TRANSPORT FOR THE NORTH

Decarbonisation Stocktake

September 2025

Transport for the North

Transport for the North is a statutory sub-national transport body, working with mayoral combined authorities, local transport authorities and other stakeholders across the North of England. We advise central government on the strategic ambitions and priorities for the region's transport system, and work with our partners to enable delivery of investment.

Our vision is that by 2050 the North of England will have become a thriving, socially inclusive region. Our communities, businesses and places will have benefitted from sustainable economic growth, improved health and wellbeing, and access to opportunities for all. This is to be achieved through a transformed zero-emission, integrated, safe and sustainable transport system, that will enhance connectivity, resilience, and journey times for all users.

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Citing this report: Transport for the North, 2025, Decarbonisation Strategy Stocktake, [Insert URL], (Accessed: [Insert date accessed])

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2. Department for Transport. (2022). National Travel Survey, 2002-2021: Special Licence Access. [data collection]. 11th Edition. UK Data Service. SN: 7553, DOI: http://doi.org/10.5255/UKDA-SN-7553-11

3. 2011 Census Microdata Individual Safeguarded Sample (Local Authority): England and Wales. UK Data Service › Study

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Executive Summary

In 2021, Transport for the North published a regional transport decarbonisation strategy, marking a major step in setting a shared direction for more sustainable and inclusive transport across the North. This stocktake builds on that foundation by reviewing the latest evidence and the level of commitment required to meet the Decarbonisation Trajectory set out in the strategy.

The 2021 Decarbonisation Strategy set an ambitious framework for reducing surface transport emissions across the North, introducing a target of near-zero carbon by 2045, supported by an illustrative Decarbonisation Trajectory with five-yearly stocktakes. This stocktake serves two key purposes:

- To provide an update on progress towards the 2045 target and Decarbonisation Trajectory.
- To consolidate evidence supporting fair transition principles for use by our constituent authorities and national government.

Transport for the North's 2023 future carbon baseline trajectory, which projects transport emissions under current national policies, has also been revised to reflect recent developments such as the Zero Emission Vehicle (ZEV) Mandate and updated national traffic forecasts. The pathway analysis has also been refreshed using actual emissions, traffic, and ZEV data since 2018, to better inform the actions now required to stay on the trajectory.

Between 2019 and 2022, surface transport emissions in the North fell faster than required by the Decarbonisation Trajectory, largely due to the effects of the COVID-19 pandemic. Reducing annual emissions is essential to lowering cumulative emissions. Since 2022, the rate of annual emissions reduction has slowed due to increased traffic and slower uptake of zero-emission vehicles. While cumulative emissions remain broadly on track, more ambitious action is needed to realign annual emissions with our target trajectory.

Areas identified where there is a need for additional investment in order to realise the North's decarbonisation ambition, include investment to support higher rates of ZEV adoption and investment in public transport and active travel in the North to widen the choices available to people. Aligning this investment with the Mayoral Local Growth Plans, and Sustainable Development Strategies will be crucial.

The expansion of devolved powers across the North gives our constituent authorities the opportunity to deliver transformative change in local economic growth and social inclusion. These measures can also improve public health by cutting air and noise pollution and reducing road injuries, while lowering long-term maintenance costs and supporting more productive, connected places. The North is well positioned to lead in clean growth sectors like hydrogen, sustainable aviation fuels, electric vehicle (EV) manufacturing, and carbon capture technologies.

Our key messages for national policy makers are:

Increased strategic public investment in EV charging infrastructure is needed to unlock and de-risk private sector investment. This should include action on VAT disparities between domestic and public charging, alongside regulatory and planning reforms to support private sector delivery.

Additional investment in local bus services is vital to improving travel choices in cities and urban areas, and its value should be assessed not only in terms of transport outcomes but also through its wider benefits to public health and social inclusion.

Local efforts to reduce car dependency must be backed by national policy and funding that address regional investment disparities. Empowering Mayors to drive modal shift also requires recognising the wider benefits of such investment, particularly for public health and social inclusion, in appraisal and decision-making.

This transition is not just a climate imperative – it is a chance for the North to unlock lasting economic and social opportunity.

1. Introduction

The North's Political leadership shares a common ambition: to realise the economic potential of our region in a way that is socially inclusive and environmentally sustainable.

Reducing emissions from how we move our people and goods can help stimulate investment and create high-quality employment across a range of future-focused sectors. It also opens the door to more accessible, affordable, and reliable transport options that better connect people to work, education, and essential services. By placing decarbonisation at the heart of its transport planning and investment, the North can lead the UK in building a modern, inclusive economy that supports the industries that will define the coming decades.

Transport for the North (TfN)'s 2021 Decarbonisation Strategy committed to reviewing the North's progress in decarbonising surface transport at five-yearly milestones along an evidence-based emissions reduction curve that culminates in close to zero emissions by 2045. This stocktake will assess progress and inform future discussions regarding actions TfN can take to support its constituent authorities.

This stocktake begins with an updated overview of the North's surface transport emissions, reflecting the significant changes in travel habits and policy since the original Decarbonisation Strategy. The long-term impacts of COVID-19 on travel behaviours make it crucial to understand both the progress made and where further work is needed. To support this, we have revised key assumptions in our emissions modelling to reflect the latest legislation and government forecasts, such as the Zero-Emission Vehicle (ZEV) Mandate for cars and vans, updated figures on ZEV uptake for heavy good vehicles (HGVs) and traffic levels in line with the National Road Traffic Forecasts core scenario.

The document also examines the challenges of delivering a just transition and considers how TfN can best support its constituent authorities in shaping and implementing future decarbonisation policy. It then assesses new illustrative pathways to understand what may be required to meet decarbonisation goals and the shared ambitions of partners across the North.

A core part of TfN's role is to support constituent authorities in meeting their own decarbonisation goals, though providing the evidence needed to advocate for pan regional public transport schemes and collaboration on cross border policy priorities, such as electric vehicle (EV) charging infrastructure, as well as convening forums to bring together stakeholders to expedite the delivery of those schemes and policies. We also provide technical assistance to our constituent partners, operationalising our evidence through tailored support, data provision and tools, to aid their plan making and priority schemes.

While this report is relevant to any parties interested in transport policy, it is primarily aimed at local and national transport planners and policymakers. It provides clear recommendations to help align regional and local efforts in delivering transport decarbonisation.

2. Emissions in the North

2.1 Current Emissions

To understand what is needed to achieve near-zero emissions from surface transport in the North by 2045, we must first establish a picture of current emissions and then project these forward based on national guidance and policy.

This 'do minimum' baseline shows what emissions might look like if no additional action is taken and can then be compared against the Decarbonisation Trajectory. To model this baseline, we use TfN's analytical framework, including our highway, rail, and land-use models, as well as our carbon modelling tool, NoCarb. This draws on a range of inputs to estimate future vehicle emissions, including:

- The composition of the vehicle fleet by size and fuel type
- The distribution of travel demand
- Emissions per kilometre travelled for each distinct type of vehicle.

Using assumptions around ZEV sales, NoCarb projects the evolving vehicle fleet and estimates emissions by combining this fleet mix with expected annual distances travelled by each vehicle type. Unless stated otherwise, the figures in this chapter are derived from TfN's own modelling which better reflect the North's circumstances.

While the 2021 Strategy used a 2018 emissions base year, this stocktake incorporates updated assumptions to reflect recent changes in legislation, better align with government traffic forecasts, and account for the COVID-19 pandemic's impact on travel behaviour.

In 2023, surface transport in the North emitted around 26 mega-tonnes of CO_2[1], accounting for over a quarter of UK surface transport emissions and approximately 7% of total UK emissions. Despite an increase in travel from 126 billion kilometres in 2018 to 141 billion kilometres in 2023, total annual emissions remained broadly unchanged. This reflects evolving road transport trends, with HGV mileage now distributed across a larger number of smaller, more efficient vehicles, particularly those used for local deliveries, while car usage increasingly involves ZEVs and newer, more fuel-efficient models.

Cars remain the largest contributor, responsible for over 60% of emissions, followed by HGVs (18%) and vans (14%). Bus and rail combined account for just 4%. Most travel took place in suburban areas, though rural residents travelled further on a per capita basis.

[1] **Note:** all references to CO_2 in this report refer carbon dioxide equivalent (CO_2e), encompassing a wider range of greenhouse gas emissions.

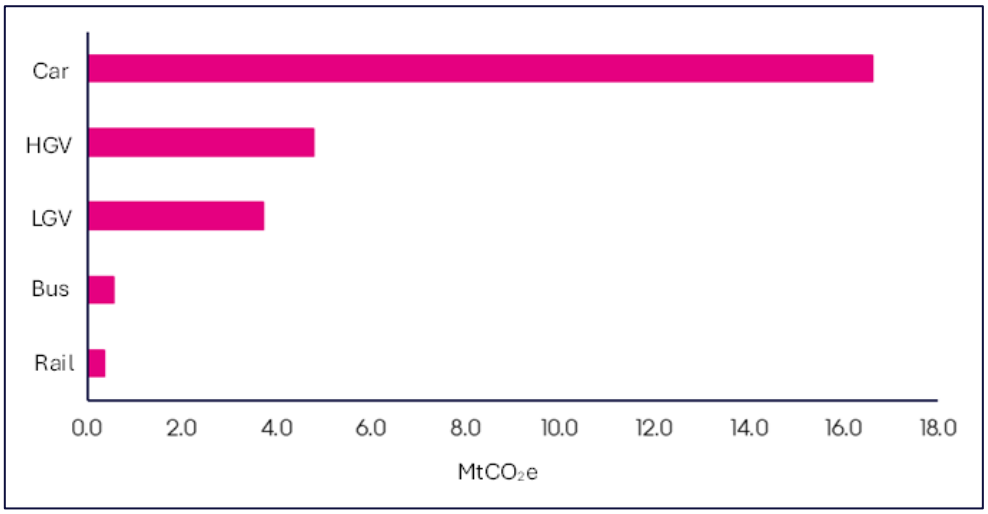

Figure 1: Total megatons of CO_2e by vehicle type in 2023

In 2023, the North had 8 million registered cars, broadly unchanged from 2018. Car ownership is highest in suburban areas across all car sizes. The share of large and SUV-type vehicles, which typically have higher emissions, has grown to over one-third of the fleet, reflecting a long-term national trend. Urban areas continue to produce lower CO_2 emissions per capita than rural areas, largely due to greater population and service density, meaning people tend to drive shorter distances and less frequently. Port and industrial hinterlands also tend to have higher carbon intensity due to greater economic activity, with factors such as greater volumes of HGV traffic.

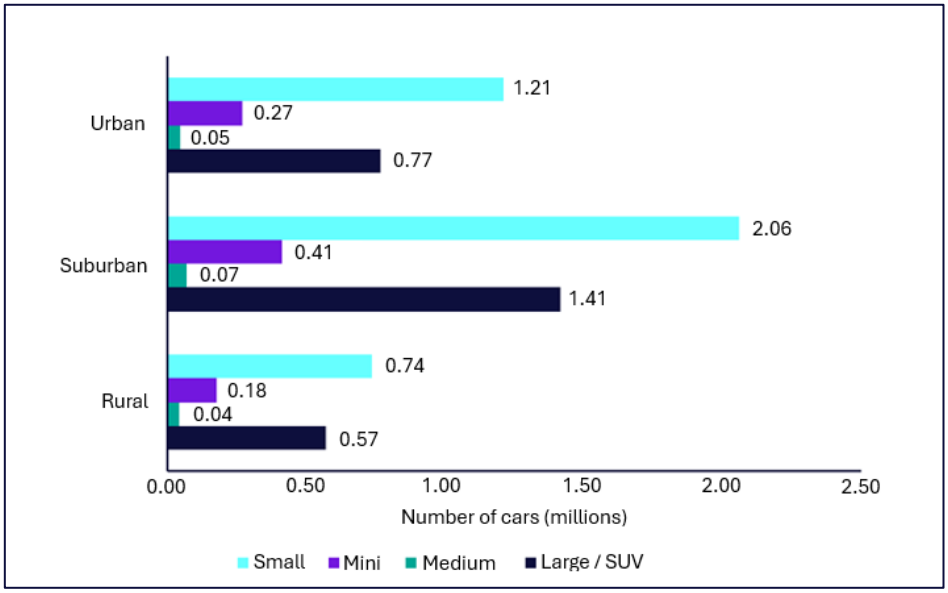

Figure 2: Car ownership in the North by area type and segment, in 2023

Analysis using the National Travel Survey (2024) and ONS socio-economic classifications (2025) shows that per capita emissions are highest among those in unclassified work (e.g. students, informal carers), having grown both in absolute and relative terms since 2018. Emissions from all other employment groups are now

broadly similar, with those in managerial and professional roles no longer standing out, likely due to increased remote and hybrid working. Routine and manual workers have the lowest per capita emissions, aligning with evidence that lower-income groups rely more on buses (Gates et al., 2019). Although per capita emissions are highest among unclassified groups and students, they collectively contribute less than 1% of overall emissions, while the long-term unemployed produce under 10%. The remaining groups – managerial, routine/manual, and intermediate/small employers – each account for around 30% of the car and van emissions in the North.

In 2023, men accounted for 54% of car trips, but this fell to 51% when including passengers, as trips are attributed to all occupants with mileage split evenly. However, when factoring in distance, men were responsible for 63% of mileage, dropping to 54% with passengers included - explaining their higher per capita CO_2e emissions.

While the differences are modest, they suggest that women are more likely to rely on alternative forms of transport and may be more exposed to transport-related social exclusion (TRSE) where travel options are limited. The gender split in emissions reflects differences in travel behaviour, though it is unlikely to prompt targeted policy responses. Nonetheless, these patterns highlight the importance of considering gender when assessing transport accessibility and environmental impact.

Most emissions in the North continue to be related to non-employment travel, with a small rise in business trips (10% to 12%) and a slight decline in commuting (35% to 33%), reflecting increased remote/hybrid working. Trip distance patterns were largely unchanged since 2018, but:

- Trips >50km rose from ~1% to 2.8% of all trips, now accounting for over one-third of vehicle kilometres and 25% of car emissions (up from under 15% in 2018)
- Trips <5km made up 46% of all trips but only 11% of emissions, down from ~25% in 2018
- Trips of 20-50km contributed around 29% of trips and car emissions, stable since 2018.

These trends point to fewer but longer trips, especially those over 50km.

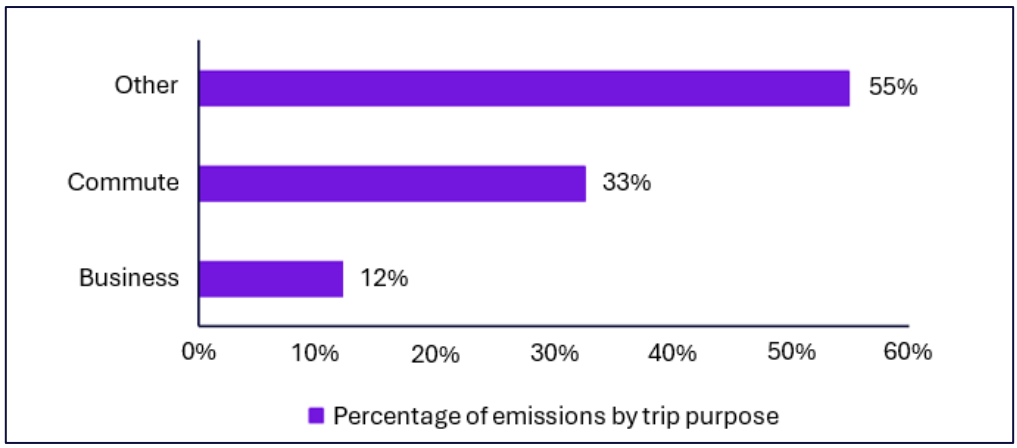

Figure 3: Percentage of car emissions in the north by trip purpose, in 2023

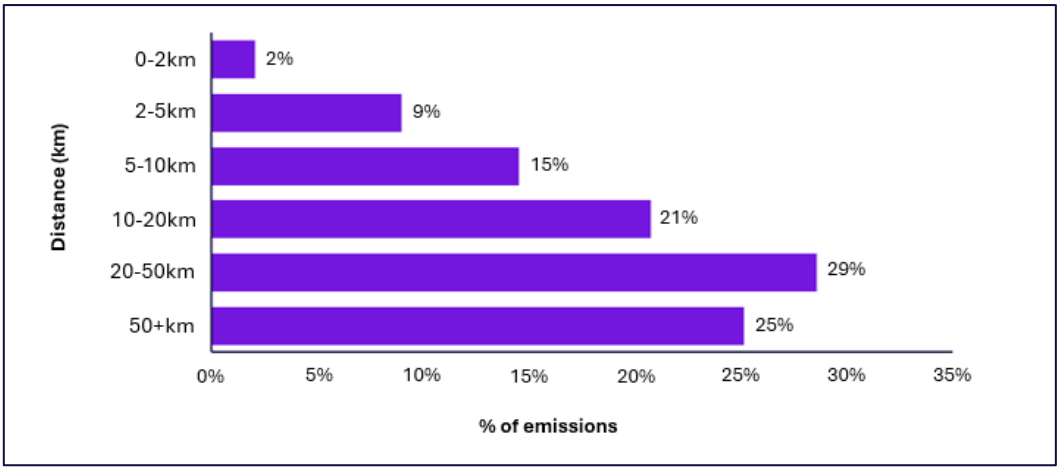

Figure 4: Percentage of car emission in the North by distance in 2023, taken from TfN's carbon modelling tools

In 2023, the largest segment of vehicle emissions occurred across the North's minor roads, with cars responsible for almost 80% of emissions on these roads. This was followed by emissions produced on motorways, where cars were responsible for around a half of CO_2e emissions and HGVs were responsible for over one third of CO_2e emissions.

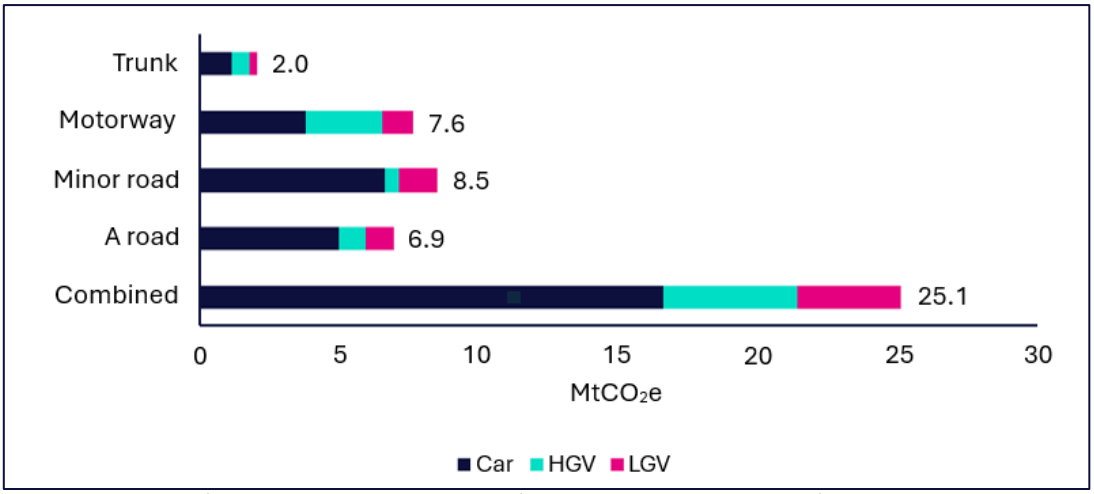

Figure 5: Megatons of CO_2e in the north by road type, in 2023

2.2 Future Emissions

To understand the scale of change needed to achieve regional carbon reductions aligned with the Decarbonisation Trajectory, a future carbon baseline (FCB) scenario has been developed. This projection incorporates existing national policies, including continued zero-emission vehicle (ZEV) sales in line with the Government's ZEV Mandate and using EV sales matching the current Northern data in the base year. It also reflects future fleet forecasts for the North of England based on regional geography, uptake to date and demographics, though without specific prioritisation of high-mileage vehicles such as taxis or fleet cars. It also assumes rapid ZEV uptake for HGVs from the early 2030s, reaching 100% sales by 2040, and car and van mileage growth based on DfT's national trip end model (NTEM) forecasts, which reflect increases in economic activity and population, without demand management.

Under this scenario, annual surface transport emissions in the North are projected to fall from around 26 $MtCO_2e$ in 2023 to 20 $MtCO_2e$ by 2030 and fall further still to 0.25 $MtCO_2e$ by 2050. However, cumulative emissions, over this period, exceed the North's surface transport carbon budget by over 100 $MtCO_2e$. Notably, emissions from all transport modes are expected to decrease over the period 2023 and 2030 except for HGVs, where decarbonisation is more technically challenging and will likely only materialise after 2030.

Mode	CO_2e emissions in 2023 (mega tonnes)	FCB CO_2e emissions in 2030 (mega tonnes)	FCB CO_2e emissions in 2050 (mega tonnes)
Car	16.36	11.88	0.04
HGV	4.78	4.98	0.03
LGV (Van)	3.71	2.72	0.02
Bus	0.55	0.28	0
Rail	0.34	0.26	0.17

Table 1: Projected emissions by mode under the Future Carbon Baseline (FCB) scenario.

TfN's 2021 Decarbonisation Trajectory set a cumulative carbon budget for the period 2018 to 2050. By the end of 2023, approximately 115 $MtCO_2$ had already been emitted, leaving around 185 $MtCO_2$. Since 2022, annual emissions have exceeded the trajectory's recommended level, reversing gains made between 2019 and 2022, when reductions were largely due to lower traffic during the COVID-19 pandemic. As a result, the North's current emissions trajectory is materially higher than required, mainly due to slower ZEV uptake and greater than expected road mileage. Closing the gap between the FCB and our Decarbonisation Trajectory will likely require a rapid increase in ZEV uptake rates beyond the levels set by the ZEV Mandate, a step change in ZEV HGV sales, and a near-term reduction in road mileage. These scenarios are explored further in our pathway analysis in section 5.

Although emissions from electricity generation are not included in traditional transport emission totals, TfN has assessed the indirect emissions associated with growing use of electric mobility. Electricity from renewable sources has increased from under 120 Terawatt-hours (TWh) in 2018 to nearly 136 TWh in 2023, with low-carbon sources (renewables and nuclear) now making up around 60% of total UK generation (DESNZ, 2024). Assuming the targets set out in the Climate Change Committee's Balanced Scenario within the Sixth Carbon Budget are met, indirect emissions from electrified transport are likely to be very low relative to surface transport emissions. Meeting future electricity demand from transport electrification will require continued growth in low-carbon supply. National Grid ESO's Future Energy Scenarios (2024) project a significant increase in electricity demand by 2035, driven largely by electric vehicles and heat pumps. While current investment and policy commitments such as those outlined in DESNZ's 2023 paper *Powering Up Britain*, aim to deliver sufficient low-carbon generation capacity to meet this demand, uncertainty remains over the pace of delivery.

Emissions from aviation and shipping, although not part of TfN's Decarbonisation Trajectory, remain significant. Aviation in the North generated 4 $MtCO_2$ – about 11% of UK aviation emissions, consistent with the 2020 base year. Forecasts suggest aviation

emissions will remain steady until the mid-2030s, before rising again and levelling off by 2050.

Shipping in the North produced around 3.5 $MtCO_2$ in 2023, with approximately half from the Yorkshire and Humber region. This represents just under one-third of total UK shipping emissions, within a broader national context of declining emissions – from around 14 Mt in 2017 to 11 Mt in 2023.

3. The Case for a Fair Transition

3.1 Harnessing Growth Potential

The North is well positioned to benefit from the shift to near-zero surface transport emissions. These benefits include cleaner air, better connectivity, and the creation of new clean mobility jobs - delivered in ways that reflect the needs and challenges of Northern communities. The transition to a low carbon economy also presents a major economic opportunity. Jobs in the net zero sector are already 1.7 times more productive than the UK average (Energy & Climate Intelligence Unit, 2023), and with the right support, the region could attract £2.65 of private investment for every £1 of public spending on developing net zero supply chains (Northern Powerhouse Partnership, 2024), unlocking up to 168,000 jobs (Transport for the North, 2023a).

The North is already a European leader in electric vehicle (EV) production, with Nissan's Sunderland plant preparing to produce next-generation EV models and nearby JATCO and AESC facilities set to supply hundreds of thousands of EV powertrains and batteries annually. Other major investments include JLR's Halewood plant in Merseyside which is being converted into its first all-electric facility, and Bentley's Crewe Factory, where plans are underway to produce fully electric models. Expanding domestic manufacturing of EVs, batteries and components not only strengthens the region's economic position but also reduces supply chain emissions by cutting freight mileage and drawing on the North's increasingly decarbonised energy grid. To fully realise this opportunity, policies that stimulate demand for new and used EVs must go hand-in-hand with support for local production to ensure economic benefits are widely shared and the transition is fair.

The North is also home to three of the UK's six highest-emitting industrial clusters: the Humber (the largest), Teesside, and Cheshire. Decarbonising these high-carbon industries and supporting workforce transition offers a significant opportunity to establish the region as a hub for clean energy generation and low carbon technology development. This includes the technologies, jobs and expertise associated with decarbonising the transport system.

3.2 Balancing the Responsibility of Change

Achieving the vision in our Strategic Transport Plan (STP) requires a fair transition to a decarbonised transport system - one that improves travel choice and, in doing so, increases access to key services and opportunities. We must also ensure the costs of decarbonisation are shared fairly, while recognising that not everyone can change how they travel. The highest earning 20% of the population contribute around 25% of transport emissions, while the lowest 20% contribute just 8% (INRIX, 2024). In 2018, the lowest income decile drove under 4,000 km per year on average, compared to over 7,000 km in the highest (Carbon.place, 2025).

This presents a clear opportunity: those with the greatest means and highest travel activity are best placed to lead the shift to low-carbon travel by changing modes and choosing zero-emission vehicles. Early action from this group could reduce costs for others by creating the demand needed to stimulate economies of scale and deliver greater carbon savings, making the wider transition more manageable and equitable. At the same time, we must acknowledge that for many communities across the North (particularly rural areas) limited public transport options constrain their ability to contribute to this transition. These communities should not be made to feel responsible for systemic gaps in infrastructure or penalised for limited travel choices. Instead, it is a challenge for policymakers and transport authorities to address by investing in inclusive low-carbon transport that works for all geographies.

Rapid growth in EV adoption and production must be matched by an equally ambitious skills transition. Around 89,000 EV-qualified technicians will be needed nationally by the mid-2030s, yet current capacity remains well below demand in several parts of the North, including North Yorkshire, Cumbria and the North East (IMI, 2023). Related employment opportunities also exist in areas such as EV charge point production and installation, car sales, and local authority planning. Targeted investment in skills and training, particularly in places historically reliant on high-carbon jobs, will be essential to delivering a just and inclusive transition.

3.3 The Inclusivity and Health Opportunity

Across the North of England, many communities face high levels of transport-related social exclusion (TRSE) – where poor access to employment, education, healthcare, and leisure is the result of transport networks that are inefficient, poorly connected, or not designed around local needs. TfN's latest research shows that 2.9 million people in the North live in areas with an elevated risk of TRSE. Six of the ten most affected areas nationally are in the North, with the North East being the worst affected region.

TRSE is not just a transport issue, it is linked to poorer health, reduced life opportunities, and economic inactivity. Tackling TRSE improves access to good jobs,

supports better health outcomes, increases personal safety, reduces exposure to pollution, and strengthens community resilience – benefits especially critical in a region already experiencing wider health and economic disadvantages.

One such barrier to realising these benefits is severance – where major road and rail infrastructure itself becomes a barrier to walking, cycling, and accessing local services. It affects around a quarter of the North West's population, the second highest rate after London, yet the wider benefits that can accrue from reducing severance is often overlooked in traditional appraisal methods. TfN is supporting partners in this area by developing evidence, data tools and methodologies that enhance our understanding of existing levels of severance and its consequences for communities. By utilising these tools and data, plan makers can build stronger cases for investment in more inclusive and accessible infrastructure.

Decarbonising surface transport presents policymakers with the opportunity to tackle transport-related social exclusion and reduce community severance. It is vital that investment and funding decisions take full account of these wider social and economic benefits. Place-based, outcome-focused approaches can help ensure that transport interventions are designed and prioritised to deliver the greatest benefit for communities. This includes improving local connectivity, and investing in walking, cycling and accessible public transport that links people to jobs, education, and services.

3.4 Further Benefits of Improving Travel Choices

Investing to improve the availability, quality and appeal of sustainable travel choices offers the chance to improve public health, boost economic inclusion and make better use of public investment.

Car use, though sometimes perceived as cheap at the point of use, can be expensive when the full costs to both individuals and society are considered. For households, buying a car is a major 'sunk' cost, which can discourage switching to more sustainable transport once the investment is made (Acosta et al., 2021). Wider societal costs are also substantial. In 2023, road congestion cost the UK economy an estimated £7.5bn, with the average driver losing 61 hours to delays over the year (INRIX, 2024). In the North, the average delay due to congestion on the strategic road network was 10.3 seconds per mile (Department for Transport, 2025) - time that could otherwise support economic activity and productivity.

£12.2 billion was spent nationally on road construction in 2023/24. Yet, expanding capacity often fails to deliver lasting benefit due to "induced traffic" – a phenomenon where expanded road capacity simply creates additional demand. Investing to expand the range of transport options available to people and businesses across

the North allows limited public funds to be used more efficiently and equitably while also easing road congestion.

Investing in additional infrastructure and services to improve travel options can also enhance the performance of road-based public transport. For example, TfN's 2023b Travel Choice research shows that a 10% drop in road speeds can reduce bus patronage by at least 10%, highlighting how crucial journey time and reliability are to making services attractive and effective. Strategic investment that improves overall network efficiency can help buses run more smoothly, attract more users, and contribute to a more viable and inclusive transport system that supports a broader range of travel choices for communities.

The implications that improving travel choices can have on access to opportunity are stark. During the morning peak, a car user in the North can reach 5.7 times more jobs within an hour than someone without a car. This gap widens to 6.4 times at weekends and 7.3 times in the evening – highlighting the deep inequalities in access to employment and services that can be addressed by improving travel options.

The health impacts of investing to increase travel choices are considerable, including improving air quality, reducing road traffic accidents, and enabling greater physical activity. The combined annual health costs of these effects in the North are an estimated £6.6bn, with almost half of these attributed to physical inactivity alone (Transport for The North, 2023a). By broadening the transport options available to individuals, we can deliver better outcomes for both people and places – raising quality of life and improving public health, which in turn helps to ease long-term pressures on health and social care systems as well as other public service.

Analysis by Friends of the Earth (2023) identifies the long-term decline in local bus as a major driver of TRSE, particularly in places like Blackpool (over 65% reduction), Blackburn and Darwen (68% reduction) and Hartlepool (60% reduction). Reversing this trend presents a significant opportunity to improve access to jobs, services, and social connection – especially in areas where past cuts have had the greatest impact. This analysis shows that over the last 15 years, urban bus services outside London have fallen by 48%, while rural services have reduced by 52%. In places like East Riding (over 74% reduction) and Rossendale (over 66%), the effects are especially pronounced.

Cuts to bus services in the North risk worsening TRSE, where people without access to a car - such as older adults, disabled people, and low-income households - struggle to reach jobs, education, healthcare, and social opportunities.

Crucially, this is not just a story of decline – it is also one of potential. Restoring and improving local bus services is not just popular; it has the potential to cut emissions, reduce exclusion, and improve everyday life across the North. But delivering this is not straightforward. In many areas, the current offer - whether in terms of cost, frequency, or reliability - simply isn't attractive enough to encourage regular use. To achieve a different outcome, we need to rethink how services are designed and valued, recognising that their true worth lies not just in passenger numbers, but in the wider benefits they bring to people and places.

Region	Weekday 16hr average (%)	Weekday morning peak (%)	Weekday evening (%)	Saturday midday (%)	Sunday night (%)
North East	-52	-53	-48	-56	-46
Yorkshire and Humber	-47	-47	-49	-49	-53
North West	-45	-47	-33	-50	-23

Table 2: Average % change in bus trips per hour for various times of the day and week over the last 15 years (2008-2023)

Perhaps unsurprisingly, engagement with our constituent authorities, wider stakeholders, and the public during development of our STP highlighted cost as a major factor influencing travel choices. Research undertaken by TfN in 2024 to further explore the relative cost of different travel choices confirmed what many already know through lived experience: car travel is often cheaper at the point of use than taking bus or train for the same distance. This pricing imbalance makes it harder to encourage a shift to public transport, despite the wider benefits to society of doing so. The wider effects of car use – like congestion, air pollution or road accidents – are lower in rural areas because of fewer people and fewer cars. In contrast, the societal costs of car use are much higher in urban areas, where congestion, emissions and road safety risks are more concentrated.

Broader cost considerations also affect travel behaviour, including the financial implications of reliability and convenience. Individuals with caring responsibilities or increased time pressures, such as single parents, may lack the flexibility required to use public transport for multiple journeys when a single car trip can serve several purposes while avoiding the need to adhere to a timetable. Similarly, those in hourly-paid roles may be compelled to drive if their public transport options are unreliable, as delays or missed connections can result in lost income.

Our research also found that for trips that can be walked (assuming 1 mile or less) or cycled (assuming 4 miles or less), active travel can result in large net benefits to both the user and wider society, reflecting the health and wellbeing benefits generated for the user and the lack of adverse carbon, air quality, congestion and health service impacts that need to be paid for by wider society. While active travel offers clear benefits, many people are deterred by safety concerns, poor infrastructure, and ingrained habits. Targeted investment in safe, convenient routes and supportive facilities can help shift behaviour and unlock those benefits.

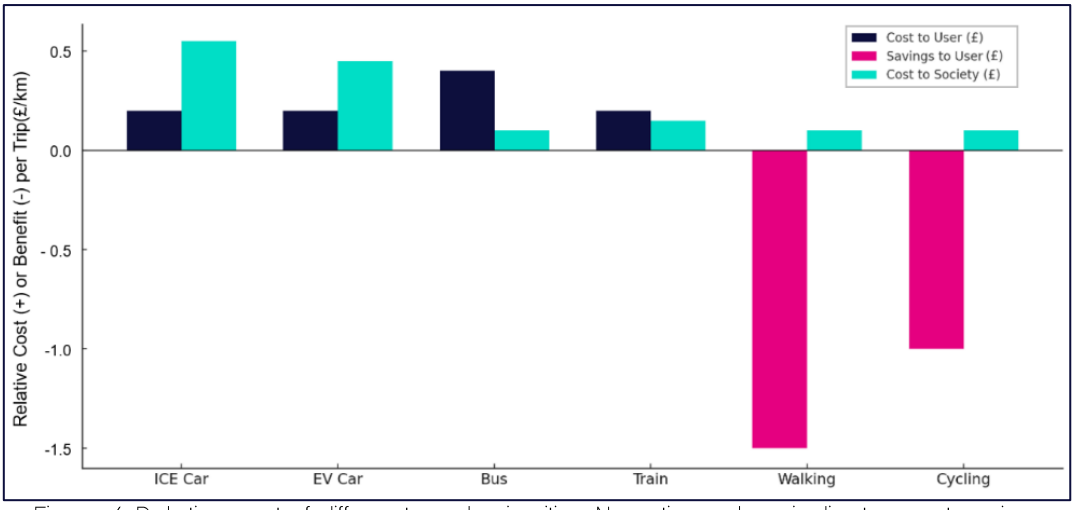

Figure 6: Relative cost of different modes in cities. Negative values indicate a net saving.

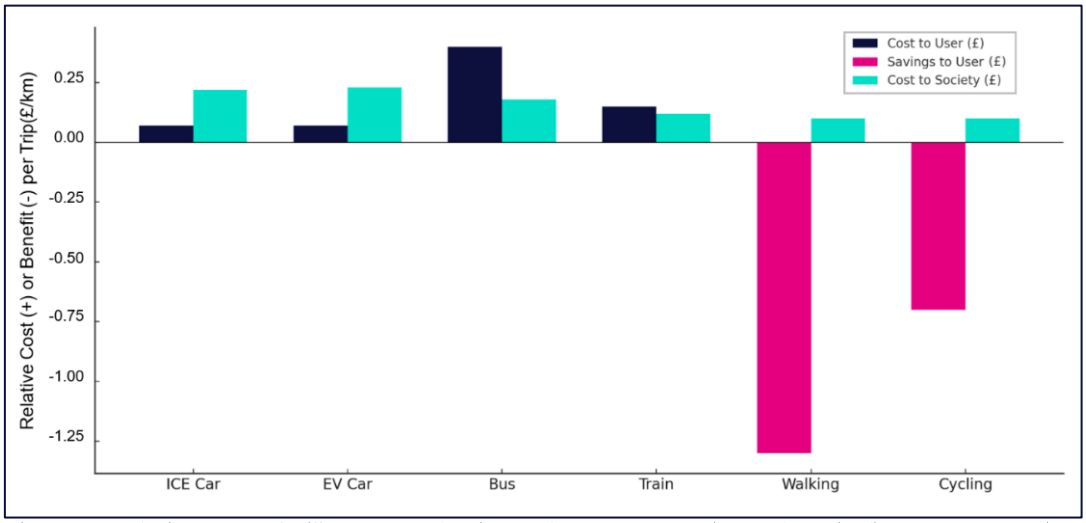

Figure 7: Relative cost of different modes in rural areas. Negative values indicate a net saving.

Our analysis also showed that bus users in rural areas often face higher fares than people making equivalent trips in cities, while car travel is usually cheaper in rural areas due to lower parking costs and greater fuel efficiency due to lower congestion.

This evidence supports targeted investment in Northern transport as a means of unlocking wider social, economic, and health benefits. Improving access to affordable, reliable and sustainable travel options enables individuals to reach education, employment, healthcare and other essential services – outcomes that are not only desirable for the individual, but for the economy and society as a whole. To justify and sustain this investment, we must advocate for a shift in how transport investment decisions are made, so that wider benefits are factored into appraisals.

3.5 How We Move Goods in the North

Freight in the North refers to long-haul logistics, local delivery services and complex supply chains – each with distinct needs and impacts. This breadth reflects the scale and diversity of the economic activity it supports, making increasing freight volumes essential to growing the North's economy. As demand grows, we have a key opportunity to shape that growth in a way that delivers maximum benefits for both businesses and communities.

With zero-emission HGV technologies still at a relatively early stage, freight modal shift will be essential in the near and medium term to stay within carbon budgets while growing the regional economy and boosting productivity. A single freight train can remove up to 76 HGVs from our roads (Rail Freight Group, n.d.) and typically emits 90% less particulates and up to fifteen times less nitrogen oxide than equivalent road freight (Transport Scotland, 2016). Rail freight also tends to produce emissions further away from where people live and work (Rail Partners, 2023), making residential areas safer and healthier.

Our STP sets out an ambition to triple rail's share of freight by 2050 to cut emissions and support a more productive, inclusive, and sustainable economy. To unlock this shift, businesses need viable, cost-effective alternatives. Growth in rail-served warehousing, planning and regulatory support, and the right incentives can make lower-carbon options more competitive. This must also be matched by prioritised investment in infrastructure to increase capacity and support the specific needs of rail freight.

Modal shift also supports safer, healthier communities. HGVs are overrepresented in serious collisions involving vulnerable road users and contribute to issues like noise, visual intrusion, and community severance – impacts often felt most in deprived or marginalised areas.

3.6 Barriers to ZEV Ownership

The transition to ZEVs risks deepening inequalities in the decarbonisation transition. EVs remain more expensive to buy than petrol or diesel cars, around 23% higher for new models (Auto Trader Insight, 2025), with the second-hand market still dominated by large, premium vehicles. Access to finance options like leasing and PCP is typically limited to higher-income households, meaning many lower-income drivers are excluded from the ZEV market entirely. This affordability gap is particularly acute in the North, where average incomes are lower.

Disabled people, who face higher living costs and barriers to vehicle adaptation, are also disproportionately impacted. Many households unable to afford the upfront cost of an EV also miss out on lower running costs – for example, saving around £579 on fuel per year as of January 2024 (Nimblefins, n.d.).

The shift to zero-emission vehicles risks deepening existing inequalities if access to charging infrastructure remains uneven. TfN's analysis indicates that despite making up 22% of the UK's population, the North has just 14% of public charge points. At the same time, around 47% of households in the North lack off-street parking - above the national average of around 40% - leaving many reliant on public charging infrastructure. This is also pertinent given the cost differential between charging at home and using public infrastructure due to the higher rate of VAT on public charging

vs electricity used to charge at home and the installation and operational costs that point operators must add to remain viable as a business.

In rural areas, there are limited commercial incentives to install public charging, meaning those without access to home charging or public transport are at risk of being particularly disadvantaged. Without continued public investment and a whole-journey approach, there is a risk of creating EV 'charging deserts'. TfN's analysis indicates that the North will require up to 240,000 public charge point plugs by 2030 to meet demand.

Whilst government funding, such as the Local Electric Vehicle Infrastructure (LEVI) fund, is in place to support the provision of public residential chargers in less commercially viable locations, the challenge of ensuring an equitable transition to EVs requires continued focus, as highlighted in our EV State of Play report.

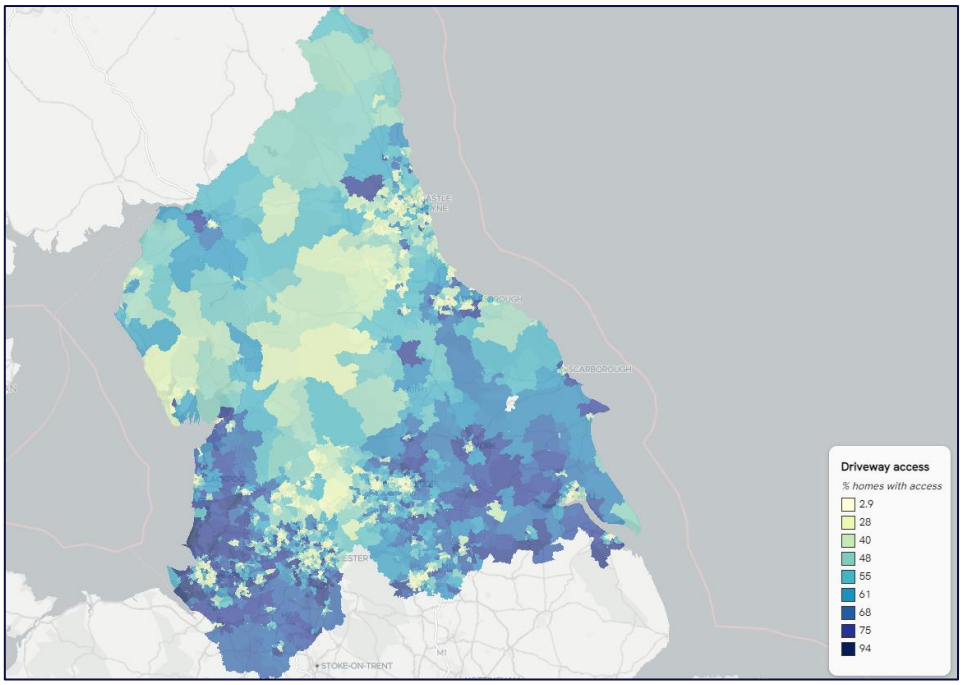

Figure 8: Off-Street Accessibility (Driveway Access) Heatmap for the North

Ensuring fair access also means designing infrastructure that works for everyone. Disabled people face multiple barriers accessing EV charging infrastructure, including poor charge point design, obstructive cables, and a lack of dropped kerbs. While accessibility standards exist, they remain voluntary, leaving many people locked out of the benefits of EV ownership. Broader accessibility concerns include reliability, safety, and digital access – further explored in our EV State of Play report.

3.7 Hydrogen and Carbon Capture and Storage (CCUS)

While most surface transport in the North is expected to decarbonise through electrification, hydrogen could offer a viable alternative in specific, harder-to-electrify use cases such as long-distance HGVs, rural buses, or freight trains. These vehicles often operate on longer duty cycles and require greater operational flexibility, making battery-electric solutions less practical.

TfN's *Hydrogen Mobility Visualiser*, developed with Northern Gas Networks, highlights areas of the North with strong potential for hydrogen demand in transport. These are typically locations where transport use cases can align with existing planned hydrogen infrastructure, including low carbon production, distribution networks, and industrial demand. Where multiple modes and operators can access a shared supply, economies of scale could reduce costs, while supporting the transition of local workforces from high-carbon sectors.

The Humber and Ellesmere Port are both home to major oil refineries and industrial clusters with planned low carbon hydrogen production and pipeline infrastructure. These areas are well placed to support transport hydrogen offtake, through repurposing existing infrastructure and transitioning the high-skilled workforce with relevant transferrable skills and knowledge. On a smaller scale, east Bradford is seeing the development of a green hydrogen production facility by Hygen and N-Gen, adjacent to two bus depots.

In addition, the Department for Transport has funded the Tees Valley Hydrogen Transport Hub, which is serving as the UK's first hydrogen transport testbed. The hub is supporting trials of hydrogen-powered vehicles across multiple modes, from buses and HGVs to construction and airport ground-handling equipment, while also developing the associated refuelling infrastructure. This kind of targeted investment can guarantee supply for specific use cases, such as rural buses, while generating new jobs through construction and ongoing operations.

Although government policy is expected to prioritise hydrogen for aviation, maritime and industry, the overall policy landscape surrounding hydrogen use in the UK should not entirely disincentivise select instances where there will be a place-based justification for hydrogen use in surface transport. Local and regional leaders have a role to play in identifying where demand can be aggregated and linked to emerging supply chains to help ensure no community is left behind in the transition.

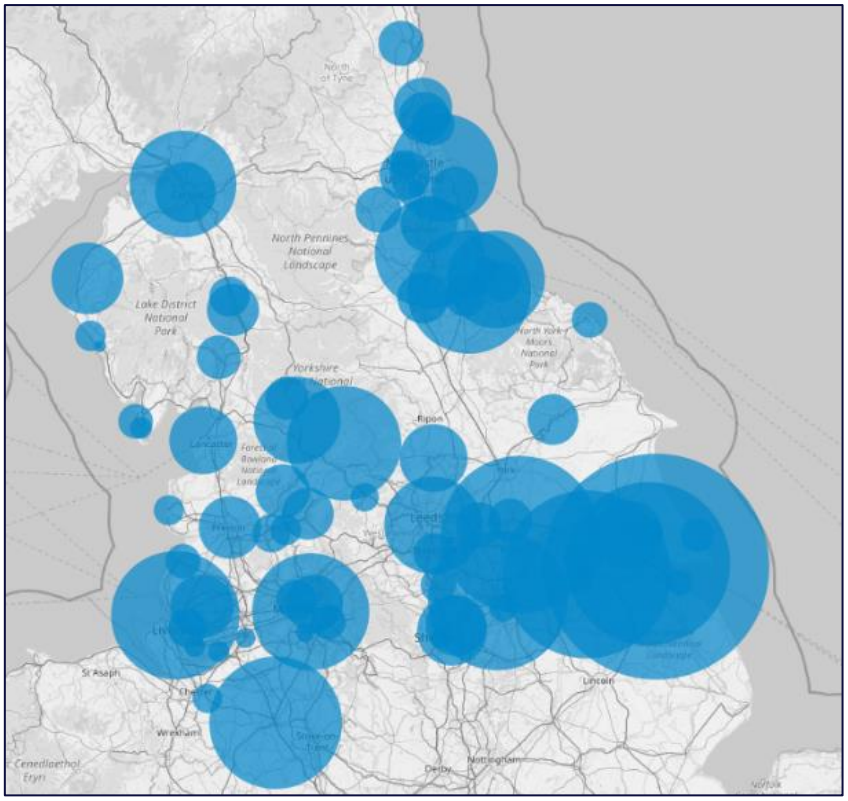

Figure 9: Potential hydrogen for transport demand clusters in the North taken from TfN/NGN's Hydrogen Mobility Visualiser

3.8 Sustainable Aviation Fuel (SAF)

Establishing a sustainable aviation fuel (SAF) industry in the North offers a clear opportunity to support decarbonisation and provide skilled employment. A North West SAF cluster alone could deliver up to 1,500 jobs and generate over £200 million in GVA annually (Sustainable Aviation, 2020). With the UK's SAF Mandate in place from January 2025, the Government has taken steps to create the right policy environment by requiring SAF supply into UK aviation and providing long-term certainty through a clear, upward trajectory. In line with the polluter pays principle, direct public funding is unlikely to be appropriate. Instead, government and local leaders should focus on long-term strategies that give industry confidence to invest in people, infrastructure, and innovation. This includes clear signals on feedstock prioritisation and ensuring education and skills policy supports the workforce transition needed to scale SAF production. The Humber region is already demonstrating this potential. Since 2017, Phillips 66 Limited's North Lincolnshire refinery has produced SAF at scale through co-processing waste oils, showing that existing facilities can adapt to lower carbon production and repurpose high-skilled jobs.

Future SAF production, particularly via power-to-liquid (PtL) pathways, will require large quantities of low carbon hydrogen. This strengthens the case for co-locating SAF facilities near the North's emerging hydrogen and carbon capture and storage (CCUS) clusters. In Teesside, several PtL projects have secured funding through the UK Government's Advanced Fuels Fund. One example is the planned demonstration plant at Saltend Chemicals Park, led by px Group and OXCCU, using

biogenic carbon dioxide and low carbon hydrogen. The project, targeted to begin operations in 2026, is backed by the wider Hydrogen to Humber Saltend scheme.

In Sunderland, Wastefront has broken ground on a £100 million tyre-to-fuel facility at the City's port, using tyre pyrolysis oil to produce SAF. Once fully operational in 2027, the plant will process 10 million end-of-life tyres annually and create over 100 local jobs, positioning Sunderland as a national leader in circular net zero technologies and their economic benefits.

3.9 Harnessing and Enhancing the North's Natural Capital

The Climate Change Committee's seventh carbon budget identifies the need for significant land-based carbon sequestration, with savings of 30MtCO_2e needed by 2050 to meet the UK's statutory climate targets (Climate Change Committee, 2025). Policymakers and those with responsibility for the North's rich natural capital have a vital role in helping to meet this objective by ensuring the region's natural assets are managed and restored to maximise their carbon storage potential. But this is not just a matter of carbon: when properly harnessed, the North's natural assets can deliver several co-benefits, including improved flood resilience, enhanced water quality, biodiversity recovery, and stronger, more climate-resilient communities.

TfN's research on TRSE highlights another challenge: many communities in the North, particularly in rural areas and urban fringes, have lost public transport links to nearby green spaces and national parks. This disproportionately affects people on low incomes, who are less likely to own a car. Nearly half a million residents in the North still live more than a 10-minute walk from any green space (Fields in Trust, 2024).

Nature-based solutions offer a dual opportunity. They can provide transport infrastructure operators with a strong defence against factors such as flooding and overheating, whilst at the same time, the provision of sustainable travel choices to these same natural assets, using that resilient transport infrastructure, provides an opportunity to tackle existing social inequalities and create jobs.

4. Possible Pathways to Near Zero

4.1 TfN's Pathways and the Role of Investment Decisions

This chapter presents a series of illustrative decarbonisation pathways for the North, examining potential emissions reductions from different levels of travel behaviour change and technology uptake. While not all of the pathways succeed in meeting the level of emissions reduction required to meet near zero surface transport emissions by 2040, they are included to demonstrate the scale of change needed and the consequences of past underinvestment in the North.

Transport for the North continues to develop the *Northern Appraisal Playbook* to help constituent partners better capture the wider social and environmental value of investment in Northern transport infrastructure, as well as the full economic value. Our work on potential pathways to near zero surface emissions, and the playbook, underscore the urgent need for more ambitious and better-targeted investment if

the North is to deliver its fair share of national decarbonisation and harness the wider social and economic benefits of doing so. This will require both public and private investment, likely with public funding playing a catalytic role in inducing private sector commitment. Investment should focus on physical infrastructure and the services that support and utilise it, ensuring that the region is equipped to transition effectively and inclusively.

All pathways account for post-2018 emissions reductions, post-COVID traffic levels, and recent national policy changes such as the Zero Emission Vehicle (ZEV) Mandate.

4.2 Progress and Disruption Since the 2021 Strategy

Figure 10 shows that while COVID-19 temporarily reduced emissions beyond the Decarbonisation Trajectory, traffic in the North rebounded sharply from 2022. ZEV uptake continues to grow but has lagged behind 2021 strategy assumptions, though long-term prospects remain strong. The North has stayed within its 2018–2023 carbon budget, but traffic now exceeds pre-pandemic levels, reinforcing the need for sustained investment—not just in ZEVs, but also in enabling modal shift. Decarbonisation must also include significant expansion of passenger and freight rail.

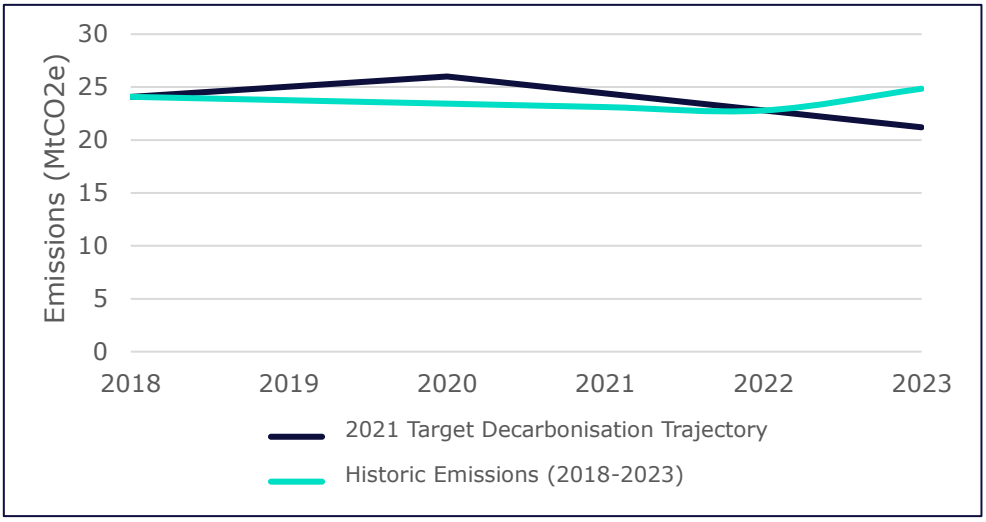

Figure 10: Historic emissions between 2018 and 2023

4.3 Indicative Pathway 1 – Technology Focused

This pathway explores the extent to which a technology-focussed approach could deliver carbon reductions, incorporating an accelerated uptake of zero-emission vehicles. It assumes that ZEV sales exceed ZEV Mandate targets, an early transition among high-mileage users such as fleets and taxis, and rapid deployment of zero-emission HGVs from the early 2030s. This scenario also includes no net growth in car and taxi mileage from 2023, a major shift of freight from road to rail, and van mileage growth in line with national forecasts.

Despite these optimistic assumptions, modelling shows the pathway still exceeds the North's carbon budget by 62 $MtCO_2e$. This highlights the limitations of relying

predominantly on vehicle technology and reinforces the need for long-term investment in the North's transport system to improve infrastructure and services to enable people and businesses to make lower carbon transport choices.

Mayoral combined authorities across the North have a critical role to play in shaping future travel patterns through their local growth plans and spatial strategies. These frameworks offer powerful levers to embed decarbonisation into land use and transport planning – supporting modal shift, reducing car dependency and aligning investment with the transition to a fairer, more sustainable transport system.

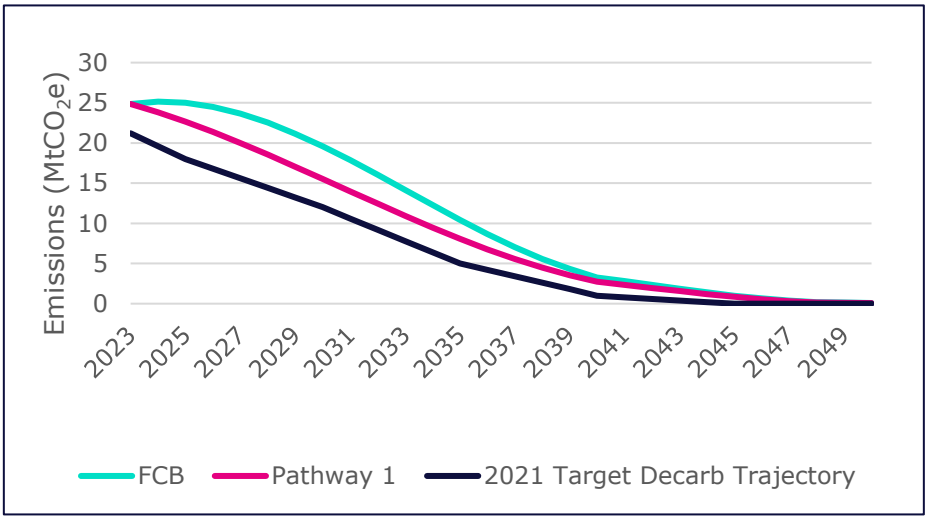

Figure 11: Pathway 1 against future carbon baseline and trajectory

4.4 Indicative Pathway 2 – Behavioural Change Focused

This pathway assesses the potential for reducing emissions by enabling more sustainable travel patterns through a focus on modal shift. It assumes ZEV sales keep pace with the Government's Mandate, early adoption of zero emission HGVs and a 10% reduction in car, taxi and van mileage by 2030 compared to 2023, supported by a major shift in freight from road to rail in line with our STP.

As shown in Figure 12, even with these shifts, this pathway still falls short of the carbon reductions required by the Decarbonisation Trajectory. This underlines that whilst modal shift is important, significant investment is also needed in ZEV infrastructure – particularly in parts of the North where lower levels of historic investment mean that sustainable travel options are limited meaning significant levels of modal shift may not be viable in the short term.

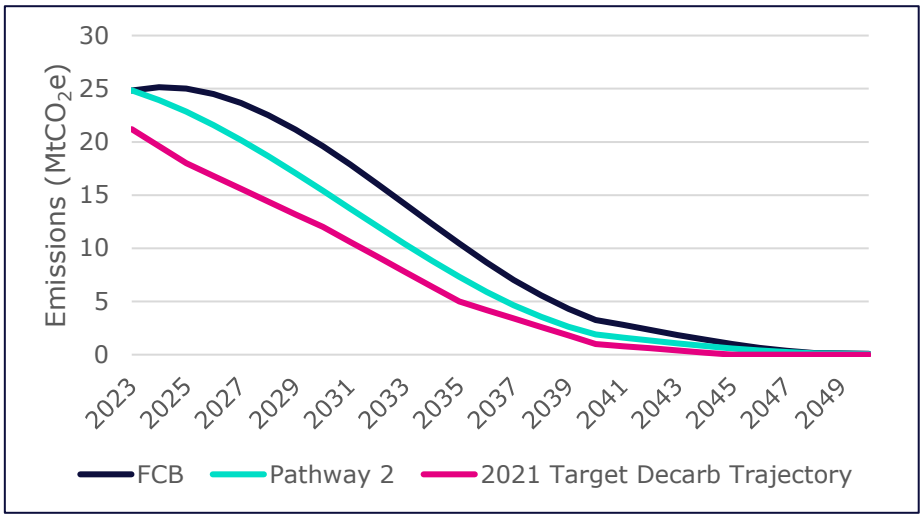

Figure 12: Pathway 2 against baseline and trajectory

4.5 Indicative Pathway 3 – Technology and Behavioural Change

Finally, we assessed a third pathway that combines ambitious technology uptake with action to support lower-carbon travel choices. This includes stronger uptake of ZEVs than currently Mandated (particularly for high-mileage users like fleets and taxis), alongside rapid HGV electrification and a modest reduction in car, van, and taxi mileage through improved access to sustainable alternatives. This blended approach delivers a closer match to the Decarbonisation Trajectory but still falls short.

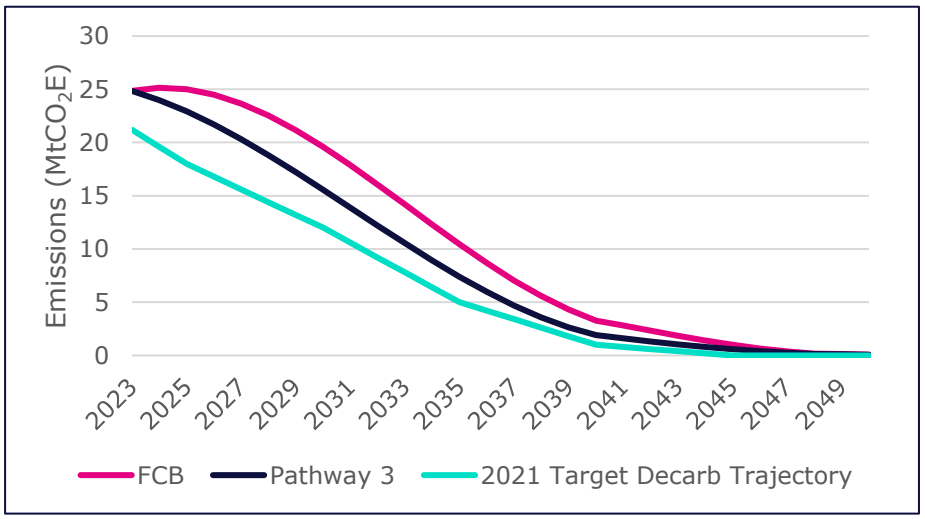

Figure 13: Pathway 3 against baseline and trajectory

Our modelling shows that staying on track with the carbon reductions set out in the 2021 Decarbonisation Strategy will now require a substantial acceleration in both the adoption of low-carbon technologies and the provision of viable alternatives to car use. Specifically, this would mean:

- More than doubling current ZEV car and van sales in the near term
- Ensuring faster uptake among high-mileage vehicles like taxis and fleets
- A step change in ZEV HGV sales to reach around 50% by 2030

- An immediate 5% reduction in road mileage from cars, taxis and vans, rising to 15% by the end of the decade.

While the North was broadly on track in terms of cumulative emissions up to 2023, meeting future carbon budgets will demand transformative change – not just in vehicles, but also in how we travel. In turn, this will require rapid, significant, and sustained investment in both our public transport and ZEV networks - at a scale that represents a significant step change from the past.

The scale of change required, also underlines the need to understand and mitigate any potential negative socio-economic impacts and ensure a just transition.

5. Next Steps

5.1 TfN's Role in Supporting Regional Decarbonisation

TfN can play a unique role as a regional convener, advocating for pan-regional infrastructure investment and policy priorities. Through our TfN Offer, we provide technical support, data and tools to our constituent authorities, facilitating their own plan making and business cases. Where asked for by our constituent authorities, TfN can amplify the collective voice of the North and support actions that enable a fair and prosperous transition to a decarbonised transport system.

Based on evidence and stakeholder engagement, we have identified key areas of focus where TfN can best complement and support local leadership and delivery:

Championing national policy alignment and investment

TfN advocates for national policies, funding, and regulatory frameworks that support the North's transport decarbonisation ambitions. This includes securing a step change in investment for sustainable transport infrastructure—such as rail upgrades and EV charging networks—and addressing barriers to private sector investment. TfN hosts a regional EV steering group and is developing enhanced data tools that incorporate energy and digital infrastructure to support a multi-system approach to EV charging delivery.

Coordinating regional collaboration and knowledge sharing

TfN facilitates collaboration across combined authorities, mayoral combined authorities, county combined authorities, businesses and stakeholders to share best practice, align strategies, and build capacity. This includes promoting data-sharing between transport providers and infrastructure operators—for example, freight data—to improve regional outcomes, and supporting pan-regional climate resilience forums to represent the North's transport interests in multi-sectoral adaptation planning.

Providing robust regional analysis and decision-making tools

TfN provides tools, data, and evidence to help constituent partners develop informed, place-sensitive decarbonisation strategies. Through the TfN Offer, we support local and combined authorities to align transport plans with carbon reduction targets, offering tailored data, bespoke carbon analysis, and 1-2-1 workshops shaped around local needs. We also develop and promote carbon tools to help partners maximise the value of regional evidence.

5.2 Monitoring and Evaluation

Monitoring and evaluating the effectiveness of our transport interventions and policies in reducing carbon emissions and enhancing social inclusion is essential to understanding what works, where, and why. Evaluation takes time, especially where

impacts may take years to emerge. However, long-term evidence is vital to guide future policies and support difficult decisions with confidence.

We are committed to understanding the impact of our work—both in advancing decarbonisation goals and supporting partners to meet theirs. Our Monitoring and Evaluation Framework (MEF) provides a consistent set of headline, core, and supplementary metrics to track progress. These also help us understand how the transition supports wider outcomes such as economic growth and social inclusion.

To ensure comprehensive monitoring, we've identified a small number of new metrics—particularly around travel behaviour and the zero-emission vehicle transition. These will be incorporated into the MEF in future updates, along with indicators to assess the quality and impact of our research.

References

Acosta, I.C., Ortega, M., Briceño, T. and Leiva, M.A. (2021) 'Public policies for sustainable transport in Chile: The role of the modal shift from cars to bicycles', *Ecological Economics*, 186, p.107066. Available at: https://www.sciencedirect.com/science/article/pii/S0921800921003943 (Accessed: 30 June 2025).

Auto Trader Insight (2025) *EV Hub*. Available at: https://www.autotraderinsight-blog.co.uk/ev-hub (Accessed: 30 June 2025).

Carbon.place (2025) *Carbon.place Legacy Webtool*. Available at: https://www.carbon.place/legacy/#8/51.482/-0.151 (Accessed: 22 May 2025).

Climate Change Committee (2025) *The Seventh Carbon Budget*. Available at: https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf (Accessed: 30 June 2025).

Department for Energy Security and Net Zero (2024) *UK Energy in Brief 2024*. Available at: https://assets.publishing.service.gov.uk/media/66a76bf2ce1fd0da7b592e5d/UK_Energy_in_Brief_2024.pdf (Accessed: 22 May 2025).

Department for Energy Security and Net Zero (DESNZ) (2023) *Powering Up Britain*. London: DESNZ. Available at: https://www.gov.uk/government/publications/powering-up-britain (Accessed: [insert date]).

Department for Transport (2024) *National Travel Survey: 2024*. Available at: https://www.gov.uk/government/statistics/national-travel-survey-2024 (Accessed: 29 August 2025).

Department for Transport (2025) *Average speed, delay and reliability of travel times (CGN)* [Statistical dataset]. Available at: https://www.gov.uk/government/statistical-data-sets/average-speed-delay-and-reliability-of-travel-times-cgn (Accessed: 30 June 2025).

Energy & Climate Intelligence Unit and CBI Economics (2023) *Mapping the Net Zero Economy*. Available at: https://ca1-eci.edcdn.com/Mapping-net-zero-economy-ECIU-CBI-DataCity-Jan2023.pdf?v=1675131416 (Accessed: 30 June 2025).

Fields in Trust (2024) *Green Space Index*. Available at: https://fieldsintrust.org/insights/green-space-index (Accessed: 30 June 2025).

Friends of the Earth (2023) *How Britain's bus services have drastically declined*. Available at: https://policy.friendsoftheearth.uk/print/pdf/node/314 (Accessed: 30 June 2025).

Gates, S., Gogescu, F., Grollman, C., Cooper, E. and Khambhaita, P. (2019) *Transport and Inequality: An Evidence Review for the Department for Transport*. London: NatCen Social Research. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/953951/Transport_and_inequality_report_document.pdf (Accessed: 22 May 2025).

INRIX (2024) *INRIX 2023 Global Traffic Scorecard: London most congested city in Europe; congestion costing the UK £7.5 billion*. Available at: https://inrix.com/press-releases/2023-global-traffic-scorecard-uk/ (Accessed: 22 May 2025).

Institute of the Motor Industry (2023) *Electric Evolution: Examining the Triumphs, Trials and Roadblocks of the UK's Electric Vehicle Aftermarket*. Available at: https://tide.theimi.org.uk/sites/default/files/2023-05/8766%20-%20IMI%20-%20OZEZ%20Report%20v2.pdf (Accessed: 22 May 2025).

National Grid ESO (2024) *Future Energy Scenarios 2024*. London: National Grid Electricity System Operator. Available at: https://www.nationalgrideso.com/future-energy/future-energy-scenarios (Accessed: [insert date]).

NimbleFins (no date) *How Much Can You Save with an All-Electric Car?* Available at: https://www.nimblefins.co.uk/how-much-save-electric-car (Accessed: 30 June 2025).

Northern Powerhouse Partnership (2024) *Net Zero by 2050: One Plan. Two Objectives. How green growth can build the Northern Powerhouse*. Available at: https://www.northernpowerhousepartnership.co.uk/wp-content/uploads/2024/10/FINAL-PROOFED-Net-Zero-Summary-Report.pdf (Accessed: 30 June 2025).

Office for National Statistics (2025) *The National Statistics Socio economic Classification (NS SEC)*. Available at: https://www.ons.gov.uk/methodology/classificationsandstandards/otherclassifications/thenationalstatisticssocioeconomicclassificationnssecrebasedonsoc2010 (Accessed: 30 June 2025).

Rail Freight Group (no date) *Rail Freight: The benefits of rail freight*. Available at: https://rfg.org.uk/rail-freight/ (Accessed: 30 June 2025).

Rail Partners (2023) *Freight Expectations: How rail freight can support Britain's economy and environment*. Available at: https://railpartners.co.uk/images/documents/Rail%20Partners%20-%20Freight%20Expectations%20-%20How%20rail%20freight%20can%20support%20Britains%20economy%20and%20environment.pdf (Accessed: 30 June 2025).

Sustainable Aviation (2020) *New research confirms UK potential to lead the world in sustainable aviation fuel production*. Available at: https://www.sustainableaviation.co.uk/news/new-research-confirms-uk-potential-to-lead-the-world-in-sustainable-aviation-fuel-production/ (Accessed: 30 June 2025).

Transport Scotland (2016) *Delivering Your Goods: Benefits of using Rail Freight*. Available at: https://www.transport.gov.scot/media/33630/transport-scotland-rail-freight-guide-web.pdf (Accessed: 30 June 2025).

Transport for the North (2021) *Transport Decarbonisation Strategy*. Available at: https://www.transportforthenorth.com/wp-content/uploads/TfN-Transport-Decarbonisation-Strategy-FINAL-TfNDEC2021_V2.pdf (Accessed: 30 June 2025).

Transport for the North (2023a) *Northern Powerhouse Independent Economic Review 2023: Summary Report*. Available at: https://transportforthenorth.com/wp-

content/uploads/NPIER-2023-Summary-Report-For-Final-Publication.pdf (Accessed: 30 June 2025).

Transport for the North (2023b) *Travel Choice Project Summary*. Available at: https://www.transportforthenorth.com/wp-content/uploads/TfN-Travel-Choice-Project-Summary-1.pdf (Accessed: 30 June 2025).

Transport for the North (2024) *Cost of Travel Choices: Project Summary Report (Project Ref. GB01T23G42)*. Commissioned by Transport for the North. Available at: https://transportforthenorth.com/wp-content/uploads/TfN-Travel-Choice-Project-Summary-1.pdf (Accessed: 30 June 2025).

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