Net zero highways

Data method statement

August 2024

Introduction

This document outlines the methods that we have used to develop the 2019/2020 baseline and carbon reduction trajectory for the Net Zero Plan (NZP) and associated updates[1]. This method statement provides an update to the previous version and details out the key changes and challenges and covers the three following areas of carbon emissions:

Corporate: Emissions from our own operations, this covers emissions sources such as office energy requirement, network lighting, and corporate purchases, for example office supplies and gritting salt for the network.

Construction and Maintenance: Emissions from our capital works supply chain. This includes emissions 'embodied' in materials, emissions from the transport of materials to and from site, and the use of construction plant, for both new construction and maintenance activities. In addition, this category also includes energy use where the supply chain is managing sections of the network under Design Build Finance Operate contracts.
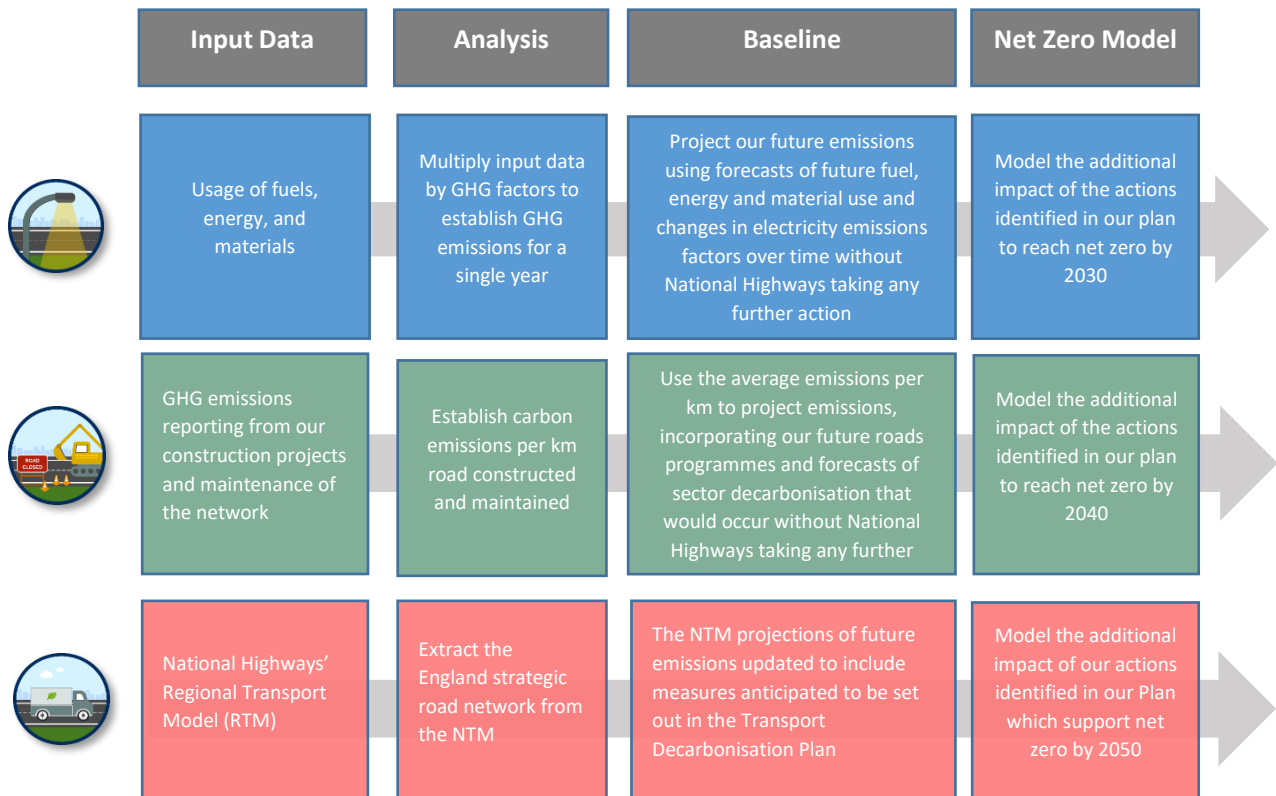
Road User: Emissions generated by vehicles using the strategic road network. These emissions are not required to be included within National Highway's Carbon footprint, as they fall outside of the minimum boundary as defined by the Greenhouse Gas (GHG) protocol corporate standard[2]. However, this has been included as we have some influence over emissions from Road users.

National Highways undertook a re-baselining of the carbon footprint that underpins the NZP in 2022/2023. Due to carrying out this re-baselining activity the data published in the 2020 NZP and 2020/2021 Annual Progress Update is not comparable to the data published within the 2022/2023 and 2023/2024 Annual Progress Updates. For more information please see: (September 2023 method statement)

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[1] National Highways's Net Zero Carbon Plan 2030-2040-2050 net-zero-highways-our-2030-2040-2050-plan.pdf

[2] GHG Protocol Corporate Standard. Corporate Standard | Greenhouse Gas Protocol (ghgprotocol.org)

Overview of Data, Methods and Outputs

Input Data	Analysis	Baseline	Net Zero Model
Usage of fuels, energy, and materials	Multiply input data by GHG factors to establish GHG emissions for a single year	Project our future emissions using forecasts of future fuel, energy and material use and changes in electricity emissions factors over time without National Highways taking any further action	Model the additional impact of the actions identified in our plan to reach net zero by 2030
GHG emissions reporting from our construction projects and maintenance of the network	Establish carbon emissions per km road constructed and maintained	Use the average emissions per km to project emissions, incorporating our future roads programmes and forecasts of sector decarbonisation that would occur without National Highways taking any further	Model the additional impact of the actions identified in our plan to reach net zero by 2040
National Highways' Regional Transport Model (RTM)	Extract the England strategic road network from the NTM	The NTM projections of future emissions updated to include measures anticipated to be set out in the Transport Decarbonisation Plan	Model the additional impact of our actions identified in our Plan which support net zero by 2050

Corporate

Net Zero Plan Baseline 2019/2020

Scope and Data

Our corporate emissions are reported according to the Greenhouse Gas (GHG) Protocol Corporate Standard[2] and the Science Based Target Imitative (SBTi) Guidance[3], which has been used to determine which Scope 3 emissions sources to include and exclude. Additional details on the difference between the Net Zero Plan (NZP) and the Greening Government Commitments can be found in the Appendix.

The key data was collected and collated from teams responsible for key activities within National Highways. This baseline was supplemented by additional data and estimates (based on available information and industry emission factor benchmarks to gauge materiality) to ensure full coverage of our corporate emissions for the SBTi Net Zero scope, as summarised below:

Scope 1

- Building Heating and Cooling – Fuel type and fuel usage/quantity (kWh, litre);
- Light Vehicle – Vehicle type and vehicle travel distance (miles, km); and
- Heavy Vehicle – Vehicle type and vehicle mileage (miles, km).

Scope 2

- Strategic Road Network (SRN) network electricity use – Electricity generation source and electricity usage/quantity (kWh); and
- Estates electricity use – Electricity generation source and electricity usage/quantity (kWh).

Scope 3 (estimated where based on available information and industry emission factor benchmarks to gauge materiality)

- Corporate purchases – Financial spend data and quantity of goods purchased (Salt, IT equipment, vehicles procured, employee services, and professional services, business trip accommodation, subsistence, and parking);
- Fuel and energy related activities – Fuel and energy type, and fuel and energy usage/quantity (kWh, litre);
- Waste generated in operations – Waste type and waste quantity (tonne);
- Business Travel - Vehicle type, and vehicle travel distance (miles, km);
- Employee Commuting and Homeworking – Commuter mode, commuter distance and time spent working from home;
- Upstream Leased Assets – Data centre energy type and usage, and landlord controlled energy supplies and cooling (estimated).
- Downstream Leased Assets – Motorway Service Area energy type and energy usage/quantity.

Carbon Removals and Offsets:

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[3] Science Based Targets initiative Net-Zero - Science Based Targets

- Carbon Sequestration from Forestry – Habitat type and habitat area. estimated 8,000 hectares of forest based on our geographic information system (GIS) data and application of Woodland Carbon Code calculator method to estimate tCO_2/year absorbed.

Calculation Methodology

To help us understand where we needed to focus our actions a baseline of historic and future GHG emissions was constructed by multiplying the input data by GHG emissions factors. Emission factors were collected from industry standard databases including but not limited to UK Government Greenhouse gas reporting: Conversion Factors, Bath Inventory of Carbon and Energy, Association of issuing bodies. Emissions are reported in carbon dioxide equivalent emissions (CO_2e).

External Factors Modelling

Department for Environment, Food & Rural Affairs (DEFRA) GHG Reporting Guidance[4] was used for historical emissions factors for electricity and other fuels. Department for Business, Energy & Industrial Strategy (BEIS) long-run marginal forecasts are used for grid electricity emission to account for grid decarbonisation. WebTAG Databooks used to provide changes in vehicle efficiency. Incorporation of carbon reduction trajectories for key industries including, hospitality, vehicle manufacturing, data centres, motorway service area providers, and rail travel.

Assumptions and limitations

The following assumptions were made based on industry benchmarks and professional judgement;

Emissions Source	Assumption
Building Cooling (F-Gas)	1% of office energy

- Independent assurance activity is still being defined and will be introduced as part of our future reporting;
- There is limited metering of our network electricity usage and estimation has been used. This is an area for ongoing validation.
- There is currently limited understanding on the impact of the digitisation and effect on data centre requirements.
- There is currently limited understanding on the impact of electric charging facilities on National Highways estate and Motorway Service Areas.

Annual Progress Update 2022/2023 and 2023/2024

The following provides any updates made to the Scope and Data, Calculation Methodology, and Action Quantification and any associated assumptions and limitations made.

Scope and Data

No updates to the underlying scope and data have been required during the 2022/2023 and 2023/2024 Annual Progress Update.

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[4] DEFRA Guidance on how to measure and report your greenhouse gas emissions - GOV.UK (www.gov.uk)

Calculation Methodology

Updated emission factors have also been used reflecting the latest published figures.

Where data is now available to replace additional milage assumptions this has been updated.

Forecasting Corporate Emissions

Action Quantification

Our net zero plan includes the implementation of actions to further reduce our emissions. This was modelled to understand the impact of these actions and include:

- Light and Heavy Vehicle Fleet – The transition of our own fleet to electric vehicles, and the use of electric vehicles for business travel;
- Building Heating – gradual switch away from gas to renewable sources by 2030;
- Network Electricity – the switch to LEDs for our lighting;
- Business Travel – implementation of a travel hierarchy and transition to zero emission travel where possible; and
- Corporate Purchases – polices to monitor and reduce emissions in this category.

Assumptions and limitations

To forecast from the 2023/2024 the following assumptions were made:

- External modelling factors including grid decarbonisation, and vehicle efficiency have been included and reflect the latest published figures;
- Design-Build-Finance-Operate (DBFO) operations was included from the contract end date when emissions move from maintenance and construction to corporate; and
- Forestry sequestration forecast to remain the same as the 2023/2024 value. Carbon removal from forestry sequestration is significant and is estimated. Independent assurance sources are being considered and will form part of the future method statement.

Maintenance and Construction

Scope and Data

Emissions from our construction and maintenance supply chain covers the manufacture, transport and use of materials such as asphalt, cement, concrete and steel on our network.

The following key data sources have been used:

1. Construction and maintenance supply chain National Highways Carbon Tool[5] outputs from financial years 2011-12 to 2023-24;
2. Major Project scheme pipeline from 2013 to 2030, covering RIS3; and,
3. Major Project Environmental Statements.

Baseline

The principal data source for the baseline is the carbon returns that construction and maintenance supply chain create using the National Highways Carbon Tool. Where the carbon returns were not complete or sufficiently robust, we supplemented this with the GHG emissions data declared within the project's Environmental Statements or we have calculated GHG emissions using the projects material bill of quantities. The resultant dataset was compiled and summarised by contract type, project type, material type and emissions source. The following section sets out how we used this data to model future performance to create a baseline. The baseline has been created for the 2019/20 financial year.

Major Projects Baseline Forecast

The carbon impact of construction is dependent on what is built, so we needed a measure of the average carbon efficiency of construction to compare performance over time (and between different projects), and to produce forecasts.

In order to establish a measure of carbon efficiency the total carbon impact (tCO_2e) was divided by the total major projects length (lane km). This gives a carbon intensity indicating the carbon emissions per lane km (tCO_2e/lane km). See below.

$$\frac{\sum Carbon\ impact\ from\ major\ projects}{\sum Lane\ km\ from\ major\ projects} = Carbon\ impact\ per\ lane\ km$$

This analysis was carried out for each category of major project deliverable:

- Widening
- Junctions
- Complex Infrastructure Projects (CIPs)
- Smart Motorway[6]
- Bypass

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[5] Carbon emissions calculation tool: National Highways Carbon emissions calculation tool

[6] All Smart Motorway and ALR Retrofits have been cancelled. Emissions provided by the supply chain have been included in the model, but these are no longer included in our forecasting.

- All Lane Running (ALR) Retrofit[6]

An overall average for performance was calculated across all project categories. To forecast future emissions a five-year rolling average was applied. The CIPs were added discreetly on top of the rolling average as this project type is built on an ad hoc basis due to their size. This also allows for future CIPs to be added to the model as they arise.

Maintenance Contracts

There are two primary types of maintenance contract that we have, regional area maintenance and DBFO contracts.

Both contracts have the same sources of maintenance GHG emissions with the exception of operational energy usage, such as lighting and variable message signs, which is only included for DBFO contracts. Operational energy usage for all other parts of the SRN outside of the DBFO contract is included within our corporate scope of GHG emissions. DBFO operational energy use has been estimated based on the average from other areas of the network currently under National Highway's control.

Total Construction and Maintenance Emissions Baseline

The combined construction and maintenance supply chain emissions baseline was summarised by source of emissions set out below based on the average split across all contract types:

- On site plant;
- DBFO operational energy;
- Material transport;
- Materials:
    - Concrete;
    - Cement;
    - Steel;
    - Asphalt;
    - Aggregates;
    - and other.

Assumptions

- The total carbon emissions for each project have been applied evenly over the total years of construction.
- A 5-year rolling average carbon footprint for maintenance and the DBFO contract works has been used to project emissions forward to 2050.
- All DBFO operational electricity will return under the control of National Highways after the contract end years.

Limitations

- Not all suppliers are currently reporting their National Highways Carbon Tool data correctly e.g., mis-reporting, late reporting or not reporting. To address this bill of quantity data and Environmental Statement carbon assessments were used to supplement the data and fill in gaps, as required.

- A location based[7] approach has been taken to estimating the GHG emissions for the operational electricity use by DBFO contracts using grid average emission factors. Therefore, this does not consider DBFO contracts using green energy tariffs. The future decarbonisation of the grid has been taken into consideration using the UK Government Green Book[8] greenhouse gas emission factors.

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[7] A location-based method reflects the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data). GHG Protocol, Scope 2 Guidance (2015): accessed online at: https://ghgprotocol.org/sites/default/files/Scope2_ExecSum_Final.pdf

[8] Department for Business, Energy & Industrial Strategy, IAG spreadsheet toolkit for valuing changes in greenhouse gas emissions (2019): accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/873679/toolkit-for-valuing-changes-greenhouse-gas-emissions.xlsm

Road Users

Policy Background

The DFT's plan to accelerate the decarbonisation of transport, the Transport Decarbonisation Plan (TDP), sets out in detail what government, business and society will need to do to deliver the significant emissions reduction needed across all modes of transport, putting us on a pathway to achieving carbon budgets and net zero emissions by 2050.

Therefore, many of the actions that will deliver the ambition for net zero road user emissions by 2050 are being pursued by the DfT and are out of our direct control, but that does not mean we cannot play our part. Our priorities are to help roll out solutions to decarbonise HGVs, and support the uptake of electric cars and vans. We will also continue our work integrating the SRN with other transport modes, whilst working to improve the efficiency of the network.

Scope and Data

For the purposes of the National Highways Net Zero Plan road user GHG emissions are the carbon dioxide emissions (CO_2) released at the tailpipe from vehicles travelling on the SRN.

The primary sources of data for road user emissions on the SRN are outputs from National Highways' five regional transport models (RTMs), with additional data taken the DfT's National Transport Model (NTM) which has been used to model the impact of the TDP. We use modelled data as there is not sufficient actual data to provide an accurate and repeatable measure of emissions across the SRN.

The five RTMs cover the full SRN and model traffic flows and speeds. They model how these are impacted by new investment, policy changes and changes in travel demand. They draw on an extensive range of demand data and are adapted to reflect a range of background scenarios defined by DfT (and reflecting the TDP), considering the major factors affecting future patterns of travel.

The RTMs provide us with the most reliable estimates of the total carbon emissions (tonnes of CO_2) from the SRN. To understand how this split by fleet (car, light goods vehicles, rigid heavy goods vehicles, articulated heavy goods vehicles and public service vehicles), we use the NTM.

The NTM is a DfT model which produces forecasts of road traffic growth, vehicle tailpipe emissions, congestion and journey times. Like the RTMs, NTM provides a systematic means of comparing the national consequences of alternative transport policies against a range of background scenarios which take into account the major factors affecting future patterns of travel.

Baseline

O Our 2019/20 baseline was updated using the above methodology as part of the 2022/23 progress report. This remains unchanged for this year's report.

Method

Annual estimates of road user emissions are derived from RTM data on forecast annual traffic volumes flows, speeds and traffic composition. These are taken from each model and combined to provide totals for the SRN.

To provide the split of emissions between modes (cars, vans, HGVs, etc), we use the proportions from an SRN (England) specific extract of the NTM.

Assumptions

- Estimates are based on the DfT's 'Core Scenario', which is recognised as a realistic and plausible scenario for use in transport appraisal. This means that:
  - Estimates of traffic growth reflect 'central' projections of economic growth, population and fuel prices;
  - Changes in traffic flows, traffic speeds reflect published plans for improvements to the SRN and Government policy commitments
  - Traffic composition and fleet composition changes reflect published policy commitments
- The baseline assumes an increase in vehicle km travelled on the SRN over time.
- Traffic and emissions figures for 2020/21 to 2024/25 have been adjusted to reflect the lasting impact of COVID 19 on travel, in line with recommendations from DfT.
- The baseline assumes an increase in vehicles that are zero emission at the tailpipe over time. For cars this will primarily be battery electric vehicles (BEVs) and for heavier duty vehicles this could include BEVs, electric road enabled vehicles or hydrogen powered vehicles.

Action Quantification

Whilst government policy is expected to drive the transition to a net zero vehicle fleet on the road network, there are actions we can take to support the transition or increase the rate of transition. To help prioritise which actions we should focus our efforts on, the potential carbon emission reduction was estimated for key actions. Some actions we have included in our net zero plan were not included in this analysis because the potential impact of some actions could not be disaggregated from existing government policy and initiatives.

Research was previously undertaken to determine the likely emissions reductions achievable by potential actions. The emissions reduction assumptions were applied to the NTM data to estimate in each year between 2021 and 2050 what the emissions reduction would be.

Assumptions

A number of assumptions were made in order to apply emissions reductions to the NTM data. The assumed impact on each action or group of actions of reducing emissions as well as the reference sources these assumptions are based on is set out in Table 6.1.

Table 1: Assumptions and reference sources for each action considered

Action / Action Group	Impact Assumptions	Reference
70 mph speed Limit compliance by cars and LGVs	2% emissions reduction across cars and LGVs	CCC Report and European Environment Agency[9]
60 mph speed Limit compliance by cars and LGVs	7% emissions reduction across cars and LGVs	CCC Report and European Environment Agent

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[9] European Environment Agency 2020. Available online: Do lower speed limits on motorways reduce fuel consumption and pollutant emissions? — European Environment Agency (europa.eu)

Action / Action Group	Impact Assumptions	Reference
Economical and efficient driving by cars and LGVs	8% emissions reduction across 20% of cars and LGVs	CCC Report and European Environment Agent CCC Report and European Environment Agency
Economical and efficient driving by rigid HGVs	13% emissions reduction, 50% take up	Energy Saving Trust[10], CCC Report and Professional judgement
Economical and efficient driving by articulated HGVs	22% emissions reduction, 50% take up	Energy Saving Trust, CCC Report and Professional judgement
Improved logistics by rigid HGVs	10% emissions reduction	Energy Saving Trust, CCC Report and Professional judgement
Improved logistics by articulated HGVs	11% emissions reduction	Energy Saving Trust, CCC Report and Professional judgement
Demand reduction through modal shift	1% emissions reduction across cars and HGVs	CCC Report and Professional judgement
Smoother road surface	Assume 2% emissions reduction on 5% of km travelled across the network	Fuelsave Project[11] and Professional judgement

Limitations

Whilst reference sources were found for the potential emissions saving from these potential actions, the extent of uptake and impact across the SRN has been largely based on professional judgement.

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[10] Energy Saving Trust. Available online: https://energysavingtrust.org.uk/service/subsidised-ecodriving-training/

[11] Ramboll Fuelsave Project. Available online: https://ramboll.com/digital-mobility-lab/modelling/fuelsave