Phase 2b Western Leg will connect Crewe to Manchester. As set out in the Integrated Rail Plan, published in November 2021, HS2 East is proposed to deliver a new high speed line from the West Midlands to East Midlands Parkway.
- 1.2 HS2 Ltd is the non-departmental public body responsible for developing and promoting these proposals. The company works under the terms of a Development Agreement entered into with the Secretary of State for Transport.
- 1.3 The construction and operation of Phase One of HS2 is authorised by the High Speed Rail (London – West Midlands) Act 2017 and Phase 2a by the High Speed Rail (West Midlands – Crewe) Act 2021.
- 1.4 In January 2022, the Government introduced a hybrid Bill to Parliament (hereafter referred to as 'the Bill'), to seek powers for the construction and operation of the Phase 2b Western Leg (the Proposed Scheme), which is called the High Speed Rail (Crewe – Manchester) Bill. The Proposed Scheme comprises the Phase 2b Western Leg from Crewe to Manchester and several off-route works. It also facilitates the delivery of Northern Powerhouse Rail by providing the Crewe Northern Connection and junctions and other infrastructure to be used in future schemes.
- 1.5 The work to produce the Bill includes an Equalities Impact Assessment and an Environmental Impact Assessment (EIA), the results of which are reported in an Environmental Statement (ES) submitted alongside the Bill. The Secretary of State has also published draft Environmental Minimum Requirements (EMRs), which set out the environmental and sustainability commitments that will be observed in the construction of the Proposed

Scheme. For more information on the EMRs please see Information Paper E1: Control of environmental impacts.

1.6 The Secretary of State for Transport is the Promoter of the Bill through Parliament. The Promoter will also appoint a body responsible for delivering the Proposed Scheme under the powers granted by the Bill. This body is known as the 'nominated undertaker'. There may be more than one nominated undertaker. However, any and all nominated undertakers will be bound by the obligations contained in the Bill, the policies established in the EMRs and any commitments provided in the information papers.

1.7 These information papers have been produced to explain the commitments made in the Bill and the EMRs and how they will be applied to the design and construction of the Proposed Scheme. They also provide information about the Proposed Scheme itself, the powers contained in the Bill and how particular decisions about the Proposed Scheme have been reached.

## **2 Overview**

2.1 This Information Paper outlines how the impact of climate change has been considered within the ES for the Proposed Scheme.

## **3 The Proposed Scheme and climate change**

3.1 The ES has assessed the impact of climate change and the Proposed Scheme in two ways:

- The in-combination climate change impacts (ICCI) assessment, which considers the combined effect of the Proposed Scheme and potential climate change impacts on the receiving environment during construction and operation.
- The climate change resilience assessment, which considers potential climate change impacts on the design, construction and operation of the Proposed Scheme's infrastructure and assets over their lifetime.

- 3.2 The greenhouse gas assessment for the Proposed Scheme is covered in Information Paper E27: Carbon.

## **4 Policy background**

- 4.1 The relevant European Directive is the EIA Directive 2014/52/EU and the related European Commission (EC) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment: The regulations implementing this Directive were transposed into UK legislation in May 2017.
- 4.2 The Climate Change Act 2008 requires the UK Government to undertake a national Climate Change Risk Assessment (CCRA) every five years. The Committee on Climate Change (CCC) published the Independent Assessment of UK Climate Risk in 2021, 'and this informed the third CCRA, published in 2022. The Independent Assessment of UK Climate Risk reports that transport faces challenges from flooding, heat, erosion, subsidence and extreme weather, and the severity of these risks is projected to increase as the climate continues to change. This assessment also identifies a range of risks and opportunities, which are relevant to the in-combination climate change impacts assessment, including the following, which are identified in a group of highest priority risks: risks to the viability and diversity of terrestrial and freshwater habitats; risks to soil health from increased flooding and drought; risks to natural carbon stores and sequestration; risks to crops and trees.
- 4.3 The third National Adaptation Programme (NAP) will be published in 2023. This will detail the Government's long-term strategy to address the main climate change risks and opportunities for the UK. The CCC and its Adaptation Sub-Committee conduct an independent assessment of progress by the NAP every two years. These Progress reports contribute towards the wider understanding of national climate change risks, including risks specific to the transport sector and rail infrastructure.
- 4.4 In addition to the NAP, the UK Government have set out plans to transform the UK's infrastructure networks within the National

Infrastructure Commission (NIC). The NIC sets out the importance of ensuring that national infrastructure is resilient to future climate change, through consideration of expected effects at the design stage, and building in cost-effective mitigation over the whole life cycle of the asset.

## **5 HS2 Ltd policy**

- 5.1 HS2 Ltd's Environmental Policy sets out the aim to "build a network that is climate resilient for the long term" and "create a resilient green corridor for both nature and people."

## **6 Climate change in-combination impact assessments**

- 6.1 HS2 Ltd has 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 route of the Proposed Scheme. An assessment was undertaken to determine if the AP2 amendments would be likely to result in any new, removed or different significant in-combination climate change effects from those reported in the main ES and outlined below. One significant effect was identified to be removed, see section 6.6.
- 6.2 The term in-combination climate change impacts refers to the combined effect of the impacts of the Proposed Scheme and potential climate change impacts on the environment.
- 6.3 The Climate data and Information report (Volume 5: Appendix CL-001-00000) presents an overview of the current climate conditions, projected climate change trends and related information. The document is based on the UK Climate Projections 2018 (UKCP18), which is the latest set of climate projections for the UK.
- 6.4 These climate change projections have been used to define the climate change trends used in the ICCI assessments for the Proposed Scheme.

- 6.5 All identified potential in-combination climate change effects during construction are mitigated by the implementation of the measures contained within the draft Code of Construction Practice (CoCP), Volume 3 Route-Wide Effects and existing topic specific mitigation measures. These mitigation measures are summarised in Volume 5: Appendix CL-002-00000 and examples of embedded mitigation outlined below.
- 6.6 As a result of the AP2 revised scheme, the significant in-combination climate change effect reported in Volume 3 of the main ES is now no longer relevant and has been removed. This change is as a result of the AP2 amendment for additional land permanently required for modifications to wastewater drainage at Annandale depot (AP2-ORW-001), which provides an alternative means of wastewater drainage. The AP2 revised scheme will therefore no longer include an on-site wastewater treatment plant at Annandale depot and treated wastewater will not be released into surface watercourses near the depot.
- 6.7 All other potential in-combination climate change effects during operation are mitigated by embedded topic specific mitigation measures. Therefore, no additional mitigation measures to address adverse effects on the ability of resources and receptors to adapt to climate change during operation are proposed beyond those described above.
- 6.8 A number of embedded mitigation measures have been incorporated within the design of the Proposed Scheme, for example:
- climate change has the potential to increase the likelihood of shortages of water supply, potentially affecting the ability to use water-based systems (such as water spray and damping down) to suppress dust. Therefore, mitigation measures to source water for the suppression of dust and measures to suppress dust which are not water dependent (such as the use of enclosures, covering stockpiles, installing hard surface roads and reducing speed limits on site) have been specified in the draft CoCP;
  - increased frequency of dry spells could make the restoration of soils to their original condition more difficult. Measures such as protecting

agricultural land adjacent to the construction site, provision and maintenance of appropriate stock-proof fencing and avoidance of traffic over the land leading to soil compaction have been specified in the draft CoCP; and

- increased frequency of heavy rainfall events may cause travel delays or congestion and therefore lengthened traffic impacts during the construction phase. Mitigation measures are therefore in place, such as the production of a route-wide traffic management plan, which is specified in the draft CoCP. climate change has the potential to compromise the establishment or function of landscape mitigation and habitat creation. Therefore, ecological mitigation measures such as consideration of climate change and potential future drought conditions when sizing and locating ponds and the selection of plant and tree species from a range of latitudes will ensure the future resilience of biodiversity to climate change;
- increased frequency of dry conditions has the potential to reduce the effectiveness of landscape planting. Maintenance, such as watering ornamental plants as required, and monitoring and weeding newly planted trees, will be carried out in order to mitigate against impacts such as vegetation die back due to dry conditions;
- increased wind speeds have the potential to increase the spread of invasive species along the route of the Proposed Scheme. An appropriate monitoring and management regime will be implemented to identify and remedy areas of weed growth in order to avoid the occurrence of invasive, non-native species; and
- increased frequency of heavy rainfall events could result in flooding, which has the potential to increase travel distance and congestion on roads already affected by the Proposed Scheme because of a need to take alternative routes. Mitigation measures, such as ensuring that drainage design for new roads as part of the Proposed Scheme include climate change allowances, will be implemented to reduce the risk of flooding along such routes.

## 7 Climate change resilience

- 7.1 A high-level climate change resilience assessment, reported in Volume 3 of the ES, has been undertaken. The climate change resilience assessment considers potential climate change impacts on the design, construction and operation of the Proposed Scheme. A scoping exercise was undertaken to determine if the AP2 amendments would be likely to result in a material difference to the assessment of climate change resilience reported in the main ES. This determined that there would be no changes to the outcome of the climate change resilience assessment, as reported in the main ES and outlined below.
- 7.2 The Climate data and Information report (Volume 5: Appendix CL-001-00000) presents an overview of the current climate conditions, projected climate change trends and related information. The document is based on the UK Climate Projections 2018 (UKCP18), which is the latest set of climate projections for the UK.
- 7.3 These climate change projections have been used to define the climate change trends used in the climate change resilience assessment for the Proposed Scheme.
- 7.4 The assessment included the identification and assessment of potential climate change risks for HS2 assets within the Proposed Scheme. The assessment has 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 have been considered based upon the trends within the UK climate projections.
- 7.5 All climate change related risks during construction and operation have been assessed to be 'low' or 'medium' due to a range of mitigation measures. Therefore, no significant climate change resilience effects have been found and no further climate change resilience measures are required or proposed.

7.6 Examples of such mitigation measures are:

- during the outline design stage, tunnel ventilation analysis has been undertaken considering the impacts of climate change on temperature to inform the ventilation capacity requirements;
- during the detailed design stage, geotechnical analysis will be undertaken in accordance with HS2 Technical Standards to develop the earthworks design and to mitigate the effects of geohazards that impact on slope stability. This shall be used to ensure robust embankment design, for example the selection of appropriate earthwork materials (i.e. those not susceptible to shrink-swell) and crest or toe drainage;
- during the detailed design stage, Overhead Contact Systems will be managed through the development of asset-specific technical specification documents. These documents will set out the operating thresholds of the asset taking into account climate change over the design life of the asset. For example, the maximum allowable thickness of ice on the overhead line;
- in locations where the route of the Proposed Scheme will cross watercourses or surface water flow paths, the Proposed Scheme is designed to accommodate flood flows up to and including the 1 in 100 year peak river flow plus an appropriate allowance for climate change. In addition, the railway infrastructure will be protected from the 1 in 1000 year return period flood event, ensuring that HS2 can return to operation without undue delay; and
- drainage is designed to the 1 in 100 year plus climate change allowance (40% increase) peak rainfall event.

7.7 Climate change resilience assessments will continue to take place throughout the design, construction and operation stages of the Proposed Scheme.

## **8 More information**

- 8.1 More detail on the Bill and related documents can be found at [www.gov.uk/hs2-phase2b-crewe-manchester](http://www.gov.uk/hs2-phase2b-crewe-manchester).

## References

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:

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0052>.

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

<http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf>.

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017:

[http://www.legislation.gov.uk/ukxi/2017/571/pdfs/ukxi\\_20170571\\_en.pdf](http://www.legislation.gov.uk/ukxi/2017/571/pdfs/ukxi_20170571_en.pdf).

The Independent Assessment of UK Climate Risk, 2021

<https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk>

HS2 Environmental Policy:

<https://www.gov.uk/government/publications/hs2-environmental-policy>

UK Climate Projections:

<https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index>

The Climate data and Information report (Volume 5: Appendix CL-001-00000):

[www.gov.uk/hs2-phase2b-crewe-manchester](http://www.gov.uk/hs2-phase2b-crewe-manchester)

Draft Code of Construction Practice:

[www.gov.uk/hs2-phase2b-crewe-manchester](http://www.gov.uk/hs2-phase2b-crewe-manchester)