

Transport for the North Strategic Transport Plan – Independent Integrated Sustainability Appraisal Carbon Review

Transport for the North

January 2019



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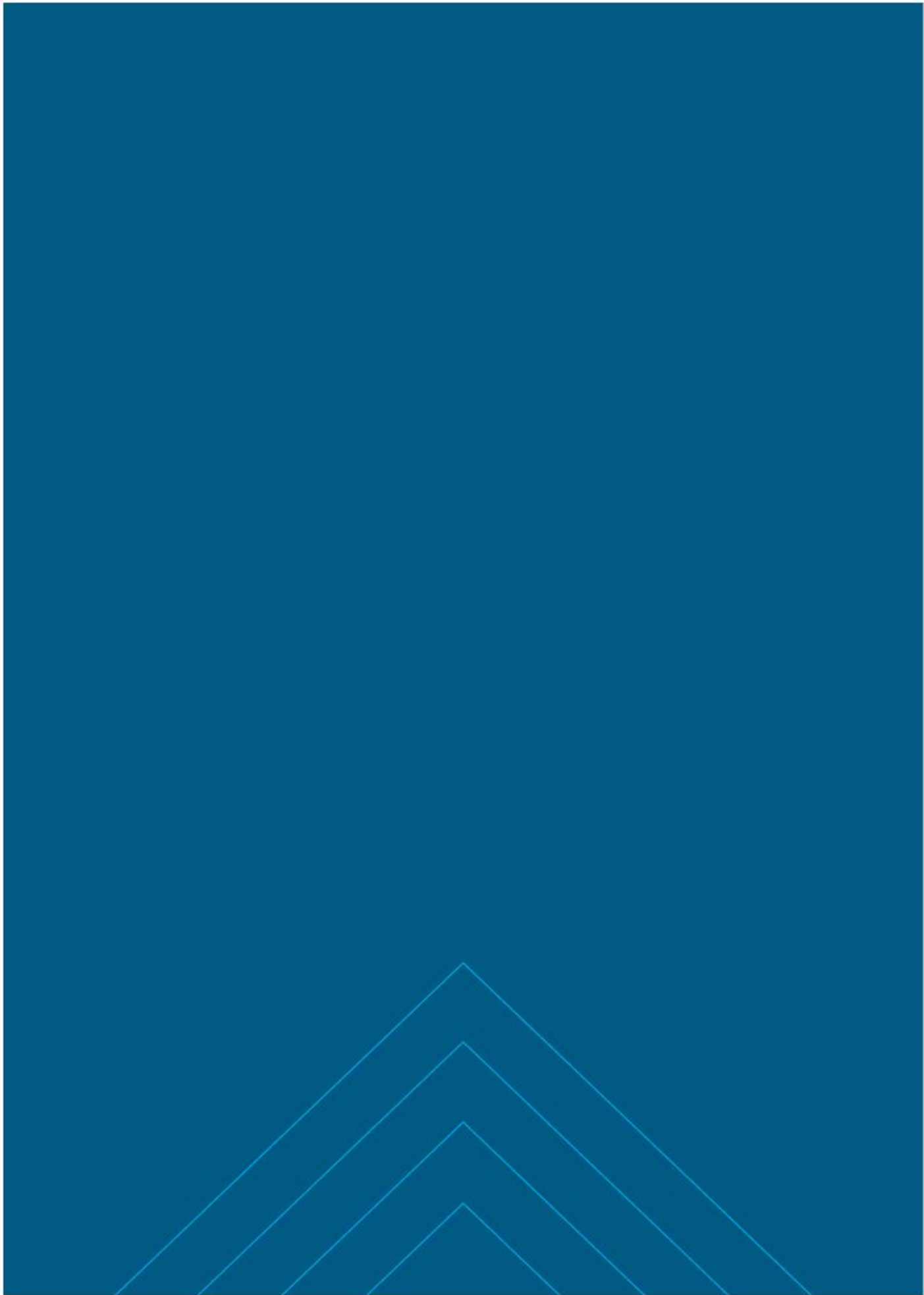
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Executive Summary

A carbon review to assist Transport for the North (TfN) in addressing consultees' comments concerning the carbon performance of the draft Strategic Transport Plan (STP) 2017 has been undertaken. The findings of this review will inform the preparation of the Final STP which will be adopted in early 2019. In addition, the carbon review complements and informs the final step of the Integrated Sustainability Appraisal (ISA) of the STP.

The carbon review has involved:

- Review of key messages from consultees' comments;
- Review of applicable carbon related Government policy and targets;
- Review of carbon approaches and targets in six northern local authorities' transport plans/strategies and in Greater London;
- Review of TfN's travel demand modelling and scenarios carbon modelling;
- Review of carbon assessments for Strategic Development Corridors (three corridors);
- Assessment and critique of STP policy in view of findings above; and
- Preparation of recommendations for improvement of the STP's carbon performance.

National policy on climate change is underpinned by the Climate Change Act 2008 and the UK's international commitments to reduction of greenhouse gas emissions, in particular the Paris Agreement. The Climate Change Act 2008 established a legally binding target to reduce the UK's 'net' greenhouse gas (GHG) emissions by at least 80% below base year (1990) levels by 2050 and contribute to global emission reductions to limit global temperature rise to as little as possible above 2°C. Since the Climate Change Act was enacted, the Paris Agreement has been signed and ratified by the majority of the world's Governments. This reflects more recent scientific evidence and commits signatories "to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels." as opposed to 2°C above pre-industrial levels as set out in the Act.

Under the Act, the UK has so far set five "carbon budgets". These set interim five-year caps on emissions from 2008 to 2032. The UK is currently in the third budget period (2018 to 2022). Targets are set by Government through consultation with the Committee on Climate Change (CCC), who suggest levels of emissions reductions in various transport areas and mechanisms to make these reductions. The UK has succeeded in meeting the first two budget periods and is on track to meet the third. However, it is not on track to meet the fourth budget period (2023 to 2027) according to CCC's findings. To meet future carbon budgets and the 80% target for 2050, the UK will need to reduce emissions by at least 3% a year, from now on.

UK Carbon Budgets

Budget number	Time-period	Carbon Budget Level	Reduction below 1990 levels
1	2008-2012	3,018 MtCO ₂ e	25%
2	2013-2017	2,782 MtCO ₂ e	31%
3	2018-2022	2,544 MtCO ₂ e	37% by 2020
4	2023-2027	1,950 MtCO ₂ e	51% by 2025
5	2028-2032	1,725 MtCO ₂ e	57% by 2030

The CCC has recently identified transport as the largest GHG emitting sector, accounting for 28% of all UK GHG emissions in 2017 and that there has been little change in the level of transport emissions since 2008. This trend must be reversed if the legally binding fourth and fifth UK carbon budgets are to be met. CCC's has called for policies with greater ambition to reduce emissions even further will need to be implemented.

The review has found that the Consultation Draft STP 2017 did recognise the need 'to reduce carbon emissions from transport' in its objectives, that transport has a significant role to play in meeting commitments to reduce greenhouse gas emissions and acknowledges that Government has set a target to reduce carbon emissions by 80% by 2050. It also acknowledged that reducing carbon emissions is now imperative and that the Government's Clean Growth Strategy includes the desire to work with transport and logistics industry to reduce the impact of freight emissions across all modes including road, rail and shipping. However, no specific carbon policy objectives, key approaches and measures to achieving carbon reduction across modes of transport have been set out in the Consultation Draft STP 2017. Equally, no reference is made to interim carbon targets nor carbon budgets as set out by Government and how they have been carried through to the Consultation Draft STP 2017 proposals. The only target acknowledgement is the ultimate target to reduce carbon emissions by 80% by 2050 from 1990 baseline.

The review has recommended that the Final STP better aligns itself with latest Government policy and Committee on Climate Change's recent stretched targets and sets out clear policy messages in terms of the role of TfN and its partners in achieving these in the northern region. This could be achieved through the addition of a new section on 'Decarbonisation of Transport' to the Final STP where clear carbon policy in terms of objectives and targets across transport modes is set out. Carbon policy would need to be set out covering the following objectives (and any targets associated with these) as a minimum:

- Reduce emissions from cars and vans
- Reduce emissions from trucks
- Reduce emissions from trains
- Reduce emissions from aviation
- Increase uptake of electric vehicles
- Increase availability of EV charge points
- Increase use of low carbon fuels (hydrogen, biofuels)
- Increase use of low carbon alternative transport (walking, cycling and public transport)

The review has found out that the transport and carbon modelling work undertaken for the STP to date does not sufficiently test the combination of measures necessary to deliver the successive carbon budgets. Current modelling work projects reductions in total emissions as 15% - 18% by 2025 and 23% - 27% by 2030, from the 2015 baseline. This represents a very serious shortfall when compared to necessary overall 51% and 57% reductions respectively from 1990 levels for the fourth and fifth national carbon budgets and further improved strategic modelling of emissions will be required. It is noted, though, that CCC points to the need for slightly lower reductions in emissions from the transport sector (around 44%) in the period to 2030.

The new section on 'Decarbonisation of Transport' needs to set out how STP proposed policies and measures are projected to result in carbon emissions reductions (from 1990 baseline) aligned with those set out in the national carbon budgets. The new section could clarify that although Government and CCC's targets are supported by TfN, TfN commits to identifying the most appropriate targets for the northern region as part of the subsequent TfN's Investment Programme. This is because commitment from TfN's partners and sufficient lead time will be necessary for the current approaches to be modified and tested as recommended by this review and this cannot realistically be accommodated within the Final STP programme.

TfN's Investment Programme, supported by complementary investment and interventions at a local level, would therefore need to set out a clear programme of phased introduction and implementation of key policies and measures through the interventions promoted, and their projected contribution to meeting carbon budget targets, through to 2050 ('Pathway to 2050').

The new section on 'Decarbonisation of Transport' could also recognise that establishing the most appropriate approaches for reducing carbon emissions will require joint collaboration and leadership through TfN (via delivery of the Strategic Transport Plan) and local transport authorities (through their local transport plans), as TfN develops the Investment Programme.

In establishing carbon impacts and reductions, an outcomes focused, evidence-based and quantitative carbon performance approach similar that used by the Mayor of London's Transport Strategy is recommended to inform the establishment of the 'Pathway to 2050'.

Given that transport is the only UK sector which saw an increase in total emissions over the second carbon budget period (2012 – 2017), and given the importance of the period covered by the third (current), fourth and fifth carbon budgets in terms of being able to limit global warming to 1.5°C, it is further recommended that estimates of total carbon impacts and reductions (from 1990 baseline) projected for the periods 2023-2027 and 2028-2032 form a key focus in terms of the identification of carbon reduction measures in TfN's Investment Programme's 'Pathway to 2050'.

1. Introduction

Atkins has been commissioned to undertake a carbon review to assist Transport for the North (TfN) in addressing consultees' comments concerning the carbon performance of the draft Strategic Transport Plan (STP). The draft STP was the subject of public consultation in 2017. The findings of this review will inform the preparation of the Final STP which will be adopted in early 2019. In addition, the carbon review complements and informs the final step of the Integrated Sustainability Appraisal (ISA) of the STP also being undertaken by Atkins.

The carbon review has involved:

- Review of key messages from consultees' comments;
- Review of applicable carbon related Government policy and targets;
- Review of carbon approaches and targets in six northern local authorities' transport plans/strategies and in Greater London;
- Review of TfN's travel demand modelling and scenarios carbon modelling;
- Review of carbon assessments for Strategic Development Corridors (three corridors);
- Assessment and critique of STP policy in view of findings above; and
- Preparation of recommendations for improvement of the STP's carbon performance.

2. Consultees comments on the draft Strategic Transport Plan

Comments pertaining specifically to the STP's carbon performance have been received from Zero Carbon Yorkshire Transport Group, Friends of the Earth, Global Justice Sheffield and Anthony Rae (on behalf of the ETOs campaigners grouping). These are set out in full in Appendix A and key messages arising summarised below. These key messages are the starting point for this carbon review.

2.1. Zero Carbon Yorkshire Transport Group

- STP's Objective No.1, "Reduce greenhouse gas emissions from transport overall, with particular emphasis on road transport" very seriously inadequate. The Committee on Climate Change's (CCC's) 2017 progress report sets out the emissions reductions required to enable legally binding carbon budgets to be met. It states "Domestic transport emissions should fall by around 44% between 2016 and 2030 and create options to allow near-zero emissions by 2050."
- TfN's own projections of carbon emissions resulting from travel on all existing Northern roads, plus roads projects currently envisaged as being included within both the TfN Strategy and parallel road strategies of other responsible authorities. These projections show total road emissions would only fall by 9 -14% by 2030. That is nowhere near the 44% reduction needed to meet carbon budgets. It is crucial that emissions from Northern transport are reduced far more rapidly from the levels currently projected.
- Climate objectives need to be strengthened in the STP to a level that properly protects both our economy and environment.
- Low –carbon technologies are not yet developed or adequately adopted in the North - and cannot reasonably be relied on to be developed - at a sufficient rate to achieve that growth, whilst simultaneously meeting these stronger climate objectives. TfN should therefore engage with other stakeholders, especially the relevant government departments, to seek solutions.
- Developing a radically different range of prospective transport projects, in particular, road transport and scaling back the major road investment is essential in the STP.
- Additional connectivity should be achieved through promoting a modal shift towards low carbon public transport and encouraging more walking and cycling within towns and cities.

- There is also a compelling case for digital connectivity, where a step change in adoption and improvements in technology can lead to greatly expanded utilisation that would replace the need for some physical connectivity.

2.2. Friends of the Earth

- The STP must reflect the fifth carbon budget for the period 2028-32 which is set at 1725 MtCO_{2e} (a reduction of emissions of 57% by 2030 on 1990 levels) if it is to be consistent with national policy.
- The CCC has issued advice to Parliament recommending a target to reduce transport emissions by 44% between 2016 and 2030 and further reductions to near zero by 2050. This clearly represents a significant step-change in progress over the period of the STP.
- However, no targets are identified for emissions reduction in the STP. While the report contains welcome words recognising the scale of transport' emissions, it lacks any indication of actual emission reductions, resulting from the STP.
- Also, draft projections released by TfN identify that the best case scenario under STP result in only a 14% reduction in transport emissions. This is an order of magnitude short of the CCC's recommendations and fails to demonstrate sufficient compliance with national policy.
- The CCC have stated that we need to reach global net-zero carbon dioxide levels (the main greenhouse gas resulting from transport) by the 2040s. The TfN projections indicate an at-best decrease of 67% by 2050, very short of the net-zero recommendations.

2.3. Global Justice Sheffield

- Alarmed that Transport for the North's Plan fails to demonstrate how the necessary 44% reduction in carbon emissions by 2030 advocated by the Committee on Climate Change to meet legally binding carbon budgets can be met.
- Little evidence that the strategy set a specific carbon reduction target as one of its core policy drivers, by which proposals could be shaped and tested.
- If the Strategy as set out is implemented, the expansion in road capacity will lead to a substantial increase in car miles. The road construction itself will involve carbon emissions. We echo the need for improved rail connectivity within the North, especially Sheffield/Leeds and Sheffield/ Manchester.
- Although improved digital connectivity can bring about a larger reduction in emissions than can physical connectivity, the thrust of the strategy is to favour improved physical connectivity. We contend that there is a good case for shorter distance connectivity, but that this should be achieved by a shift from car to bus, cycle or foot and that improved longer distance connectivity should largely be achieved by rail.
- It is foolhardy to think that the economy should take precedence over environmental considerations. The international Paris Agreement recognises that the global average temperature rise must be kept to 1.5 - 2°C because, if it goes beyond this, the economic and social damage from extreme weather events could wipe out any economic benefits gained from further economic development.

2.4. Anthony Rae (on behalf of the ETOs campaigners grouping)

- The STP has failed its 'carbon test'. The STP does acknowledge that 'Reducing carbon emissions is now imperative' but an explicit carbon reduction objective, trajectory and target within the STP has not been set.
- Not having carbon reduction as a strong policy driver has consequences within the STP and its programme approaches, particularly in road mode, The initial TfN STP carbon analysis of the carbon impacts of the four traffic demand scenarios (in comparison to a DfT BAU) at 2030/40/50 dates records carbon reductions of -9 or 14% by 2030 under any scenario but which are nowhere near the -44% by 2030 recommended by the CCC. The fact also that the low end of this range provides just a 1% reduction compared to the BAU (-9% as against -8%) demonstrates how weak any TfN carbon reduction interventions must be. Beyond 2030 the rate

of reduction of course accelerates (as EV decarbonisation spreads) but to focus instead on the 2030-50 period would be to demonstrate a lack of understanding of the time-specific nature of the policy framework (CCC's legally adopted national carbon budgets) within which the STP has to work. Against those requirements the STP is proposing to underachieve by a shortfall of 68-80%.

- The STP environmental objective must include a specific and quantified carbon reduction trajectory and target, located within and responding to the adopted carbon budgets set by the Climate Change Act. This should be prepared incorporating aviation emissions within the same approach utilised by CCC.
- Alongside this objective a carbon reduction protocol, covering both TfN and combined authority activity, should be developed and applied. A carbon reduction objective/target having been established, it should then used as a 'policy driver' for all subsidiary levels of the STP to ensure that their outputs are contributing to the objective and are consistent with the guidance of the CCC.
- The entire STP must be reviewed and revised against an alternative 'carbon reduction scenario' consistent with the CCC recommended -44% reduction by 2030.

3. Government policy and targets review

3.1. Background

National policy on climate change is underpinned by the Climate Change Act 2008 and the UK's international commitments to reduction of greenhouse gas emissions, in particular the Paris Agreement. The Climate Change Act 2008 established a legally binding target to reduce the UK's 'net' greenhouse gas emissions by at least 80% below base year (1990) levels by 2050 and contribute to global emission reductions to limit global temperature rise to as little as possible above 2°C. Since the Climate Change Act was enacted, the Paris Agreement has been signed and ratified by the majority of the world's Governments. This reflects more recent scientific evidence and commits signatories "to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels." as opposed to 2°C above pre-industrial levels as set out in the Act.

Under the Act, the UK has so far set five "carbon budgets". These set interim five-year caps on emissions from 2008 to 2032. The UK is currently in the third budget period (2018 to 2022).

Table 3-1 UK Carbon Budgets

Budget number	Time-period	Carbon Budget Level	Reduction below 1990 levels
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4	2023-2027	1,950 MtCO _{2e}	51% by 2025
5	2028-2032	1,725 MtCO _{2e}	57% by 2030

Targets are set by Government through consultation with the CCC, who suggest levels of emissions reductions in various transport areas and mechanisms to make these reductions.

The UK has succeeded in meeting the first two budget periods and is on track to meet the third. However, it is not on track to meet the fourth budget period (2023 to 2027) according to CCC's

findings. To meet future carbon budgets and the 80% target for 2050, the UK will need to reduce emissions by at least 3% a year, from now on. This will require the Government to apply more challenging measures as recently identified by the CCC (see Sections 3.8 and 3.9 and Table 3.2).

The national Government policy / strategy documents reviewed all stem from the targets set in the Climate Change Act and the five-year budgets, and the measures and targets that are set out therein to meet the 2050 target. The following policy documents have been reviewed and are summarised in the sections that follow:

- Climate Change Act 2008
- Reducing emissions from road transport. The Road to Zero Strategy (2018)
- Automated and Electric Vehicles Act 2018
- The Clean Growth Strategy (2017)
- Driving the Future Today - A strategy for ultra-low emission vehicles in the UK (2013)
- The Carbon Plan (2011)

In addition, the following highly relevant documents have also been reviewed:

- CCC Reducing UK emissions 2018 Progress Report to Parliament (June 2018)
- CCC's Lord Deben letter to Secretary of State for Transport (11 October 2018)
- Delivering Clean Growth Progress Against Meeting Our Carbon Budgets – The Government Response to the CCC (October 2018)

3.2. Climate Change Act 2008

The Climate Change Act 2008 established a legally binding target to reduce the UK's 'net' greenhouse gas emissions by at least 80% below base year (1990) levels by 2050 and contribute to global emission reductions to limit global temperature rise to as little as possible above 2°C.

Under the Act, it is the duty of the Secretary of State:

- (a) to set for each succeeding period of five years beginning with the period 2008-2012 ("budgetary periods") an amount for the net UK carbon account (the "carbon budget"), and
- (b) to ensure that the net UK carbon account for a budgetary period does not exceed the carbon budget.

The carbon budget for a budgetary period may be set at any time after this Part comes into force, and must be set:

- (a) for the periods 2008-2012, 2013-2017 and 2018-2022, before 1st June 2009;
- (b) for any later period, not later than 30th June in the 12th year before the beginning of the period in question.

Therefore, alongside the long term legally binding target, the Climate Change Act 2008 sets out shorter and medium term five year carbon budgets. These budgets recognise the cumulative nature of greenhouse gases and are designed to accelerate early action on emissions reduction rather than leaving it to later in the period to 2050.

3.3. The Road to Zero Strategy (2018)

3.3.1. Introduction

The Road to Zero (RTZ) Strategy sets out measures towards cleaner road transport and to put the UK at the forefront of the design and manufacturing of zero emissions vehicles. The RTZ Strategy is aligned with the Clean Growth Strategy 2017 (see below) in that its main ambition is to introduce measures that will assist in reaching the goal for all new cars and vans to be effectively zero emission by 2040. Leading up to this ambition both strategies aim for at least 50%, and as many as 70%, of new car sales and up to 40% of new van sales to be ultra-low emission by 2030.

3.3.2. Reducing emissions from vehicles already on the road

Under the RTZ Strategy, the Government aims to increase the supply and sustainability of low carbon fuels in the UK through a legally-binding 15-year strategy to more than double their use, reaching 7% of road transport fuel by 2032. Furthermore, the Government will extend the Clean Vehicle Retrofit Accreditation Scheme (CVRAS) beyond buses, coaches and HGVs to include vans and black cabs.

3.3.3. Encouraging uptake of Ultra-Low Emission Vehicles (ULEVs)

The Government will continue to offer grants for plug-in hybrid/electric cars, vans, taxis and motorcycles until at least 2020 and consumer incentives in some form will continue to play a role beyond 2020.

Government will also launch a 2018/19 Go Ultra Low campaign and continuing to work with industry on consumer communications about ULEVs until at least 2020.

3.3.4. Electric vehicle charging infrastructure

Under the strategy, the Government will implement a £400 million Charging Infrastructure Investment Fund to help accelerate charging infrastructure deployment. In alignment with the Automated and Electric Vehicles Act 2018 (see section 2.3), the Government will ensure:

- that charge points are available at motorway service areas and large fuel retailers;
- that charge points are easily accessed and used across the UK. This includes powers to provide a uniform method of accessing public charge points and refuelling points; make certain information publicly available in an open and transparent format and set reliability standards; and
- that charge points are smart ready by giving Government powers to set requirements prohibiting the sale or installation of charge points unless they meet certain requirements.

Furthermore, the Government will take steps to introduce a requirement that all newly built houses are electric vehicle ready and that all new streets with parking provision will include charging points in lighting columns for residents. This will come under a £4.5million On-street Residential charge point Scheme that Government will support until 2020.

Government will also continue to provide grant support through the Electric Vehicle Home charge Scheme (EVHS) until March 2019, with all installations becoming smart enabled. Furthermore, Government will increase the grant level of the Workplace Charging Scheme from £300 per socket to 75% of the purchase and installation costs of a Charge Point capped at a maximum of £500 per socket.

3.3.5. Government vehicle fleet

The Government aims to lead the way in the switch to ULEVs by ensuring 25% of the central Government car fleet is ultra-low emission by 2022 and that all new car purchases are ultra-low emission by default. Government is committing to 100% of the central Government car fleet being ultra-low emission by 2030.

3.3.6. Freight emission reductions

Under the RTZ Strategy, the Government is introducing a new voluntary, industry-supported commitment to reduce Heavy Goods Vehicle (HGV) greenhouse gas emissions by 15% by 2025 (from 2015 levels). A joint research project with Highways England is also being launched to identify and assess zero emission technologies suitable for HGV traffic on the UK road network.

3.3.7. Supporting local action

The strategy aims to ensure local planning policies incorporate facilities for charging electric vehicles via the National Planning Policy Framework.

The Government will also continue to fulfil a £48million ultra-low emission bus scheme funding round to accelerate local uptake and deployment of supporting infrastructure, as well as launching a

second round of funding for local authorities to roll out dedicated taxi charging infrastructure, of at least £6million.

3.4. Automated and Electric Vehicles Act 2018

3.4.1. Introduction

New laws have been approved to apply regulations to the provision of electric charging and charging infrastructure in 2018. Regulations have yet to be applied under this Act.

3.4.2. Provision of public charging or refuelling

Under the Act, regulations may be implemented requiring large fuel retailers or service area operators to provide public charging or refuelling points. Regulations may also include a requirement for charge points to be made available at specified times.

3.4.3. Provision of information for public charge point users

Regulations may require operators of public charging or refuelling points to make available specific information relating to such points. This information is such information as the Secretary of State considers likely to be useful to users or potential users of the point. Information may include:

- the location of the point and its operating hours;
- available charging or refuelling options;
- the cost of obtaining access to the use of the point;
- the method of payment or other way by which access to the use of the point may be obtained;
- means of connection to the point;
- whether the point is in working order; and
- whether the point is in use.

3.4.4. Smart charge points

Regulations may include specific requirements that must be met in order to sell or install a charge point, including technical specifications for a charge point. Specifications may include the ability for a charge point to:

- receive and process information provided by a prescribed person;
- to react to information of a kind mentioned in paragraph (a) (for example, by adjusting the rate of charging or discharging);
- to transmit information (including geographical information) to a prescribed person;
- to monitor and record energy consumption;
- to comply with requirements relating to security;
- to achieve energy efficiency; and
- to be accessed remotely.

3.5. The Clean Growth Strategy (2017)

3.5.1. Introduction

The Clean Growth Strategy (CGS) sets out actions that Government is taking to put clean growth at the centre of the modern Industrial Strategy for the UK. Transport emissions are addressed in alignment with the Climate Change Act (see section 3.2 above), the Carbon Plan (see section 3.7 below) and the strategy for ULEVs in the UK (see section 3.6 below).

The CGS highlights that whilst the transport sector now accounts for 24% of UK emissions, the fuel used in cars is now lower carbon, with biofuels now accounting for around 3% of fuel sales. According to the CGS, as of 2017 the UK had over 115,000 ULEVs on the road. ULEV uptake has

been driven through a combination of grants, together with improved charging infrastructure and new approaches like the £40 million 'Go Ultra Low Cities' scheme. Through 'Go Ultra Low Cities' eight local authority areas are trialling local initiatives including city centre charge point hubs, free parking and access to bus lanes for ULEVs.

Following the Government's announcement to end the sale of all new conventional petrol and diesel cars and vans by 2040, the CGS states that by 2040 cycling and walking should be the natural choice for shorter journeys, and a pathway should be pursued involving emissions from transport falling by almost 30% compared to today by 2032 (to around 83 Mt).

3.5.2. Achieving the 2032 emissions reduction pathway

To achieve the 2032 30% transport emissions reduction the CGS recognises that the transport system will need to be further upgraded. The Government and local authorities will need to do more to accelerate ULEV uptake by motorists. 30% of new car sales are expected to be ULEVs by 2030, with the possibility of reaching as many as 70%. For new vans, up to 40% of sales could be ULEVs by 2030. There needs to be significant improvement in the efficiency of HGVs, with new HGVs needing to be up to 15% more efficient by 2030. A cleaner public transport system is also required. A large increase on the 13% of UK buses that are currently low-emission is necessary, and more use of electric, bi-mode (electric and diesel hybrid) and alternative fuel traction on the railway is needed. The CGS stresses the importance of reducing the number of shorter journeys made by car by supporting people to use alternative forms of transport for these trips such as cycling and walking.

3.5.3. Government actions and mechanisms

3.5.3.1. ULEV cars

The Government is spending £1 billion to drive the uptake of ULEVs. Government will provide support for ULEVs to help the development of a mature and self-sufficient market. And if battery prices continue to fall there will be less need for Government subsidies for new vehicles in the future.

3.5.3.2. Charging infrastructure

The Government aims to have one of the best electric vehicle (EV) charging networks in the world. To support this:

- In addition to workplace and residential charging support, the Government has also allocated an additional £80million to support charging infrastructure deployment, alongside £15 million from Highways England to ensure rapid charge points every 20 miles across 95% of England's Strategic Road Network
- New powers under the Automated and Electric Vehicles Bill will allow the Government to set specific requirements for the provision of EV charge points or hydrogen refuelling infrastructure at motorway service stations and large fuel retailers, as well as ensuring that charge points are convenient to access and work seamlessly right across the UK
- The Bill will also allow the Government to require all new charge points sold or installed in the UK to be 'smart' enabled. This will help shift charging away from peak times of the day, reducing demand on the electricity system and keeping costs lower for everyone.
- The Government will consider the role of regulation to accelerate the UK's transition to widespread provision of ULEV infrastructure

3.5.3.3. Hydrogen fuelled vehicles

The Government has provided £4.8 million through the Hydrogen for Transport Advancement Programme to create a network of 12 hydrogen refuelling stations, and £2 million through the Fuel Cell Electric Vehicle Fleet Support Scheme to increase uptake of hydrogen fuel cell cars and vans in the public and private sector. A new £23 million fund was recently announced to boost the creation of hydrogen fuel infrastructure and encourage roll-out of hydrogen vehicles.

3.5.3.4. Low emission taxis

The government will also support the uptake of low emission taxis:

- The Government will provide £50 million for the Plug-in Taxi programme, giving taxi drivers up to £7,500 off the purchase price of a new ULEV taxi, alongside £14 million to support ten local areas to deliver dedicated charge points for taxis.
- Government will consider whether their revised best practice guidance to local taxi and private hire vehicle (PHV) licensing authorities in England should recommend zero emission capability in urban areas by 2032.

3.5.3.5. Low carbon alternative transport

The government will continue to invest in the public transport network, and help people to cycle, walk or travel by bus or train.

The government will invest £1.2million in cycling and walking between 2016-21. Under this investment and strategic approach, Local Cycling and Walking Infrastructure Plans will identify where improvements are required at the local level, enabling a long-term approach to developing local cycling and walking networks.

Government will also provide £100 million for a national programme of support for retrofitting and new low emission buses in England and Wales. Furthermore, the Government will seek more use of electric, bi-mode (electric and diesel hybrid) and alternative fuel traction on the railway. This will include investing in route electrification where it provides benefits to passengers.

3.5.3.6. Freight and aviation

There are fewer options for reducing emissions in the freight and aviation sectors, but innovation in fuel technology can play an important role. Government is providing £40 million out to 2021, to fund the development of advanced low carbon fuels derived from wastes or industrial and agricultural by-products.

In developing a more efficient and low carbon freight system the government will accelerate their activity to enable cost effective options for shifting more freight from road to rail, including using low emission rail freight for deliveries into urban areas, with zero emission last mile deliveries.

3.6. Driving the Future Today – A strategy for ultra-low emission vehicles in the UK (2013)

3.6.1. Introduction

In 2013 the Department for Transport (DfT) and the Office for Low Emission Vehicles (OLEV) released their strategy for the increased uptake of ULEVs in the UK. The aim of the strategy is to set out an ambitious programme for ULEVs in the UK. The ULEV strategy is aligned with The Carbon Plan as it aims to provide measures to meet the vision of, by 2050, almost every car and van in the UK being an ultra low emission vehicle.

3.6.2. Funding for ULEVs

In the OLEV's Action for Roads paper, a funding commitment of over £500 million was set out of new capital investment between 2015 and 2020 to continue to establish the UK as a premier market for ULEVs.

The Government and OLEV launched the Plug-in Car Grant and the Plug-in Van Grant to help reduce the cost differential between ULEVs and conventional vehicles and also provide incentives for ULEVs through the tax system.

In alignment with The Carbon Plan, OLEV have supported the Green Bus Fund which encourages bus operators and local authorities to switch to low and ultra low emission buses. This £87 million fund has delivered more than 1200 new low carbon buses in England, with nearly 350 in London and 275 in Manchester.

3.6.3. The vision

The Government has an ambitious vision for ULEV uptake in the UK, but one that is realistic in the long term. The Government wants to see:

- buoyant domestic fleet and private markets for ULEVs with every new car an ULEV from 2040 and an effectively decarbonised fleet by 2050 to meet The Carbon Plan targets;
- a network of supporting infrastructure that ensures ULEVs are an attractive customer proposition;
- world class skills and facilities for the development and manufacture of ULEV technologies, exporting vehicles globally;
- a smarter electricity grid that maximises the benefits to vehicle owners and the electricity system from the shift to ULEVs; and
- all of the above combining to make the UK the best place in Europe for the automotive sector and associated ULEV industries to invest.

3.6.4. Charging Infrastructure

OLEV and the Government recognize that for drivers to choose an ULEV they need the same confidence to be able to drive anywhere in the UK, and beyond, knowing that they will be able to refuel when they need to. The ULEV strategy therefore sets out a goal to implement supporting charging infrastructure to achieve this.

Whilst much of the UK is already well served by suitable charge points, the strategy suggests the need to build on the existing infrastructure and monitoring the need for additional charge points and other refuelling infrastructure as vehicle uptake grows and as new technologies such as hydrogen are introduced.

OLEV recognise in the strategy that the majority of people charge their vehicles at home overnight, and the installation of a dedicated domestic charging unit can help to do this safely and quickly. But it is recognized that installation of a suitable charge point is costly; therefore a charge point grant is included under the Government's £37million package for charging infrastructure. Under this scheme homeowners can claim up to 75% (capped at £1,000 including VAT) off the total capital costs of the charge point and associated installation costs. Furthermore, a number of vehicle manufacturers and charge point suppliers are willing to contribute the remaining 25%, so that the charge point can be installed without cost to the homeowner.

OLEV and the Government also recognize that a national network of rapid charge points is critical to the successful uptake of plug-in ULEVs, to replace the convenience of traditional refuelling stations. The Government will continue to work with stakeholders to consider the best way of implementing a sustainable network of rapid charge points to meet the needs of current and prospective ULEV owners. The strategy also sets out a requirement that every publicly accessible charge point that the Government funds must have 'pay-as-you-go' functionality. The integration of payment systems with other services, such as transport ticketing systems or car parking charges is also encouraged.

The strategy suggests that train station car parks are ideal locations for charge points as vehicles tend to be parked there for several hours at a time. The Government has made funding available to train operating companies (TOCs) in England to cover a proportion of the costs of obtaining and installing plug-in vehicle charging infrastructure at train stations.

The Government is also providing a grant to support the installation of recharging infrastructure in public sector workplace car parks. This will help public sector bodies and their employees integrate plug-in vehicles into fleets and demonstrate leadership.

3.6.5. Local Authorities

The £37million charging infrastructure fund also includes a specific grant scheme for local authorities that supports on-street charge points in residential streets where off-street parking is not available, and rapid charge points in locations where they will support uptake of plug-in vehicles.

3.7. The Carbon Plan (2011)

3.7.1. Introduction

In 2011 the UK government published 'The Carbon Plan: Delivering our low carbon future' (the Plan). The purpose of this plan was to set out the proposals and policies for meeting the five-year carbon budgets.

The Carbon Plan sets out the Government's vision that by 2050 the transport system will need to change significantly, with almost every car and van being an ULEV and the UK automotive industry at the forefront of ULEV technology. To achieve this the Plan states that almost all cars and vans sold should be near-zero emission by 2040.

3.7.2. Targets for ULEV uptake

The Government sets smaller targets within the five-year budgets to move towards the 2040 goal. For new cars, by 2030, a range of emissions between 50 gCO₂/km and 70 gCO₂/ km is suggested, and for vans a range between 75 gCO₂/km and 105 gCO₂/km.

These vehicle emissions reductions can be achieved through various ULEV technology including batteries, hydrogen fuel cells, sustainable biofuels, or a mix of these and other technologies. Encouraging consumers to switch to ULEVs will come through improved technology, and reductions in costs of batteries, as well as government grants. The Plug-In Car Grant provides 25% (up to £5,000) of the cost of an eligible vehicle and is reviewed regularly to ensure it is effective at incentivising uptake. ULEV users also benefit from exemptions from Vehicle Excise Duty and Company Car Tax, as well as Enhanced Capital Allowances.

To facilitate the switch to ULEVs the government recognises that charging infrastructure will need to be improved. A £30million programme called 'Plugged-In Places' was set up to provide a mechanism to set up charging points across the UK.

3.7.3. Decarbonisation of rail

The Plan addresses decarbonisation of rail travel through electrification, more efficient trains and lower carbon fuels. The Government has committed to the electrification of the Great Western Main Line, and the electrification of the North Trans-Pennine route from Manchester to York via Leeds. Other schemes are also under consideration for electrification, including the Midland Mainline and the Welsh Valleys.

3.7.4. Sustainable travel

The Government also proposes measures to encourage sustainable travel such as encouraging the use of public transport, cycling or walking. This will not only reduce emissions, but also help to reduce congestion and improve air quality. To encourage sustainable transport, the £560million Local Sustainable Transport Fund was introduced for local authorities to use in delivering transport solutions. A further £25million was introduced for the Green Bus Fund, for the purchase of low emission buses.

3.7.5. Freight

Freight is also addressed in the Plan. A target of an 8% reduction in freight emissions between 2010 and 2015 is set. Suggested measures to achieve this target are eco-driving training, improved supply chain management, low-carbon fuelled vehicles, and making best use of other modes such as rail.

3.7.6. Biofuels

The Plan suggests uptake targets for the use of biofuels in alignment with the EU Renewable Energy Directive (RED). 15% of total energy consumption and 10% of energy for transport is required to come from renewable sources by 2020. A 6% reduction in the greenhouse gas intensity of fuel is also required by 2020 in alignment with the EU Fuel Quality Directive.

3.8. CCC Reducing UK emissions 2018 Progress Report to Parliament (June 2018)

3.8.1. Messages to Government

The UK is not on course to meet the legally binding fourth and fifth carbon budgets. It will not be on course unless risks to the delivery of existing policies are reduced significantly and until Government brings forward new fully funded policies, beyond the achievements to date on electricity generation and waste. Four messages to Government to put emissions reduction on track:

3.8.2. Support the simple, low-cost options

Low-cost, low-risk options to reduce emissions are not being supported by Government. This penalises the consumer. There is no route to market for cheap onshore wind; withdrawal of incentives has cut home insulation installations to 5% of their 2012 level; woodland creation falls short of stated Government ambition in every part of the UK. Worries over the short-term cost of these options are misguided. The whole-economy cost of meeting the legally binding targets will be higher without cost-effective measures in every sector.

3.8.3. Commit to effective regulation and strict enforcement

Tougher long-term standards, for construction and vehicle emissions for example, can cut emissions, while driving consumer demand, innovation, and cost reduction. Providing longline of sight to new regulation also reduces the overall economic costs of compliance. Regulations must also be enforced to be effective: the consumer is cheated when their car's fuel consumption and real emissions exceed the quoted test-cycle numbers; or when high energy bills are locked-in for generations when stated building standards are not enforced.

3.8.4. End the chopping and changing of policy

A number of important programmes have been cancelled in recent years at short notice, including Zero Carbon Homes and the CCS Commercialisation Programme. This has led to uncertainty, which carries a real cost. A consistent policy environment keeps investor risk low, reduces the cost of capital, provides clear signals to the consumer and gives businesses the confidence to build UK-based supply chains.

3.8.5. Act now to keep long-term options open

An 80% reduction in emissions has always implied the need for new national infrastructure -to transport and store CO₂ for example, or to provide decarbonised heat. The deeper emissions reductions implied by the Paris Agreement make these developments even more important. We cannot yet define the 2050 systems for carbon capture, zero-carbon transport, hydrogen or electrification of heat, but the Government must now demonstrate it is serious about their future deployment. Key technologies should be pulled through to bring down costs and support the growth of the low-carbon goods and services sector.

CCC's assessment of the cost-effective path to meeting future emission reduction targets includes a reduction in transport emissions of 46% from 2017 to 2030. This will require improved efficiency of conventional vehicles, a major increase in the uptake of electric vehicles, measures to move goods more efficiently and to encourage the switching of travel to more sustainable modes.

3.8.6. Key messages and recommendations for the transport sector

As emissions in other sectors have reduced, transport has grown as a share of overall emissions. Transport is now the largest-emitting sector of the UK economy at 126 MtCO₂e, accounting for 28% of UK greenhouse gas (GHG) emissions in 2017.

- Cost-effective reductions in emissions in transport are not being delivered across almost all CCC indicators. Emissions in domestic transport were flat after rising for three consecutive years from 2014 to 2016. Demand for travel continues to grow across cars and vans, whereas efficiency improvements have slowed. This sector is now significantly off-track from the cost-effective path in the Committee's fifth carbon budget assessment.

- Test-cycle new car CO2 emitted per mile has increased for the first time since records began (in 2000), increasing by 0.8% in 2017. A decrease of 5.9% is now required every year to meet the EU 2020/21 target. The new car CO2 intensity increase is largely due to people buying larger cars, with only a small part arising from the switch away from diesel.
- Sales of electric vehicles (EVs) increased in 2017 to 1.9% of new cars, slightly lower than our indicator of 2.2%. Demand for electric vehicles outstrips manufacturer supply leading to long wait times for orders, and it is likely that sales are suppressed as a result.
- Significant risks to meeting carbon budgets remain. Key priorities to be addressed by the Government are:
 - Clarity about the UK regulatory approach to the EU 2020/21 new car and van CO2 targets and proposed targets for 2025 and 2030 is urgently required. Manufacturers need to be incentivised to sell their most efficient and ultra-low emission models in the UK. When setting future targets, a measure of real-world performance of vehicles must be used alongside standardised tests to regain public trust and ensure actual emissions reductions are realised on the road.
 - Policies, including fiscal instruments, must strengthen incentives to purchase cleaner vehicles and support new car and van emissions targets. The current move to higher-emitting cars is undermining efforts to improve fleet efficiency and must be addressed.
- Significant opportunities for people and industry could be realised in implementing policies to deliver the cost-effective path:
 - Opportunities to reduce demand for travel must be exploited. Demand reduction is generally highly cost-effective and has many co-benefits. Cities and towns can take the lead in encouraging sustainable travel choices, including walking, cycling and public transport, which can improve congestion, air quality and public health.
 - Improvements in freight logistics efficiency such as driver training to drive more fuel efficiently can help raise productivity, but there remains a need for the regulation of the fuel efficiency of new HGVs.
 - Policies to deliver a high uptake of EVs to around 60% of new car and van sales by 2030 will deliver air quality improvements and clean growth opportunities for UK industry.

Existing and planned policies leave a further 33 MtCO₂e reductions required in 2030 to meet our assessment of the cost-effective path to meeting the fifth carbon budget.

3.9. CCC's Lord Deben letter to Secretary of State for Transport (October 2018)

3.9.1. Introduction

In this letter which followed the publication of the CCC's Progress Report above, CCC states that transport is now the largest greenhouse gas (GHG) emitting sector, accounting for 28% of all UK GHG emissions in 2017. There has been little change in the level of transport emissions since 2008. This trend must be reversed if the legally binding fourth and fifth carbon budgets are to be met.

Many of the initiatives set out in the Government's Road to Zero Strategy are welcomed by CCC, but their detailed assessment indicates that there remains a large gap to the most cost-effective path for reducing transport emissions. Policies with greater ambition to reduce emissions even further need to be implemented.

Overall, CCC's assessment of existing and newly agreed policies for road transport is that they are insufficient to ensure the reductions in emissions necessary to meet the Fifth Carbon Budget in the most cost-effective way.

CCC's advice for closing the gap in transport emissions covers the following five key topics (each is set out in turn below):

- Set out a vision for future travel demand
- Accelerate the uptake of the cleanest vehicles
- Address supply issues and long waiting times for electric vehicles
- Support the efficient rollout of affordable EV charging infrastructure

- Tackle emissions from trucks

3.9.2. Set out a vision for future travel demand

The continued rise in road transport emissions highlights the urgent need for stronger policies to reduce growth in demand for travel. Evidence from cities like Greater Manchester shows it is possible to plan for economic growth while reducing car traffic, by promoting walking, cycling and public transport and deterring car and van traffic.

3.9.3. Accelerate the uptake of the cleanest vehicles

The commitment to end sales of conventional petrol and diesel vehicles should be brought forward to 2035 to ensure road transport emissions are near-zero by 2050. A stretching target can be set now to give industry and consumers certainty. A minimum electric range for hybrid electric drive should also be established – at present the electric range of conventional hybrids and low range plug-in hybrids is too short and the majority of journeys are not completed in zero emissions mode. Financial support for the higher upfront costs of electric vehicles (EVs) will be required beyond 2020. Minor amendments to vehicle excise duty (VED) and company car tax (CCT) can support continued improvement in fleet efficiency.

3.9.4. Reduce risks and costs to vehicle manufacturers by providing clarity on new car and van targets beyond 2020 and tighten testing procedures.

Stretching CO₂ targets for new cars and vans are needed beyond 2020 to drive a higher uptake of EVs. While a number of loopholes in the emissions testing regime have been addressed with the move to Worldwide Harmonised Light Vehicle Test Procedure (WLTP), there is evidence that car manufacturers intend to report artificially high emissions under the new test, making it easier to report emissions reductions over the course of the 2020s. The consumer is cheated by this approach. A real-world driving test using a portable device or the monitoring of fuel consumption meter data would help reinforce the new standards, as recently endorsed by the European Parliament Environment committee.

3.9.5. Address supply issues and long waiting times for electric vehicles

This is an emerging market and it is important that consumers have confidence to purchase EVs. Vehicle manufacturers are releasing new EV models, but there is increasing evidence that production volumes are insufficient, with demand outstripping supply for many models, resulting in long waiting times. It is recommended the Government reviews the operation of the EV market, to establish whether the willingness of manufacturers and dealers to sell EVs is a barrier to uptake.

3.9.6. Support the efficient rollout of affordable EV charging infrastructure

New steps to increase the availability of EV charge points were a welcome feature of Road to Zero, including the commitment that all new homes should be EV-ready and that new street lighting should include charge points. Next year CCC will publish advice on the number and types of charging points required to achieve high levels of EV uptake in the UK. A wider assessment of the barriers to uptake from reliability and unfamiliarity issues should also be undertaken. Drivers report that chargers are unreliable and difficult to use and that coverage in certain areas of the country is lacking.

3.9.7. Tackle emissions from trucks

New HGV CO₂ targets for 2025 and 2030, in line with the EU proposals, would provide a clear direction of travel for the truck sector. The target of a 15% reduction in emissions by 2025 from fleet operators is welcome. There will be a need to move beyond the current voluntary approach should real emissions reductions not be delivered, otherwise opportunities to improve logistics and encourage eco-driving techniques will be missed.

3.10. Delivering Clean Growth Progress Against Meeting Our Carbon Budgets – The Government Response to the Committee on Climate Change (October 2018)

3.10.1. Introduction

A review of the fourth chapter of the Government response has been undertaken, which outlines the UK Government's response to the CCC's recommendations above on reducing emissions from transport.

3.10.2. Accelerating the uptake of clean vehicles

The Government wants to ensure that only the cleanest new vehicles are being rolled out onto UK roads. The Government will pursue a future approach to vehicle emissions regulation that is at least as ambitious as the current arrangements. They suggest that the European Commission's proposal for future regulation, that 15 per cent of new cars should be zero or low emission by 2025, and 30 per cent by 2030, falls short of the UK's ambition. Government suggests they are aiming for 50-70 per cent of new car sales to be ULEVs by 2030.

Furthermore, following a newly implemented testing regime for new vehicles, the WLTP from January 2019 all new cars will be labelled reflecting the results of this testing.

The Government will continue to ensure the tax system incentivises the purchase of the cleanest vehicles and, in particular, zero emission vehicles. Local authorities may also use money from the £220 million Clean Air Fund to provide financial incentives for lower emission or ULEVs, to help individuals and businesses adapt to plans for reaching NO₂ compliance.

Tax incentives are in place for ULEVs and supporting infrastructure, with both vehicle excise duty and company car tax graded to promote the lowest emitting vehicles.

3.10.3. Accelerating uptake of electric vehicles

By 2030, the Government wants at least 50 per cent and as many as 70 per cent of new car sales to be ultra low emission, and up to 40 per cent of new van sales. This will be reviewed in 2025 to consider what interventions are required if not enough progress is made.

Government has a supporting package of nearly £1.5billion to support this transition to zero emission vehicles. As part of this, the Government will continue to offer grants for plug-in cars and vans until at least 2020. Furthermore, the Electric Vehicle Homecharge Scheme and the Workplace Charging Scheme will continue to be supported. Consumer incentives will also continue in some form beyond 2020.

3.10.4. EV charging infrastructure

Government has taken new powers through the Automated and Electric Vehicles Act 2018 to ensure that charge points have good interoperability and are more readily available and accessible. The Government is consulting on proposals for charge points to be installed with all new built homes in England, where appropriate, potentially providing a huge expansion in the number of charge points. They also want all new lamp posts to include charging infrastructure and will provide guidance to local authorities to support this. They are also seeking to increase charging provision for residential and non-residential buildings through the National Planning Policy Framework and possible amendments to both Building Regulations and commonhold tenure rules.

3.10.5. Emissions from trucks

The Government recently issued a Call for Evidence on sustainable last mile deliveries, to explore opportunities for replacing vans with electric cargo bikes, vans and micro vehicles.

After the UK's exit from the EU, Government will pursue a future approach to heavy duty vehicles (HDV) carbon dioxide performance standard regulation that is at least as ambitious as arrangements in the EU.

Regarding HGVs specifically, the Government is firm in its view that in the long-term zero-emission technologies must be developed and made available commercially for all types of HGVs. DfT is working with industry to develop an Ultra Low Emission Truck standard to provide clarity on expected emission standards.

Furthermore, the Government has asked the National Infrastructure Commission to examine the future of freight out to 2050, to set out how the UK can deliver efficient and productive freight, while reducing its impact in terms of carbon emissions and congestion.

The Government will continue the Energy Saving Trust scheme to carry out HGV fleet reviews, and an industry-wide voluntary targets to reduce HGV greenhouse gas emissions by 15%, from 2015 levels, is in place. The Government is also delivering trials of HGV platoons, which could bring significant fuel and emissions savings, with the first on-road trials expected in spring 2019.

The Government continues to support shifting freight from road to rail, to deliver emissions savings and wider environmental and social benefits from reduced HGV traffic. The Government has committed to providing grants of more than £15 million until at least March 2020 to help with the operating costs associated with running rail or water freight, where this is more expensive than road transport.

In Network Rail Control Period 5 (2014 to 2019), the Government is investing £235 million in the Strategic Freight Network, to improve the capacity and capability of the rail network for freight. The Statement of Funds Available for Control Period 6 (2019 to 2024) includes funding for continued investment in improvements to the rail freight network.

3.10.6. Plans to increase cycling and walking

The Government is now implementing the Cycling and Walking Investment Strategy (CWIS), which was published in April 2017. The ambition for England by 2040 is to make cycling and walking the natural choices for shorter journeys, or as part of a longer journey. The CWIS also sets out some nearer term aims and targets for 2025, including an aim to double cycling to 1.6 billion stages by 2025. The CWIS identified £1.2 billion available for investment in cycling and walking out to 2021. Since the strategy's publication, further funding has been made available for cycling and walking projects, such as the £1.7 billion Transforming Cities Fund, where £840 million has already been allocated to six mayoral combined authorities. In addition, the £220 million Clean Air Fund and the £5 billion Housing Infrastructure Fund can also be used to support cycling and walking infrastructure.

3.10.7. Incentivising public transport

The UK Government will continue to invest in the public transport network, and help people to cycle, walk or travel by bus or train. For example, the £1.7 billion Transforming Cities Fund is providing support for public transport in some of England's largest cities. To encourage further uptake, the Government is looking to improve the consumer experience of fares and ticketing through measures such as smart ticketing and supporting the rail industry's trial of the 26-30 railcard.

For buses, the £220 million Clean Air Fund is available for investment in a range of measures, including bus priority measures, which improve reliability and reduce journey times. In addition, around £2 billion is provided to bus operators and local authorities to support bus services, and £250 million is provided in the form of the Bus Service Operators Grant, with £43 million of this directly devolved to local authorities to support non-commercial bus services. The Government also supports free off-peak travel for older and disabled persons through the English National Concessionary Travel Pass.

The Government is actively seeking to reverse the decline in bus use through the provisions of the Bus Services Act 2017. This gives local authorities new powers to work with operators to bring passengers a richer and more informative experience of bus travel, delivering services that go further to meet their needs. It introduces new bus franchising powers for local authorities, as well as providing other tools to improve bus services.

3.10.8. Rail electrification

The Government wants all diesel-only trains taken off the track by 2040. The Government also suggest that rail electrification should only be undertaken where it is cost-effective, and where it will deliver passenger benefits such as journey time savings. It is likely there will always be a proportion of the rail network that is not electrified, where electrification does not deliver additional benefits.

The Government is promoting the transition to bi-mode (modern diesel / electric) trains, and trains using alternative technologies such as power by batteries or hydrogen fuel cells, through the inclusion of environmental trajectories in the invitations to tender for rail franchises, thereby encouraging the market to investigate alternative fuels and drive trains that reduce emissions.

3.10.9. Aviation emissions reduction

The UK’s 2050 target and carbon budgets currently exclude emissions from international aviation; but carbon budgets have been set in a way that takes these emissions into account and puts the UK on a trajectory consistent with a 2050 target that includes these emissions. However, Government has not reached a final view on the appropriate level of aviation emissions in 2050.

3.11. Overview and recommendations

3.11.1. Policy objectives

The following transport carbon emissions reduction policy objectives have been identified through this review that are relevant to TfN’s remit:

- Reduce emissions from cars and vans
- Reduce emissions from trucks
- Reduce emissions from trains
- Reduce emissions from aviation
- Increase uptake of electric vehicles
- Increase availability of EV charge points
- Increase use of low carbon fuels (hydrogen, biofuels)
- Increase use of low carbon alternative transport (walking, cycling and public transport)

It is recommended that TfN fully considers the above objectives in preparing the STP.

3.11.2. Carbon targets

Table 3.2 shows the main carbon related targets of relevance to TfN’s STP and maps out CCC’s recent key recommendations in relation to some of the targets in order to meet the ultimate 2050 target of 80% reduction.

Table 3-2 Main carbon related targets

Target date	Target	Source	Recommendations by CCC
By 2050	At least 80% reduction of GHG emissions (from 1990 levels)	Climate Change Act 2008	None
By 2050	Almost every car and van being an ultra-low emission vehicle (ULEV)	Carbon Plan 2011	Road transport emissions are near zero.
By 2040	End of sale of all new conventional petrol and diesel cars and vans	Clean Growth Strategy 2017 & Carbon Plan 2011	Uptake of cleaner vehicle needs to be accelerated and commitment needs to be brought forward to 2035.
By 2040	Cycling and walking should be that natural choice for shorter journeys	Clean Growth Strategy 2017	Plans to increase cycling and walking must be implemented.
By 2032	Emissions from transport falling by 30% compared to 2017	Clean Growth Strategy 2017	A reduction in transport emissions of 46% from 2017 to 2030 will be required. This will require improved efficiency of conventional vehicles, a major increase in the uptake of electric vehicles, measures to move goods more efficiently and to encourage the switching of travel to more sustainable modes.

By 2032	7% of all road transport is low carbon	Road to Zero Strategy 2018	None
By 2030	30% of new car sales to be ULEVs with the possibility of reaching as many as 70%	Clean Growth Strategy 2017	Policies to deliver a higher uptake of electric vehicles to around 60% of new car and van sales by 2030 are necessary. Fiscal incentives for the purchase of electric vehicles should be set out over this time. Significant co-benefits from these measures include air quality improvement and opportunities for UK industry.
By 2030	Up to 40% of vans sales to be ULEV	Clean Growth Strategy 2017	
By 2030	100% of the Central Government car fleet to be ultra-low emission	Road to Zero Strategy 2018	None
By 2025	HGV greenhouse emissions reduced by 15% (from 2015 levels) – voluntary, industry supported	Road to Zero Strategy 2018	New HGV CO2 targets for 2025 and 2030, in line with the EU proposals, would provide a clear direction of travel for the truck sector. The European Commission (EC) has recently proposed targets for a 15% reduction in emissions from trucks in 2025 and 30% reduction by 2030 from 2019 levels. Target of a 15% reduction in emissions by 2025 from fleet operators welcomed, but there will be a need to move beyond the current voluntary approach should real emissions reductions not be delivered.
By 2022	25% of the Central Government car fleet is ultra-low emissions and all new car purchases are ultra-low emissions by default	Road to Zero Strategy 2018	None
By 2020	10% of energy from transport required to come from renewable sources	Carbon Plan 2011	None
Until at least 2020	<u>Grants for plug-in cars, vans, taxis and motorcycles</u> The Government will continue to offer grants for plug-in cars, vans, taxis and motorcycles until at least 2020 and consumer incentives in some form will continue to play a role beyond 2020.	Road to Zero Strategy 2018	Financial support for the higher upfront costs of electric vehicles will be required beyond 2020. Commitments for grants to continue in some form until 2020 welcomed, although current rates have only been guaranteed until October 2018. It is important that Government commits to extend support for EVs until they become cost-competitive with conventional vehicles, and that the level of the grant is sufficient to provide an effective incentive for prospective EV customers. Minor amendments to vehicle

			excise duty (VED) and company car tax (CCT) can support continued improvement in fleet efficiency.
No defined timescale	<p><u>EV Charging Infrastructure</u> The Government will ensure:</p> <ul style="list-style-type: none"> • that charge points are available at motorway service areas and large fuel retailers; • that charge points are easily accessed and used across the UK. This includes powers to provide a uniform method of accessing public charge points and refuelling points; make certain information publicly available in an open and transparent format and set reliability standards; and • that charge points are smart ready by giving Government powers to set requirements prohibiting the sale or installation of charge points unless they meet certain requirements. <p>Furthermore, the Government will take steps to introduce a requirement that all newly built houses are electric vehicle ready and that all new streets with parking provision will include charging points in lighting columns for residents.</p>	Road to Zero Strategy 2018	<p>To meet long distance on route charging requirements, the number of rapid chargers near the major road networks need to expand to around 1170 by 2030. In addition, the number of publicly available chargers for 'top-up' charging around towns and local areas must increase to over 27,000 by 2030.</p> <p>Next year we will publish advice on the number and types of charging points required to achieve high levels of EV uptake in the UK. A wider assessment of the barriers to uptake from reliability and unfamiliarity issues should also be undertaken. Drivers report that chargers are unreliable and difficult to use and that coverage in certain areas of the country is lacking.</p>

It is recommended that in addition to Government targets, TfN endorses and adopts the interim targets proposed by the CCC as set out in Table 3.2 in the preparation of the STP, in particular:

- End of sale of all new conventional petrol and diesel cars and vans by 2035
- 60% of new car and van sales to be ULEV by 2030
- Emissions from transport falling by 46% by 2030 compared to 2017
- Cycling and walking should be that natural choice for shorter journeys by 2040
- 7% of all road transport is low carbon by 2032
- 15% reduction in emissions from HGVs by 2025
- Need for faster expansion on EV charging infrastructure (CCC will publish further advice in 2019)

4. Local authorities transport plans and strategies review

4.1. Introduction

A review of carbon policy and targets has been undertaken of the following six northern local authorities transport plans and strategies:

- North Yorkshire: Local Transport Plan 2016-2045
- East Riding of Yorkshire Council: Local Transport Plan 2015 – 2029
- Sheffield City Region Transport Strategy 2011-2026
- Lancashire Strategic Transport Prospectus 2016
- West Yorkshire Transport Strategy 2017-2040
- Greater Manchester 2040 Transport Strategy (2017)

Three more urban (Greater Manchester, West Yorkshire and Sheffield) and three more rural transport authority areas (North Yorkshire, East Riding of Yorkshire and Lancashire) have been chosen for the review.

To provide further regional context, the recent Greater Manchester Combined Authority report 'Greater Manchester's Springboard to a Green City Region (2018)' has been reviewed as it provides useful insights into latest carbon policy and targets for the region.

The Mayor of London's Transport Strategy and Environmental Strategy have also been reviewed. These are considered 'Best in Class' in terms of setting out local carbon policies and targets and have been used as a benchmark to assess the transport strategies and plans from the northern region.

A summary of key review findings is provided below, and Appendix B provides further details on each of the documents that has been reviewed.

4.2. North Yorkshire: Local Transport Plan 2016-2045

4.2.1.1. Introduction

North Yorkshire County Council published the Local Transport Plan (LTP) in 2015. The North Yorkshire LTP does not align itself with key carbon targets set by the Government, however, through consultation with local residents North Yorkshire recognize the importance of managing the adverse impact of transport on the environment. But North Yorkshire also recognize that the region is largely rural meaning that the private car is often the only means of transport for residents, and therefore carbon emission reduction mechanisms such as increased public transport may not be as appropriate as for other regions.

4.2.1.2. Reducing traffic emissions

North Yorkshire suggest in their strategy that by monitoring air quality and carbon levels in busy areas, promoting public transport in order to reduce car use, and maintaining and providing better facilities for walking and cycling they can improve localised pollution, visual intrusion, and reduce traffic noise.

The North Yorkshire county council suggest that they cannot directly influence the choice of mode for the majority of trips made, however they can influence the decisions people make by maintaining roads, promoting sustainable travel options such as cycling, walking and buses where feasible, and by promoting car sharing and linked or combined trips for staff (like shopping on the way home from work).

4.2.1.3. Ultra low emission vehicles

The county council will also support measures to promote environmentally friendly forms of transport including provision for ULEV's and are currently developing a policy which will consider the provision of infrastructure for electric vehicles.

4.2.1.4. Active travel

North Yorkshire will continue to encourage people to choose active travel by communicating the health, financial and environmental benefits. They will also aim to reduce the real and perceived risks of road accidents and fears about personal security that are often associated with active travel modes, and where possible maintain and provide the infrastructure (footways, crossings, cycle routes etc.) that will allow people to make the switch to walking and cycling.

4.3. East Riding of Yorkshire Council: Local Transport Plan 2015 – 2029

4.3.1.1. Introduction

East Riding of Yorkshire Council published their LTP in 2015. The LTP is aligned with Government emission reduction targets including the Climate Change Act's 80% emissions reduction target by 2050 (from 1990 levels).

The Council suggests in the strategy that the biggest opportunities for encouraging sustainable travel in the region lie in short, local journeys as nationally two thirds of all journeys are less than five miles. The council therefore focuses on encouraging these trips to be cycled, walked or undertaken by public transport. But it is also recognized that the region is rural and so the council acknowledges that public transport, walking or cycling are not viable alternatives to the private car for all journeys. The council therefore commits to making car travel greener through encouraging the use of electric and ultra-low emission vehicles.

4.3.1.2. Switch to sustainable travel

The 2011 Census shows that the majority (67.4%) of East Riding residents in employment drive to work compared to 57% nationally, this is due to the rural nature of the region. Most people therefore are, and will continue to be, dependent on the private car as their main way of travelling around the East Riding.

A key challenge for the LTP in terms of reducing carbon emissions is therefore to address the heavy reliance of local residents on car travel and encourage modal shift away from car use towards more sustainable transport options, where possible. This is particularly important for journeys to work as it is these regular trips that contribute heavily towards peak hour congestion. The East Riding County Council recognize that encouraging people to walk or cycle for shorter distance commutes can contribute towards reducing carbon emissions by removing cars from the road and reducing congestion and emissions from idling vehicles.

While more residents choose to walk or cycle to work within East Riding's larger settlements, the number of people driving from and within these urban areas is also still relatively high. For example, in Willerby and Kirk Ella ward an average of 74.3% of residents drive to work each day. In addition, residents living in larger settlements tend to have the shortest commute – over 30% of those living in Willerby and Kirk Ella drive less than 5km to their place of work. The East Riding Council recognize that this demographic, who are using their car to travel relatively short distances, are an important target group for modal shift schemes as many of these shorter journeys could easily be made by public transport, walking or cycling. This would have a knock-on effect on reducing carbon emission from high rates of car use. Further, the Council recognize that adequate infrastructure will need to be in place to support this modal shift.

4.3.1.3. Freight

East Riding generates a relatively high proportion of carbon emissions from freight transport, a lot of which involves road transport. East Riding of Yorkshire Council will work collaboratively with Hull City Council, the Highways Agency and Network Rail to assess whether higher levels of freight can be transferred from the road network on to rail. However, the rail freight network is limited to some degree by gauge constraints and these will need to be addressed before additional rail freight services can become operational. Some freight is already transported via the River Ouse and the Aire and Calder Navigation which form sustainable transport alternatives to road-based freight movements.

4.4. Sheffield City Region Transport Strategy 2011-2026

4.4.1.1. Introduction

Sheffield City state that they want to play a full role in tackling the challenge set out in the Climate Change Act 2008, of reducing carbon emissions by at least 80% below 1990 levels by 2050. Working towards this target, Sheffield has committed to reducing carbon by 30% from 2010 levels by 2020, and 60% below by 2050.

Reducing emissions from vehicles is also one of Sheffield's key goals as they intend to create a culture whereby people are happy to make sustainable travel choices and where economic prosperity goes hand-in-hand with carbon efficiency.

Sheffield set out their key policies to reduce emissions, which include:

- Working to improve the efficiency of all vehicles and reduce their carbon emissions
- Encouraging active travel and develop high-quality cycling and walking networks
- Providing information and travel advice for the users of all modes of transport, so that they can make informed travel choices
- Supporting the generation of energy from renewable sources, and use energy in a responsible way
- Improving air quality, especially in designated AQMA areas

4.4.1.2. Encouraging the use of less polluting vehicles

Sheffield plan to design pedestrian-friendly streets and footpaths, create a continuous cycling network, support car clubs and car sharing schemes, and make information about all these travel options easier to find and use. They also plan to assist drivers in becoming more fuel-efficient, enforcing speed limits and encouraging the use of less polluting vehicles.

Furthermore, Sheffield City Council has been working continuously to promote the introduction of Low Carbon Vehicles (LCV). This has included a trial of 10 Compressed Natural Gas (CNG) vehicles with temporary fuelling stations, aiming to promote long-term use of LCVs and introduce permanent refuelling infrastructure.

4.4.1.3. Improved carbon efficiency of vehicle fleet

Sheffield have an ambition to improve the carbon efficiency of their vehicle fleets and in doing so, to set an example to others. To achieve this, Sheffield council will encourage the use of electric vehicles, and are working with the Leeds City Region to explore incentives to encourage low carbon vehicles, such as preferential parking and exemptions from lorry bans.

4.4.1.4. Efficient driving style

Sheffield recognize that even before any technological progress is made, reduced emissions can be achieved by the adoption of fuel-efficient driving styles. Efficient driving is not only more sustainable, with an expected reduction of up to 10% in emissions but can also reduce operating costs substantially. Furthermore, Sheffield recognize that enforcement of speed limits can reduce emissions drastically, since a car driven at 70 mph emits about 19% more CO₂ per km than when driven at 50 mph. Sheffield council will therefore work with the Police to enforce speed limits and continue with the Eco-Stars scheme to promote more efficient vehicle operation and eco-driving training initiatives.

4.4.1.5. Electrification of rail

Sheffield are lobbying for the electrification of rail services and the introduction of newer diesel units, which can bring environmental improvements as well as better levels of service.

4.4.1.6. Active travel

Sheffield have identified that an increase in the proportion of cycle trips from 2% to 15% is feasible and would lead to a substantial reduction in emissions.

Sheffield recognize that for the use of bikes to become convenient and widespread, some investment is required in additional facilities such as cycle parking or storage in urban centres, shopping centres, interchanges and stations.

Sheffield council will work with all districts to design convenient and direct routes for walking and cycling. They will also ensure that the needs of those walking and cycling form an integral part of

planning processes, negotiations with developers and the design of stations and interchanges. Cycle routes will be designed to meet the criteria of the national Bikeability programme and training and information on walking and cycling options will continue to be provided.

4.4.1.7. Electric vehicle charging infrastructure

The increasing use of electric vehicles will create a need for recharging points, and Sheffield council will work to develop capability to provide power for electric vehicles. Strategic investment through the Local Transport Partnership will support this.

4.4.1.8. Potential Issues to successfully following the strategy

There is clear evidence that the likely impact of population growth over the lifespan of the strategy, coupled with a considerable rise in car ownership, would be greater than the mitigating effect of these interventions. Extensive work to provide a choice between car and other modes of travel, especially for short-distance trips, would therefore be required in order to tackle further increase in congestion, loss of productive time, air pollution and high carbon emissions.

4.5. Lancashire Strategic Transport Prospectus 2016

4.5.1.1. Introduction

Published by the Lancashire Enterprise Partnership in 2016, this prospectus identifies the long-term strategic transport requirements and the opportunities and constraints on growth over the next twenty years, as well as the more immediate interventions needed to stimulate Lancashire’s latent potential.

4.5.1.2. Electrification of rail

Lancashire welcomes the introduction of brand new electric trains on services between Manchester, Preston and Blackpool North / Windermere as part of a wider ‘Northern Connect’ network which were announced in 2015.

Lancashire have identified that electrification would make the most significant contribution to transformational change to their rail network, however this will require, as a minimum, support from Network Rail, Rail North and the relevant Train Operating Companies. Rolling stock quality and infrastructural enhancements will also be required to support this transformation. Lancashire identify that these changes will resolve connectivity issues between certain towns and cities, as well as increased efficiency of transport routes.

4.5.1.3. Local travel improvements

Lancashire recognizes that improved bus services supported by safe, convenient and attractive walking and cycling networks are needed to reduce car usage and encourage active travel. Lancashire proposes that embodying the principles of good accessibility, on foot and by cycle, as well as by public transport is critical when planning future housing and employment developments across the region.

Lancashire identify cycling as having the potential to offer options for short journeys but also for longer journeys to work and education and for leisure. Following a successful bid to the Government’s Local Sustainable Transport Fund, a strategic cycle network is being created in East Lancashire, initially focused on Blackburn, Accrington and Rossendale. The intention is to extend the concept across Lancashire, improving access to jobs, education and training opportunities and the health of Lancashire’s residents.

4.6. West Yorkshire Transport Strategy 2017-2040

4.6.1.1. Introduction

Published by the West Yorkshire Combined Authority in 2017, the strategy sets out a vision and a framework to deliver a world-class, modern, integrated transport system in West Yorkshire.

The combined authority aligns its transport strategy with the targets set by UK key policy drivers such as the Road to Zero and the Clean Growth Strategy as it aims to reduce traffic emissions to near zero by 2040. The strategy sets out some short term targets and mechanisms to work towards the traffic emissions reduction goal, including:

- 25% more trips made by bus by 2027
- 75% more trips made by rail by 2027
- 300% more trips made by bicycle by 2027

To achieve these targets, West Yorkshire have adopted the West Yorkshire Low Emission Strategy (WYLES). Set up in 2016, WYLES aims to work with partners to reduce local transport emissions as far as possible to zero, with particular focus on nitrogen dioxide and particulate matter.

4.6.1.2. Clean Air Zones

Under WYLES, West Yorkshire will support the implementation of Clean Air Zones (CAZ) where needed, setting strong emission standards for types of vehicles permitted to enter the zone.

4.6.1.3. Infrastructural improvements

West Yorkshire will provide a comprehensive electric vehicle charging network to support the shift to more environmentally-friendly cars, provide facilities to charge power assisted bicycles and work with bus operators to move to a near-to-zero emissions bus fleet.

4.6.1.4. Encouraging alternative and public transport

West Yorkshire will provide behaviour change programmes, including training, access to cycles through grant and sharing schemes, and promotional campaigns, that encourage walking, cycling and public transport. Furthermore, increase the number of car parking spaces at key transport hubs will be substantially increased as well as the implementation of new park and ride facilities on the edge of town and city locations. An existing car club network will also be expanded to provide more choice for car travel, and provide more, low emission vehicles in the car club fleet.

4.6.1.5. Freight

West Yorkshire recognizes the good progress made by the freight industry in reducing emissions from heavy goods vehicles through the Euro Standards but believe they can do more to encourage the take-up of electric vehicles and alternative fuels. They will work with the freight industry, businesses and other partners to improve journey times and reliability for deliveries, and to reduce the environmental impact of logistics through the promotion of electric and alternative-fuelled vehicles in town and city centres, and support mode shift from road freight to rail and inland waterway.

4.6.1.6. Low emission taxis

West Yorkshire aim to provide better taxi access, parking and drop-off/pick up at transport hubs. They will work with Taxi Licensing Authorities and the taxi trades to promote the take up of low emission electric taxis by accelerating the provision of recharging facilities for taxis.

4.6.1.7. Implementation plan

West Yorkshire set out a timescale of implementation for the different mechanisms used to meet their targets. The plan includes measures for next 10 years.

In the first 5 years West Yorkshire will implement:

- Electric vehicle and bike charging infrastructure
- Bus emission reduction strategies
- CityConnect 1 and 2 cycling and walking programmes, with engagement on cycling and walking to work and education
- Greener fleet initiatives

In the second 5 years West Yorkshire will implement:

- CityConnect 3 - cycling and walking programmes
- Low carbon/alternative fuels

4.7. Greater Manchester 2040 Transport Strategy

4.7.1.1. Introduction

In response to the global climate change agenda, the Greater Manchester Strategy (published in 2017) sets an ambitious 2020 target for reducing carbon emissions by 48% from 1990 levels which is in direct alignment with the current carbon budget.

Greater Manchester has demonstrated further commitment alongside global cities by becoming a signatory to three International commitments on climate change: The Integrated Covenant of Mayors, The Compact of Mayors, and the Under 2 Coalition.

Greater Manchester aim to continue to improve the quality of their walking, cycling and public transport networks and provide people with the facilities and training to make them easy choices. Greater Manchester is also focused on changing travel behaviour; reducing emissions from HGVs; stimulating the uptake of ultra-low emission vehicles; and reducing emissions from buses on key urban corridors.

4.7.1.2. Existing infrastructure

Greater Manchester aim to make best use of the existing infrastructure to reduce environmental impacts. This will be achieved by locating new developments where there is good access to public transport and services, reducing the demand for car travel and therefore reducing emissions. Road and rail networks must also be used as efficiently as possible and be well maintained.

4.7.1.3. Reduced car travel

Greater Manchester aims to deliver its desired economic growth without any further growth in peak period car traffic levels. This will include accommodating around 68,000 additional commuter trips in the morning peak period by 2040, which is clearly a major challenge. This will be achieved by improving the quality and capacity of public transport, walking and cycling networks to encourage as many people as possible to travel to the Regional Centre by these modes rather than by car.

4.7.1.4. Alternative fuel vehicles

The ambition for smaller vehicles in Greater Manchester is to shift to a fully electric fleet. GM already has an extensive EV network and will expand this further if adequate funding can be obtained. For heavy vehicles they will work with the Government and other city regions with the aim of establishing a consistent policy framework to encourage an accelerated uptake of alternatively fuelled vehicles. Within Greater Manchester the council will work with infrastructure providers and fleet operators to encourage and facilitate a shift to alternative fuelled vehicles or a retrofit of existing vehicles.

4.7.1.5. Active travel

Greater Manchester will develop a regional cycle network, through their Velocity programme, supported by large-scale cycle training and travel choice programmes to encourage more cycling and walking. The council will also work with including the Canals and Rivers Trust, to enhance green and blue infrastructure to provide a safe and attractive environment for walking and cycling.

4.7.1.6. Improved public transport

Greater Manchester council understand that improved public transport can encourage growing numbers of people out of their cars for more of their journeys, helping to reduce emissions. The Strategy therefore sets out an ambition to develop a fully integrated, customer-focused, low emission public transport network, with simple, integrated ticketing, that provides an attractive and accessible alternative to travelling by car to key Greater Manchester destinations.

For buses Greater Manchester aims to develop a modern low-emission accessible bus system, fully integrated with the wider Greater Manchester transport network on which everyone will be happy to travel regardless of their background or mobility level.

4.7.1.7. Freight

The majority of freight in Greater Manchester is carried by road, which is a large source of carbon emissions. Whilst the 'last mile' of deliveries will in most cases need to be completed by road, Greater Manchester aim to shift more freight to more sustainable modes such as rail and water. However, Greater Manchester has very few rail or water-connected distribution sites and constraints on the rail network limit future rail freight growth. Future improvements and

developments such as the Northern Hub rail enhancements should greatly increase freight capacity by rail. In addition, the regeneration of the Manchester Ship Canal, to provide low cost access by water to Port of Liverpool, has the potential to take a proportion of freight traffic off the roads between the two cities.

A further action outlined in the strategy includes maximising the practice of consolidation, where deliveries to the same location are bundled together to or where goods are delivered to locations for onward distribution by smaller, low emission vehicles (including cycles or electric-assisted cycles in town and city centres) or for collection by individuals. This will reduce the numbers of large goods vehicles entering the city centre and town centres.

4.7.1.8. Implementation of Clean Air Zones

Greater Manchester will carry out a feasibility study into a Clean Air Zone (CAZ), to assess whether emissions can be reduced without having a disproportionate impact on business.

4.7.1.9. Potential issues

Greater Manchester realise that economic and population growth will increase the demand for travel making reducing emissions from travel a particular challenge, they understand that this will require more radical measures to enable the region to meet challenging standards and targets.

Greater Manchester aim to encourage a shift to more sustainable modes of travel but recognize that some journeys will always need to be undertaken on the highway network.

4.8. Greater Manchester's Springboard to a Green City Region (2018)

4.8.1.1. Introduction

Further to the Greater Manchester 2040 Transport Strategy, Greater Manchester launched their 'Springboard to a Green City Region' in response to public consultation which identified that the people of Greater Manchester want the council to provide a strategy to a greener future for the city region. The report sets out expert academic, engineering and technical input received at Greater Manchester's Green Summit, together with the ideas and priorities of citizens, activists, parents, young people, children, businesses, charities and community organisations.

Under the Springboard strategy, Greater Manchester aims to be the first UK city to devise a science based pathway to becoming carbon neutral, and in doing so will make its contribution to the IPCC target of keeping global average temperature change to below 2°C.

In alignment with key Government policy drivers, the Springboard sets a target of reducing carbon emissions by 48% by 2020 and suggests that Greater Manchester is well on its way to achieving this.

4.8.1.2. What the public want (results from public consultation)

- Make public transport, walking & cycling the easy choice for travel to work - through greater integration, sufficient capacity, greener routes, contactless card technologies and online planning tools (e.g. London's Oyster card call it the Bee Card)
- Boost cycling rates by supporting improved quality & quantity of cycling infrastructure in the right places, based on studies of traffic patterns and efficient routes. Invest in infrastructure based on usage; map walking & cycling potential across the city region.
- Adopt policy that links active travel to green infrastructure and connected networks; develop a set of active travel standards in Greater Manchester Spatial Framework
- Expand and increase frequency of bus/tram services in and between urban peripheries, public transport is inconvenient for users on fringes of urban core

4.8.1.3. Key actions to be completed by Greater Manchester before March 2019

- Produce a Smart Energy Plan by September 2018, as part of an overall Greater Manchester Infrastructure Strategy
- Establish a new public sector-led commercial model for the Greater Manchester electric vehicle charging network with the long term aim to at least double the size of the present system

- Explore whether an emissions free bus fleet is possible and by when
- Transform cycling and walking in the City Region by investing up to £50m per year for three years from 2019/20 through the Transforming Cities Fund
- Ensure that the ongoing development and delivery of its 2040 Transport Strategy is aligned with our carbon neutral ambition

4.8.1.4. Enabling low carbon mobility/transport actions

- Shift transport to zero emissions – such that 100% of buses are zero emissions by 2035 and 66% of cars are zero emission by 2030 (100% by 2050).
- Domestic transport behaviour – a 25% reduction in passenger distance travelled by 2035.
- Freight – road modal share falls to 50%, greater hybridisation; rail freight is all electric (*assumed to be by 2035*).
- Ensure that Greater Manchester citizens' CO2 emissions from flights hold steady to 2030 and then reduce to zero by 2075 (this action is also required across the UK)

4.8.1.5. Achieving carbon neutrality actions

- Reduce the use of fossil fuel powered vehicles through reducing travel, increasing electric vehicles, making public transport zero emissions and increasing the use of public transport and active travel; cycling and walking.
- Connect every neighbourhood in the city, starting with 1,000 miles of walking and cycling routes as well as 1,400 new crossing points
- Meet the increased electricity demand of electric buses and cars through low carbon and renewable energy generation
- Increase capacity of trams by 15% by implementing 27 new trams to the Metrolink network, through the recently signed £72million contract

4.8.1.6. Issues that must be addressed to deliver actions

- Delivery of an integrated, affordable, accessible zero carbon public transport system for the whole city-region within such tight timescales
- Coordination with improved green space, high quality well connected walking and cycling infrastructure and support for residents to increase their active travel
- Providing the infrastructure to enable residents and businesses to move to electric cars and freight vehicles – putting infrastructure in place and in time with mass EV uptake
- Managing the grid demands of EV charging at scale
- Providing the low carbon and renewable energy generation to meet the increased electricity demands
- Using spatial planning and digital infrastructure to reduce the need to travel by car and reduce freight vehicle trips
- Establishing 'clean air' zones to reduce the impact of most polluting vehicles in some areas
- Changing traveller behaviour so the norm is walking, cycling and public transport use, car share/hire and cycle-carriage on trains/trams
- Rail electrification which is a national issue in which some northern routes are neglected
- Airport passenger growth, how we hold emissions flat and how we reconcile air transport with lowering carbon emissions
- Monitoring and reducing emissions from shipping and air travel which, given their nature, also require action and cooperation

4.8.1.7. Suggested Actions from Experts which may be implemented

- Introducing strict emissions standards for buses and taxis and ban on all diesel by 2025
- Introducing a workplace parking levy for large and medium sized businesses in Greater Manchester, which is used towards funding the city's public transport system
- Introducing a cap on air transport emissions to and from Manchester Airport to remain at current levels despite planned doubling of passengers
- Incentivising fleet change

- Putting infrastructure in place for electric fleet with rapid charging and depot charging
- Incentivising consolidation of loads– for example space needs to be provided for micro-consolidation so the final mile can be delivered on foot or in cargo bikes

4.9. Mayor of London Transport Strategy (2018)

4.9.1.1. Introduction

The Mayor's ambition is for London to be a zero-carbon city by 2050. The Mayor pledges to transform London's streets and transport infrastructure to enable zero emission operation. The Mayor considers air quality and climate change together as the two are ultimately linked.

4.9.1.2. The Strategy

The strategy goes beyond Government aim for all new cars and vans to be zero emission from 2040 stating that this aim is not ambitious enough. Mayor suggests that this aim should be accelerated to ensure that all new cars and vans are zero emission from 2030, with all new heavy vehicles (over 3.5 tonnes) being zero emission from 2040.

4.9.1.3. Road-Related Actions

Actions to be implemented before 2020:

- All new taxis to be zero emissions
- Encourage and accelerate the transition from diesel-powered taxis to Zero Emission capable vehicles by providing financial incentives, the necessary infrastructure and regulation with the objective of achieving a minimum of 9,000 such vehicles in the fleet by 2020.
- Electric single-deck buses and bus-charging infrastructure
- Low emission freight

Actions to be implemented before 2025:

- Major expansion in electric vehicle charging points (including on-street residential charging)
- Minimum 15 hydrogen fuelling stations installed
- Reduced parking charge for zero-emissions vehicles
- Expand ultra-low emissions zone in central London
- Tighten low emissions zone standards for heavy vehicles

Actions to be implemented before 2030:

- Town centre zero emissions zones
- Central London zero emissions zone

Actions to be implemented before 2035:

- All newly registered cars and LGVs driven in London zero emission
- All buses zero emission or hybrid
- All taxis and PHVs zero emission
- All public sector car fleets zero emission capable

Actions to be implemented before 2045:

- All newly registered heavy vehicles driven in London zero emission
- Wider zero emission zone
- All buses zero emission

Actions to be implemented before 2050:

- London-wide zero emission zone
- Zero emission road transport

4.9.1.4. Non-Road-Related Actions

- All rail lines in London to be electrified and hauled by zero emission motive-power by 2050
- Improve the energy efficiency of the river fleet
- Update TfL's Travel Plan guidance to ensure developments encourage active, efficient and sustainable travel, apply the Healthy Streets Approach and help deliver carbon-free transport
- Using technology to make using active, efficient and sustainable travel options easier
- Ensuring that payment platforms are up to date and fit for purpose.
- New services should help more people who would otherwise complete their journey by car to access the public transport network, while not reducing walking and cycling to and from stops and stations
- 80% of all trips in London to be made on foot, by cycle or using public transport by 2041. This aim is expected to be fulfilled by increases in levels of walking and cycling from the current 27% to between 30 and 40% of trips and increases in public transport use from the current 35% to between 40 and 50% of trips.

4.10. London Environment Strategy (2018)

4.10.1.1. Introduction

The London Environment Strategy states that to achieve a zero-carbon London, in line with the Mayor's Transport Strategy, greenhouse gas emissions from transport must reduce from around 8.3 MtCO_{2e} a year to 1.5 MtCO_{2e} a year by 2050.

4.10.1.2. Reducing emissions from cars

The Strategy calls on the UK Government to implement:

- A national vehicle scrappage fund for diesel vehicles
- Essential if compliance costs to people and businesses of such action is to be minimised
- A national retrofit certification scheme
- Further reducing compliance costs to businesses to meet new emission standards and build on the work that has been done with London's bus fleet
- Vehicle excise duty, capital allowances and other fiscal reforms (for example tax treatment of red diesel)
- Need to reduce emissions and promote the uptake of zero emission vehicles
- A national car labelling scheme
- Raising awareness about the differential pollution emissions from vehicles at the time of purchase (including for second hand vehicles)
- A commitment to providing the necessary funding to convert all UK black taxis to zero emission capable models by 2025 at the latest and scrapping older diesel taxis.

4.10.1.3. Enabling the transition to ULEVs

- The strategy calls for a major expansion in electric charging and hydrogen infrastructure, including implementing rapid charging to support zero emission capable taxis, private hire vehicles and commercial vehicles
- TfL to work with boroughs and private operators to provide on-street residential charging.
- As well as standalone stations, hydrogen refuelling systems and charging infrastructure to be integrated into existing refuelling stations.
- The Strategy recognizes that switching to ULEVs will require a significant change to London's energy systems. The supporting supply infrastructure must be in place, while maximising CO₂ benefits.
- The Mayor will work with TfL, Government and stakeholders to ensure systems are upgraded and robust.
- Plans will be put in place to manage the energy demand associated with the transition to ULEVs.

- Strategy calls for Government investment to ensure the grid, energy network and available charging infrastructure is capable of hosting large numbers of electric vehicles.
- Going forward, the Mayor will seek to integrate hydrogen alongside electric technology into zero emission and alternative fuels plans for London. This is a normalisation phase, which will support the development of mechanisms towards mass introduction and use of hydrogen fuel cell technologies.
- As well as incentives and supporting infrastructure to encourage a move to ULEVs, the Mayor will also support the use of disincentives to phase out fossil fuel vehicles altogether.

4.10.1.4. Zero emissions zones

- The Mayor, through TfL and the boroughs, and working with Government, will implement local zero emission zones in town centres from 2020 and aim to deliver a central London zero emission zone from 2025, as well as broader congestion reduction measures, to pave the way to larger zero emission zones in inner London by 2040 and then London-wide by 2050 at the latest.

4.11. Overview and recommendations

4.11.1. Overview of local transport plans and strategies

The transport plans and strategies of the northern region that have been reviewed vary substantially in their approach to reducing carbon emissions. Those that have been prepared earlier in this decade (Sheffield, East Riding of Yorkshire and North Yorkshire) are weaker in terms of setting clear policies, targets and time frames for carbon emission reductions. The Lancashire Transport Prospectus prepared in 2016 does not cover carbon emissions at all. The more recent transport strategies for Greater Manchester and West Yorkshire develop in some detail their approaches to carbon reduction and, for Greater Manchester, the recent report 'Springboard to a Green City Region' provides further policy and targets direction.

The recent Greater Manchester Combined Authority report 'Springboard to a Green City Region' sets out some quantified carbon emissions targets including timescales to meet those targets and, in most cases, clear mechanisms to achieve these targets with a great focus on transport linking to the Greater Manchester 2040 Transport Strategy. Issues that Greater Manchester will face in performing the actions set out are also comprehensively considered. However, there is not always an adequate response as to how these issues will be rectified. The report could further benefit by clearly setting out the approaches for the various aspects of transportation such as rail, road and freight.

The Greater Manchester 2040 Transport Strategy is clearly aligned with the Climate Change Act's 80% emissions reduction target by 2050 (from 1990 levels) and sets its own ambitious interim targets in order to meet this long term target. Many ambitions are outlined with feasible mechanisms to meet these ambitions, however, the strategy lacks specific volumes of emission reductions for different aspects under the transport strategy and specific targets and timescales for each mechanism. There is also little content on making the switch from traditional vehicles to ULEVs or the necessary infrastructure that will be needed to support this. The strategy provides plenty of information on how improved public transport will help with ease-of-use for customers, reduce congestion on roads etc, but there is little mention of how this will reduce carbon emissions. Carbon emission reductions as a result of improved public transport seem to be an added benefit rather than a priority.

Whilst the West Yorkshire Transport Strategy outline carbon reduction targets in line with key UK Policy drivers and sets out some mechanisms to be used to meet the targets, the strategy generally lacks content regarding emissions reduction targets in general, and details of mechanisms. Some targets are set out, but there is a lack of any quantified targets with specific volumes of emissions reductions. Whilst mechanisms such as introducing clean air zones are suggested, there is no information on what areas the zones will cover, when they will be implemented or what vehicles will be allowed in. Furthermore, there is mention of improving infrastructure by building a vehicle charging network across the region but no mention of how much money will be spent on that infrastructure or where the funding will come from. There is also no detail on how many charge points will be set up, where will they be, or when they will be implemented.

The Sheffield City Region Transport Strategy clearly separates out ideas, actions and policies which makes their emissions reduction policies and actions clear. Whilst Sheffield City does align its Transport Strategy emission reduction targets with the 80% reduction below 1990 levels by 2050 target of the Climate Change Act 2008, and under this set its own targets for 2020 and 2050, there is a lack of specific emission reduction targets for the various areas of transport. There is a further lack of mechanisms identified to meet specific targets, and what volumes of emission reductions will come from each mechanism. There is some mention of the potential issues and complexities of reducing carbon such as increased population and therefore traffic in the future, but there is only a small amount of focus on this, and other potential issues are not identified. There is lacking content on the switch to ULEVs and the necessary supporting infrastructure, which could be a very good mechanism for emission reductions in the region.

The East Riding of Yorkshire LTP does mention Government set emissions reduction targets, specifically the Climate Change Act's 80% emissions reduction target by 2050 (from 1990 levels). However, there is no alignment within their transport strategy with this target. No clearly quantified carbon reduction targets are set within the transport system, and only a small number of mechanisms for reducing emissions are suggested. The LTP does outline difficulties it will face in reducing emissions in transport such as the rural nature of the region and thus difficulty in implementing public transport. As a solution to this issue, the Plan suggests encouraging residents who make short trips to switch their cars for more active transport such as walking and cycling. However, no specific reductions in car usage are mentioned, or mechanisms to encourage the switch to active travel. Again, for freight, switching to more sustainable modes such as rail and water transport is mentioned, but no specific timeframes or clear reductions targets are set out. Furthermore, the LTP does not mention ultra low emission vehicles such as electric cars at all, which would be a good method of reducing emissions in a car-dependant rural region such as the East Riding of Yorkshire.

The North Yorkshire LTP dedicates an entire section to carbon and climate change strategies, however there are very few clear, quantified targets set, or mechanisms to enable emission reductions. There is a real lack of specific volumes of emissions to be reduced, and no alignment with Government strategies. The county council also tends to shift the weight of responsibility away, for example suggesting that they cannot directly influence the mode of travel for the majority of trips.

The Lancashire Transport Prospectus sets out some actions that would lead to carbon emission reductions, but these aren't discussed in terms of their potential to reduce emissions, rather they are discussed in relation to economic efficiency, access or health. A large emphasis is put on the benefits of electrification of rail networks, however again, the emphasis is on increased seating capacity, speed or reliability rather than carbon emission reductions or air quality improvements. Similarly, improved bus services and cycling routes are mentioned only from a perspective of improving access to jobs, education and health. No carbon reduction objectives and no quantified carbon emissions reduction targets or timeframes are set out.

However, of all plans and strategies reviewed, the recent Mayor of London's Transport and Environment Strategies are the only ones which provide fully quantified volumes of emissions reductions as well as simple percentage reduction targets. Emission reduction targets are aligned with key Government policies but also go above and beyond Government targets where the Mayor has identified them as inadequate. Targets are broken down into sub-targets which enables London to monitor progress in meeting higher level targets. The various aspects of transport have their own carbon emission reduction targets, timeframes and mechanisms. Mechanisms for achieving targets are provided with specific timeframes to implement these measures. Future increased transport demand is accounted for in emission reduction targets.

4.11.2. Recommendations

It is recommended that TfN follows an approach similar to that of the Mayor of London in terms of plotting the path up to 2050 of how emission reductions are going to be achieved. The Greater Manchester's Springboard to a Green City Region report should inform that approach. Interim targets and actions necessary to achieve these targets should be set over a number of consecutive periods, for example: by 2020, by 2025, by 2030, by 2035, by 2040,

by 2045 and by 2050 and across transport modes (cars and vans, trucks, buses, trains and active travel).

Also, like the Mayor of London, the TfN STP should identify and call on Government to implement overarching policies and actions which will allow the northern region to meet the necessary emissions reductions.

5. TfN's travel demand modelling and scenarios carbon modelling review

5.1. Introduction

A review has been undertaken of the following:

- TfN's Transport Modelling Study 2016
- TfN's High-level analysis of potential carbon impacts 2018
- Strategic Transport Modelling Case Study: Mayor's Transport Strategy for London 2018

The Mayor's Modelling Case Study has been considered in this review following the recommendation arising from the previous section that TfN should consider the approach set in the Mayor's Transport Strategy in terms of plotting the carbon reduction path up to 2050.

5.2. Transport Modelling Review

A transport modelling study was completed in 2016 by Steer David Gleeve (SDG) for TfN to inform the development of its STP and also to enable the consistent appraisal of transport interventions. This work involved development of a Northern Transport Demand Model (NTDM) to model transport scenarios showing how the volume and pattern of transport demand would respond to the various assumptions in each alternative future. Four demand scenarios were developed, focusing on two dimensions of uncertainty:

- **Enabling Policy & Plans:** The level of synergy of local transport plans and policies with wider connectivity across the North; and
- **Technological & Socio-Cultural Change:** The effect of the evolution of technology (both transport and non-transport) on socio-cultural attitudes towards travel and digital connectivity.

By considering opposite ends of these two dimensions of uncertainty, the four travel demand scenarios were defined as:

- Compact & Digital
- Compact & Travel Friendly
- Dispersed & Digital
- Dispersed & Travel Friendly

Assumptions which were common to all four scenarios were:

- The level and distribution of population and employment growth envisaged in the Northern Powerhouse Independent Economic Review (NPIER)¹ (at Local Authority District-level); and,
- The successful implementation of TfN-sponsored interventions in road, rail and integrated travel.

Generalised costs of travel were developed for road and rail modes to simulate the four scenarios in the NTDM, together with other key assumptions, as listed in the table below.

Table 5-1 Summary of Demand Scenario Assumptions

Assumption	Scenario 1: Compact & Digital	Scenario 2: Compact & Travel Friendly	Scenario 3: Dispersed & Digital	Scenario 4: Dispersed & Travel Friendly
General model parameters	WebTAG ² where applicable			
Background road and rail demand growth	National Trip End Model (NTEM) 7.0 ³			

¹ [https://transportforthenorth.com/reports/?publication-keywords=northern+powerhouse+independent+economic+review®ion=.](https://transportforthenorth.com/reports/?publication-keywords=northern+powerhouse+independent+economic+review®ion=)

² National Transport Analysis Guidance. <https://www.gov.uk/guidance/transport-analysis-guidance-webtag>.

³ <https://data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem>.

Population and employment growth per district	NPIER transformational scenario			
Interventions to strategic transport systems	Emerging TfN Rail and Integrated Travel Conditional Outputs ⁴			
Proportion of district growth (in housing & employment) concentrated in district centres	+50%	+50%	-50%	-50%
Relative change to rail access/egress generalised cost within districts	-10%	-10%	+10%	+10%
Relative change to generalised cost of all road travel	+10%	-10%	+10%	-10%
Relative change to commuting trip rate (e.g. telecommuting effect)	-10%	N/A (increase in trip rate not plausible)	-10%	N/A (increase in trip rate not plausible)
Relative change to other trip rate for selected purposes	-10%	+10%	-10%	+10%

SDG NTDM road demand forecasts were benchmarked against forecasts of road and rail demand in the North by DfT (National Road Traffic Forecasts - NRTF⁵) and Network Rail respectively. This analysis found that the SDG NTDM scenarios result in future travel demands that are within the range suggested by independent national forecasts of both road and rail demand. Modelling outputs were also developed to be consistent with the following regional transport models for the North: Highways England Trans-Pennine South model, and HS2 PLANET long and short distance models.

Forecasts for road and rail demand for each SDG NTDM scenario are shown in the following tables.

Table 5-2 NTDM Total Growth in Road Traffic (vehicle km), 2015 - 2050

Scenario	Car	LGV	HGV
TfN 1: Compact & Digital	17%	51%	33%
TfN 2: Compact & Travel Friendly	47%	51%	33%
TfN 3: Dispersed & Digital	18%	51%	33%
TfN 4: Dispersed & Travel Friendly	50%	51%	33%
NRTF Scenario 1	34%	51%	5%

Table 5-3 NTDM Total Growth in Rail Travel (passenger km), 2015 - 2050

Scenario	Commuting	Other	Business to Business
TfN 1: Compact & Digital	90%	27%	5%
TfN 2: Compact & Travel Friendly	93%	42%	16%
TfN 3: Dispersed & Digital	36%	5%	5%
TfN 4: Dispersed & Travel Friendly	35%	21%	15%

The SDG NDTM scenarios are intended to represent four plausible alternative scenarios for future travel demand in the North and have been developed by the SDG study Steering Group, comprised of stakeholders drawn from TfN and their advisors, and also from the northern City Regions. However, there is a lack of information in the study report as to how, firstly, the focus on the two 'dimensions of uncertainty' was arrived at and, secondly, how the details of the assumptions underlying each scenario definition were derived. In particular, there is lack of reference sources cited for the scenarios definition. The model scenarios conflate a number of parameters, such as fuel / energy costs, digital connectivity, land use policy and uptake of new vehicle technology, implying linkages between these parameters which are not explained, rather than exploring one or more closely related parameters individually. The modelling outputs therefore suffer from the perception of being something of a 'black box', overly simplified and uncertain in internal logic.

⁴ See the STP for more information on Rail and Integrated Travel Conditional Outputs.

⁵ <https://www.gov.uk/government/publications/road-traffic-forecasts-2018>.

It is not clear how the results of the transport modelling work were used to inform development of the STP. There is no evaluation of modelled scenario outputs in terms of transport (e.g. modal split, congestion, average speeds), environmental or other outcomes, other than changes in demand. There is no analysis of which scenario(s) may form the basis of STP 'preferred option(s)' or packages of interventions.

Modelling outputs are provided for 2050 only. Although the SDG study report includes diagrams showing demand projections for both road and rail covering the period 2015 - 2050, no data are provided and diagrams cover total demand only, i.e. not broken down by vehicle or trip type. There is also no indication of geographical distribution of demand forecasts provided in the SDG study report, other than the data in Table F.1 (see study report). This would be much easier to interpret if a) further disaggregated, e.g. by mode, vehicle type; b) presented in one or more maps.

5.3. Carbon Analysis Review

In October 2017 TfN developed a high-level analysis of potential GHG (expressed as CO₂e, hereinafter referred to as 'carbon') impacts to help understand the relative differences in impacts between the four demand scenarios developed as part of the transport modelling work to support the STP preparation (see Section 5.1 above). The carbon analysis was subsequently revised and updated over the following year. This review is based on the latest version (v7) of the carbon analysis and accompany Technical Note (v8). The original carbon analysis considered car, van and Heavy Goods Vehicle (HGV) road transport only, using data from the NTDM and the DfT's NRTF. The latest version of the STP carbon analysis has been extended to also include bus road transport and rail transport.

The carbon analysis is based on a number of assumptions regarding projected road vehicle characteristics:

- **Vehicle types:** The carbon analysis covers vehicles of four broad categories, cars, vans, HGVs and buses.
- **Powertrain types:** Cars and vans can either be Internal Combustion Engine (ICE) or Battery Electric Vehicle (BEV). Neither Plug-in Hybrid Electric Vehicles (PHEVs) nor Fuel Cell Electric Vehicles (FCEVs) are considered.
- **Fleet age profile:** Based on UK vehicle licensing statistics for cars, vans and HGVs.
- **Baseline vehicle efficiency projections:** Standard assumptions taken from DfT's WebTAG data book, split by vehicle type and powertrain.
- **Powertrain and efficiency assumptions:** These are presented for three 'mitigation' scenarios ('high', 'medium' and 'low'), as a series of a) uptake percentages for Electric Vehicle (EV) cars, vans, HGVs and buses, for 2030 and 2040; b) ICE efficiency gains by 2050.
- **Transport demand:** Figures for total vehicle-km travelled in the scenario year (2050) are taken from the SDG NTDM scenarios outlined above. Interpolation has been undertaken for intermediate years assuming constant Compound Annual Growth Rate (CAGR). DfT's NRTF Scenario 1 (central growth, central travel propensity) is also considered, as a reference case.
- **Electricity grid CO₂e intensity:** To calculate indirect emissions from EVs, CO₂e intensity is assumed to fall from the outturn value of 286 gCO₂e/kWh in 2016 to 100 gCO₂e/kWh in 2030 and for 2030 - 2050, this varies with three 'mitigation' scenarios: 75 gCO₂e/kWh by 2050 ('Low'), 50 gCO₂e/kWh by 2050 ('Central') and 0 gCO₂e/kWh by 2050 ('High').
- **Rail CO₂e emissions:** Assumed to be zero by 2040.

The total road transport CO₂e emissions (direct and indirect) in each year are then calculated by multiplying the fleet-average gCO₂/km by the total vehicle-km. Rail emissions have been calculated based on a linear interpolation of total diesel railway emissions for the North for 2013 as reported in national statistics.

There is very little information provided in the Technical Note accompanying the STP carbon analysis on the derivation of several of the assumptions listed above, e.g. in terms of reference sources. In particular, it is not clear how the EV uptake percentages, ICE efficiency gains, and grid CO₂e intensity figures for different mitigation scenarios have been derived. By way of further commentary, it is understood that the 'High' mitigation carbon analysis scenario posits 60% of new cars and vans being EV by 2030, whereas advice from the Committee on Climate Change's 2018

Progress Report to Parliament⁶ indicates 60% as the percentage required to meet the fifth carbon budget (2028-2032), implying that this should actually be the ‘Central’ mitigation scenario. That being the case this requires further clarification of the rationale behind this analysis.

The reported percentage total CO₂e reductions by 2050 for each SDG NTDM scenario are expressed relative to the 2015 figures. There is no reference to estimates of baseline emissions for 1990, which forms the basis for the UK’s legally binding five yearly carbon budgets. Based on the STP carbon analysis estimates, reduction in total emissions are projected as 15% - 18% by 2025 and 23% - 27% by 2030, from the 2015 baseline. This compares to the overall 51% and 57% reductions respectively from 1990 baseline for the fourth and fifth national carbon budgets and represents a very significant shortfall in contributing to national carbon reduction targets.

Given the importance of the period covered by the fourth and fifth carbon budgets in terms of being able to limit global warming to 1.5°C, as highlighted in the recent Intergovernmental Panel on Climate Change (IPCC) Special Report⁷, and given that transport is the only UK sector which saw an increase in total emissions over the second carbon budget period (2012 – 2017), the need to implement policies and measures to ensure reductions in overall national emissions of at least 57% in the period to 2030 is now even more critical. It should be noted, however, that the Committee on Climate Change Sectoral Scenarios for the Fifth Carbon Budget report⁸ points to slightly lower reductions in emissions from the transport sector (around 44%) in the period to 2030.

5.4. Strategic Transport Modelling Case Study: Mayor’s Transport Strategy for London

This section presents a summary of the approach to strategic modelling used in development of the Mayor’s Transport Strategy (MTS)^{9,10}, which is recommended as a best practice case study. The MTS is the statutory document that sets out the Mayor of London’s policies and proposals to reshape transport in London over the next 25 years. It is an ambitious strategy that puts people’s health and quality of life at the very heart of planning the city’s transport.

Development of the MTS has been informed by strategic modelling work carried out by Transport for London (TfL). The MTS relies upon an understanding of what could happen in the future without the measures proposed in the draft strategy. A Core Reference Case was produced to build on TfL’s understanding of current travel and present possible future travel volumes, distribution and mode share. This formed the basis of analysis identifying the challenges and opportunities facing London and its transport network over the period to 2041 and reflects a ‘business-as-usual’ scenario based on current conditions and assumptions.

The strategic modelling work carried out by TfL was used to assess MTS impacts and effectiveness based on quantified outcomes of various policies and interventions, evaluating the benefits of the strategy in terms of the Mayor’s aims and compared to the current funded plan. Various ‘packages’ were developed from these alternative policies and interventions and an assessment of their relative effectiveness carried out against the Mayor’s vision for travel in London. Finally, an assessment was made of the expected outcomes for London from implementing the MTS policies and proposals – the MTS scenario.

A series of illustrative tests explored the possible impacts of interventions at a more conceptual stage and particularly those designed to deliver mode shift. TfL developed a set of six cumulative ‘packages’ (A to F) to be tested in the strategic modelling suite. Packages were designed to pull together measures of a similar type, and represent measures to be implemented in the short, medium and long term. The packages get progressively more ambitious – starting with optimising the existing network, then expanding it, then adding new connections, and then introducing measures to reduce traffic and tackle car use. The figure below sets out this ‘hierarchy of ambition.’

⁶ <https://www.theccc.org.uk/wp-content/uploads/2018/06/CCC-2018-Progress-Report-to-Parliament.pdf>.

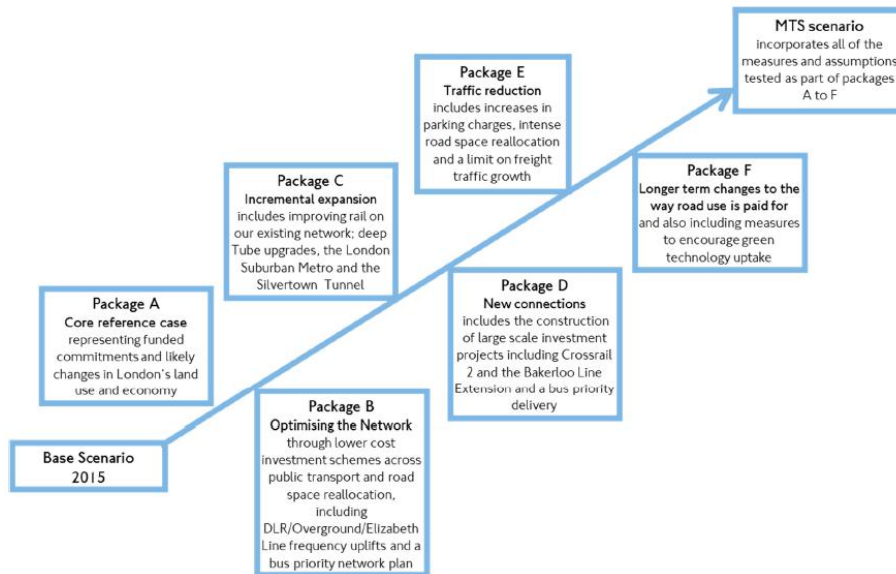
⁷ <http://www.ipcc.ch/report/sr15/>.

⁸ <https://www.theccc.org.uk/wp-content/uploads/2015/11/Sectoral-scenarios-for-the-fifth-carbon-budget-Committee-on-Climate-Change.pdf>.

⁹ <https://tfl.gov.uk/corporate/about-tfl/the-mayors-transport-strategy#on-this-page-0>.

¹⁰ <http://content.tfl.gov.uk/mts-outcomes-summary-report.pdf>.

Figure 5-1 MTS Package Model Tests



Eight key quantified measures were used to assess the impact of a) the Core Reference Case; b) relative impact of the sensitivity and package modelling carried out subsequently; and c) the proposals and policies included in the draft MTS against the Core Reference Case. The quantified measures were:

1. Mode share for walking, cycling and public transport, by area of London.
2. Vehicle kilometres (motorised road vehicles).
3. Congestion for road traffic (traffic speed).
4. Bus speeds.
5. Public transport usage (passenger kilometres travelled).
6. Rail crowding.
7. Emissions – CO₂, NO_x, PM_{2.5} and PM₁₀.
8. Connectivity provided by the transport network.

By way of example of assessment results, the figures below graphically illustrate a) evaluation of the Core Reference Case against quantified measure 8, connectivity; and b) evaluation of the MTS Scenario against quantified measure 7, emissions.

Figure 5-2 Change in public transport connectivity, 2015 to 2041 Core Reference Case

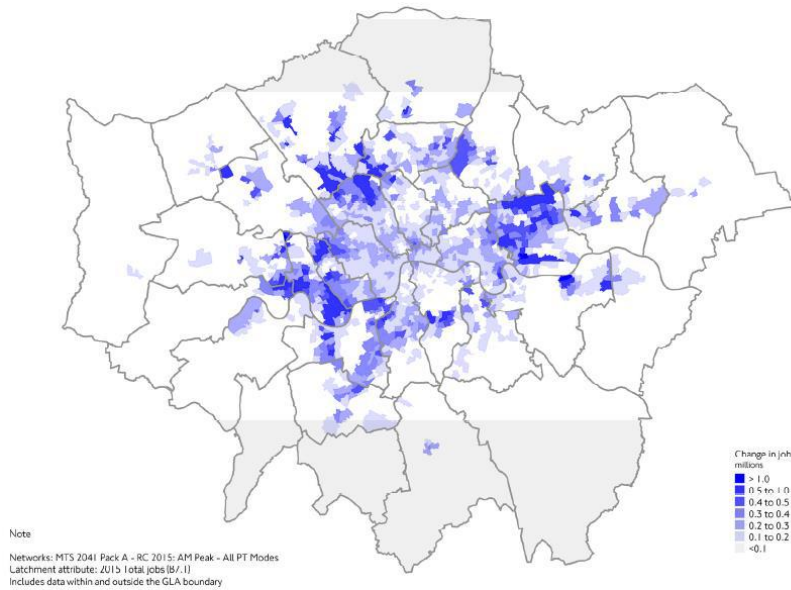
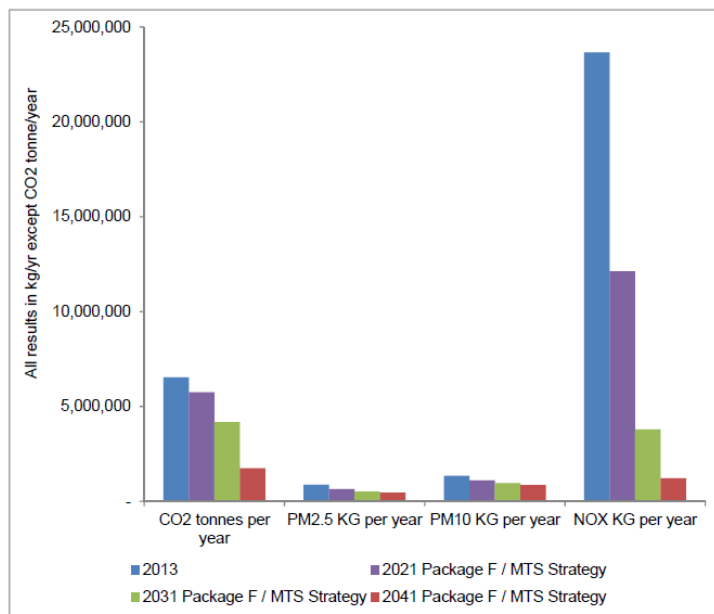


Figure 5-3 Road vehicle emissions including vehicle emissions policy measures, 2013 to 2040



The strategic modelling approach developed by TfL to inform development of the MTS provides for direct quantitative testing of the impacts and effectiveness of MTS policies and measures across key evaluation criteria, including carbon and other air emissions. This type of outcomes focused performance improvement approach, with clear temporal disaggregation of impacts over timeframes aligned with the national carbon budget periods¹¹, is recommended as a key component of the STP development going forward.

5.5. Overview and recommendations

In order to address the several shortfalls identified above regarding TfN's modelling work, and in the light of the Mayor of London's approach highlighted in Section 5.4, the following recommendations are made:

¹¹ <https://www.theccc.org.uk/tackling-climate-change/reducing-carbon-emissions/carbon-budgets-and-targets/>.

5.5.1. Transport Modelling

- A two stage approach is recommended to update and enhance the transport modelling for the STP, aimed at enabling a more outcomes focused policy / intervention / package approach:
 - Stage One: Definition of each of the four scenarios is 'opened up' to explore linkages between potential policy/intervention/package options, one or more scenario parameters and strategic outcomes. Direct consideration of modal split should form a strong focus of this approach, in particular walking/cycling/public transport (all modes) versus other road transport.
 - Stage Two: Development of a new, enhanced approach to modelling scenarios / options, which is strategic outcomes led and focused on definition, evaluation and programming of policy / intervention / package options designed to deliver strategic outcomes over the STP programme to 2050. The approach developed for the Mayor of London's Transport Strategy is recommended as a key reference.
- The fundamental requirement to robustly respond to the carbon reduction agenda set out in the fourth and fifth carbon budgets, correcting the recent increase in transport sector carbon with rapid, deep cuts, requires testing and evaluating all available policy / intervention 'levers' simultaneously: rapid shift to low carbon public transport, cycling and walking via substantially enhancing the relevant 'offers', in particular easy-to-use, fast, reliable and affordable public transport; managing fossil-fuelled road demand with emissions zones, particularly in congested urban centres and key routes; rapid upscaling of enabling infrastructure to support accelerating uptake of low / zero emission vehicles. This should include looking at energy generation and distribution systems as well as charging/fuelling infrastructure. In the short / medium term (up to 2030) modal shift will likely comprise the key means of achieving the substantial carbon reductions required.
- Option / scenario modelling outputs should be developed to be coincident with five yearly carbon budget periods. Outputs should facilitate full disaggregation and grouping, preferably via interactive tools, in terms of types/categories, time periods and spatial distribution.
- Carbon analysis should be fully embedded within multi-criteria evaluation of outcome focused policy / intervention/package options, preferably coupled with simultaneous analysis of local air pollutant emissions.
- The logic and linkages between policy / intervention / package definition, testing and evaluation and assembling of these items into the 'preferred' strategy should be clearly set out.

5.5.2. Carbon Analysis

- References and / or supporting analysis should be provided to evidence the 'mitigation' scenarios developed for the carbon analysis.
- An estimate of 1990 baseline emissions for the North should be developed to enable comparison with appropriate national carbon budget reductions.
- The analysis should include consideration of the range of low / zero emission road vehicles other than electric vehicles, covering all vehicle types.
- The current carbon analysis results are highly dependent on the SDG NTDM scenario forecast outputs. It is recommended that, going forward, carbon analysis is fully integrated with outcome-focused policy / package testing and evaluation, preferably as part of a wider multi-criteria evaluation, as featured in the evidence study supporting the Mayor of London's Transport Strategy highlighted in Section 5.4.

6. Strategic Development Corridors carbon review

6.1. Introduction

A review has been carried out of the draft Environmental Appraisal Reports for three Strategic Development Corridors (SDCs):

- Central Pennines;
- Southern Pennines; and
- Energy Coasts.

The reports have been prepared by WSP for TfN. The main aims of the review have been to identify how the environmental assessments for the SDCs are being approached generally and how carbon emissions are being addressed more specifically.

6.2. Approach to Environmental Assessments of Strategic Development Corridors

The purpose of the Environmental Appraisal Reports is to inform decision makers and stakeholders of the likely environmental implications of the Strategic Programme Outline (SPO) proposed for each the various SDCs, and how environmental considerations have been taken into account.

The approach to transport appraisal outlined in the Department for Transport (DfT)'s WebTAG appraisal process is being applied for the SPO cases of each of the SDCs. Environmental topics as outlined in the WebTAG appraisal guidance (TAG Unit A3 Environmental Impact Appraisal) are being used. However, considering the high-level nature of the programme of interventions proposed and associated uncertainty, not all environmental topics are being considered within the SPO.

Environmental topics to be presented in an Appraisal Summary Table (AST), as part of the WebTAG appraisal for the SPO case, comprise the following:

- Noise;
- Air Quality; and
- Greenhouse Gases

Environmental capital topics, as follows, are not presented in the AST:

- Landscape;
- Townscape;
- Historic Environment;
- Biodiversity; and
- Water Environment.

The environmental capital topics above are the subject of a risk based appraisal only, as insufficient information relating to the characteristics of the SOP's interventions is available to appraise the nature and magnitude of impacts relating to these topics, At later stages of the transport appraisal process, it is expected that these topics will be considered fully in accordance with WebTAG guidance.

As already indicated, Greenhouse Gases impacts measured in tonnes of carbon dioxide equivalent will be quantified. However, for the three strategic corridors being considered, carbon quantification is currently missing from the draft Environmental Appraisal Reports that have been reviewed, as traffic model outputs are being awaited. Therefore, the results of this review are inconclusive at this stage. Carbon emissions from SDCs can only be considered further when carbon quantification becomes available for the various SDCs.

7. Assessment and critique of Draft STP policy

7.1. Introduction

The reviews undertaken in the previous chapters of this report have arrived at the following set of recommendations which are tested in this chapter of the report by considering the proposals contained in the Consultation Draft STP 2017.

7.2. Summary of recommendations

7.2.1. STP Carbon Objectives

The STP should consider the following objectives in defining carbon policy:

- Reduce emissions from cars and vans;
- Reduce emissions from trucks;
- Reduce emissions from trains;
- Reduce emissions from aviation;
- Increase uptake of electric vehicles;
- Increase availability of EV charge points;
- Increase use of low carbon fuels (hydrogen, biofuels); and
- Increase use of low carbon alternative transport (walking, cycling and public transport).

7.2.2. STP Carbon Targets & Budgets

The STP should consider the following carbon targets and budgets in defining carbon policy:

Long term carbon target: 80% reduction by 2050 from 1990 levels

Interim carbon targets:

- End of sale of all new conventional petrol and diesel cars and vans by 2035
- 60% of new car and van sales to be ULEV by 2030
- Emissions from transport falling by 46% by 2030 compared to 2017
- Cycling and walking should be that natural choice for shorter journeys by 2040
- 7% of all road transport is low carbon by 2032
- 15% reduction in emissions from HGVs by 2025
- Need for faster expansion on EV charging infrastructure (no target date)

Carbon budgets:

Budget number	Time-period	Carbon Budget Level	Reduction below 1990 levels
3	2018-2022	2,544 MtCO ₂ e	37% by 2020
4	2023-2027	1,950 MtCO ₂ e	51% by 2025
5	2028-2032	1,725 MtCO ₂ e	57% by 2030

7.2.3. STP Carbon Pathway to 2050

The STP should follow an approach similar to that of the Mayor of London's Transport Strategy in terms of plotting the carbon pathway to 2050 of how emission reductions are going to be achieved. The recent Greater Manchester's Springboard to a Green City Region report should inform that approach.

Interim targets and actions necessary to achieve these targets should be set over a number of consecutive periods to match the carbon budgets periods and across transport modes (cars and vans, trucks, buses, trains and active travel).

Going forward, carbon analysis should be fully integrated with outcome-focused policy / package testing and evaluation, preferably as part of a wider multi-criteria evaluation, as featured in the evidence study supporting the Mayor of London's Transport Strategy.

The STP should identify and call on Government to implement overarching policies and actions which will allow the northern region to meet the necessary emissions reductions.

7.3. Assessment of Consultation Draft STP 2017

The Consultation Draft STP 2017 recognises the need 'to reduce carbon emissions from transport' in its objectives, that transport has a significant role to play in meeting commitments to reduce greenhouse gas emissions and acknowledges that Government has set a target to reduce carbon emissions by 80% by 2050.

It also acknowledges that reducing carbon emissions is now imperative and that the Government's Clean Growth Strategy includes the desire to work with transport and logistics industry to reduce the impact of freight emissions across all modes including road, rail and shipping.

In addition, it states that Clean Growth Strategy sets out a series of key policies and proposals aimed at driving down carbon emissions over the next decade. The Strategy identifies transport, which accounts for 24% of UK emissions as a key area for action, setting out a series of policy measures focussed on accelerating the shift to low carbon transport. These include actions on introducing new vehicle technologies, on encouraging the shift of freight from road to rail and on working with the private sector to support research and development of connected and autonomous vehicles. TfN will need to work with Partners to ensure that the right infrastructure is in place for new low emission vehicles to be successful in the North, for example there needs to be a sufficient and appropriate charging and refuelling network in place. This also requires working with stakeholders in one of the North's prime capabilities in energy generation and supply to support this innovative change.

However, the assessment reveals that no specific carbon objectives for key approaches to achieving carbon reduction across modes of transport nor ultimate or interim carbon targets have been set out and carried through to the proposals in the Consultation Draft STP 2017. No pathway to 2050 has thus been established.

It should be recognised, however, that since the Draft STP was prepared various highly relevant Government carbon policy documents have been published in 2018: Road to Zero Strategy, the Automated and Electric Vehicles Act and the CCC's Reducing UK emissions 2018 Progress Report to Parliament and that carbon policy is currently fast evolving after years of stagnation. It is thus very timely that improvements are made to the Final STP to ensure that its proposals are aligned with latest policies and targets and that transport in the northern region contributes meaningfully to the national carbon reduction targets.

8. Final recommendations for improvement of the STP's carbon performance

8.1. Key findings of the review

The key findings of this review are summarised as follows:

- No specific carbon policy objectives, key approaches and measures to achieving carbon reduction across modes of transport have been set out in the Consultation Draft STP 2017.
- No reference to interim carbon targets nor carbon budgets and how they have been carried through to the Consultation Draft STP 2017 proposals. The only target acknowledgement is the ultimate target to reduce carbon emissions by 80% by 2050 from 1990 baseline.
- Local transport authorities in the northern region are only now awakening to the need to reduce carbon emissions as an imperative, with Greater Manchester leading the way. The recent Greater Manchester Combined Authority report 'Springboard to a Green City Region' sets out some quantified carbon emissions targets including timescales to meet those targets and, in most cases, clear mechanisms to achieve these targets with a great focus on transport linking to the Greater Manchester 2040 Transport Strategy.
- The transport and carbon modelling work undertaken for the STP to date does not sufficiently test the combination of measures necessary to deliver the successive carbon budgets. Current modelling work projects reductions in total emissions as 15% - 18% by 2025 and 23% - 27% by 2030, from the 2015 baseline. This represents a very serious shortfall when compared to necessary overall 51% and 57% reductions respectively from 1990 levels for the fourth and fifth national carbon budgets and further improved strategic modelling of emissions will be required.
- The strategic modelling approach developed by TfL to inform development of the recent Mayor's Transport Strategy provides for direct quantitative testing of the impacts and effectiveness of MTS policies and measures across key evaluation criteria, including carbon and other air emissions. It also provides with clear temporal disaggregation of impacts over timeframes aligned with the national carbon budget periods. The Mayor's ambition is for London to be a zero-carbon city by 2050 and a carbon pathway to 2050 of how emission reductions are going to be achieved has been plotted in the MTS. This has been fully informed by the strategic modelling approach.

8.2. Final recommendations

It is recommended that the Final STP better aligns itself with latest Government policy and CCC's recent stretched targets and sets out clear policy messages in terms of the role of TfN and its partners in achieving these in the northern region. This could be achieved through the addition of a new section on 'Decarbonisation of Transport' to the Final STP where clear carbon policy in terms of objectives and targets across transport modes is set out.

Carbon policy would need to be set out covering the following objectives (and any targets associated with these) as a minimum:

- Reduce emissions from cars and vans
- Reduce emissions from trucks
- Reduce emissions from trains
- Reduce emissions from aviation
- Increase uptake of electric vehicles
- Increase availability of EV charge points
- Increase use of low carbon fuels (hydrogen, biofuels)
- Increase use of low carbon alternative transport (walking, cycling and public transport)

In this new section, TfN could also identify and call on Government to implement overarching policies and actions which will allow the northern region to meet the necessary emissions reductions.

It is further recommended that the new section on 'Decarbonisation of Transport' sets out how STP proposed policies and measures are projected to result in carbon emissions reductions (from 1990 baseline) aligned with those set out in the national carbon budgets.

The new section could clarify that although Government and CCC's targets are supported by TfN, TfN commits to identifying the most appropriate targets for the northern region as part of the subsequent TfN's Investment Programme. This is because commitment from TfN's partners and sufficient lead time will be necessary for the current approaches to be modified and tested as recommended by this review and this cannot realistically be accommodated within the Final STP programme.

TfN's Investment Programme, supported by complementary investment and interventions at a local level, would therefore need to set out a clear programme of phased introduction and implementation of key policies and measures through the interventions promoted, and their projected contribution to meeting carbon budget targets, through to 2050 (the 'Pathway to 2050').

The new section could also recognise that establishing the most appropriate approaches for reducing carbon emissions will require joint collaboration and leadership through TfN (via delivery of the Strategic Transport Plan) and local transport authorities (through their local transport plans), as TfN develops the Investment Programme.

In establishing carbon impacts and reductions, an outcomes focused, evidence-based and quantitative carbon performance approach similar that used by the Mayor's Transport Strategy is recommended to inform the establishment of the 'Pathway to 2050'.

Given that transport is the only UK sector which saw an increase in total emissions over the second carbon budget period (2012 – 2017), and given the importance of the period covered by the third (current), fourth and fifth carbon budgets in terms of being able to limit global warming to 1.5°C, it is further recommended that estimates of total carbon impacts and reductions (from 1990 baseline) projected for the periods 2023-2027 and 2028-2032 form a key focus in terms of the identification of carbon reduction measures in TfN's Investment Programme's 'Pathway to 2050'.

9. References

- TfN's Consultation Draft Single Transport Plan 2017
- Climate Change Act 2008
- Reducing emissions from road transport. The Road to Zero Strategy (2018)
- Automated and Electric Vehicles Act 2018
- The Clean Growth Strategy (2017)
- Driving the Future Today - A strategy for ultra-low emission vehicles in the UK (2013)
- The Carbon Plan (2011)
- Committee on Climate Change Reducing UK emissions 2018 Progress Report to Parliament (June 2018)
- Committee on Climate Change's Lord Deben letter to Secretary of State for Transport (11 October 2018)
- Delivering Clean Growth Progress Against Meeting Our Carbon Budgets – The Government Response to the Committee on Climate Change (October 2018)
- North Yorkshire: Local Transport Plan 2016-2045
- East Riding of Yorkshire Council: Local Transport Plan 2015 – 2029
- Sheffield City Region Transport Strategy 2011-2026
- Lancashire Strategic Transport Prospectus 2016
- West Yorkshire Transport Strategy 2017-2040
- Greater Manchester 2040 Transport Strategy (2017)

- The Mayor of London's Transport Strategy (2018)
- London Environmental Strategy (2018)
- TfN's Transport Modelling Study 2016
- TfN's High-level analysis of potential carbon impacts 2018
- Committee on Climate Change Sectoral Scenarios for the Fifth Carbon Budget (2015)
- Strategic Transport Modelling Case Study: Mayor's Transport Strategy for London 2018

Appendices



Appendix A. Consultees's comments

A.1. Zero Carbon Yorkshire Transport Group

We consider only Objective No.1, "Reduce greenhouse gas emissions from transport overall, with particular emphasis on road transport".

This objective is very seriously inadequate. The projects resulting from the Strategic Transport Plan must form part of a whole transport system that remains in line with emissions targets set nationally.

Transport emissions in the North will need to reduce at least as rapidly as for the UK as a whole. Due to demand rising much more rapidly in Southern England than elsewhere, a much-publicised disparity in transport funding between the North and South has developed. If funding is equalised, as many Northern political leaders are calling for, then the Northern target can reasonably be expected to closely match the national one.

The Committee on Climate Change's (CCC's) 2017 progress report sets out the emissions reductions required to enable legally binding carbon budgets to be met. It states "Domestic transport emissions should fall by around 44% between 2016 and 2030 and create options to allow near-zero emissions by 2050." Thus the ISA's target to "reduce" emissions clearly falls massively short of this.

A briefing available on the TransportNorth!'s website describes the results of unpublished modelling work carried out by yourselves. (This site is produced by campaigners that have engaged with TFN staff.). This briefing describes TFN's own projections of carbon emissions resulting from travel on all existing Northern roads, plus roads projects currently envisaged as being included within both the TFN Strategy and parallel road strategies of other responsible authorities. These projections show total road emissions would only fall by 9 -14% by 2030. That meets your Objective 1 of "a reduction". However, it is nowhere near the 44% reduction needed to meet carbon budgets.

It is important to understand how significant this is by describing the background to the level at which national targets are set. The CCC's carbon budgets are set at a level intended to meet intergovernmental agreements to mitigate climate change, through the Climate Change Act 2008 (CCA). At that time, the international community had come to a near-consensus view that average global temperature rise should not exceed 2C. (Unfortunately, the CCA's stated aim to "limit global temperature rise to as little as possible above 2°C", is somewhat too weak, due to a reluctance of the Government at the time to make a more robust commitment).

Since the CCA was passed, the Paris Agreement has been signed and ratified by the majority of the world's Governments (though the US has since committed to withdrawing). This reflects more recent scientific evidence and commits signatories "to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels." Carbon budgets have yet to be adjusted in line with this however, and legal action against the Government is currently in progress over this failure.

If average temperatures exceed 1.5-2°C, it is likely to lead to increased extreme weather, through climate change, severe enough to not only cause great environmental damage but also economic damage that would ultimately cancel out the benefits of any growth achieved in the meantime. Clearly a failure to meet sectoral carbon budgets recommended by the CCC in any individual sector endangers that for the whole economy. Furthermore, in the light of the above current legal development, the flexibility to meet more stringent carbon budgets should be maintained.

We cannot accept TFN's claim that pursuing the Strategy in its current form would bring net long-term GVA growth. Further, we believe the likely environmental consequences of a failure to achieve appropriately revised emissions reduction objectives to be more serious than the economic ones. It is crucial that emissions from Northern transport are reduced far more rapidly from the levels currently projected.

Solutions

We at ZCY recognise that we are calling for very radical changes to the TFN Strategy in order to bring about very rapid emissions reductions. Above all, we advocate reduced travel and other measures to strengthen compact local communities. However, below we recommend action we believe it is reasonable for TFN to take.

This must be based on a recognition that the level of economic and jobs growth sought through developing the Transport Strategy is not achievable by the means it sets out. Climate objectives need to be strengthened in it to a level that properly protects both our economy and environment, which are of course inter-linked. Low-carbon technologies are not yet developed or adequately adopted in the North - and cannot reasonably be relied on to be developed - at a sufficient rate to achieve that growth, whilst simultaneously meeting these stronger climate objectives. TFN should therefore engage with other stakeholders, especially the relevant government departments, to seek solutions.

We propose that this would involve developing a radically different range of prospective transport projects. In particular, road transport is responsible for the vast majority current surface transport emissions. We would regard scaling back the major road investment programme to be essential. Instead, additional connectivity should be achieved through promoting a modal shift towards low carbon public transport and encouraging more walking and cycling within towns and cities. This becomes a more urgent consideration as measures to tackle poor air quality, including Clean Air Zones, start being implemented in most urban conurbations.

There is also a compelling case for digital connectivity, where a step change in adoption and improvements in technology can lead to greatly expanded utilisation that would replace the need for some physical connectivity.

We support TransportNorth's 10 Core Responses document which covers a wider range of issues than our own response. We have one reservation, relating to Point 3, in that we would not support greater transport connectivity of any type, where it creates a conflict with the radically improved emissions reduction objectives that we call for.

A.2. Friends of the Earth

Climate change

National policy on climate change is underpinned by the Climate Change Act 2008² and the UK's international commitments to reduction of greenhouse gas emissions, in particular the Paris Agreement.

Alongside the long term target of reducing UK greenhouse gas emissions by at least 80% by 2050 (on 1990 levels), the architecture of the Climate Change Act 2008 sets out shorter and medium term five year carbon budgets. These budgets recognise the cumulative nature of greenhouse gases and are designed to accelerate early action on emissions reduction rather than leaving it to later in the period to 2050.

The fifth carbon budget under this regime³ for the period 2028-32 is set at 1725 MtCO₂e (a reduction of emissions of 57% by 2030 on 1990 levels). The UK Government has accepted the fifth carbon budget at these levels and so, it is our position, the Strategic Transport Plan must reflect that budget if it is to be consistent with national policy (as per S102(8)c as above).

In 2016, transport became the largest emitting sector of greenhouse gases representing 26% of UK emissions.⁴ Note that this figure consists of surface transport and domestic aviation – it does not include international aviation (which the STP sets out to facilitate with infrastructure connections to the region's airports). Very little progress has been made to date on reduction of transport emissions (2% reduction between 1990 and 2016) and recent years have seen a small year-on-year growth.

The Committee for Climate Change has issued advice to Parliament⁵ recommending a target to reduce transport emissions by 44% between 2016 and 2030 and further reductions to near zero by 2050. This clearly represents a significant step-change in progress over the period of the Strategic Transport Plan.

Therefore, it is of grave concern that no targets are identified for emissions reduction in the STP. While the report contains welcome words recognising the scale of transport' emissions, it lacks any indication of actual emission reductions, resulting from the STP.

Of even greater concern is the fact that draft projections released by Transport for the North (and attached to this submission) identify that the best case scenario under the Strategic Transport Plan result in only a 14% reduction in transport emissions. This is an order of magnitude short of the CCC's recommendations and is therefore untenable, failing as it does to demonstrate sufficient compliance with national policy.

It is noteworthy that the UK Climate Change Act is based on limiting the global temperature rise to 2 degrees Celsius, by 2050. In 2015 the UK Government agreed to, and later ratified, the Paris

Agreement on Climate Change which builds on the ambition of maintaining temperature rises (as close as possible) to 1.5°C. The CCC, in response have stated that we need to reach global net-zero carbon dioxide levels (the main greenhouse gas resulting from transport) by the 2040s. The TfN projections indicate an at-best decrease of 67% by 2050, again woefully short of the net-zero recommendations.

A.3. Anthony Rae (on behalf of the ETOs campaigners grouping)

(extract from a wider response...)

1) The STP has failed its 'carbon test'. This is unacceptable

Throughout the period of their constructive engagement with TfN the ETOs have been emphatic that carbon reduction is one of, if not the priority they wish to see embedded within the STP (see highlighted section of A5 on p.25). In January 2017 we drew to TfN's attention their obligations to do this under the 2016 Cities & Local Government Devolution Act A9. The statistical and policy basis (under the Climate Change Act, as determined by the Committee on Climate Change - CCC) for this priority are set out in A5 and also in paragraphs 31-2 of CPRE-SY

But since the STP does acknowledge that 'Reducing carbon emissions is now imperative' p.35 the question must be: how has it turned that 'imperative' into strategic direction? We have been clear that this requires an explicit carbon reduction objective, trajectory and target within the STP – for a number of reasons: so that these mechanisms can act as a policy driver to influence and direct all subsidiary levels of the strategy, and to demonstrate carbon leadership, seeing that under subsection 10 of S102I of the C&LGDA subsidiary transport authorities would be required to work within the same carbon framework - but a careful reading of the objective Promote and support the built and natural environment shows that that has not been done.

This is deeply disappointing, and unacceptable. A5 identifies the quantitative aspects of the STP's carbon reduction failure, based on the preliminary carbon analysis TfN have produced, but have not made available to any other stakeholders; and also note that a question relating to carbon reduction is not included in the IPSOS Mori consultation form, meaning that effectively the carbon issue has almost no visibility within the STP the STP or its consultation mechanisms.

So what are the consequences within the STP and its programme approaches, particularly in road mode, of not having carbon reduction as a strong policy driver? The initial TfN STP carbon analysis A12 of the carbon impacts of the four traffic demand scenarios (in comparison to a DfT BAU) at 2030/40/50 dates, provided to the ETOs in February 2018 records carbon reductions of -9 or 14% by 2030 under any scenario but which are nowhere near the -44% by 2030 recommended by the Committee on Climate Change. The fact also that the low end of this range provides just a 1% reduction compared to the BAU (-9% as against -8%) demonstrates how weak any TfN carbon reduction interventions must be. Beyond 2030 the rate of reduction of course accelerates (as EV decarbonisation spreads) but to focus instead on the 2030-50 period would be to demonstrate a lack of understanding of the time-specific nature of the policy framework (CCC's legally adopted national carbon budgets) within which the STP has to work. Against those requirements the STP is proposing to underachieve by a shortfall of 68-80%, and the scale of this - to be clawed back in little more than a decade - will obviously require the preparation of an alternative Carbon Reduction scenario for the entire STP; thus with carbon reduction acting as a top level 'policy driver' as we have asserted from the start.

Because we have not had access to the methodology behind these overall numbers it's not possible to understand immediately what might be happening at levels of finer detail. However, the ISA appendices do contain a non-quantitative expression of what is projected to happen in each of the strategic development corridors: 'For all SDCs, GHG emissions from road movement is anticipated to grow in the short term, up to 15% in the case of SDC 1, relative to today. However, by the medium term, for most of the SDCs there was an overall (small) drop in GHG emissions relative to today, or a declining trend in emissions relative to the short term.' p.89 For each individual SDC the reported outcome is:

SDC Medium term carbon impact – by 2035
carbon emissions from road ...

1 should continue to slightly be higher than 2015 levels, though lower than in the short term

- 2 should show a decline
- 3 will show a low increase
- 4 will show a slight decline
- 5 should show a decline
- 6 are expected to show a continuing slight increase,
- 7 are expected to show a low increase

Expressing these results concisely: strategic development corridors in road mode are carbon generators, not reducers, and this ought to be a significant policy determinant against the SDC concept as a whole.

TfN have asserted that ‘using sustainability appraisal progressively to correct strategy direction’ is an adequate alternative/preferred methodology to a ‘using a carbon reduction objective as a policy driver’ approach - whereas in the 2017 consultation we argued that it was too weak in its influence over other policy components – and this specific SDC example is a further demonstration of that. ISA table 11-3 is instead recording that the performance of the SDCs is positive against ISA objective 1 (‘reduced GH GM emissions from transport overall, with particular emphasis on road transport’) and this must be because its methodology is insufficiently sensitive to the quantified requirements of the real-world policy framework. Whilst ISA Appendices table A-1 p.13 duly records that ‘amendments were made where these were considered appropriate in the light of the full range of considerations’ in response to my 2017 critique, it is now clear beyond doubt that TfN’s ‘response-to-carbon’ methodology underpinning the preparation of the STP does not work.

[My colleague Anne Robinson has made similar criticisms of the effectiveness of ISA CPRE-SY para.69 which I also support.]

Yet another example would be the ISA’s treatment of aviation’s environmental impacts, where all 11 references (to ‘airports’; there are none to ‘aviation’ or ‘flights’) are positive in tone. In general TfN’s inexpert and partial consideration of the aviation policy area makes the STP’s treatment of the carbon issue even worse; the detail of this policy ‘case study’ is reviewed in A6 and A10. Furthermore this episode has proved to be revealing of other weaknesses within the TfN policy process, and what happens when it experiences ‘challenge’ - it ignores it (as also happened with the ETOs ‘challenge’ to Trans-Pennine Tunnel feasibility – see A) above). After a review meeting I had requested in order to ‘challenge’ the technical weaknesses of TfN’s International Connectivity report I identified just the ‘headline’ number of these in writing highlighted in A10 August 2017. Yet despite being confronted with substantive criticism of the methodology and content of the report all its policy positions have still been repeated within the STP.

One of these criticisms (iv) interacts also both with the STP’s roads (mostly) programme, and also the ISA assessment. I had pointed out that a policy of public financial support for ‘improving surface access to airports’ is in fact contrary to government policy. Now whilst buried within the ISA appendices is a recognition that ‘a potential growth in air travel and it is likely that this would have a consequent impact on GHG emissions’ table G-4 p.139 the ISA itself seeks to justify an aviation carbon increase by claiming that ‘this growth in air travel would include the potential for all air freight to fly from the North’s airports, compared to just 4% in 2016. Reducing surface transfer of freight to/from southern airports would therefore act to offset some of the GHG emissions from extra flights.’ In my August 2017 letter I had already suggested that such transfers should be treated as occurring ‘only ‘at the margin’ and can therefore be discounted until they have been demonstrated as possible and significant. Again I think a certain amount of policy naivete is being displayed.’

Finally, how the carbon issue has been included - in fact excluded - within the STP evidence base appendix A makes the same point. It should have included reference to all the relevant CCC publications (e.g the 2017 Progress Report, or the report on Sectoral scenarios for the Fifth Carbon Budget November 2015) together with such as CBT’s Environmental quality, climate change and transport innovation 2017, but instead there is nothing at all. There is indeed no identifiable carbon related process, exposed to public engagement, within TfN. This de facto marginalisation can only undermine the credibility and reputation of TfN and its processes.

For all these reasons (just summarised here) the 10 Core Response document reached the conclusion: ‘the STP fails the ‘carbon test’ and cannot be supported on this ground alone.’ A1 no.7 Above all strategies such as the STP have to be the vehicle by which top-level national policy

imperatives like carbon reduction have to supported, contributed to and delivered. TfN haven't understood this and their proposed strategy acts against it.

Recommendations-I: the STP environmental objective must include a specific and quantified carbon reduction trajectory and target, located within and responding to the adopted carbon budgets set by the Climate Change Act. This should be prepared incorporating aviation emissions within the same approach utilised by CCC. Alongside this objective a carbon reduction protocol, covering both TfN and combined authority activity, should be developed and applied. A carbon reduction objective/target having been established, it should then used as a 'policy driver' for all subsidiary levels of the STP to ensure that their outputs are contributing to the objective, and are consistent with the guidance of the Committee on Climate Change. The entire STP must be reviewed and revised against an alternative 'carbon reduction scenario' consistent with the CCC recommended – 44% reduction by 2030. The TfN International Connectivity report and its analysis must be submitted to independent peer review, which includes environmental stakeholders. The STP evidence base should make appropriate reference to the UK carbon reduction framework and CCC guidance.

A.4. Global Justice Sheffield

We are therefore alarmed that Transport for the North's Plan fails to demonstrate how the necessary 44% reduction in carbon emissions by 2030 advocated by the Committee on Climate Change to meet legally binding carbon budgets can be met. The report has 15 references to "carbon" as opposed to 362 for "economic" or "economy", and we see little evidence that the strategy set a specific carbon reduction target as one of its core policy drivers, by which proposals could be shaped and tested. The importance of reducing carbon emissions is acknowledged on pages 35 and 90, but does not feature in the evidence base on pages 94-95. The word "carbon" does not appear at all in the concise booklet "Key Messages".

If the Strategy as set out is implemented, the expansion in road capacity will lead to a substantial increase in car miles. The road construction itself will involve carbon emissions. We echo the need for improved rail connectivity within the North, especially Sheffield/Leeds and Sheffield/ Manchester. A major omission, when advocating the development of northern airports to handle the alarming figure of 75m international passengers per year by 2050, is any attempt to model the additional contribution of aviation carbon this would involve.

Although improved digital connectivity can bring about a larger reduction in emissions than can physical connectivity, the thrust of the strategy is to favour improved physical connectivity. We contend that there is a good case for shorter distance connectivity, but that this should be achieved by a shift from car to bus, cycle or foot and that improved longer distance connectivity should largely be achieved by rail.

It is foolhardy to think that the economy should take precedence over environmental considerations. The international Paris Agreement recognises that the global average temperature rise must be kept to 1.5 - 2 degrees C because, if it goes beyond this, the economic and social damage from extreme weather events could wipe out any economic benefits gained from further economic development. Transport for the North needs to recognise this and rethink its Strategic Plan.

Appendix B. Local authorities' transport plans and strategies

B.1. The Lancashire Strategic Transport Prospectus

Section	Topic	Details
The Preston to Manchester Rail Corridor (page 31)	Introduction of electric trains	In January 2015, the Government announced more diesel-powered carriages for selected services in the corridor, but these are of a much lower quality than the rolling stock currently operating Trans-Pennine Express services between Blackpool North and Manchester Airport. Four carriage electric trains are now operating services between Preston and Liverpool providing a significant increase in seating capacity. The commitment in the new Northern franchise announcement on 9th December 2015 to introduce brand new electric trains on services between Manchester, Preston and Blackpool North / Windermere as part of a wider 'Northern Connect' network once electrification works are complete is therefore a most welcome development.
	Introduction of new diesel trains	The commitment in the new Northern franchise announcement on 9th December 2015 to introduce brand new diesel trains on the Blackpool North to York service via Preston, Blackburn and Burnley Manchester Road as part of a wider 'Northern Connect' network is therefore a most welcome development.
	Electrification would make the most significant contribution to transformational change to East Lancashire's rail network	The Connectivity Study adopted a Conditional Outputs approach in accordance with standard rail industry practice, recognising that to deliver transformational change to East Lancashire's rail network will require as a minimum the support of Network Rail, Rail North and the relevant Train Operating Companies. Whilst the realisation of each output will be subject to the identification of an affordable and value for money solution, the study concluded that electrification of the routes between Preston and Leeds / Colne and Clitheroe / Blackburn and Bolton together with associated rolling stock improvements would make the most significant contribution. In addition to the 'Calder Valley' route, the report of the North of England Electrification Task Force includes the Bolton to Clitheroe via Blackburn line as a Tier One scheme, with a recommendation for implementation in Control Period 6 (2019 to 2024).
	Electrification of the Ormskirk to Preston route	Merseyrail currently operates a fast and frequent service between Liverpool and Ormskirk using electric trains. However, onward travel to Preston requires a change of train to a diesel-operated service that is infrequent and run to an irregular timetable. Rolling stock quality is also poor. Electrification of the Ormskirk to Preston route with appropriate infrastructure enhancements would resolve the majority of issues, significantly improving connectivity between Preston, West Lancashire and the Liverpool City Region.
	Electrification of the Morecambe – Lancaster rail section	Electrification of the short length of route between the West Coast Main Line north of Lancaster and Morecambe could significantly enhance the town's connectivity thereby allowing the resort to benefit from the ongoing electrification programme across the North West. Work to be undertaken shortly will establish whether there is a business case for such an enhancement.

Local Travel (page 43)	Lancashire needs improved bus services supported by safe, convenient and attractive walking and cycling networks	Lancashire’s main centres for employment, education and training need to be served by reliable, accessible and profitable bus services supported by safe, convenient and attractive walking and cycling networks to encourage people to participate in more active ways of travel. It is therefore crucial to embody the principles of good accessibility, on foot and by cycle, as well as by public transport, in the future planning of both housing and employment developments across Lancashire.
	Improved cycling networks	Cycling in particular has the potential to offer options for short journeys but also for longer journeys to work and education and for leisure. Following a successful bid to the Government’s Local Sustainable Transport Fund, a strategic cycle network is being created in East Lancashire, initially focused on Blackburn, Accrington and Rossendale. The intention is to extend the concept across Lancashire, improving access to jobs, education and training opportunities and the health of Lancashire’s residents.

B.2. Sheffield city region Transport Strategy 2011 – 2026

Section	Topic	Details
Our Goals (page ii)	Goal: Reduce emissions from vehicles	Our third goal is to reduce the emissions from vehicles, since they lead to air pollution and climate change. We mean to create a culture whereby people are happy to make sustainable travel choices and where economic prosperity goes hand-in-hand with carbon efficiency. We also intend to promote sustainability by establishing an integrated approach to transport and land use planning.
Our key policies (page iii)	To reduce emissions	<ul style="list-style-type: none"> • To work to improve the efficiency of all vehicles and reduce their carbon emissions • To encourage active travel and develop high-quality cycling and walking networks • To provide information and travel advice for the users of all modes of transport, so that they can make informed travel choices • To support the generation of energy from renewable sources, and use energy in a responsible way • To improve air quality, especially in designated AQMA areas
Our Actions (page iv)	Potential impact of population growth	There is clear evidence that the likely impact of population growth over the lifespan of the strategy, coupled with a considerable rise in car ownership, would be greater than the mitigating effect of these interventions. Extensive work to provide a choice between car and other modes of travel, especially for short-distance trips, would therefore be required in order to tackle further increase in congestion, loss of productive time, air pollution and high carbon emissions.
	Encouraging the use of less polluting vehicles	We will also design pedestrian-friendly streets and footpaths, create a continuous cycling network, support car clubs and car sharing schemes, and make information about all these travel options easier to

		find and use. We will take action to make a wiser use of energy through assisting drivers in becoming more fuel-efficient, enforcing speed limits and encouraging the use of less polluting vehicles.
Cross cutting topics (page 10)	Cross over between economic and environmental sustainability	A second cross-cutting topic is the need to ensure that our growth is sustainable. Economic growth is the primary goal of this strategy, and sustainability is explicitly covered by our goal to reduce emissions; but when prioritising transport interventions, there are sometimes conflicts between the economic and environmental agendas. We introduce the topic of sustainable growth so that throughout the strategy we can emphasize our choice of policies that combine the two goals, and thus achieve economic prosperity while maintaining a minimum impact on the environment over time.
Our achievements (page 12)	Carbon reduction commitment of 30% from 2005 to 2020	<p>Authorities across SCR have risen to the challenge of setting ambitious carbon targets and setting out carbon reduction delivery plans. Sheffield, for example, has committed to reducing carbon of 30% from 2005 to 2020.</p> <p>The move towards more environmentally friendly buses has led to more than 50% of the fleet operating services in South Yorkshire having engines which meet the requirements of Euro III or above.</p> <p>The Sheffield City Council has been working continuously to promote the introduction of Low Carbon Vehicles (LCV). This has included a trial of 10 Compressed Natural Gas (CNG) vehicles with temporary fuelling stations, aiming to promote long-term use of LCVs and introduce permanent refuelling infrastructure.</p>
Travel by car (page 23)	<p>Distribution of carbon emissions</p> <p>Each district has its own carbon reduction targets</p>	<p>High levels of carbon emissions are generated around the centre of Sheffield and around the strategic road networks. There are also high carbon emissions along the national roads crossing SCR, particularly the M1, A1(M) and M18, where SCR authorities have no direct control for mitigation. Motorways account for some 47% of Doncaster's CO2 transport emissions, 40% of Rotherham's and 30% of Barnsley's. Each district has its own reduction targets. For example, the Sheffield City Strategy has targets of carbon 30% below 2010 levels by 2020, 60% below by 2050</p>
	Key challenges and complexities of reducing carbon: increase in trip length	The growth in trip length will lead to an increase in CO2 emissions. It should be noted, though, that different models estimate different levels of rise, between 12% and 17% across SCR. It is also worth noting that potential improvement in engine and fuel efficiency may moderate this increase or reverse it, but our tools for quantifying this effect are not accurate. The Department of Energy and Climate Change published the Low Carbon Transition Plan in July 2009, which sets a target of 18% reduction in emissions on 2008 levels by 2020.
Controlling congestion (page 60)	Reducing congestion	Congestion is a cause for a loss of productive work time, carbon emissions, air pollution and noise, and can therefore put at risk our efforts to brand SCR as an attractive area. A successful delivery of our strategy will ensure that people in SCR willingly make travel choices that do not increase congestion.
Reducing Emissions (Page 77)	Reasons for reducing emissions	Our goal of reducing emissions from vehicles relates to two different types of challenges. First, emission of carbon dioxide contributes to the greenhouse effect which is widely believed to be a cause of climate change. Second, emission of other gases causes air pollution, and there is compelling evidence that this causes damage to people's health. Both types of emissions put at risk the sustainability of SCR's growth.

	High level emissions reduction targets	Under the Climate Change Act 2008, ambitious national targets were set to reduce carbon emissions by at least 80% below 1990 levels by 2050. This general aspiration is also supported by the current government. SCR wants to play a full role in tackling this challenge.
	Main emissions contributions	The main contributor to emissions from transport is trunk road traffic, and the highest emissions in SCR are recorded near the motorways; the districts most badly hit are Rotherham and Bolsover. In chapter 4 we have already touched upon the impact of these emissions when discussing the resilience of our networks to the changing weather conditions. While previous policies relate to adaptation to climate change, we focus here on mitigating the change.
	Carbon emissions and air pollution	<p>Since both carbon emissions and air pollution are outcomes of current patterns of highway travel, some of the actions identified to mitigate them are similar. Some of the policies we have already presented will contribute to this goal. Emissions rise with the increase of the total distance travelled by all vehicles, and therefore a reduction in the number of vehicles on our roads will generally tend to support the development of a more sustainable transport system. This links the matters discussed in this chapter directly to all policies supporting the improvement of public transport services.</p> <p>We seek to reduce both types of emission either by means of technology advances or through increasing awareness and encouraging a cultural change. We present these policies under four sections:</p> <ul style="list-style-type: none"> • Vehicle efficiency; • Informed travel choices; • Energy use and generation; • Air quality.
Vehicle efficiency (page 78)	Ambition to improve the carbon efficiency of vehicle fleet	<p>The sustainability of SCR's growth depends, among other factors, on the improvement of vehicle efficiency. The European Commission's strategy on clean and energy-efficient vehicles predicts an increase in the use of alternative fuels and propulsion technologies. There are advances in the development and use of electric vehicle technology which reduce emissions significantly. We have an ambition to improve the carbon efficiency of our vehicle fleets and in doing so, to set an example to others.</p> <p>We will encourage the use of electric vehicles, and are working with the Leeds City Region to explore incentives to encourage low carbon vehicles, such as preferential parking and exemptions from lorry bans</p>
	Adoption of fuel efficient driving style	Even before any technological progress is made, reduced emissions can be achieved by the adoption of fuel-efficient driving styles. Efficient driving is not only more sustainable, with an expected reduction of up to 10% in emissions, but can also reduce operating costs substantially. Large firms in the logistics, and public transport sectors are already running training in efficient driving, and South Yorkshire authorities have run their own eco-driving programme. Enforcement of speed limits can reduce emissions drastically, since a car driven at 70 mph emits about 19% more CO2 per km than when driven at 50 mph.

		<p>We will continue the Eco-Stars scheme to promote more efficient vehicle operation and our eco-driving training initiatives. We will work with the Police to enforce speed limits, as described.</p> <p>When introducing improvements to bus services, either through partnership working with operators, statutory schemes or via a Quality Contracts Scheme, we will take steps to help make the bus fleet more efficient.</p>
	Lobbying for electrification of trains	<p>The rail network contributes to carbon emissions as well, especially due to the predominance of old diesel trains on all but the East Coast Main Line. While SCR partners do not directly influence the selection of train types, we are lobbying for the electrification of rail services and the introduction of newer diesel units, which can bring environmental improvements as well as better levels of service.</p> <p>We will continue our lobbying for rail electrification and newer rail rolling stock. We will also support long distance travel by coach which in many cases offers lower carbon emission per passenger.</p>
	Policy	To work to improve the efficiency of all vehicles and reduce their carbon emissions.
Informed travel choices (page 79)	Active travel: Walking and cycling	<p>There are many sources of evidence for the environmental benefit from a reduction in the number of car trips. A comparison between different UK cities demonstrates that an increase in the proportion of cycle trips in SCR from 2% to 15% is feasible and would lead to a substantial reduction in emissions.</p> <p>The hilly topography in parts of SCR is sometimes raised as a difficulty in promoting active travel. However, a high proportion of walk and cycle trips is observed in some hilly areas outside SCR, through the use of paths along rivers, canals and flat hilltops.</p> <p>For the use of bikes to become convenient and widespread, some investment is required in additional facilities such as cycle parking or storage in urban centres, shopping centres, interchanges and stations.</p>
	Policy	To encourage active travel and develop high-quality cycling and walking networks
	Actions: Active travel	<p>We will work with all SCR districts to design convenient and direct routes for walking and cycling. We will ensure that the needs of those walking and cycling form an integral part of planning processes, negotiations with developers and the design of stations and interchanges.</p> <p>We will design cycle routes to meet similar criteria to those established through the national Bikeability programme.</p> <p>We will continue to provide training and give information on walking and cycling options.</p> <p>In areas such as the Dearne Valley we will support local initiatives to deliver a low-carbon environment, closely linked with the provision and maintenance of infrastructure for the use of pedestrians and cyclists.</p>

Travel Planning (page 81)	Traffic calming and demand management	The scenario in the rightmost column, where the reduction in emissions is more significant, includes very strict measures of traffic calming and demand management. However, we believe that the application of such measures will become relevant over time, but it is not considered feasible in the short term.
Energy use and generation (page 82)	How do we generate the energy used by our vehicles?	The use of sustainable fuels, technological improvements to fuel efficiency, the desired shift into carbon efficient driving and the rise of electric vehicles relate to the broader question of how we generate the energy used by our vehicles, and how this links to broader advances in energy generation.
	Develop capacity for recharging increased electric vehicles	The increasing use of electric vehicles will create a need for recharging points, and we will work to develop capability to provide power for electric vehicles.
	Action	An emerging market for innovative vehicle types in SCR will need security of supply and the refuelling stations to support the shift from diesel and petrol fuelling to cleaner and quieter engines. Strategic investment through our Local Transport Partnership will not only support this but will enable new revenue streams to be generated.
Air quality (page 83)	Air quality management	Air Quality Management Areas (AQMAs) in SCR comprise the entire urban area of Sheffield, and main strategic network routes into the other South Yorkshire towns, especially along the Don Valley and the M1125. Along the M1 a particularly high level of NOx emissions is reported. In the Sheffield urban area there are very high levels of PM10/12.7. The statutory duty for Local Authorities, when dealing with AQMAs, is to manage local air quality and to ensure that it is brought down to a safe limit.
	Actions	<p>Much of the air quality impacts are caused by the national network routes in SCR. We will work with the Highways Agency to mitigate these as far as possible, in particular through the management of vehicle flow to reduce stop-start conditions which can exacerbate emissions.</p> <p>On our strategic and local networks, we will manage traffic flow in a similar way, but also seek to accelerate the take-up of cleaner bus and lorry engines.</p>

B.3. East Riding of Yorkshire Council: Local Transport Plan 2015 – 2029

Section	Topic	Details
Strategic Policy Context (page 20)	Creating growth, cutting carbon	A key theme of 'Creating Growth, Cutting Carbon' is helping people to make transport choices that are good for society as a whole. The biggest opportunities for encouraging sustainable travel lie in short, local journeys. Nationally two thirds of all journeys are less than five miles. A focus of the White Paper is therefore to encourage these trips to be cycled, walked or undertaken by public transport. This has been considered

		<p>throughout the development of the Council's LTP, particularly through the 14 individual transport strategies for East Riding's main settlements.</p> <p>The White Paper acknowledges that public transport, walking or cycling are not viable alternatives to the private car for all journeys, particularly in rural areas such as the East Riding. The government is therefore committed to making car travel greener through encouraging the use of electric and ultra-low emission vehicles. To reflect this, the Council has used LTP3 funding to install electric vehicle charging points in some Council owned car parks and support initiatives to encourage sustainable car use such as car sharing and eco-driving training.</p>
Strategic objectives (page 32)	'We value and care for the diverse character of the area'	The impact of climate change and severe weather in the East Riding will be managed, and the Council will support and encourage more trips to be made using low carbon transport modes.
The Council's five Corporate Priorities (page 33)	Valuing our environment	Well maintained roads and highways are critical for access to employment, education and other services. We are responsible for the maintenance of local highways and we must ensure that we make best use of the money available for maintaining our transport assets. This includes the need to reduce street lighting energy costs, which will also reduce carbon emissions and contribute towards meeting the Council's overall carbon reduction targets. The Council will also help to reduce transport related carbon emissions by encouraging more people to travel using low carbon modes such as walking or cycling and supporting low carbon travel such as public transport and electric vehicles.
Congestion (page 42)	Encouragement of Goole residents to make short local trips using sustainable modes	In May 2012 it was announced that the Transport Policy Team had been successful with a £1.8 million LSTF bid to the DfT. The bid was based around Goole and was developed to encourage Goole residents to make short local trips using sustainable modes rather than travelling by single occupancy private car, reducing traffic levels and associated congestion in the town. Initiatives completed through the 'Get Moving Goole' LSTF project include significant improvements to the local cycle network, a new wheels to work scheme office, and Personalised Travel Planning with all households in Goole.
	Sustainable school transport	The Council's School Travel Team works with many of the schools in the East Riding to encourage parents, teachers and pupils to travel to school using sustainable transport where possible. More details on school travel are set out under the Council's Network Management Plan.
Objective 3: Reduce Carbon Emissions (page 50–56)	National Challenges	<ul style="list-style-type: none"> • Climate change happening on a global scale • Immediate measures must be implemented • Climate Change Act 2008 – world's first legally binding climate change target • Aims to reduce UK's greenhouse gas emissions by at least 80% from 1990 baseline by 2050 • The delivery of the Council's LTP will contribute towards the achievement of this extremely challenging national target.
	National Challenges	Although carbon dioxide (CO ₂) emissions from transport reduced slightly between 2011 and 2012, the transport sector still represents around a quarter of the UK's domestic greenhouse gas emissions.

		<p>Implementing schemes and initiatives to move towards a low carbon transport system will therefore be a key component in meeting the government's obligations under carbon budgets.</p> <p>To help to reduce transport related carbon emissions at a national level, the government has set up the green bus fund to provide new low emission buses, electrified significant lengths of the national rail network, and provided grants to individuals and businesses purchasing new low emission vehicles.</p>
	National Challenges	<p>The government's White Paper, 'Creating Growth, Cutting Carbon', was published in 2011 and set out plans to meet the DfT's two key objectives of stimulating economic growth and reducing carbon emissions. The document sets out the importance of taking action at a local level to reduce carbon emissions by encouraging people to make sustainable travel choices, particularly for short distance local trips. This key principle has been incorporated throughout the development of the LTP.</p>
	Local Challenges	<p>Carbon emissions, including those from motorised vehicles, can contribute towards long term climate change, the effects of which could have a significant detrimental impact on the Council's transport assets. The latest projections of climate change include hotter summer weather which would affect the service life of the asphalts used for most road surfacing treatments. Higher rainfall and severe storm events may put pressure on highway drainage systems, and an increased chance of tidal surges could have a major impact on roads adjacent to the River Humber. These conditions could cause significant damage to transport infrastructure and disruption to users.</p>
	Local Challenges	<p>The total CO2 emissions from transport in the East Riding was 2.4 tonnes of CO2 released per resident compared to 2.0 for the Yorkshire and Humber region and 1.9 nationally (figures from the Department for Energy and Climate Change, 2012). This is partly due to the rural nature of the East Riding and the distance between more remote settlements and local services coupled with higher than average car ownership. Transport therefore has a key role to play in reducing the carbon footprint of the East Riding.</p>
	Local Challenges	<p>The Council has an environmental policy which sets out our approach to managing climate change and ensures that this is coordinated across the Council. This LTP and future Plan updates will take account of these emerging climate change requirements. Many of the schemes that have been funded through the LTP process have already had a positive impact on reducing carbon emissions. For example, schemes which encourage residents to walk, cycle or use public transport will have a corresponding impact on reducing car use and associated emissions.</p>
	Vehicle ownership	<p>The percentage of East Riding residents that have access to a car or van has increased over the ten-year period between the 2001 and 2011 census, from 79.8% to 82.4%. Although this may not sound like a significant increase, this is equivalent to an additional 13,300 households that now own a vehicle. A continued rise in car ownership may result in a corresponding increase in vehicle related carbon emissions.</p>
	Vehicle ownership	<p>Most people are, and will continue to be, dependent on the private car as their main way of travelling around the East Riding.</p> <p>A key challenge for the LTP in terms of reducing carbon emissions is therefore to address the heavy reliance of local residents on car travel and encourage modal shift away from car use towards more sustainable</p>

		transport options, where possible. This is particularly important for journeys to work as it is these regular trips that contribute heavily towards peak hour congestion.
	Modes of Travel and Distance to Work	The 2011 Census shows that the majority (67.4%) of East Riding residents in employment drive to work compared to 57% nationally. Perhaps not surprisingly, a high proportion of people who use their car to reach their place of employment are in the more rural wards such as Mid Holderness and Beverley Rural (75.9% and 73.1% respectively).
	Modes of Travel and Distance to Work	While more residents choose to walk or cycle to work within East Riding's larger settlements, the number of people driving from and within these urban areas is also still relatively high. For example, in Willerby and Kirk Ella ward an average of 74.3% of residents drive to work each day. In addition, residents living in larger settlements tend to have the shortest commute – over 30% of those living in Willerby and Kirk Ella drive less than 5km to their place of work.
	Modes of Travel and Distance to Work	Using data from the 2001 census (2011 data has yet to be released) a similar trend is apparent in other urban areas within the East Riding. In Bridlington North ward 72% of people travel to work by car, while 44.6% of journeys to work in this ward are under 5km. In Goole North 64.7% use their car to commute and over 39% drive less than 5km. This demographic, who are using their car to travel relatively short distances, are an important target group for modal shift schemes as many of these shorter journeys could easily be made by public transport, walking or cycling. This would have a knock-on effect on reducing carbon emissions from high rates of car use. Ensuring that the infrastructure is in place to support this modal shift is crucial in underpinning this challenge.
	Modes of Travel and Distance to Work	Some places in the East Riding have lower rates of transport-related CO2 emissions per person. For example, those living in the Major Haltemprice Settlements benefit from frequent high quality public transport links into Hull and as a result, a relatively high number of Haltemprice residents travel to work by bus or train. For example, 8.5% of residents in Hessele ward travel to work by bus or train compared with 4.3% for East Riding as a whole. Partnership working with Hull City Council and the Highways Agency will be vital to continue to encourage sustainable travel for these short trips in to Hull from the Major Haltemprice Settlements.
	Modes of Travel and Distance to Work	Some areas within the East Riding have low rates of commuting by car because residents are choosing to travel to work on foot or by bike. Goole has the highest rates of cycling to work in the East Riding area, with up to 11.4% of residents cycling to work each day compared to an average of 3% in England. Encouraging people to walk or cycle for shorter distances can contribute towards reducing carbon emissions by removing cars from the road as people change to other transport modes and reducing congestion and emissions from idling vehicles.
	Modes of Travel and Distance to Work	In some cases it may be possible to remove the need for business travel by encouraging home working and videoconferencing as an alternative to travelling to the office or to meetings.

		The Council also supports the use of low carbon technology such as electric and hybrid vehicles and has already installed electric vehicle charging points in car parks in Bridlington and Hessle.
	Freight Transport (Road)	The East Riding generates a relatively high proportion of carbon emissions from freight transport. Around 10 million tonnes of freight passes through the Port of Hull each year and a further 3million tonnes through Goole, resulting in a high volume of road freight travelling along the M62/A63 corridor to access the ports and other large industrial parks located adjacent to the trunk road network such as Melton Business Park and Capitol Park at Goole. Other roads carrying significant volumes of freight traffic include the A1079 (York to Hull) and the A614 (Bridlington to the M62).
	Freight Transport (Rail)	Rail freight traffic in the East Riding runs predominantly to and from Hull docks, amounting to nearly 100 trains a week with the potential for further expansion. Collaborative working between East Riding of Yorkshire Council, Hull City Council, the Highways Agency and Network Rail will continue to assess whether higher levels of freight can be transferred from the road network on to rail. However, the rail freight network is limited to some degree by gauge constraints and these will need to be addressed before additional rail freight services can become operational.
	Freight Transport (River)	Some freight is already transported via the River Ouse and the Aire and Calder Navigation which form sustainable transport alternatives to road-based freight movements.
	Key Priorities	Car ownership in the East Riding is rising and the majority of residents continue to commute to work by car. Priorities for reducing carbon emissions through the LTP are therefore: <ul style="list-style-type: none"> ■ To reduce the high proportion of residents in the East Riding’s larger settlements that are still choosing to drive for short distances to get to work. ■ To encourage and support residents to make short local trips on foot, by bike or using public transport where possible and ensuring that high quality infrastructure is in place to support these trips.
Plans for the future (page 95)	Reverse the decline in cycling	Data from the 2011 census shows that the proportion of people cycling to work nationally, regionally and locally has declined over the last 30 years. It is essential that this continued decline in levels of cycling to work in the East Riding is reversed in order that corresponding benefits in terms of improving health, reducing carbon emissions and supporting the economy are realised.

B.4. North Yorkshire Local Transport Plan 2016 – 2045

Section	Topic	Details
Local transport strategy (page 23)	Objectives and commitments	Environment and Climate Change - Managing the adverse impact of transport on the environment

	Managing existing networks to reduce pollution	Manage the transport network and services to make the best use of what we already have. This may involve things like better coordination of roadworks to reduce congestion and delays and encouraging more people to use public transport to reduce the number of cars causing congestion and pollution.
Personal security	Reducing carbon emissions as a result of street lighting	Street lighting contributes approximately 16% of the County Council's annual carbon emissions of approximately 78,000 tonnes. The Government has introduced a carbon tax called the 'Carbon Reduction Commitment' which is intended to encourage energy and carbon saving initiatives. In April 2012 we introduced a Street Lighting Energy Reduction Programme as part of our carbon reduction management programme to reduce energy consumption and carbon emissions. Street lights are considered for dimming technology, part-night lighting provision or removal, and are assessed against a comprehensive list of criteria ³ . Paramount in this assessment is road safety and personal security. It is estimated that approximately 27% of current street lighting emissions can be saved through this programme.
Environment and Climate Change (page 60)	Why is Environment and Climate Change one of our Objectives?	<p>Protecting the environment and preventing climate change is ever present on the agenda for transport management. There are pressures to reduce our carbon footprint, and the impact we have on the environment around us. Transport can in some ways make a big impact in terms of reducing CO₂ emissions as new technologies allow for cleaner vehicle engines, fewer carbon and nitrogen emissions, addition of stop-start functions, and ultra-low emission vehicles (ULEV's) such as electric and hybrid vehicles.</p> <p>Our consultation showed us that the environment and climate change remains of high importance to our residents. We recognise however, that we must balance the desire to reduce carbon emissions from transport with the travel needs of North Yorkshire residents. Given the largely rural nature of the County and its sparse population, the private car is often the only means of transport for residents, and can be the most efficient and environmentally friendly compared to operating an empty diesel bus. Nevertheless, this should not stop us encouraging people to travel by other modes, where alternative means of travel exist, in order to reduce emissions in the County.</p>
	Tackling traffic congestion, road noise and pollution	It is recognised that increased congestion and traffic levels can lead to an increase in noise and pollution. Tackling these issues by monitoring air quality and carbon levels in busy areas, promoting public transport in order to reduce car use, and maintaining and providing better facilities for walking and cycling can help to improve localised pollution, visual intrusion, and reduce traffic noise. In addition, where traffic reduction measures such as those mentioned above do not improve the situation where it is feasible we will seek to reduce congestion and air pollution through highway improvement schemes, reduce traffic noise impacting on residential areas from new highways schemes, and potentially from the existing network where this is feasible. This is in line with our 'Manage, Maintain, Improve' hierarchy.
	Managing air quality related to emissions from traffic	Local authorities have a statutory duty under the Environment Act 1995 to carry out air quality monitoring for a number of pollutants listed in the national air quality objectives, and to take action when air quality problems are identified. In North Yorkshire this statutory duty lies with the seven district councils,

		<p>however, where an air quality problem is related to traffic on the County Council's roads we have a duty to work with the district councils to try to improve air quality.</p> <p>Generally, the air quality in North Yorkshire is very good but there are a small number of locations where high traffic volumes cause localised problems. Air Quality Management Areas (AQMA) for nitrogen dioxide (NO₂) are designated if current or projected levels breach, or are likely to breach, the objective of 40 micrograms per cubic metre (40 µg/m³) as prescribed by the Air Quality Regulations.</p>
Reducing Carbon Emissions and Adapting to a Changing Climate (page 63)	The current state	The transport sector contributes 21% of the UK's greenhouse gas emissions ⁴ ; however the good news is that the amount of greenhouse gases in all sectors, including transport, is decreasing over time.
	Current distribution of carbon emissions	<p>Carbon dioxide emissions make up the largest percentage of greenhouse gas released into the atmosphere. In general, the highest concentrations of carbon emissions are found along the county's main roads, emanating from both vehicles and industry. These levels are monitored regularly though out the county, and remedial measures can be taken in order to reduce the impact of these emissions</p> <p>As expected, the A1(M) is the source of the highest levels of carbon emissions as this is a highly trafficked road. This road belongs to Highways England, and is therefore out of the control of NYCC. Our county's A and B type roads are emitting lower levels of carbon pollution, and these roads generally connect our county's towns. The Yorkshire Dales and North York Moors national parks show the lowest levels of carbon emissions.</p>
	How can the county council influence emissions?	Industry can also contribute to the carbon emissions recorded in the county, the highest concentrations of which are found in our towns, and lined along the county's main roads. This has a doubling-up affect where the road is also a high carbon producer, and where the industrial process requires heavy transportation of good and products to and from the site. The County Council cannot directly influence choice of mode for the majority of trips made, however we can influence the decisions people make by maintaining our roads, promoting sustainable travel options such as cycling, walking and buses where this is feasible, and by promoting car sharing and linked or combined trips for our staff (like shopping on our way home from work).
	Conclusions	Promoting the environment and reducing air pollution remains high on the agenda for the transport sector. We cannot directly influence the majority of travel choices for those in the County, however where appropriate we will promote sustainable travel. We will encourage staff to travel to work using sustainable modes like buses and trains, walking and cycling, and will promote car sharing and combining trips.
	Measures in place or future measures	We work with District Councils and other partners to help reduce transport related pollution (carbon and nitrogen dioxide) across the whole highway network, especially at AQMA sites and for new highway

		schemes. We will support measures to promote environmentally friendly forms of transport including provision for ULEV's and are currently developing a policy which will consider the provision of infrastructure for electric vehicles in North Yorkshire. We will seek to provide minor highway improvement schemes to reduce congestion and promote sustainable transport
Promoting healthier travel opportunities (page 70)	Promote healthier travel opportunities	<p>This objective aims to address the health aspects linked to transport, by encouraging healthier travel such as walking and cycling, and by reducing some of the negative effects of transport, such as air pollution.</p> <p>Healthier travel opportunities aim to improve the health of those travelling. They also reduce the reliance on motor vehicles, and so play a part in reducing the amount of pollution caused by them. We need to consider what we can do to promote, facilitate and influence the choice of how we travel.</p> <p>By incorporating healthier travel options into our journeys, we can help meet both transport and health objectives as well as reducing carbon emissions and making air quality improvements.</p>
	What is being done to promote low-emission travel?	We will continue to encourage people to choose active travel by communicating the health, financial and environmental benefits. We will also aim to reduce the real and perceived risks of road accidents and fears about personal security that are often associated with active travel modes. Where possible, appropriate and affordable we will maintain and provide the infrastructure (footways, crossings, cycle routes etc.) that will allow people to make the switch to walking and cycling.

B.5. West Yorkshire Transport Strategy 2040

Section	Topic	Details
Executive Summary: Our Policies (page 6)	Traffic emissions reduced to near zero by 2040	We aim to reduce traffic emissions to near zero, tackle the damaging impacts of climate change on our homes and businesses and reduce road accidents, aspiring to 'zero tolerance' of transport-related deaths. We want to become known as a great, safe place for cycling and walking
Challenges (page 11)	Challenges facing the transport system	<p>Climate change: A slower rate of carbon reduction in the transport sector than in other sectors</p> <p>Poor air quality: The negative impacts of harmful pollutants produced by traffic is linked with a range of illnesses and premature deaths</p>
Our targets (page 16)	Targets for sustainable transport	<p>We have identified some mid-term targets for the first 10 years of the strategy, to grow the number of journeys made by using sustainable transport:</p> <ul style="list-style-type: none"> • 25% more trips made by bus by 2027 • 75% more trips made by rail by 2027 • 300% more trips made by bicycle by 2027
Leeds (page 23)	Issues in Leeds	The road and rail networks are constrained with congestion and crowding in the peak periods, there are significant air pollution and carbon emissions.

Inclusive Growth, Environment, Health and Wellbeing (page 31)	Aim to reduce traffic emissions to near zero by 2040	We aim to reduce traffic emissions to near zero, to tackle the damaging impacts of climate change on our homes and businesses.
Reduce air pollution, carbon emissions and noise levels associated with road transport (page 32)	Transport emissions issues	<p>Road transport is the biggest contributor to roadside air pollution. Cars are the largest source of emissions, but buses, trains, taxis and goods vehicles also contribute. Air pollution - especially nitrogen dioxide and particulate matter - increases the risk of lung cancer, asthma and heart disease. New evidence also suggests links with other cancers, strokes, low-birth weight babies and children's development</p> <p>West Yorkshire's urban areas have some of the highest levels transport emissions in the UK. Public Health England estimate that 1 in 20 deaths in West Yorkshire are attributable to particulate air pollution and Leeds is required to reduce its Nitrogen Dioxide levels in central areas by 2020 to within legal limits</p>
	Move to a lower-carbon transport system	Road traffic also accounts for 21% of carbon emissions in West Yorkshire. Moving to a lower-carbon transport system is vital if we are to play our part in combating the effects of climate change and the disruptive impact of extreme weather on our infrastructure, homes and communities, as well as wider objectives towards global carbon reduction.
	West Yorkshire Low Emission Strategy (2016)	A West Yorkshire Low Emission Strategy (WYLES) was adopted in 2016 by all of the West Yorkshire Local Authorities following public consultation in 2015, and we will deliver the recommendations of WYLES to reduce local transport emissions, especially nitrogen dioxide and particulate matter.
	Policy: Deliver the West Yorkshire Low Emission Strategy	We will work with partners to deliver the West Yorkshire Low Emission Strategy to reduce as far as possible to zero, emissions of CO ₂ , NO ₂ , particulates and noise from transport.
	Implementation of Clean Air Zones	We will support the implementation of Clean Air Zones (CAZ) where needed, setting strong emission standards for types of vehicles permitted to enter the zone.
	Provision of infrastructure to assist movement to sustainable transport	We will provide a comprehensive electric vehicle charging network to support the shift to more environmentally-friendly cars, provide facilities to charge power assisted bicycles and work with bus operators to move to a near-to-zero emissions bus fleet.
	Encouraging alternative transport	We will provide behaviour change programmes, including training, access to cycles through grant and sharing schemes, and promotional campaigns, that encourage walking, cycling and public transport
Provide wider options for car travel and improve environmental	Policy: Encouraging use of public transport	We will substantially increase the number of car parking spaces at key transport hubs and new park and ride facilities on the edge of town and city locations.

performance (page 37)		
	Car Club network	We will expand our Car Club networks to provide more choice for car travel, and provide more, low emission vehicles in the car club fleet
	Reducing emissions from freight	We also want to reduce emissions from freight vehicles and to move more freight on to other modes. Good progress has been made by the freight industry in reducing emissions from heavy goods vehicles through the Euro Standards, but we can do more to encourage the take-up of electric vehicles and alternative fuels.
	Policy: Reduce emissions from freight	We will work with the freight industry, businesses and other partners to improve journey times and reliability for deliveries, and to reduce the environmental impact of logistics through the promotion of electric and alternative-fuelled vehicles in town and city centres, and support mode shift from road freight to rail and inland waterway.
	Accelerating take up of low emission taxis	We will provide better taxi access, parking and drop-off/pick up at transport hubs, and work with Taxi Licensing Authorities and the taxi trades to promote the take up of low emission electric taxis by accelerating the provision of recharging facilities for taxis.
Implementation plan (page 54)	First 5 years	<ul style="list-style-type: none"> • Electric vehicle and bike charging infrastructure • Bus Emission Strategy implementation • CityConnect 1 and 2 cycling and walking programmes, with engagement on cycling and walking to work and education • Greener fleet initiatives
	Second 5 years	<ul style="list-style-type: none"> • CityConnect 3 - cycling and walking programmes • Low carbon/alternative fuels
Delivering the transport strategy (page 55)		We will need to gear up to deliver an expanding capital programme of transport infrastructure schemes including HS2, Northern Powerhouse Rail, the West Yorkshire plus Transport Fund and a range of transformational active travel and low carbon/low emission projects

B.6. Greater Manchester 2040 Transport Strategy

Section	Topic	Details
Overview (page 1)	Health and safety of customers	Our travelling customers – residents, business and visitors – sit at the heart of this Strategy. An effective transport system supports a strong economy by enabling goods to reach customers, and businesses to access skills and talent. And it has a major bearing on people’s health and well-being by facilitating social interaction, encouraging more active travel and addressing traffic pollution.

Protecting our Environment (page 6)	Background	Motorised transport has brought great benefits to society, giving easy access to a wide range of opportunities, but its impact on the environment can be very damaging. At a global level, CO2 emissions are a major contributor to climate change, which may disrupt transport networks e.g. through increased flooding. At the same time, a concentration of harmful emissions in areas close to major highways contributes to illness and premature death, while noise can also blight communities.
	Key challenges for environmental protection:	Increasing the use of sustainable transport to reduce the negative impacts of car use. Many people do not currently see sustainable modes as realistic alternatives and we must continue to work hard to improve the quality of our walking, cycling and public transport networks and to provide people with the facilities and training to make them natural, easy choices. The design of new development needs to make it easier for people to use sustainable modes.
		Reducing transport emissions is a particular challenge, given that economic and population growth will increase the demand for travel, hence more radical measures will be needed to enable Greater Manchester to meet challenging standards and targets, in terms of air quality and in response to the challenge of climate change.
		Making the best use of existing infrastructure will help to reduce environmental impacts. Locating new development where there is good access to public transport and services will reduce car travel and therefore emissions. Road and rail networks must also be used as efficiently as possible and be well maintained.
		Both the natural and built environment need to be protected from the impacts of transport, and enhanced. Damage to, or loss of, habitats as a result of construction, disturbance from traffic noise or street lighting, and pollution due to run-off from highways must all be minimised.
Building on success (page 9)	Investment in cycle network	Investment in the first phases of a comprehensive Greater Manchester-wide cycle network, through our Velocity programme, supported by large-scale cycle training and travel choices programmes to encourage more cycling and walking.
Environmental Responsibility (page 23)	Issues currently facing Greater Manchester	Local air pollution and carbon emissions cause significant harm to health and the environment and, as a result, have an adverse impact on the economy. Climate change, mainly caused by CO2 and other greenhouse gas emissions, looks likely to give us: warmer, drier summers, impacting on water supply and soil shrinkage/subsidence; warmer, wetter winters with increased flood risk from rivers and surface run-off; and more extreme weather patterns. In terms of local air pollution, the most dangerous pollutants are NO2 and particulates, small particles which are harmful even in low concentrations. Both of these contribute to respiratory illness, as well as cardio-vascular problems and cancer, and lead to thousands of early deaths in Greater Manchester (and other major cities) every year. Transport is a major source of all three emissions in the conurbation, contributing 76% of NO2, 82% of particulates and 32% of CO2, due to the continued high dependence on traditional engine technology, and use of petrol and diesel to fuel vehicles.
	Ambition: For Greater Manchester to be known for the quality of its urban	In response to the global climate change agenda, the Greater Manchester Strategy set an ambitious 2020 target for reducing carbon emissions by 48% from 1990 levels. Greater Manchester has demonstrated clear commitment alongside global cities by becoming a signatory to three International

	areas, natural environments with transport emissions reduced to near zero, and new transport schemes delivering environmental enhancements whenever possible.	commitments on climate change: The Integrated Covenant of Mayors, The Compact of Mayors, and the Under 2 MOU.
	Air quality in the UK	At present (in 2016), the UK is in breach of EU emission levels for NO ₂ , which is extremely damaging to health. A single Greater Manchester Air Quality Management Area (AQMA) was declared on 1st May 2016 (replacing the previous ten District AQMAs), covering the areas where levels are exceeded (or are at risk of being exceeded) and where there is risk of exposure to the general population. These are mainly areas close to the motorway network and the major roads converging on the Regional Centre and town centres, as shown on the map below.
	Greater Manchester Air Quality Management Area: Greater Manchester will adopt measures reduce emissions from transport significantly as set out in the Climate Change Implementation Plan and Air Quality Action Plan	Existing and planned measures, including the transport proposals in this strategy, are helping/will help to reduce emissions, however the need to reduce emissions in the context of a growing economy means that a concerted and co-ordinated effort, potentially requiring radical actions, is needed by all parties. The latest Department for Environment, Food and Rural Affairs (Defra) forecasts suggest that Greater Manchester will comply with EU levels for NO ₂ by 2020 if action is taken now to implement proposed interventions. We will adopt appropriate measures to reduce significantly the emissions from transport, as set out in the Climate Change Implementation Plan and Air Quality Action Plan. We have developed a 'Low Emissions Strategy' to identify the types of measure that will have the greatest impact, given the mix of traffic in Greater Manchester. These include: changing travel behaviour; reducing emissions from HGVs; stimulating the uptake of ultra-low emission vehicles; and reducing emissions from buses on key urban corridors.
	Feasibility study into the potential for a clean air zone to be undertaken	This has informed the detailed actions in our Climate Change Implementation Plan and statutory Air Quality Action Plan. The latter includes a commitment to carry out a feasibility study into a Clean Air Zone (CAZ), to assess whether emissions can be reduced without having a disproportionate impact on business.
	Transport Policy	We will work with partners to reduce, as far as possible, the emissions from transport, particularly CO ₂ , NO ₂ , particulates and noise.
	Expansion of Electric vehicle network	Whilst our primary ambition is to encourage a shift to more sustainable modes of travel, we recognise that some journeys will always need to be undertaken on the highway network. In these instances, our priority is to reduce the harmful emissions and population exposure levels. The ambition for smaller vehicles is a shift to a fully electric fleet. GM already has an extensive GMEV network and we will expand this further as funding allows. For heavy vehicles we will work with the Government and other city regions with the aim of establishing a consistent policy framework to encourage an accelerated uptake of alternatively fuelled vehicles. Within GM we will work with infrastructure providers and fleet

		operators to encourage and facilitate a shift to alternative fuelled vehicles or a retrofit of existing vehicles.
	Policy	We will work with partners, including the Canals and Rivers Trust, to enhance green and blue infrastructure to provide a safe and attractive environment for walking and cycling. Reducing the impact of traffic, by increasing the use of public transport and through effective traffic management, will be essential if we are to achieve this and will improve the quality of life by reducing noise, severance and pollution.
	Policy	We will aim to minimise the impact of transport on the built and natural environment, (including townscape, the historic environment, cultural heritage, landscape, habitats and biodiversity, geodiversity, water quality, pollution, flood risk and use of resources) and will seek to deliver environmental enhancements and biodiversity net gain where possible.
Streets as places (page 37)	Population to enjoy an environment free of harmful emissions	The future road network will also increasingly be about the ability of places to support economic and cultural activities and events – particularly in the Regional Centre and our other Key Centres, enable the delivery of the homes and jobs identified within the Spatial Framework, and meet and sustain our growing population’s aspirations for a high quality of life, including the need to feel safe and secure and enjoy an environment free of harmful emissions including noise.
Developing a Comprehensive Walking and Cycling Network (page 42)	Ambition: To create a comprehensive network of on and off-road walking and cycling routes that make it easier and safer for people to walk and cycle to key local destinations, such as local centres, jobs, healthcare and education, for leisure purposes and for local public transport access.	Throughout our 2040 Strategy, we place a strong emphasis on enabling people to travel more easily and safely on foot and by bicycle. Achieving this will help to increase levels of physical activity as well as reducing the significant numbers of very short car trips currently made in our local towns and neighbourhoods, making them more attractive places to live, work and visit. This will, in turn, reduce harmful emissions and traffic noise.
	Policy	We will work with partners to improve pedestrian and cycle facilities across Greater Manchester, including development of a strategic walking and cycling network, wayfinding and cycle parking.
Public transport integration (page 45)	Ambition: To develop a fully integrated, customer-focused, low emission public transport network, with simple, integrated ticketing, that provides an attractive and accessible alternative to travelling by	Improved public transport can encourage growing numbers of people out of their cars for more of their journeys (helping to reduce emissions). Our approach also opens the way for a future where car ownership is not perceived as indispensable, and residents can choose from a range of sustainable and efficient travel options – public transport, ride sharing, car sharing/hire, walking, cycling or taxi – which in aggregate reduce congestion, carbon and emissions whilst providing residents with the excellent connectivity that they need.

	car to key Greater Manchester destinations.	
	Policy	Working with partners, we will seek to establish and promote one integrated Greater Manchester public transport network, making it easy and affordable for customers to plan, make, and pay for their journeys using different modes and services.
Vision for buses	Ambition:	To develop a modern low-emission accessible bus system, fully integrated with the wider Greater Manchester transport network on which everyone will be happy to travel regardless of their background or mobility level.
2040 Rapid Transit Strategy	Ambition: To extend the benefits of rapid transit to more areas of Greater Manchester A very attractive alternative to car travel	Rapid transit – principally Metrolink, alongside the higher frequency parts of the commuter rail network – has been a critical component in supporting economic growth and housing market renewal in Greater Manchester. Metrolink has proved highly popular, with over 30 million people a year (2014 patronage data) benefitting from accessible, fast, and frequent public transport with a high degree of segregation from other traffic, making it a very attractive alternative to car travel.
Goods and servicing (page 58)	Transferring freight from roads to rail/water	The vast majority of freight is carried by road and these movements are a source of congestion, carbon emissions, poor air quality and noise as well as leading to conflict with vulnerable road users such as cyclists. Road freight is a significant contributor to poor air quality due to the dominance of diesel fuelled vehicles. This is a particular problem in congested areas, as HGV emissions are markedly worse at lower speeds. The 'last mile' of deliveries will, in many cases, need to be by road, but shifting more freight to sustainable modes would be desirable. However, Greater Manchester has very few rail or water-connected distribution sites and constraints on the rail network limit future rail freight growth. In the future, Northern Hub rail enhancements will increase freight capacity, enabling a tripling of freight trains to operate in Greater Manchester, should there be a demand for the available routes. In addition, the regeneration of the Manchester Ship Canal, to provide low cost access by water to Port of Liverpool (Liverpool 2), has the potential to take a proportion of freight traffic off the roads between the two cities. Port Salford incorporates a new railhead capable of handling 16 container trains per day together with a new berth capable of handling existing barge traffic from the Port of Liverpool with short sea feeder ships.
	Potential implementation of Clean Air Zones (CAZ)	A key intervention will be to maximise the practice of consolidation, whereby deliveries to the same location are bundled together or where goods are delivered to locations for onward distribution by smaller, low emission vehicles (including cycles or electric-assisted cycles in town and city centres) or for collection by individuals. This will reduce the numbers of large goods vehicles entering the city centre and town centres, reducing noise, congestion and air pollution. Central Government wish to pursue Clean Air Zones (CAZ) as a measure to improve air quality in major urban areas and such a measure could incentivise the use of consolidation centres. We will assess the potential impact of a CAZ, including the impact on freight operators.

Accommodating growth in commuter travel (page 82)	Aim to significantly reduce the number of commuter trips made by car	In the City Centre, our aim is to deliver the desired economic growth without any further growth in peak period car traffic levels. We recognise that this is a major challenge, particularly as we estimate that we will need to accommodate around 68,000 additional commuter trips in the morning peak period by 2040. Car commuting to The Quays is currently much higher than in the City Centre, reflecting the sparser public transport network. Here, our aim is to reduce significantly the proportion of trips made by car. Our focus is on improving the quality and capacity of our public transport, walking and cycling networks to encourage as many people as possible to travel to the Regional Centre by these modes rather than by car. We must also ensure that our streets can cope with the huge increase in public transport passengers who will be walking or cycling from interchanges to their final destination.
Connected Neighbourhoods	Managing impacts on neighbourhoods	<p>While it is certainly true that motorised transport has improved all our lives by allowing us to travel further and faster, accessing a wider range of opportunities, its impact on our local neighbourhoods needs to be carefully managed to improve safety and reduce noise, pollution and severance.</p> <p>While bus or car are the best option for some people and some types of trip, if more journeys can be made on foot or by bike, the number of car trips can be reduced leading to fewer collisions, lower emissions and improved health.</p>
Environmentally Quality (page 103)	Pollution impact on quality of life	In addition to safety concerns, the pollution and noise from motorised traffic can impact on the quality of life in residential areas and deter people from walking and cycling.

B.7. Greater Manchester's Springboard to a Green City Region

Section	Topic	Details
Background	Overarching target	We will be the first UK city to devise a science based pathway to becoming carbon neutral; reducing our carbon emissions to tackle climate change and make our fair contribution to keeping global average temperature change below 2°C
	Overarching target	We aim to reduce our carbon emissions by 48% by 2020 and are well on our way to achieving this. But this is not enough or fast enough to hit our Carbon Neutrality target. A big change is needed to scale up and deliver deep carbon cuts and to protect and improve green space across the city region.
	Actions to be completed before March 2019	<p>Greater Manchester will produce a Smart Energy Plan by September 2018, as part of an overall Greater Manchester Infrastructure Strategy which will also cover digital, electric vehicle and green & blue infrastructure.</p> <p>Greater Manchester will establish a new public sector-led commercial model for the Greater Manchester electric vehicle charging network with the long term aim to at least double the size of the present system.</p>

		<p>TfGM will look at whether our new bus powers can help us to achieve an emission free bus fleet and by when.</p> <p>Greater Manchester will transform cycling and walking in the City Region by investing up to £50m per year for three years from 2019/20 through the Transforming Cities Fund.</p> <p>TfGM will ensure that the ongoing development and delivery of its 2040 Transport Strategy is aligned with our carbon neutral ambition.</p>
Science based targets (page 11)	Enabling low carbon mobility/transport	<ul style="list-style-type: none"> • Shift transport to zero emissions – such that 100% of buses are zero emissions by 2035 and 66% of cars are zero emission by 2030 (100% by 2050). • Domestic transport behaviour – a 25% reduction in passenger distance travelled by 2035. • Freight – road modal share falls to 50%, greater hybridisation; rail freight is all electric. • Tyndall research says we must act to ensure that Greater Manchester citizens' CO2 emissions from flights should hold steady to 2030 and then reduce to zero by 2075 (this action is also required across the UK)
Transport (Page 24)	To achieve carbon neutrality (BEIS funded) research says we must:	<ul style="list-style-type: none"> • Reduce the use of fossil fuel powered vehicles through reducing travel, increasing electric vehicles, making public transport zero emissions and increasing the use of public transport and active travel; cycling and walking. • Meet the increased electricity demand of electric buses and cars through low carbon and renewable energy generation.
	To deliver actions, these issues must be addressed:	<ul style="list-style-type: none"> • Delivery of an integrated, affordable, accessible zero carbon public transport system for the whole city-region within such tight timescales • Coordination with improved green space, high quality well connected walking and cycling infrastructure and support for residents to increase their active travel • Providing the infrastructure to enable residents and businesses to move to electric cars and freight vehicles – putting infrastructure in place and in time with mass EV uptake • Managing the grid demands of EV charging at scale • Providing the low carbon and renewable energy generation to meet the increased electricity demands • Using spatial planning and digital infrastructure to reduce the need to travel by car and reduce freight vehicle trips. • Establishing 'clean air' zones to reduce the impact of most polluting vehicles in some areas • Changing traveller behaviour so the norm is walking, cycling and public transport use, car share/hire and cycle-carriage on trains/trams • Rail electrification which is a national issue in which some northern routes are neglected • Airport passenger growth, how we hold emissions flat and how we reconcile air transport with lowering carbon emissions

		<ul style="list-style-type: none"> Monitoring and reducing emissions from shipping and air travel which, given their nature, also require action and cooperation.
	What the public want (results from public consultation)	<ul style="list-style-type: none"> Make public transport, walking & cycling the easy choice for travel to work - through greater integration, sufficient capacity, greener routes, contactless card technologies and online planning tools (e.g. London's Oyster card call it the Bee Card) Boost cycling rates by supporting improved quality & quantity of cycling infrastructure in the right places, based on studies of traffic patterns and efficient routes. Invest in infrastructure based on usage; map walking & cycling potential across the city region. Adopt policy that links active travel to green infrastructure and connected networks; develop a set of active travel standards in Greater Manchester Spatial Framework Expand and increase frequency of bus/tram services in and between urban peripheries, public transport is inconvenient for users on fringes of urban core
Pioneering projects (page 26)	We aim to connect every neighbourhood in the city region	Starting with 1,000 miles of walking and cycling routes as well as 1,400 new crossing points
	Electric vehicle users	More than 2,000 registered users of the GMEV electric vehicle charging point network, with around 5,000 charging sessions per day
	Emissions-free bus fleet	TfGM is working with bus operators to develop a roadmap to achieve an emissions free bus fleet.
	Increased tram capacity	TfGM has recently signed a £72m contract that will see 27 new trams added to the Metrolink network, increasing its capacity by 15%
	Expert proposals	<ul style="list-style-type: none"> Introducing strict emissions standards for buses and taxis and ban on all diesel by 2025 Introducing a workplace parking levy for large and medium sized businesses in Greater Manchester, which is used towards funding the city's public transport system Introducing a cap on air transport emissions to and from Manchester Airport to remain at current levels despite planned doubling of passengers Incentivising fleet change Putting infrastructure in place for electric fleet with rapid charging and depot charging. Incentivising consolidation of loads– for example space needs to be provided for micro-consolidation so the final mile can be delivered on foot or in cargo bikes

B.8. Mayor's Transport Strategy

Section	Topic	Details
Reducing carbon emissions from road transport sources		

Achieving a zero-carbon city and good air quality (pg. 54).	Mayor's ambition is for London to be a zero-carbon city by 2050.	Significant action required for this to be possible.
	Mayor committed to achieving the 10µg/m ³ for PM _{2.5} level of particulate matter recommended by leading health experts, by 2030.	London currently meeting legal limits (PM 2.5 microns in diameter) but further action is required, London projected to exceed these guidelines until well after 2030.
	Under zero-carbon city target, Mayor will seek to make London's transport network zero emission by 2050.	London's streets and transport infrastructure will be transformed to enable zero emission operation, and the switch to ultra-low and zero emission technologies will be supported and accelerated.
	Air quality and climate change to be considered together - rather than simply reversing 'dieselisation' which has occurred to achieve CO ₂ savings.	Need a clear direction towards ultra-low emission vehicles (ULEVs) to avert the adverse impacts of a rush back to petrol. ULEVs include battery electric vehicles, plug-in hybrid vehicles, range-extended electric vehicles and hydrogen fuel cell electric vehicles. For heavier vehicles, alternative fuels that demonstrate clear reductions in air pollutant and CO ₂ emissions will be considered as a bridging technology on the path to zero emission by 2050.
	Accelerated zero emissions vehicles plan, with public fleets taking the lead.	The Government's aim for all new cars and vans to be zero emission from 2040 is not ambitious enough, and should be accelerated to ensure that all new cars and vans are zero emission from 2030, with all new heavy vehicles (over 3.5 tonnes) being zero emission from 2040.
Zero-emission road transport timeline (pg. 55).	Actions to be brought in before 2020.	<ul style="list-style-type: none"> • All new taxis to be zero emissions. • Electric single-deck buses and bus-charging infrastructure. • Low emission freight
	Actions to be brought in before 2025.	<ul style="list-style-type: none"> • Major expansion in electric vehicle charging points (including on-street residential charging) • Minimum 15 hydrogen fuelling stations installed • Reduced parking charge for zero-emissions vehicles • Expand ultra-low emissions zone in central London. • Tighten low emissions zone standards for heavy vehicles
	Actions to be brought in before 2030	<ul style="list-style-type: none"> • Town centre zero emissions zones. • Central London zero emissions zone
	Actions to be brought in before 2035	<ul style="list-style-type: none"> • All newly registered cars and LGVs driven in London zero emission

		<ul style="list-style-type: none"> All buses zero emission or hybrid All taxis and PHVs zero emission All public sector car fleets zero emission capable
	Actions to be brought in before 2045	<ul style="list-style-type: none"> All newly registered heavy vehicles driven in London zero emission Wider zero emission zone All buses zero emission
	Actions to be brought in before 2050	<ul style="list-style-type: none"> London-wide zero emission zone Zero emission road transport
Zero emission public transport (pg. 56).	Fully zero emission public transport fleet in place by 2037.	More work needed, TfL will work with suppliers to try to accelerate this.
	Make London's taxi fleet the greenest in the world and phase out diesel.	<ul style="list-style-type: none"> All newly licensed taxis to be Zero Emission Capable (ZEC) from 2018. Encourage and accelerate the transition from diesel-powered taxis to Zero Emission Capable vehicles by providing financial incentives, the necessary infrastructure and regulation (including maintaining a taxi age limit, currently set at 15 years) with the objective of achieving a minimum of 9,000 such vehicles in the fleet by 2020.
	GLA group and functional bodies to lead by example in use of ULEVs	The GLA group will work towards: all cars in GLA group support fleets being Zero Emission Capable (ZEC) by 2025 at the latest; all newly purchased or leased cars and vans (less than 3.5 tonnes) in GLA group fleets, including emergency response vehicles, being ZEC from 2025; all heavy vehicles in GLA group fleets being fossil fuel free from 2030; and entire GLA fleets being zero emission by 2050.
	Ensure dependability on charging and refuelling infrastructure	Must ensure that London's energy-generating and supply system can accommodate and manage the increased demand associated with increased ULEVs.
	Disincentivise fossil fuel vehicles	Achieved by tightening emission standards by implementing a network of zero emission zones would help reduce total CO ₂ , NO _x and PM emissions and would send a clear signal that the city is moving towards a fossil fuel-free future. A zero-emission zone is likely to require vehicles that drive within it that are not capable of operating with zero exhaust emissions to pay road user charges.
Reducing carbon emissions from non-road transport sources		
Rail emissions (pg. 59).	By 2050, all rail lines in London should be electrified and all trains hauled by zero emission motive-power within London	Further measures to improve the energy efficiency of rail transport include new energy-efficient trains on the Elizabeth line from 2017, saving up to 30 per cent more energy through an on-train management system and regenerative braking. TfL will ensure that new Tube trains rolled out from the mid-2020s on the Piccadilly, Waterloo & City, Bakerloo and Central lines will

		be energy efficient.
River vessel emissions (pg. 59).	Work with stakeholders to improve the energy efficiency of the river fleet and will lead by example by delivering new hybrid vessels for the Woolwich Ferry.	Air pollutant and CO2 emissions from river vessels represent a small but significant contribution to the London total. Emissions need to be carefully managed, particularly in light of the PLA ambition to increase the number of river users to 20 million a year by 2035.
Getting the planning process right (p.g. 135)	Update Travel Plan guidance	Update TfL's Travel Plan guidance to ensure developments encourage active, efficient and sustainable travel, apply the Healthy Streets Approach and help deliver carbon-free transport.
Changing technology (p.g. 139)	Using technology to make using active, efficient and sustainable travel options easier	Ensuring that payment platforms are up to date and fit for purpose. Tracking and shaping new technological developments as they emerge. Managing the way people pay for road use could play a key role in ensuring that these services do not cause major increases in congestion or emissions.
New transport services (p.g. 141)	Ensure new technologies do not encourage more car journeys	This is particularly important for areas where there are good walking, cycling or public transport options.
	Complementing the public transport system	New services should help more people who would otherwise complete their journey by car to access the public transport network, while not reducing walking and cycling to and from stops and stations. They should also provide a means of travel in areas where public transport connectivity is currently poor (especially in outer London).
	Cleaning London's air and reducing carbon emissions	New services should achieve the very best emissions standards to reduce emissions of carbon dioxide, nitrogen oxides and particulate matter in London, and enable faster switching to cleaner technologies.
Expected outcomes of the strategy (p.g. 152).	Central aim for 80 per cent of all trips in London to be made on foot, by cycle or using public transport by 2041 (compared to 63 per cent today).	Reducing Londoners' dependency on cars in favour of active, efficient and sustainable modes of travel. This aim is expected to be fulfilled by increases in levels of walking and cycling from the current 27 per cent to between 30 and 40 per cent of trips, and increases in public transport use from the current 35 per cent to between 40 and 50 per cent of trips.

B.9. London Environment Strategy

Air Quality

Section	Topic	Details
Air quality: Introduction (page 40)	London will have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities.	Air quality and carbon emissions are inherently linked. Two pollutants remain a specific concern. These are particulate matter (PM 10, PM2.5 and black carbon) and nitrogen dioxide (NO2). London is failing to meet the legal limit for NO2. Particulate matter is damaging to health at any level and must be reduced.
	Improving London's air quality	<ul style="list-style-type: none"> • Reducing exposure of Londoners to harmful pollution across London – especially at priority locations like schools – and tackling health inequality • Achieving legal compliance with UK and EU limits as soon as possible, including by mobilising action from the London boroughs, government and other partners • Establishing and achieving new, tighter air quality targets for a cleaner London, meeting World Health Organization (WHO) health-based guidelines by 2030 by transitioning to a zero emission London • In parallel to reducing exposure, the Mayor will take urgent action to tackle pollution to achieve legal compliance with UK and EU limits as soon as possible and in the most effective manner. Where available, the Mayor will use statutory powers to ensure this result. • This strategy also recognises the need to go beyond legal limits, as these reflect political and economic considerations as well as health impacts.
London's pollution concentrations (page 46)	General trends in London's air quality since 2000	Overall, there has been a gradual reduction in NO 2, PM10 and PM2.5 concentrations at background sites in inner and outer London and at outer London roadside sites. Inner London NO2 roadside sites have shown a more variable trend but have seen a steeper decline from 2012. This decline is also reflected in the inner London PM 10 and PM2.5 roadside sites. These reductions are important as they show, overall, that air quality is improving in London.
	Tackling all sources of emissions	Currently around half of nitrogen oxides (NOx) emissions come from road transport sources. The other half of emissions come from nonroad transport sources, including construction, residential and commercial buildings, river, aviation, and industrial emissions (Figure 4). While much of the public attention remains focused on vehicles, this strategy must consider how best to tackle all of these sources. A similar breakdown also applies to PM10 Emissions.
	Emissions reduction performance	Total NOx emissions in London fell by 25 per cent over the period 2008 to 2013 (compared to a 35 per cent target to 2015 in the previous air quality strategy). Total PM10 emissions fell by 20 per cent over the period 2008 to 2013 (compared to a 31 per cent target to 2015 in the previous air quality strategy). The source of PM 2.5 emissions in London is similar to that for PM 10 but some sources, such as tyre and break wear are more significant.

		Total PM 2.5 emissions fell by 27 per cent over the period 2008 to 2013 (there was no reduction target in the previous air quality strategy). Whilst in some instances the target was not met, the fact that a large reduction was made is very positive.
Transboundary pollution (page 54)	The challenge of cleaning London's air is made more difficult because a large amount of the pollution sources are not within London.	<ul style="list-style-type: none"> The most recent analysis shows that sources outside London make up nearly half (48 per cent) of the contribution to the estimated death risk from long-term exposure to PM 2.5 in London as a whole. Even if all local emissions sources were removed, nearly half the health effects linked to London's air pollution would still be felt. This is why working closely with European partners is vital to reduce emissions across the continent
Public Health (Page 54)	Air pollution has a big impact on health at all life stages, from development in the womb to the end of life	In 2010, London air pollution was linked to over 3,000 hospital admissions. The economic cost of these health impacts in London is estimated as being up to £3.7bn a year
	Social inequality means those in deprived areas of London are disproportionately disadvantaged.	This affects the poorest, the youngest, the oldest, those with pre-existing health conditions and those from minority ethnic groups the most. Perhaps most worryingly, 438 schools and 364 other educational institutions in London are located in areas exceeding safe legal pollution levels. This report does a good job of addressing other areas of sustainability related to carbon, other than environmental, for instance social.
Achieving legal compliance as quickly as possible (page 56)	Diesel vehicles, especially cars and vans are the main source of road transport pollution	A comprehensive approach is required to phase out their use. Rather than a return to petrol, mode shift to sustainable forms of transport like walking and cycling wherever possible should be encouraged. Any vehicles that remain will need to transition to zero emission technology.
	Government controls some of the most powerful policy levers to influence air quality.	This includes fiscal incentives such as vehicle tax.
	Co-benefits between air quality and climate change policies must be maximised	There is a risk that unintended consequences can arise if climate and air quality policies are developed in isolation, for example in relation to energy and planning policy. Conversely, integrated policy design can bring benefits for both air quality and climate change, for example reducing black carbon emissions by switching to zero emission vehicles.
	Further reductions are needed in PM10 and PM2.5, particularly from	London is currently far from achieving WHO health-based limits for PM 2.5. One of the best ways to do this would be to reduce the number of vehicle kilometres by supporting a mode shift to walking, cycling and public transport.

	transboundary pollution, tyre and brake wear, and wood burning	
Roles and legal duties (page 58)	The Mayor will act to improve air quality, where the Mayor or bodies within the control of the Mayor have relevant powers or resources.	The Mayor will help the boroughs in exercising their statutory duties to improve air quality. Where needed, the Mayor can use powers of direction to require boroughs to take steps to meet air quality objectives.
	The ultimate responsibility for achieving compliance with the legally required air quality standards “as quickly as possible” lies with the government.	The government is required to have an Air Quality Plan that will achieve this. The government has unique tools available to it, such as control over fiscal incentives or the ability to legislate, which can accelerate compliance. Without a clear national plan to tackle emissions, especially from vehicles, the air in UK cities will not improve as quickly as it must. The government needs to give local authorities across the country extra powers to address non-transport pollution sources, to help scrap older polluting vehicles, and use fiscal and other incentives to encourage the use of clean vehicles.
	London’s boroughs have a duty to work towards achieving legal limits. They have an important role to play in addressing local pollution	There are a number of levers they can use to help. These include: <ul style="list-style-type: none"> • emissions based parking charges • improving the public realm for walking and cycling • targeted measures at pollution hotspots, such as vehicle restrictions and green infrastructure • supporting installation of infrastructure to fuel zero emission vehicles
	Public sector responsibilities	The public sector has a wider duty to lead by example to reduce emissions and exposure to pollution, particularly in relation to its vehicle fleets, as well as to raise awareness.
Policy 4.1.2 Improve the understanding of air quality health impacts to better target policies and action (page 65)	The Mayor will work with boroughs to safeguard the existing air quality monitoring network, and enhance it by exploiting new technologies and approaches such as personal and localised monitoring	The GLA, TfL, and London boroughs fund and maintain one of the most extensive automatic monitoring networks of any world city. This is supplemented with additional monitoring. The Mayor will use statutory powers, as well as work with boroughs to enhance monitoring networks where possible. Particular areas of focus are increasing the number of long-term NO2 diffusion tubes, especially in Air Quality Focus Areas. Another is identifying opportunities for additional PM2.5, black carbon, and ultra-fine particle monitoring.
	Mayor’s wider ambitions:	<ul style="list-style-type: none"> • The Mayor is committed to policies that support phasing out fossil fuels, especially diesel, and encourage take up of zero emission vehicles in London • all taxis and private hire vehicles to be zero emission capable by 2033 • all TfL buses to be zero emission by 2037 • all newly registered road vehicles driven in London to be zero emission by 2030 • London’s entire transport system to be zero emission by 2050

<p>Why prioritise the phasing out of diesel vehicles? (page 69)</p>	<p>Diesel vehicles are the single biggest source of NOx emissions. Any strategy to improve air quality must consider this source, and how to enable the transition to clean and ultimately zero emission vehicles.</p>	<p>The Mayor strongly believes that government must deliver effective national incentives exclusively under their control (such as taxation and scrappage) to discourage diesel while these vehicles remain more polluting. Longer-term, the Mayor is committed to policies that support phasing out all fossil fuels, recognising the impact CO2 emissions from petrol cars can have, and accelerating the uptake of zero emission vehicles in London to deliver further improvements in air quality.</p>
<p>Reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport (page 74)</p>	<p>The Mayor will promote and prioritise more sustainable travel in London, including walking, cycling and public transport, as part of the Healthy Streets Approach</p>	<ul style="list-style-type: none"> • The Mayor, through TfL, will clean up the bus fleet by phasing out fossil fuels, prioritising action on diesel, and switching to zero emission technologies • The Mayor, through TfL, will reduce emissions in the taxi and private hire fleet by phasing out fossil fuels, prioritising action on diesel, and switching to zero emission technologies • The Mayor aims to reduce emissions from private and commercial vehicles by phasing out and restricting the use of fossil fuels, prioritising action on diesel • The Mayor aims to reduce emissions from freight through encouraging a switch to lower emission vehicles, adopting smarter practices and reducing freight movements through better use of consolidated trips • The Mayor has put in place a Cleaner Vehicle Checker to help fleet operators understand the emissions of their cars and vans, and will work with industry to set out a clear plan to phase out fossil fuels. This is vital, especially amongst heavier specialist vehicles, which are often more challenging to switch to cleaner alternatives. • The Mayor will work with stakeholders to understand the barriers to deploying ultra low emission auxiliary power units on vehicles and encourage further take up in London
	<p>In line with the Mayor's Transport Strategy, TfL buses will be expected to meet the following requirements:</p>	<ul style="list-style-type: none"> • all new double-deck buses will be hybrid, electric or hydrogen from 2018 • all double-deck buses in central London will be Euro VI and hybrid by 2019 • all TfL buses will meet the Euro VI diesel standard for NOx and PM by 2020 • all new single-deck buses will be zero emission from 2020 • the whole bus fleet will be fully zero emission by 2037 at the latest
	<p>Road charging schemes</p>	<p>The Mayor, through TfL, will keep under review existing and planned road user charging schemes, including the Congestion Charge, Low Emission Zone, ULEZ and the Silvertown Tunnel schemes. Charging schemes have so far proved very effective at promoting a shift to more sustainable modes of transport.</p>

	Low-emissions zones	<ul style="list-style-type: none"> The Mayor has proposed (subject to public and stakeholder consultation) that the ULEZ is expanded to Inner London by 2021 for light vehicles (cars, vans, minibuses and motorbikes), covering an area up to the North / South Circular It is also proposed that the requirement to comply with ULEZ emission standards is expanded London wide for heavy vehicles by 2020, which will result in only an estimated one percent of road length in outer London remaining in exceedance of the NO2 limit values in 2025
	Engine idling	The Mayor, working with government, the boroughs, bus and coach operators, manufacturers, and other organisations will tackle emissions from unnecessary engine idling throughout London
Reduce emissions from non-road transport sources, including by phasing out fossil fuels (page 86)	The Mayor will work with government and relevant groups to reduce emissions from activity on London's waterways	The term 'waterways' does not only refer to the River Thames, its tributary rivers and canals, but also to other water spaces including docks, lakes and reservoirs.
	The Mayor will work with government and other partners to seek reductions in emissions from aviation activity in London and the south east, particularly from Heathrow	There is a high risk that Heathrow expansion will lead to an exceedance of legal limits of air pollution across a large swathe of London until at least 2030. Aviation contributes around 2.5 per cent of London's monitored greenhouse gas (GHG) emissions. 23 If this sector fails to decarbonise, by 2050 these emissions would make up over 20 per cent of London's total.
	The Mayor opposes any airport expansion in London unless it can show that there is no unacceptable impact on air quality and that GHG emissions are minimised. This will include:	<ul style="list-style-type: none"> demonstrating airport expansion will not cause new exceedances of the UK air quality standards, or increase of existing areas of exceedance demonstrating airport expansion will not increase exposure to pollution where improvements in local or regional air quality have been, or will be, secured by other Mayoral, local or national policies demonstrating airport development or expansion has incorporated Air Quality Positive principles and other Mayoral policies to minimise the impact of development, including impacts during the construction phase demonstrating that any airport expansion ensures that London's contribution to aviation emissions reduce in line with recommendations to meet national GHG emission targets. the Mayor working with airports in London to develop their climate action plans and determine how they will minimise net emissions. It may be possible to establish an offsetting fund where reductions in GHG emissions cannot be met onsite

	<p>The Mayor will work with government and other partners to seek reductions in emissions from rail transport and at stations</p>	<p>Making rail more efficient and electrifying lines will be essential for meeting the Mayor's zero carbon ambition. It will also replace diesel transport and the associated harmful air pollution emissions. By 2050, all rail lines in London should be electrified as part of Network Rail's investment programme.</p> <p>The Mayor, through TfL, will investigate opportunities to decarbonise TfL controlled rail services, with the aim of achieving a zero-carbon network by 2030.</p>
<p>The Mayor will work with the government, the London boroughs and other partners to accelerate the achievement of legal limits in Greater London and improve air quality (page 97)</p>	<p>The Mayor will use the London Local Air Quality Management (LLAQM) framework to assist boroughs and require them to exercise their statutory duties to improve air quality in accordance with that framework, and will exercise statutory powers as required</p>	<p>The levers under the control of the London boroughs include:</p> <ul style="list-style-type: none"> • emissions based parking charges • reducing pollution from new developments through the planning system • improving public realm for walking and cycling • rolling-out targeted measures at pollution hotspots • integrating air quality into their public health duties • supporting new infrastructure for fuelling zero emission vehicles • taking enforcement action against idling vehicles <p>The Mayor will recognise borough efforts to improve air quality through awarding Cleaner Air Borough status. This will provide increased recognition for high achieving boroughs and include more rigorous criteria that reflect the increased ambition of this strategy, and will be reviewed annually.</p>
	<p>The Mayor calls on the UK government to:</p>	<ul style="list-style-type: none"> • Introduce a powerful new twentyfirst century Clean Air Act to entrench citizens' right to breathe clean air and tackle pollution in London once and for all. • A national vehicle scrappage fund for diesel vehicles (largest source of NOx) is essential if compliance costs to people and businesses of such action is to be minimised. • a national retrofit certification scheme to further reduce compliance costs to businesses to meet new emission standards and build on the work that has been done with London's bus fleet • vehicle excise duty, capital allowances and other fiscal reforms (for example tax treatment of red diesel) are also needed to reduce emissions and promote the uptake of zero emission vehicles, auxiliary engines (including transport refrigeration units) and NRMM. • fiscal reform should be complemented by a national car labelling scheme to raise awareness about the differential pollution emissions from vehicles at the time of purchase (including for second hand vehicles)

		<ul style="list-style-type: none"> • a commitment to providing the necessary funding to convert all UK black taxis to zero emission capable models by 2025 at the latest and scrapping older diesel taxis. The structure of vehicle excise duty should not make it harder for taxi drivers to purchase zero emission capable models • additional powers to manage traffic during high and very high pollution episodes, including to effectively enforce the temporary exclusion of certain types of vehicles from certain areas during time-limited periods • Government is also uniquely placed to provide enhanced public information, especially during air pollution episodes by utilising national communication infrastructure and working closely with the media, for example pollution updates on weather bulletins or tube stops • revise current policy advice that parking charges should not be linked to emissions
<p>London's entire transport system to be zero emission by 2050</p>	<p>The Mayor, working with government, TfL, the London boroughs and industry will aim for London's entire transport system to be zero emission by 2050, with work towards this including using regulatory and pricing incentives to support the transition to the usage of Ultra Low Emission Vehicles</p>	<p>The government's approach of incentivising the use of diesel vehicles to achieve CO₂ savings has meant that local air quality has suffered. Rather than simply seeking to reverse this dieselisation, air quality and climate change must be considered together. This means a clear direction towards Ultra Low Emission Vehicles (ULEVs) to avert the adverse impacts of a rush back to petrol.</p> <p>The aim is that all new cars and vans being driven in London should be zero emission by 2030 at the latest.</p>
	<p>Enabling the transition to ULEV</p>	<p>To succeed in making the transition to ULEVs, a major expansion in electric charging and hydrogen infrastructure is required. This includes meeting the need for rapid charging to support zero emission capable taxis, private hire vehicles and commercial vehicles, and working with boroughs and private operators to provide on-street residential charging. TfL and City Hall will work with boroughs and industry to understand the long-term need for charging. As well as standalone stations, hydrogen refuelling systems and charging infrastructure can, and should, be integrated into existing refuelling stations.</p> <p>Bringing in ULEVs will require a significant change to London's energy systems. The supporting supply infrastructure must be in place, while maximising CO₂ benefits.</p> <p>The Mayor will work with TfL, government and stakeholders (including National Grid and Distribution Network Operator Companies) to ensure systems are upgraded and robust. Plans will be put in place to manage the energy demand associated with the transition to ULEVs.</p> <p>To facilitate this, government must invest to ensure the grid and energy network and available charging infrastructure is capable of hosting large number of electric vehicles. Robust planning</p>

		<p>regulations at a national level would also strengthen local requirements for infrastructure in new developments, making electric vehicles a convenient choice for residents and businesses. Going forward, the Mayor will seek to integrate hydrogen alongside electric technology into zero emission and alternative fuels plans for London. This is a normalisation phase, which will support the development of mechanisms towards mass introduction and use of hydrogen fuel cell technologies.</p>
	<p>Implementation of zero-emission zones and broader congestion reduction measures</p>	<p>The Mayor, through TfL and the boroughs, and working with government, will implement local zero emission zones in town centres from 2020 and aim to deliver a central London zero emission zone from 2025, as well as broader congestion reduction measures, to pave the way to larger zero emission zones in inner London by 2040 and then London-wide by 2050 at the latest. As well as incentives and supporting infrastructure to encourage a move to ULEVs, it will also be necessary to use disincentives to phase out fossil fuel vehicles altogether. In addition to the proposed earlier introduction and expansion of ULEZ, tightening emission standards by implementing a network of zero emission zones would help reduce total CO₂, NO_x and PM_{2.5} emissions. This would send a clear signal that the city is moving towards a fossil fuel-free future. A zero emission zone is likely to subject any non zero emission vehicles driven within it to road user charges (similar to ULEZ or LEZ) and/ or other vehicle prohibitions or restrictions. Creating zero emission zones will be an essential part of the move towards zero emission transport. The Mayor, through TfL and the boroughs, and working with Government, will seek to implement zero emission zones in town centres from 2020 and aim to deliver a zero emission zone in central London from 2025, as well as broader congestion reduction measures to facilitate the implementation of larger zero emission zones in inner London by 2040 and London-wide by 2050 at the latest.</p> <p>This proposal, including the vehicles and area it applies to, charge levels and hours of operation, and discounts and exemptions or other restrictions, will be developed in the next few years.</p>
	<p>The Mayor will work with the industry and other partners to seek solutions to reduce emissions from tyre and brake wear</p>	<p>By 2030, an estimated 90 per cent of PM emissions from road transport will be from tyre and brake wear.²⁵ If PM_{2.5} levels are to be improved, this needs to be significantly reduced. The first step to achieving this will be a reduction in total vehicle kilometres by supporting a shift to walking, cycling and public transport, and more efficient delivery and servicing. Promoting more efficient eco-driving can also help. New technologies, including the use of properly designed regenerative braking, have the potential to reduce emissions. The Mayor, working with government, manufacturers and other partners will support and accelerate research into the development and uptake of technologies to tackle tyre and brake wear. This includes regenerative braking and providing advice on more efficient driving.</p>
	<p>Research into effect on health of particulate matter (PM) related to London underground network transport</p>	<p>Improving London's air quality extends to the London Underground network. Comprehensive research has concluded that concentrations of PM, caused in part by train wheel and brake wear, are high in some parts of the Tube network. This PM is, however, of a very different</p>

		<p>composition to in the air above ground. The increasing use of electric braking systems and regular cleaning on the network help to reduce concentrations.</p> <p>The Mayor will ensure that TfL carries out further dedicated research into the risks posed to customers and staff by the Tube's air quality. It will also take action in response to any new issues, supported by robust and compelling evidence.</p>
Achieving compliance with legal pollution limits (page 116)	Achieving compliance with legal pollution limits as soon as possible and going beyond these limits to further improve public health	<p>In particular, the Mayor wants London to achieve World Health Organization (WHO) recommended targets for PM2.5 by 2030.</p> <p>The GLA Act creates a distinction between the measures to be taken by the Mayor and those he can encourage other organisations, including the government, to take. Together these should achieve legal limit value compliance for NO2 in the Greater London area in accordance with the legal duties confirmed in recent High Court rulings under which there is a three-fold obligation: to achieve compliance by the soonest date possible, choose a route which reduces exposure as quickly as possible, and ensures compliance is not just possible but likely.</p>
	<p>Reaching air quality targets:</p> <p>Nitrogen dioxide – NO2</p>	<p>Compared to a 2013 baseline, a 40 per cent reduction in NOx is expected by 2020, a 55 per cent reduction by 2025, a 65 per cent reduction by 2030, and a 82 per cent reduction by 2050. However, there are a few small areas that still exceed the EU air quality limit value of 40 µg/m3. We anticipate that with the implementation of zero emission zones and targeted measures (such as Oxford Street pedestrianisation) the whole of London will be compliant by 2025.</p> <p>The action being taken by the Mayor is important and capable of achieving NO2 limit value compliance in London. However, compliance will only be achieved as quickly as possible if all levels of government take full and effective action using the complete range of the powers and resources available to them in a way that has the greatest likelihood of success, by mutually reinforcing action taken at any one particular level of government.</p> <p>Currently the government's NO2 Air Quality Plan states that London will meet legal limits by 2025. Analysis suggests that were the government-led measures identified above implemented, and the additional powers requested by the Mayor provided, the compliance date for London would move forward. The Mayor continues to believe that compliance with legal NO2 limits can, and should, be achieved before 2025.</p>
	<p>Particulate matter - PM₁₀ and PM_{2.5}</p>	<p>Particulate Matter – PM10</p> <p>Compared to a 2013 baseline, a 16 per cent reduction in PM10 is expected by 2020, a 23 per cent reduction by 2025, a 28 per cent reduction by 2030, and a 38 per cent reduction by 2050. These reductions should mean that legal limit values continue to be met, and further reductions that will be beneficial for health will be delivered.</p> <p>Particulate Matter – PM2.5</p> <p>Compared to a 2013 baseline, Figure 20 shows that a 28 per cent reduction in PM2.5 is</p>

		<p>expected by 2020, a 37 per cent reduction by 2025, a 43 per cent reduction by 2030, and a 52 per cent reduction by 2050.</p> <p>Despite a substantial improvement at all locations, modelling indicates all of London will continue to exceed the WHO guideline limit of 10 µg/m³ primarily because of transboundary pollution. It is important to note that this modelling does not take into account the additional powers and action by the UK government and the EU called for by the Mayor.</p> <p>The Mayor continues to want London to meet the WHO guideline limit for PM_{2.5} by 2030. The WHO guidelines could be achieved if: the government led measures identified above were implemented; the additional powers requested by the Mayor were provided; and if this were complemented by concerted action to address transboundary pollution, including through a tighter EU National Emission Ceiling Directive.</p> <p>The Mayor will work to ensure that the necessary action will be adopted in the coming years. This strategy provides the framework to coordinate these efforts and the Mayor will continue to work with stakeholders to achieve the WHO guidelines by 2030.</p>
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Climate Change Mitigation and Energy

Section	Topic	Details
Introduction (page 202)	Decarbonising London	<p>The Mayor will re-establish London’s position as a leader in tackling climate change by setting an ambition for London to become zero carbon by 2050.</p> <p>To fully decarbonise London, GHG emissions will need to be reduced from around 34 megatons in 2015 to near zero by 2050. To make this happen, London will require careful but far reaching reforms, which are underpinned by three high-level objectives:</p> <ul style="list-style-type: none"> • decarbonise London’s homes and workplaces, while protecting the most disadvantaged by tackling fuel poverty • develop clean and smart, integrated energy systems using local and renewable energy resources • deliver a zero-emission transport network by 2050
	London’s GHG emissions	<p>London’s GHG emissions are dominated by buildings and transport. In 2015 it is estimated that 24% of London’s emissions were generated through transport.</p>

Transport (page 232)	Transport emissions reduction requirements	GHG emissions from transport must reduce from around 8.3 MtCO ₂ e a year to 1.5 MtCO ₂ e a year by 2050.
	Alignment with Mayor's Transport Strategy and emissions trajectory	Measures set out in the Mayor's Transport Strategy will reduce CO ₂ emissions from road, rail and shipping in London by 72 per cent by 2041. This will set London's transport emissions on a clear trajectory to reach the Mayor's ambition of a zero carbon London by 2050.
	Aviation	<p>Aviation is perhaps the most difficult transport area to decarbonise.</p> <p>At present, it contributes just under three per cent of London's monitored GHG emissions under the London Energy and Greenhouse Gas Inventory (LEGGI).</p> <p>This is around 940,000 tCO₂e a year (for airport operations and take-off and landings). If unmanaged, emissions from the proposed Heathrow expansion are likely to increase by around a third.</p>
Decentralising energy	Investigate the potential for further smart, flexible energy system demonstrators and pilots where Londoners can help manage demand	<p>The Mayor has assessed the impact on the national electricity system resulting from the electrification of heating and transport to achieve zero carbon. The London Infrastructure Plan considered the system reinforcement investment and the impact on Londoners' energy bills for a high decentralised energy scenario compared with a low scenario. It concluded that the former would cost the national system £20bn less, and Londoner's bills would be 40 per cent lower.</p> <p>The conclusions for decentralised energy also apply for electric vehicles. Modelling undertaken by the GLA and TfL indicates that the additional electricity demand arising from the electrification of vehicles in London can be accommodated without significant reinforcement cost. However, an uncoordinated approach could increase peak demand on the electricity system by over 2 GW by 2050.</p> <p>London therefore plays an important role within the national energy system. The Mayor will work with national government and other key stakeholders (including Ofgem, National Grid and Distribution Network Operator Companies) to plan smart, flexible city energy</p>

		<p>systems operating as part of the national system. This will enable Londoners to participate in the demand side response market.</p> <p>This work includes:</p> <ul style="list-style-type: none"> • demand side response initiatives and the impact of electrification upon the grid • working with transmission and distribution network operators to mitigate the potential impact of EV charging and electrification of heat
Emissions in Transport	A zero emission transport network by 2050	<p>The Mayor's ambition is to have a zero emission transport network by 2050. This will be achieved through an integrated approach, reducing carbon emissions and air pollutants from transport side by side in both this strategy and the Mayor's Transport Strategy. The policies and proposals to reduce London's carbon emissions from transport have therefore been combined with policies and proposals under the air quality chapter of this strategy.</p>

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