Future Travel Scenarios

Adaptive planning to deliver our strategic vision in an uncertain future

December 2020

TRANSPORT FOR THE NORTH

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Foreword

At Transport for the North, our vison is of a thriving North of England, where world class transport supports sustainable economic growth, an excellent quality of life, and improved opportunities for all.

When we published our Strategic Transport Plan and Investment Programme in February 2019, we looked to 2050 and beyond; setting out the transport projects that should be prioritised in order to lay the foundations for transformational growth.

This was based on research, insight and experience, bringing together Northern political and business leaders to speak with one voice about our region's needs. The resulting blueprint and vision is clear; connectivity is not just about getting from A to B, but also about opening up opportunities for people and businesses.

Just over a year later, when the Covid-19 pandemic hit, that focus on not only the physical infrastructure of the transport network, but also the way we move and, more fundamentally, what we deem as important was brought to the fore. Overnight our travel patterns and behaviours changed, and although it is not yet clear which trends will remain or which will revert to pre-pandemic levels, it is clear that some existing trends have been accelerated.

This experience has reiterated the need to be brave when setting out our future plans and providing statutory advice to UK Government. We need to treat uncertainty as an opportunity, and approach it with the ambition and confidence we need to truly shape the future of our region.

We've developed our Future Travel Scenarios to do just that.

Our work to expose and explore future uncertainty has resulted in the generation of a rich diversity of insights, including broader assessment of the interactions between social, economic and environmental aspects which affect how we will travel in the future.

A narrow forecasting approach to travel demand and the assessment of interventions can no longer be the case. The scenarios we have developed provide a range of plausible futures that allow our plans for investment to be tested rigorously. This will enable us to maintain a coherent strategy and design effective investments to provide opportunities for all, protect the environment, and give businesses added confidence to invest.

The Future Travel Scenarios provide a launchpad for further work to strengthen our evidence base within Transport for the North. This is critical as we look to continue driving the delivery of a sustainable and inclusive transport network, be it through our Decarbonisation Strategy, Investment Programme, Northern Powerhouse Rail, Integrated and Smart Travel programme and other work activities. The Future Travel Scenarios also provide a building block to support future statutory advice and updates of our Strategic Transport Plan, as we use a strong evidence base for connectivity enhancements across the North of England to bring the most impactful benefits for our businesses and 15 million residents.

Barry White
Chief Executive

TRANSPORT FOR THE NORTH

“ Our work to expose and explore future uncertainty has resulted in the generation of a rich diversity of insights ”

1. Introduction

Executive summary

Scenario planning is used to explore uncertainty about the future, providing enhanced information and testing to improve the resilience of long-term plans. Transport for the North (TfN) has adopted this approach to help future-proof decision-making on the investment needed to deliver the vision set out in our Strategic Transport Plan (STP). Our new Future Travel Scenarios represent strategic factors that are external to our direct control and are used as 'reference case' scenarios to test the performance of different strategies and policies against our objectives.

Starting in summer 2019, TfN has been working with Local Transport Authority (LTA) and national delivery partners, as well as industry and academic advisors, to develop a new set of Future Travel Scenarios. These stakeholders have been involved throughout and have provided valuable expertise, intelligence and viewpoints, particularly regarding local strategies and priorities. The scenarios represent uncertainty across the following five external strategic factors:

- ⇒ Growth in the population and economy
- ⇒ Spatial planning policy and economic distribution
- ⇒ Technological advancement and uptake
- ⇒ Social and behavioural change
- ⇒ National policy on environment and sustainability

Our Future Travel Scenario Advisory Panel supplied 'Factor Technical Notes' to provide insights into the five key external strategic factors and their future uncertainties. Our Advisory Panel 'Theme Technical Notes' are provided as a separate annex to this report and can be found here: transportforthenorth.com/future-travel-scenarios/

The Future Travel Scenarios will be used by TfN in the following ways:

- ⇒ **Communicating our approach to uncertainty:** The first stage is to publish this report, which articulates the process of developing the scenarios, our understanding of key drivers of change and policy solutions, the implications for future travel patterns, and how the scenarios will be used to help TfN continue to develop our strategy in the face of an uncertain future.
- ⇒ **Use in TfN programmes:** The scenarios will be used to test and inform a range of plans under TfN's Investment Programme and are key to enhancing TfN's Analytical Framework to strengthen business case development. By assessing how interventions perform across a range of scenarios, we can develop transport policies and strategies that are robust, resilient, flexible and innovative.
- ⇒ **Refining the TfN and partner vision:** The Future Travel Scenarios represent a set of plausible futures with different outcomes for the North. The development and use of these scenarios help to inform a discussion with TfN partners on what a preferred set of outcomes should look like. Along with the other workstreams to deliver the Northern Transport Charter, the scenarios can be used to help establish a more detailed and holistic representation of this TfN vision.
- ⇒ **Improving understanding of policy interactions:** The scenarios include assumptions on key policy areas where TfN's influence is to some extent indirect, such as technology uptake and spatial planning. Scenario analysis provides a way for TfN to test the interactions between these policies and our transport strategy to identify synergies that contribute towards realising the overall vision. This analysis will provide new evidence on the local and national policies that complement TfN's strategy, and that TfN and partners should support.

Our Future Travel Scenarios

Summaries of the four Future Travel Scenarios (2050 end year) are shown in Figure 1 below.

Figure 1: Our Future Travel Scenarios

Just About Managing

This scenario sees a state of inertia, although this should not be taken as neutral. It sees a future where people do not alter their behaviours much from today, or give up certain luxuries, although there is a gradual continued trend towards virtual interaction. Economic growth continues at a moderate rate, but it is largely consumption-led and unequal, lacking agility and vulnerable to shocks. This scenario is led by markets, without much increase in political direction, with its biggest driver being economic.

Digitally Distributed

This scenario sees a future where digital and technological advances accelerate, transforming how we work, travel and live. In general, we embrace these technological changes and the move towards a distributed, service-based transport system. Long-term climate change targets are met, but there is slow progress in the short-term due to a general preference for individualised mobility over traditional public transport. This scenario is led by technology, with the biggest drivers being technical advances and a willingness to embrace mobility-as-a-service and shared mobility in the long-term.

Prioritised Places

This scenario sees a significant shift in political and economic direction to ensure that no place is left behind. Every area, including cities, towns and rural and coastal areas, has a bespoke local economic strategy, supported by investment in local assets, specialisms and economic and social infrastructure. Community, localism and place-making across the North is applied to build a sense of local identity to improve local economies. There is a focus on work-life balance and social equity within and between places. This scenario is led by a change in priorities, with its biggest driver being the push for a fairer redistribution of economic prosperity.

Urban Zero Carbon

This scenario sees a significant shift in public attitudes towards action on climate change, and strong national Government response to meet it. There is a boost to economic productivity to levels consistent with the NPIER, primarily through a combination of urban agglomeration and place-making. Transport users demand and embrace publicly available transit and active travel options, as there is a blurring of the line between ‘public’ and ‘private’ with increasing shared mobility systems online. This scenario is led by attitudes to climate action and urban place-making, with the biggest drivers being strong Government policy and trends of urban densification.

Who is this report for?

This report provides a comprehensive overview of the process undertaken by TfN to develop the new Future Travel Scenarios and sets out the planned use of the scenarios in the ongoing development of the STP and Investment Programme. The intention is to provide **transparency** over how evidence, stakeholder input and wider considerations have been used to shape the scenarios and to provide **clear guidance** for how they will be used in practice.

TfN would like to promote the use of the Future Travel Scenarios by partner organisations and the wider transport planning community in the North, and transparency and clear guidance are both critical to achieving this. This report is therefore aimed at transport planning practitioners and other technical audiences, within LTAs, Sub-national Transport Bodies (STBs), national Government and academia.

A shorter summary report is available at transportforthenorth.com/future-travel-scenarios to provide a wider audience with the key information required to understand the scenarios, the rationale behind them and how they will be used.

Structure of this report

The report is structured as follows:

- **Introduction** providing background and purpose, as well as setting out what travel currently looks like in the North, including changes following the global Covid-19 pandemic.
- **Scenarios** development and description explaining our approach and the scenarios developed.
- **Next steps** setting out how TfN will continue to apply and refine the scenarios to inform development of our strategy and Investment Programme.
- **Technical annexes** providing more information on aspects of our Future Travel Scenarios are available separately from https://transportforthenorth.com/future-travel-scenarios/. These include:
- Future Travel Scenarios - Future transport measures and solutions: Mapping the uptake or success of travel-related developments, policies and measures across our scenarios
- Future Travel Scenarios - Technical Annex: Describing the TfN modelling tools that have been used to provide quantitative representations of the Future Travel Scenarios
- Future Travel Scenarios - Advisory Panel Factor Technical Notes: Insights into the five key external strategic factors and their future uncertainties

About Transport for the North

TfN has a unique arrangement bringing the North's LTAs, Local Enterprise Partnerships (LEPs), Network Rail, Highways England, HS2 Ltd, and central Government together. As a partnership, we have the shared aim to transform the Northern economy. We enable the North to speak with one voice on the transport infrastructure investment needed to drive transformational growth and rebalance the UK economy.

We published our STP and Investment Programme in February 2019. The STP set out TfN's vision of "a thriving North of England, where world class transport supports sustainable economic growth, excellent quality of life and improved opportunities for all". Supporting this vision are four pan-Northern transport objectives, which shape TfN's work programmes:

- Transforming economic performance
- Increasing efficiency, reliability, integration, and resilience in the transport system
- Improving inclusivity, health, and access to opportunities for all
- Promoting and enhancing the built, historic, and natural environment

TfN's STP is underpinned by the Northern Powerhouse Independent Economic Review (NPIER). This provides a detailed understanding of the prosperity and productivity gap that exists between the North of England and the rest of the UK, and a high-level assessment of the potential contribution of improved transport connectivity to narrowing that gap. A key output of the NPIER was a 'transformational' future scenario in which the North experiences higher levels of population, employment and productivity growth relative to 'business as usual', as part of the UK Government's levelling up agenda.

Figure 2: Transport for the North's vision and objectives

Vision

A thriving North of England, where world class transport supports sustainable economic growth, excellent quality of life and improved opportunities for all.

Increasing efficiency, reliability, integration, and resilience in the transport system

The North's transport networks and connections must meet the needs of both people and freight, whether they are residents, businesses or visitors. The network must adapt to changing demands, such as shifting commuter patterns, changing leisure aspirations, more extreme weather conditions as a result of climate change, and the emergence of new technologies.

Integration across sustainable regional networks and local networks is vital, providing multi-modal options and supporting modal shift to provide more travel choice for the user.

Transforming economic performance

Investment in transport can lay the foundations for a transformed Northern Economy and deliver the Government's levelling up agenda. Enhanced connectivity between the important urban and rural economic centres and assets of the North can deliver agglomeration and productivity opportunities identified in the Northern Powerhouse Independent Economic Review, balancing our economy and create a prosperous and sustainable future.

To combat the economic shockwave of COVID-19, it's essential we build back better. It is also vital to connect the North to the world's most important economic markets to enhance trade, tourism and inward investment through international gateways.

Improving inclusivity, health, and access to opportunities for all

The Strategic Transport Plan must work for everyone who lives and works in the North. Economic growth in the North should be as inclusive as possible, avoiding transport poverty and limits to access opportunities in communities. This includes better access to employment, health, social activities and education, regardless of an individual's age, income level, location and mobility. Promoting active and sustainable travel will improve people's health, reduce air pollution and improve the environment.

A carefully co-ordinated approach is required to ensure strategic and local transport investment programmes and policies are aligned and complementary.

Promoting and enhancing the built, historic, and natural environment

TfN's Board is committed to delivering near-term actions in support of a collective, robust, and comprehensive response to achieving zero carbon transport.

Sustainable travel choices are key to ensure the movement of people and goods sees a reduction in air pollutant and carbon emissions and makes best use of existing transport infrastructure before investing in new capacity. New infrastructure should be designed to minimise the negative impacts on the natural, historic and built environment, including biodiversity, and results in net environmental gains where possible. Through collaboration with TfN's Partners, stakeholders and communities, TfN will promote access to the natural and green environment will also promote physical and mental health.

About Transport for the North

Figure 3: A summary of Transport for the North's Strategic Transport Plan

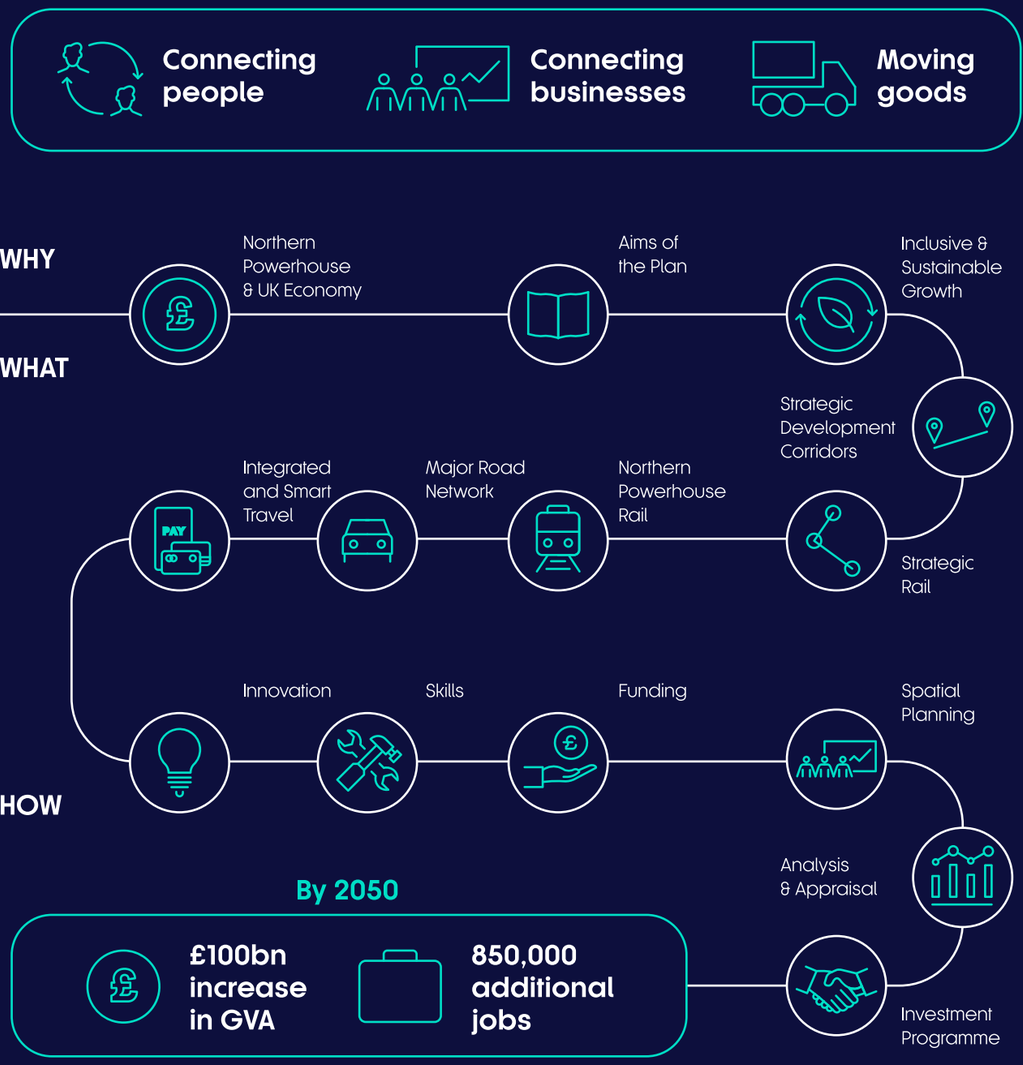


Figure 4: TfN Future Travel Scenarios participating organisations

Overview and insight from Glenn Lyons

Even before the pandemic during 2020, the effects of the digital age colliding and merging with the motor age over the last two decades were becoming apparent in our daily lives. Long-run trends of relevance to travel and transport have been changing (in the UK and other countries). Technology-based innovations are a source of ongoing potential disruption and change. Now underscored by Covid-19 and its effects, there is deep uncertainty regarding what the future has in store. There is also recognition of considering what it should have in store if we have a chance to shape it – the so-called 'new normal'.

The uncertainty is such that our traditional forecast-led approach in transport planning that has prevailed over past decades, now falls short in providing the sort of guidance to decision makers that they are entitled to expect in considering policy and investment decisions. 'Predict and provide' reflects demand-led supply - predict future demand for travel and provide appropriate transport supply to meet that demand. Yet in the face of deep uncertainty, future demand cannot be predicted with much confidence. In turn it becomes more challenging to understand what constitutes a resilient strategy and sound investment.

There is a growing realisation that an alternative or evolved approach to transport planning is called for. Uncertainty can be turned into an opportunity to shape the future, to the extent any one body - such as TfN and its partners - can. Early work by the New Zealand Ministry of Transport in 2014[1] called this new approach 'decide and provide' - decide upon a preferred future and provide the means to help move towards that future. This also underlined that transport forms part of a wider picture of how we access things we need (people, goods, services and opportunities) to support economic prosperity and social wellbeing in society. Land-use (spatial proximity) and, increasingly, digital connectivity also play a big part. They combine to provide us with resilience and adaptability – as has been exemplified in societal response to the pandemic.

A major example of decide and provide concerns decarbonisation: the UK Government has decided that the economy must have net zero carbon emissions by 2050 and the challenge is now determining a resilient strategy that provides a means of getting there. Transport Scotland recently employed decide and provide in developing its revised National Transport Strategy[2]. It is therefore fitting that TfN is also embracing this with its partners.

The approach involves two important elements: being vision-led; and accommodating uncertainty. It can be summarised as follows:

1. Determine a preferred future – a vision with associated outcomes that is desirable and achievable.

2. Develop a series of plausible future scenarios that helps expose the uncertain context ahead within which efforts to achieve the preferred future will play out.

3. Establish and prioritise options for helping move towards the preferred future.

[1]Lyons, G. and Davidson, C. (2016). Guidance for transport planning and policymaking in the face of an uncertain future. *Transportation Research Part A: Policy and Practice*, 88, 104-116. http://dx.doi.org/10.1016/j.tra.2016.03.012 See also https://www.transport.govt.nz/area-of-interest/strategy-and-direction/strategic-policy-projects/#stageaccordionitem-412

[2]Lyons, G., Cragg, S. and Neil, M. (2018). Embracing uncertainty and shaping transport for Scotland's future. *Proc. European Transport Conference*, Dublin, 10-12 October. https://aetransport.org/en-gb/past-etc-papers/conference-papers-2018?abstractId=5915&state=b See also https://www.transport.gov.scot/media/45142/scenario-planning-process-report.pdf

4. Test how those options perform in each of the plausible scenarios – are they effective in all scenarios (resilience) or are they ineffective (or less effective) in some scenarios (risk)?

5. Compose a strategy for vision realisation that accounts for, with the selected options included, the uncertainty that has been explored.

This approach aligns with the Futures Toolkit available from the Government Office for Science[3]. Public domain resources are also freely available specific to the transport sector[4] and the Department for Transport is addressing such approaches to handling uncertainty - including the application of common analytical scenarios in appraisal of transport schemes - as part of its Appraisal and Modelling Strategy[5].

Addressing an uncertain future, with imperatives to shape a better future socially, economically and environmentally, is far from easy. It is uncomfortable, and this has only been amplified by the pandemic and the heightened urgency over the need to tackle climate change. Problems and opportunities are multi-faceted, with varied needs and expectations from different stakeholders. In this respect, TfN faces a particularly challenging remit as a statutory STB, charged with making the case for strategic transport improvements for the North of England. It must balance the priorities of multiple partners within the region, as well as accounting for national stakeholders' perspectives. It must work with all stakeholders to help chart a course through the uncertainty ahead towards mutually acceptable outcomes. That course cannot treat transport in a vacuum but must understand and influence how the land-use, telecommunications and transport systems are together changing over time.

With its unique set of circumstances as outlined above, TfN joins other transport authorities in taking bold but necessary steps to address strategic planning in a way that meets the demands of the times we live in. The Future Travel Scenarios developed by TfN as part of a decide and provide approach create an enabling resource to better understand the challenges and opportunities ahead, improve decision-making resilience, and better inform the case for investment.

[3]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/674209/futures-toolkit-edition-1.pdf
[4]E.g. http://www.mottmac.com/futures
[5]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/795924/appraisal-and-modelling-strategy.pdf

Future Travel Scenarios Advisory Panel

TfN worked with expert independent advisors to support the in-house development of our new Future Travel Scenarios. This included scenario planning expertise to guide the development and an Advisory Panel which provided evidence, challenge and critique to TfN and partners across the key themes explored. This evidence is captured throughout this report, and also in our five 'Theme Technical Notes' which set out the important trends and drivers of change in each area. TfN has published these annexes alongside this report.

Jon Peters, Head of Infrastructure, Steer
Scenario planning expert

Jon Peters is the Head of Infrastructure at Steer where for the past 16 years he has helped clients realise their goals in the funding, financing and competitive bidding for transport infrastructure in both the public and private sectors internationally, advising project sponsors, investors, lenders and grantors in successful transactions/funding bids. He is an experienced Futures Practitioner and led the recent scenario development work undertaken by TfN to explore long-term uncertainty in transport demand.

Professor Glenn Lyons, Mott MacDonald Professor of Future Mobility at the University of the West of England, Bristol
Scenario planning expert

Taking a socio-technical perspective in understanding how the digital age has collided and is merging with the motor age, Glenn has engaged in transport futures and scenario planning for 20 years. From directing the Transport Visions Network at the turn of the millennium, he was more recently seconded to the New Zealand Ministry of Transport where, as Strategy Director, he led a national project examining the uncertain future of demand for car travel. This became the foundational work for a new vision-led approach to transport planning for an uncertain world called 'decide and provide'. In his current role, Glenn is working across academia and consultancy to help transport authorities embrace the challenges and opportunities in planning for the future of mobility. He is a former Trustee of the Chartered Institution of Highways & Transportation and is a member of the Department for Transport's Joint Analysis Development Panel.

Professor Greg Marsden PhD
Theme advisor 1 - Local and national transport sustainability

Greg is Professor of Transport Governance at the Institute for Transport Studies at the University of Leeds. He has researched issues surrounding the design and implementation of new policies for over 20 years covering a range of issues. He is an expert in climate and energy policy in the transport sector and is the Transport Decarbonisation Champion for the Engineering and Physical Sciences Research Council. He is the Principal Investigator on the DecarboN8 network where he is responsible for integrating a new place-based approach to decarbonising transport. Greg co-chairs the Commission on Travel Demand which has published influential studies on travel demand and shared mobility. He is the Secretary General of the World Conference on Transport Research Society and the Chair of the Special Interest Group on Governance. He has served as an advisor to the House of Commons Transport Select Committee and regularly advises local, national and international governments.

Charlene Rohr, Senior Research Leader, RAND Europe
Theme advisor 2 – Social and behavioural change

Charlene is a Senior Research Leader at RAND Europe and is the Co-Director of RAND Europe's Centre for Futures and Foresight studies. She has substantial expertise in developing and using future scenarios to assess policy interventions and has contributed to studies using these methods for the DfT, Innovate UK and others. More broadly, she has led two evidence reviews for the DfT to identify factors influencing car travel demand in Britain. She also has more than 25 years of experience in developing discrete choice models to understand and predict travel demand and to quantify the impact of policy and investment and has been involved in the development of large-scale travel demand models for urban, regional and national geographies (in the UK, Scandinavia, Europe and Australia). She is an advisor to the Joint Analysis Development Panel of the DfT providing advice on appraisal, modelling and evaluation methods and was the former chair of the Applied Methods Committee for the European Transport Conference.

Keith Mitchell, Regional Director (UK): Infrastructure, Stantec UK
Theme advisor 3 – Spatial Planning Policy

Keith's professional experience encompasses a range of national infrastructure and planning projects and growth strategy projects in the UK, Europe and Australia. He was elected as Chairman of Peter Brett Associates in 2010 before PBA joined forces with Stantec in 2018. He has also acted as Chairman of the Transport Planning Society in 2001, the Transport Planning Skills Initiative between 2002 and 2004, the TPP Professional Standards Committee between 2008 and 2010, and was Board Chairman of the National Infrastructure Planning Association from 2010 until 2015. Keith has led the National Infrastructure Planning Association Insights research programme focused on effective delivery of major infrastructure, worked with the British Property Federation and Revo to identify a new approach to reinvigorating town centres; worked with Highways England on their drafting of Planning for the Future; worked with the Chartered Institute of Highways and Transportation to develop its Better Planning, Better Transport, Better Places Guidance, and with the Royal Town Planning Institute on developing a Spatial Planning Framework for the North of England, 'Ambitions for the North', forming part of the work relating to the Great North Plan.

Richard Holt, Head of Global Cities Research, Oxford Economics
Theme advisor 4 – Economic outcomes

Richard is Head of Global Cities Research, with responsibility for developing Oxford Economics' in-depth knowledge of city and regional economies, globally. Richard leads major assignments for private and public sector clients, as well as contributing to regular forecasting publications. He is a frequent conference speaker, and was the 2020 winner of the Society of Professional Economists' prestigious Rybczynski Prize for the previous year's best piece of writing on economics 'How Robots Change the World: Their Impact on Regional Inequalities'. He is an independent director of Without Walls, an Arts Council England-funded company which supports outdoor arts festivals, and a trustee of the Royal Institute of Chartered Surveyors Research Trust.

Giles Perkins, Head of Future Mobility, WSP
Theme advisor 5 - Technological change and advancement

Giles leads WSP's Future Mobility team in the UK and has over 30 years' experience in the transportation planning and intelligent transport sectors. He has worked in the public and private sectors as a senior client and director-level consultant and has led major projects across all modes. He has a detailed understanding of the strategic needs and opportunities surrounding the transport challenges that face our networks, regions, towns and cities. As a recognised expert in the field of future mobility, access and transport his insight is helping to build 'future ready' thinking into strategies, policies, business cases, plans and asset specifications.

Glossary

Transport for the North (TfN) – TfN is England's first Sub-national Transport Body, formed to transform the transport system across the North of England, providing the infrastructure needed to drive economic growth.

Sub-national Transport Body (STB) - STBs are transport governance organisations set up to ensure that funding and strategic decisions are informed by local knowledge, expertise and need. The ability to create STBs to plan and prioritise long-term infrastructure investment in a specific region was created by Parliament with an amendment to the Local Transport Act, passed in January 2016.

TfN Board - Our Board is made up of a mix of representatives from the public and private sectors, Rail North authorities from outside of the TfN area, and our delivery partners, with John Cridland (former Director-General, CBI) as independent Chairman.

TfN Local Transport Authority (LTA) partners – LTAs manage and invest in local transport networks within economic clusters, such as roads, cycling, walking, and buses, and in some cases light rail. TfN complements the work of existing LTAs with powers that are devolved down from central Government rather than up from local Government to add value, ensuring that funding and strategic decisions about transport in the North are informed by local knowledge, expertise and requirements.

TfN delivery partners - Alongside our Northern local political leaders, our Board also has representatives from the national delivery partners (Network Rail, Highways England and HS2 Ltd) and works closely with national UK Government and our neighbours in Wales, Scotland and the Midlands.

Northern Powerhouse Independent Economic Review (NPIER) - This provides a detailed understanding of the prosperity and productivity gap that exists between the North of England and the rest of the UK, and a high-level assessment of the potential contribution of improved transport connectivity to narrowing that gap. A key output of the NPIER was a 'transformational' future scenario in which the North experiences higher levels of population, employment and productivity growth relative to 'business as usual'.

Strategic Transport Plan (STP) – TfN's STP, published in February 2019, outlines how strategic investment in transport could unlock inclusive and sustainable transformative economic growth. The accompanying Investment Programme identified the transport projects which should be funded to deliver this step-change.

Northern Transport Charter (NTC) – The NTC sets out TfN's ambitions for our future, all of which are essential if we are to realise the ambitions of the STP and realise devolved decision-making and funding.

TfN Investment Programme – This outlines a pipeline of multi-modal transport interventions to better connect the whole of the North, with a short, medium and long-term plan for investment.

Northern Powerhouse Rail (NPR) - NPR is a major strategic rail programme, specifically designed to support the transformation of the North's economy by providing effective and efficient rail connectivity between the North's main centres, offering a faster and more frequent service across the entire region.

Integrated and Smart Travel (IST) – TfN's IST programme will transform the passenger experience now and in the future by working in mutually beneficial partnerships with public transport operators, local authorities and digital innovators.

Decarbonisation Pathways - TfN's Decarbonisation Pathways will be designed to show what policies and measures are likely to be required to achieve TfN's target of a zero-emission transport system before 2050. A report on the Pathways is being developed for publication in Spring 2021.

Strategic external factors – Based on a review of the STP, we have identified five strategic factors that are likely to influence the scale and shape of future travel demand in the North, to be used to structure this Future Travel Scenarios.

Drivers of change – These are underlying trends or potential changes in policy that both have a significant impact on travel demand and are often subject to uncertainty. Drivers of change are categorised into the five overarching strategic factors.

External and internal drivers of change – Some drivers of change are directly influenced by TfN's policies and strategies, particularly regional transport infrastructure. These are referred to as 'internal' drivers of change. 'External' drivers are instruments of change outside of TfN's direct sphere of influence, for example fuel prices, rail fares or global progress in advancement of autonomous vehicle technology.

Exogenous change – Similar to an external driver of change, this is a factor or driver which, for the purposes of our Future Travel Scenarios, originates, or is caused by something, from outside of TfN.

External policies – These are a specific category of external driver of change, mainly focused on national policies over which TfN has limited influence, such as the level of fuel duty. This also includes local non-transport policies and, to an extent, local transport policies within the North, given that they are subject to uncertain future levels of central funding and/or devolution.

TfN transport strategies – These are transport interventions, such as infrastructure investments or ticketing policies, that TfN will test the performance of in each of the Future Travel Scenarios. These are the 'internal' drivers of change which are managed separately to the Future Travel Scenarios at the time of production. Later elements of TfN work will combine these to support our statutory advice and delivery of work programmes.

Policy or transport measure change – A course or principle of action adopted or proposed by an organisation or individual. In the case of our Future Travel Scenarios, this may be local or national Government change.

Transport solutions – These are modes of transport, infrastructure, transport service business models and technologies that could change the way we travel in future. This includes a range of options, from walking to autonomous taxis. These can either be external or internal, depending on how much influence TfN has over policies to promote a particular solution.

TfN Future Scenario Framework – The Future Scenario Framework refers to the way TfN intends to use its Future Travel Scenarios within its decision-making processes, alongside other decision support frameworks. It is intended to ensure that Future Travel Scenarios are integral to making decisions and not an after-thought.

TfN Analytical Framework - TfN has been developing the Analytical Framework, a new suite of software tools that provides a consistent approach to data, modelling and appraisal across travel modes and regions of the North. The Analytical Framework can represent both Future Travel Scenarios and transport strategies and provides quantitative data on performance metrics to allow a comparative appraisal.

Northern Economy and Land-Use Model (NELUM) - NELUM is a Land-Use Transport Interaction (LUTI) model developed by Steer for TfN. NELUM's primary purpose is to test how investment in transport, sometimes coupled with changes to land-use policy, could affect the economy of the North of England and the UK as a whole.

2. Why take a future scenarios approach?

Why has TfN used Future Travel Scenarios?

The world continues to change and with new signals and insights comes a need to review and interpret future uncertainty. Since our first future scenarios were published in 2017, TfN has developed and published the STP, built our Analytical Framework, and undertaken more detailed policy and scheme development, particularly for NPR and our Investment Programme. To fully capture aspects in these developments, and keep pace with an ever-changing landscape, we have revisited our assessment of future uncertainty to ensure our policymaking and statutory advice is based on the latest evidence and accounts for a more sophisticated range of future uncertainties that are key to realising our vision of a thriving North of England.

Our STP highlighted a wide range of factors that might affect how we travel (or not travel) in the future, and this Future Travel Scenarios full report (and the accompanying summary) build on our initial work on travel scenarios. The new scenarios apply a broader consideration of the economic, environmental and social uncertainties which will affect people's travel decisions, combining TfN's powerful analytical tools with expert user insight in a sophisticated and in-depth analytical programme. Together, TfN and our partners have collaboratively explored, challenged and stretched our considerations to build a comprehensive understanding of future uncertainty; its impact on the future travel patterns of people, business and goods; and the actions we might take to accommodate this in pursuit of our vision.

The purpose and approach of these refreshed 2020 travel scenarios is also different from that of our previous 2017 travel scenarios, which were designed to illustrate the potential scale of travel demand in a future transformed North of England, including the impact of the infrastructure investments set out in the STP. These new scenarios are designed to understand future trends before TfN intervention. This places a greater focus on external change drivers – those things outside TfN's direct influence, to help accommodate a wide range of uncertainty in the planning of our Investment Programme. Our refreshed 2020 scenarios are therefore not directly comparable with the 2017 scenarios, but share the same core foundations of the NPIER and STP.

What will they allow us to do and what are the benefits?

To communicate our approach to future uncertainty

Our aim is to develop a robust and evidence-based means by which the impacts of potential transport and land-use policies, measures or actions in the North can be gauged within the context of various plausible futures. There are a broad range of influences and trends affecting current and future transport in the North of England. Scenarios are not predictions. They are not in themselves intended to represent 'good' or 'bad' future worlds, but they should help us challenge and stretch thinking to develop a more comprehensive understanding of future uncertainty, with the aim of developing resilient strategies that move us towards our shared vision for the region.

Our intention is to use the scenarios as a constructive mechanism to test and refine our transport strategies; provide a vehicle for discussion to influence and inform the future of transport debate; and design transport interventions that can deliver on a broad range of objectives in different futures.

Improve the shared understanding of policy interactions

Future transport will likely be shaped through a combination of changes which remain to some extent uncertain. These include global socio-cultural trends, future national, regional and local policies, changes to regulations, new technologies, new mobility solutions and changes in behaviours. Transport is also likely to increasingly require interaction and integration with energy generation and supply, digital connectivity, housing infrastructure and associated land-use planning.

The right combination of investment in infrastructure, future policy, regulation and support for beneficial changes in behaviour, and adoption of new technologies, will be critical to realising our vision for the North of England as a whole. To inform our strategic planning, we have applied these strategic factors within the scope of our Future Travel Scenarios to test the interactions between these policies and our transport strategies and provide new evidence on the local and national policies that complement TfN's strategy, and that TfN and partners should support.

Our scenarios will help enable an evidence-based approach to strategy and policy development, helping policy makers navigate both the risks and opportunities these uncertainties pose to meeting our vision for sustainable economic growth, excellent quality of life, and improved opportunities for all. An example of this is our advice provided in response to UK Government's call for evidence on Future Transport[6].

[6] https://transportforthenorth.com/wp-content/uploads/TfN-response-to-Future-of-Transport-call-for-evidence.pdf

Application to TfN programmes

Our Future Travel Scenarios will deliver a direct connection from future thought leadership and foresight to strategic planning and project delivery. Our Future Travel Scenarios enable us to establish estimates of travel demand associated with particular future states, which we can then apply within TfN's Analytical Framework. To allow this, our Future Travel Scenarios represent plausible futures for travel demand in the North - before any TfN transport interventions and connectivity enhancements are introduced. This allows us to assess the performance of different TfN transport strategies (policies, programmes and projects), as well as identifying other actions we should support, to achieve our vision.

Through doing this we can better understand the adaptability and resilience of our strategy and Investment Programme, and use that insight to support policy decisions, business case development, and the choice of transport investment. By assessing which interventions perform best in a range of scenarios, we can develop transport policies and strategies that are robust, resilient, flexible and innovative.

The 'How will we use our scenarios' section of this report provides more detail on how the Future Travel Scenarios will be applied to our programmes at TfN.

Refining our collective vision for the North

The TfN Board approved a draft NTC which sets a future direction for TfN and our ambitions. One of these ambitions, 'championing an inclusive and sustainable growth', includes further developing TfN's appraisal system to target investments which balance transformational economic growth with environmental and social outcomes. The Future Travel Scenarios will help us explore how different external factors will affect our ability to realise those outcomes and will also help us to refine our strategic objectives in line with these outcomes.

TfN and LTA engagement with individuals, transport users and communities will be fundamental in informing our Investment Programme and implementing any integrated future policies or strategies. The future of the North's transport network will be shaped by a range of strategic factors outside the control of any single organisation, including TfN.

Exploring the interaction between the scenarios and TfN strategies will help us understand what kind of transport network is likely to support realisation of our objectives, aiding development of both our Investment Programme and our wider policy positions used to influence local and national policy in a direction that supports our vision. As such, the work on our Future Travel Scenarios provides additional evidence and is an important building block in providing robust statutory advice and updates to our STP.

What does scenario planning enable us to do?

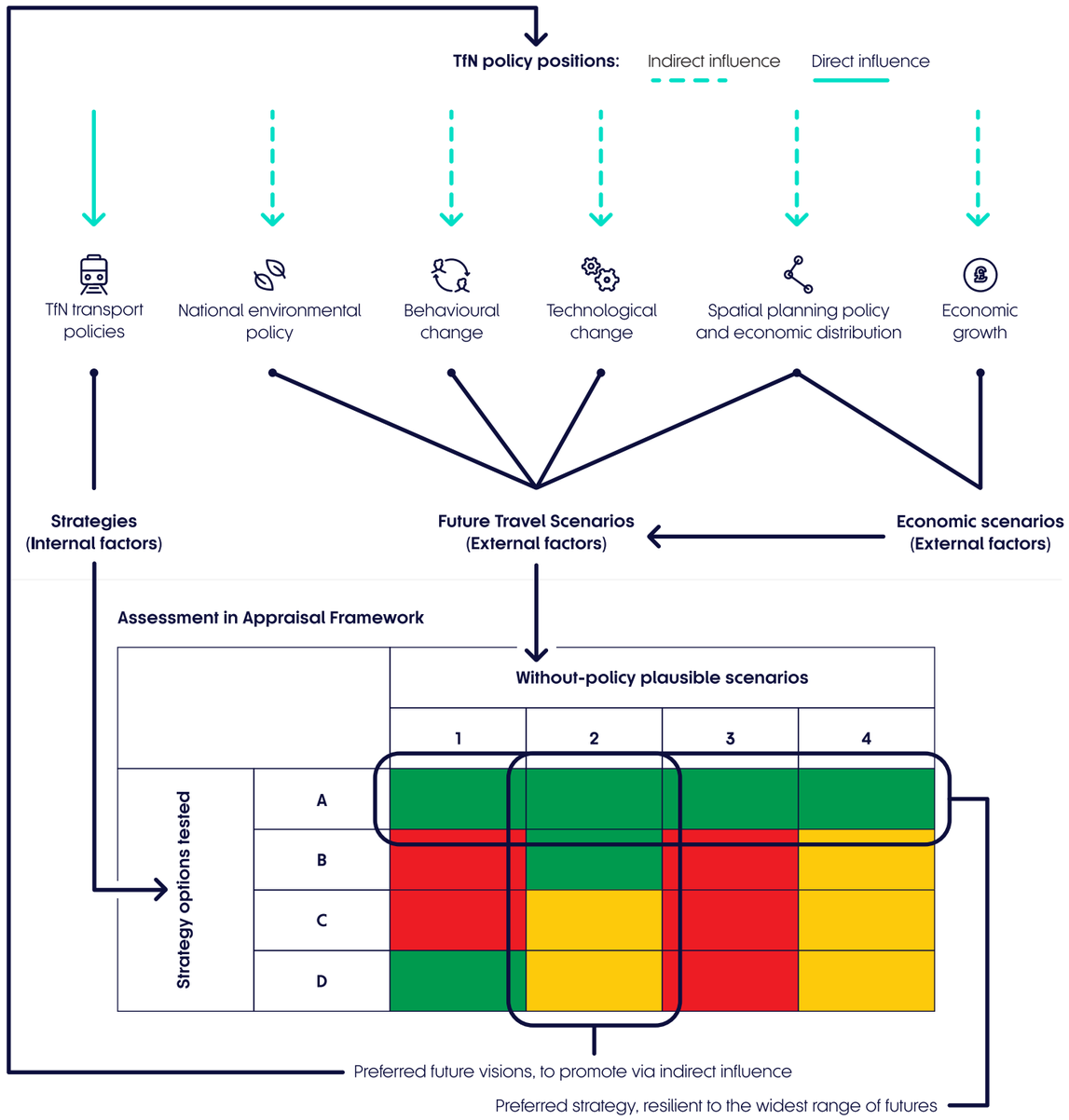
Scenario planning is a technique to expose and explore uncertainty about the future to help improve decision-making resilience as part of a vision-led strategic planning approach. TfN has adopted this approach to help future-proof decision-making and to help to establish a more detailed and holistic representation of TfN's vision. TfN's new Future Travel Scenarios represent strategic factors that are external to TfN's direct control and are used as 'reference case' scenarios to test different TfN strategies and policies in terms of their performance against objectives.

Figure 5 illustrates how our scenario analysis cycle can help us to identify which non-TfN policies have the most positive synergies with our transport strategies. Within the 'Assessment in Appraisal Framework' box, green represents a series of outcomes closely aligned to TfN's objectives, amber less so, and red indicates a misalignment with the objectives. In this illustration, 'Strategy A' represents the preferred intervention as it performs best in a range of scenarios. In addition, we can see that 'Scenario 2' also has the most positive outcomes and is therefore likely to include non-TfN policies that TfN should promote through its indirect influence with national and local stakeholders.

In exploring economic, social and environmental interdependences, our approach is aligned to the National Planning Policy Framework and ensures our strategies recognise and address interdependencies with non-transport sectors. There is an important balance to be achieved between improving the North's economic performance (which may entail regional increases in certain types of travel), ensuring that transport becomes increasingly sustainable in line with meeting carbon reduction targets, whilst supporting improvements in inclusivity and prosperity.

[7]See the 'How will we use our scenarios' section of this report provides more detail on how our Future Travel Scenarios will be applied to TfN programmes.

Figure 5: TfN's Future Travel Scenario Framework Cycle[7]



How do our regional scenarios fit with other UK national and local policies?

We have developed our scenarios with the aim of delivering a credible and lasting framework for considering uncertainty, which is supported by TfN, LTAs across the North, our delivery partners (Highways England and Network Rail) and UK Government. These scenarios are a product of this collaboration and sharing of diverse views, providing a collective understanding of potential future trends and informing delivery of transport policy at a local, regional and national level. In doing so TfN has opted to develop scenarios for the North of England to ensure we capture a regional approach and the drivers of change that Northern leaders see as having a significant impact on delivery of our vision.

In doing so, we have treated the direction of national policy as a key source of future uncertainty at local and regional level. Our approach enables us to better represent the drivers of change seen as most important to our Northern partners, ensuring the scenario assessment and application is of relevance to, and 'speaks for' the North. UK Government has also been developing travel scenarios, to allow scheme promoters to present the sensitivity of scheme performance to several common key drivers of change. This enables a direct comparison of evidence between schemes to aid decision-making. TfN is working with UK Government to ensure our approach to using scenarios meets their requirements. The 'How will TfN use our scenarios' section of this report outlines how we plan to align and reconcile TfN's scenarios with the national scenarios, to support a better approach to scheme development and decision-making.

Providing transparency and gathering feedback

The Future Travel Scenarios have been developed collaboratively by TfN, partners and other stakeholders, which has helped to deepen our collective understanding of the potential dynamics of change in the North. To support this understanding, we have published an interactive online data dashboard, including maps and charts that allow detailed exploration of each future world and comparison of broad outcomes across the four scenarios. The intention is that this tool provides a richer representation of the scenarios than is possible from a static report and allows interested stakeholders to feedback on the plausibility of the scenarios to enable TfN to continue to refine them. The tool can be accessed at: transportforthenorth.com//future-travel-scenarios/

Collaborative engagement has been at the heart of our STP and this scenario development process, and we will continue to gather structured stakeholder feedback on the Future Travel Scenarios through planned activities to inform future rounds of scenario development. We are also happy to receive feedback via engagement@transportforthenorth.com

3. How has TfN developed the scenarios?

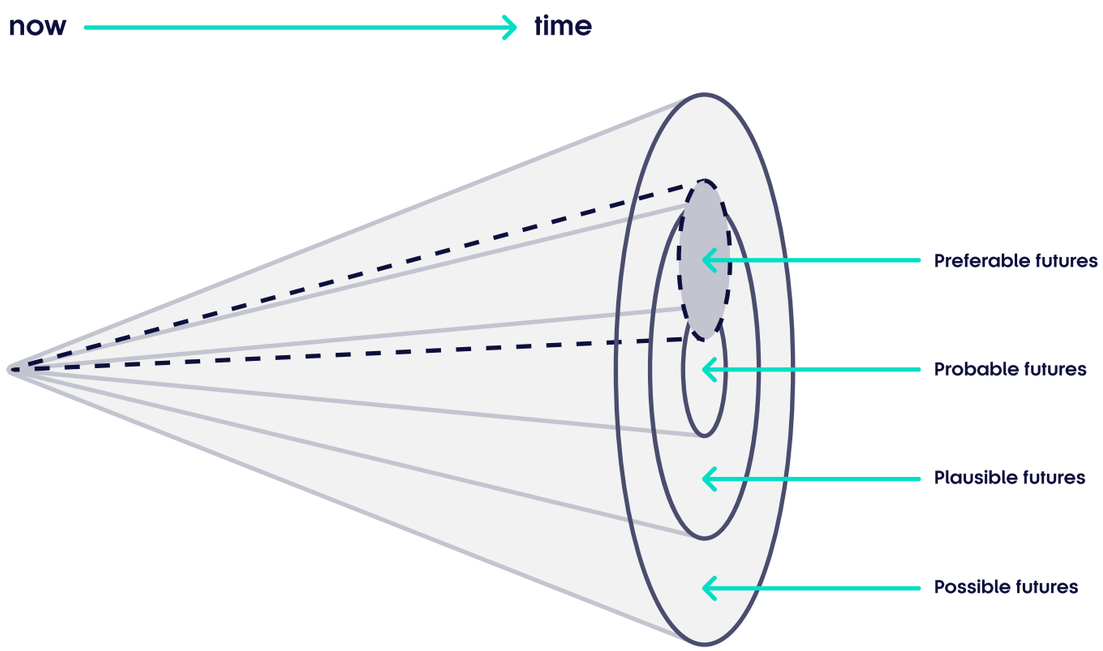
The guiding principles for our scenarios

i. Scenarios should be plausible and coherent, but also challenge the status quo: As we are uncertain about the future it would not be prudent to focus attention on a presumed 'probable' future; meanwhile entertaining 'possible' futures may seem too extreme. Focusing upon plausible futures allows uncertainty to be embraced in a balanced way.

We have opted to develop scenarios that depict coherent plausible worlds, in which the multiple drivers of change are interconnected by underlying trends, rather than worlds in which only a single factor differs from the perceived 'business as usual' scenario. Our scenarios are intended to challenge the status quo, to 'stress test' the development and evaluation of TfN strategies. The plausibility of our scenarios has been tested with expert advisors and TfN partners and stakeholders.

A summary of the approach[8] is shown in Figure 6.

Figure 6: The cone of future uncertainty



[8]For further detail on this approach see - https://www.linkedin.com/pulse/handling-uncertainty-transport-planning-decision-making-glenn-lyons/

ii. Variation in outcomes: Scenarios should be sufficiently different from one another to reflect the 'uncertainty space' of relevance to TfN. If scenarios are too similar, they will not provide a key function of stress-testing interventions against significantly different future contexts.

iii. Scenarios are 'before TfN intervention': Our scenarios offer a means to foresee problems, challenges and opportunities which can then be addressed through policy action and intervention.

We have intentionally developed alternative worlds which go beyond the typical transport sector, to assess a broad range of drivers of change, which in some cases are beyond TfN's direct influence. We will test our transport strategies against these to understand how they impact and help towards meeting our Northern vision.

We do not comment on costs and feasibility of schemes identified within TfN's Investment Programme as part of this work.

iv. Illustration of trade-offs: Realising a vision involves maximising a range of often competing objectives, e.g. maximising economic growth, maximising inclusivity and minimising carbon. Scenario analysis is one way of highlighting the trade-offs that external forces may drive between such competing objectives and allow the development of strategies that successfully balance these trade-offs.

Probable futures – Easiest to see and define. Extrapolation from current trends (thereby may be perceived as probable).

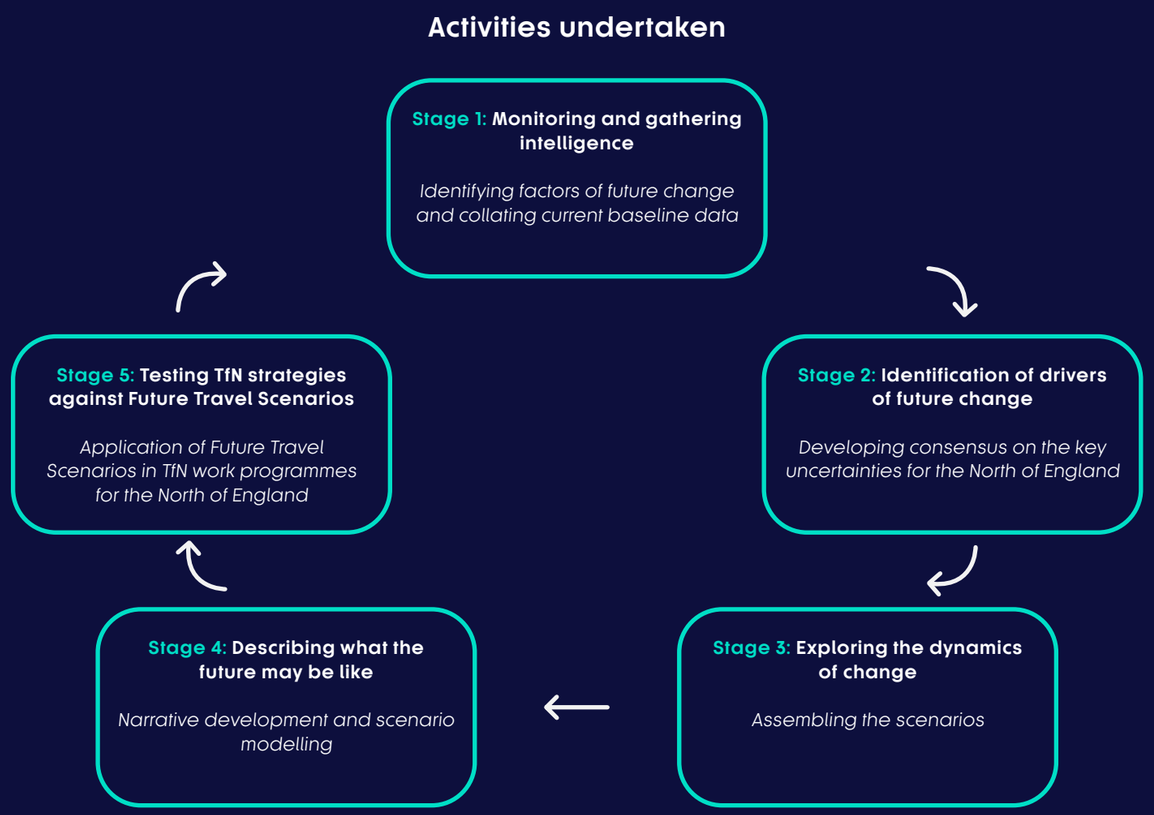
Plausible futures – Multiplicity of plausible futures as external contexts for TfN's pursuit of our vision. Less clearly defined; plausible based on current understanding of variables and trends.

Possible futures – Deep uncertainty. Hardest to see and define, yet possible. May rely on technology or knowledge which doesn't exist.

Our methodology

Our approach is consistent with the Government Office for Science (GO-Science) Futures Toolkit[9]. Scenario development has followed the five-stage approach model outlined in Figure 7.

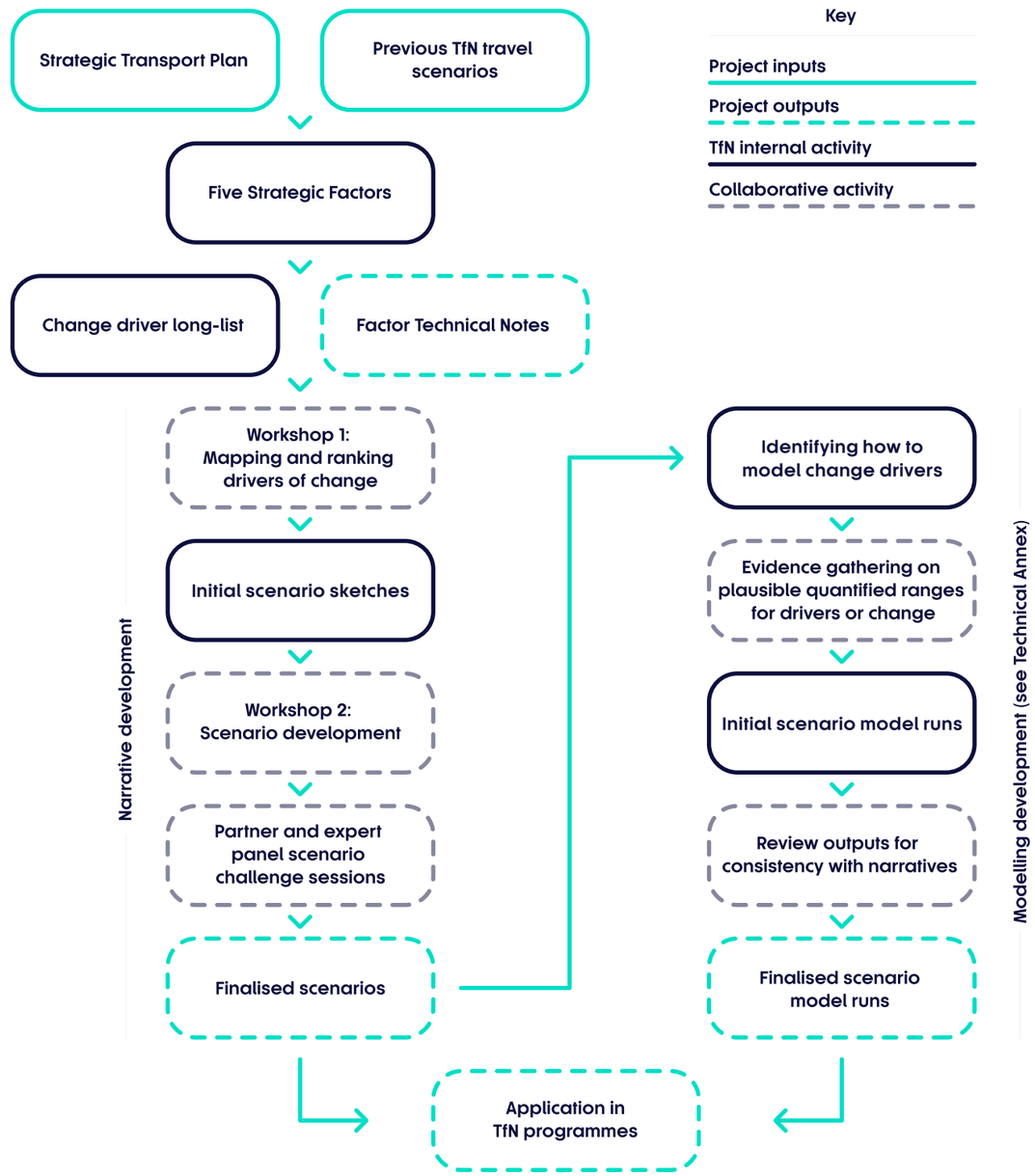
Figure 7: GO-Science stages as applied to TfN future scenario development



Whilst the GO-Science Futures Toolkit shaped our methodology we adapted this broad guidance to fit with TfN-specific requirements. These requirements included involving our partner organisations in different stages of scenario development and providing a set of scenarios that both aligned to our STP and met technical requirements for use in transport business cases. Figure 8 provides a more detailed and specific process flowchart for our methodology, including initial collaborative development of scenario narratives, followed by a more technical process of translating these narratives into a series of model runs. The following sections of this report describe the stages of this process in more detail.

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/674209/futures-toolkit-edition-1.pdf

Figure 8: TfN's scenario development process



Monitoring current events and gathering intelligence of future change

Key factors of interest applied to our Future Travel Scenarios

Our Future Travel Scenarios are based on future factors outside TfN's direct sphere of influence. The external strategic factors used in our 2020 scenarios are based on the STP 2019 policy positions deemed as critical influencing strategic factors which the transport sector should consider. The five strategic external factors identified broadly align to PESTLE (political, economic, social, technological, legal and environmental) drivers which shape the policy environment and influence travel demand[10]:

- ⇒ Growth in the population and economy
- ⇒ Spatial planning policy and economic distribution
- ⇒ Technological advancement and uptake
- ⇒ Social and behavioural change
- ⇒ National policy on environment and sustainability

[10]PESTLE – Political, Economic, Societal, Technological, Legislative and Environmental

Intelligence gathering to inform our scenarios

TfN collaborated with a panel of subject matter advisors to understand emerging future trends, conflicting views and expectations and highlight potential trade-offs and choices. This intelligence gathering informed, challenged and shaped TfN and partner development of our Future Travel Scenarios, providing evidence towards future implications and opportunities.

Our Advisory Panel supplied 'Factor Technical Notes' to provide insights into the five key external strategic factors and their future uncertainties. This set the scene for the main considerations and issues surrounding our five factors. They highlighted the emerging drivers of change (within each external factor) that may influence the future, and the potential for conflicting views and expectations that may need to be considered for these. Our Advisory Panel 'Theme Technical Notes' are provided as a separate annex to this report and can be found at: transportforthenorth.com/future-travel-scenarios/

Projections for economic growth are treated separately, with the scenarios for overall growth drawn directly from TfN's latest NPIER. TfN commissioned a detailed technical update to the NPIER in 2019, which was subject to a full governance and peer review process and is broadly consistent with the planning assumptions used by TfN partners. The impact of the Covid-19 pandemic (covered below) prompted TfN to commission a light-touch update to the 2019 work in summer 2020 to use for TfN's transport planning activities and in these Future Travel Scenarios. It is important to note that the 2020 versions of the NPIER scenarios have not been through the same governance processes as the 2019 update and are primarily intended for use in TfN programmes.

Current baseline of travel demand in the North of England

Growth in the population and economy

2018 level

Population in 2018: **15 million** with **6.6 million** in jobs. GVA: **318 billion**

Spatial planning policy and economic distribution:

Population growth

Urban: **24%**

Suburban: **61%**

Rural: **15%**

Social and behavioural change

Technological advancement and uptake

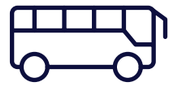
Share of fleet:
Zero emission vehicles: **0.5%**
Autonomous vehicles: **0%**

Remote working average **<0.5 days per week.**

National environment and sustainability policy:

Mode share

Rail: **2%**



Bus and shared mobility: **10%**

Transport carbon emissions: **26 million tonnes**

Car: **58%**

Active travel: **30%**

Total vehicles kilometres: **126 billion**

We are also continuously refining our evidence base and have used the latest evidence to establish a current baseline picture of travel demand and trends. We will continue to monitor and review trends as new evidence arises.

This section shows the current baseline picture of the North in our chosen scenario base year of 2018 using key metrics across the five strategic factors identified above. 2018 has been used as this aligns to the most recent base year of the models in TfN's Analytical Framework, used to simulate and quantify the Future Travel Scenarios.

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Covid-19: Adapting the Scenarios Framework to account for the global pandemic of 2020

Whilst the Future Travel Scenarios are focused on the longer-term, we cannot lose sight of the fact that current global challenges to tackle Covid-19 are creating significant additional uncertainty by changing the way we move and, more fundamentally, what we deem as important. There will inevitably be at least a partial reversion to pre-pandemic trends, but some changes will stick, and other new trends will emerge as society decides how best to recover from the crisis. Many of these strategic factors will affect the way we travel, whether that means new economic models to boost the recovery, increased working from home, or social distancing on public transport.

This makes it even more important to build tools that allow for more effective assessment of what these trend changes may mean. We believe that at a broad narrative level, the scenarios as developed pre-crisis still represent a range of plausible longer-term futures. Many of the potential changes that TfN and partners identified during development have come to the fore during the 2020 pandemic. This includes increases in use of active travel, a step change in levels of remote working, and an acceleration in uptake of online shopping and, to some extent, greater use of electric bikes and scooters.

Our scenario analysis tool provides the basis for further interrogation of evolving and new trends, based on evidence as it develops. The Scenarios Framework can be regularly reviewed and adjusted with a mixture of light-touch annual updates and less frequent, more fundamental refreshes over time, with the aim of learning more about future change trends and supporting an ambition of 'building back better'.

Covid-19: What we have seen so far

Throughout the Covid-19 pandemic, there have been significant changes in both travel demand and distribution of travel across modes. We have been working closely with partners across the North to monitor travel demand and modal changes throughout the pandemic and partner data broadly aligns with those UK-wide at the current stage.

In the short-medium term, qualitative research has shown there is hesitancy in using public transport for everyday journeys. Current public transport usage is showing at around 65% lower than pre-Covid levels (w/e 8 November 2020)[11]. Passengers have expressed safety concerns around Covid transmission with around 50% stating they would feel unsafe using public transport, even with Covid-19 safety measures in place[12]. Car travel has returned towards pre-Covid levels in many areas and a greater number of shorter journeys are potentially being undertaken via car at this time, with a rise in local journeys particularly noticed. The travel behaviours surrounding Covid-19 are in a continuous state of change and future policy direction will need to take account of the evolving impacts of the pandemic on people's behaviours.

Evidence during the first UK-wide restrictions to tackle the pandemic also indicate a greater prevalence of home working. A study by Savanta[13] indicated that 65% of SMEs and 93% of larger businesses plan to change working practices permanently in a post-pandemic situation. However, it is also recognised that the North's sectoral composition is one that may not lend itself well to remote working when compared to the rest of the UK. Since the beginning of Covid-19 lockdown, the North has had a persistently higher proportion of employees working from their normal place of work, rather than working remotely. Significant sectors in the North also include hospitality and the visitor economy which face highly uncertain futures.

[11]Transport use by mode: Great Britain. https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic
[12]Transport Focus: travel during Covid-19 survey. 30th October 2020.
[13]https://savanta.com/view/the-new-normal-for-office-workers/

During the Covid-19 pandemic, we have seen the emergence of more active travel in communities and a greater focus on work-life balance as people have benefited from reduced travel time. Further, there has been increased digital remote working. These are trends which may continue over the longer term, although it is important to recognise that that not everyone can change how they travel or have the option of remote working.

In the long-term, transport solutions and policy measures will need to adapt to future changes in travel behaviour which are currently unclear. This highlights the need for the future scenarios to facilitate the development of a dynamic and flexible approach which can adapt to change.

Covid-19: What does the pandemic mean for long-term planning

As the pandemic started before TfN finalised its new Future Travel Scenarios, we have taken the opportunity to review and adjust our scenario narratives and outcomes to assess what changes might be needed as a result of the global pandemic which began in early 2020. This has included:

Adjustments to scenario assumptions as a result of significant changes to baseline patterns of travel and economic activity. Most stakeholders we have consulted with agree that a complete return to pre-pandemic conditions is unlikely and all scenarios need to be adjusted to reflect this. Key factors we have adjusted for include:

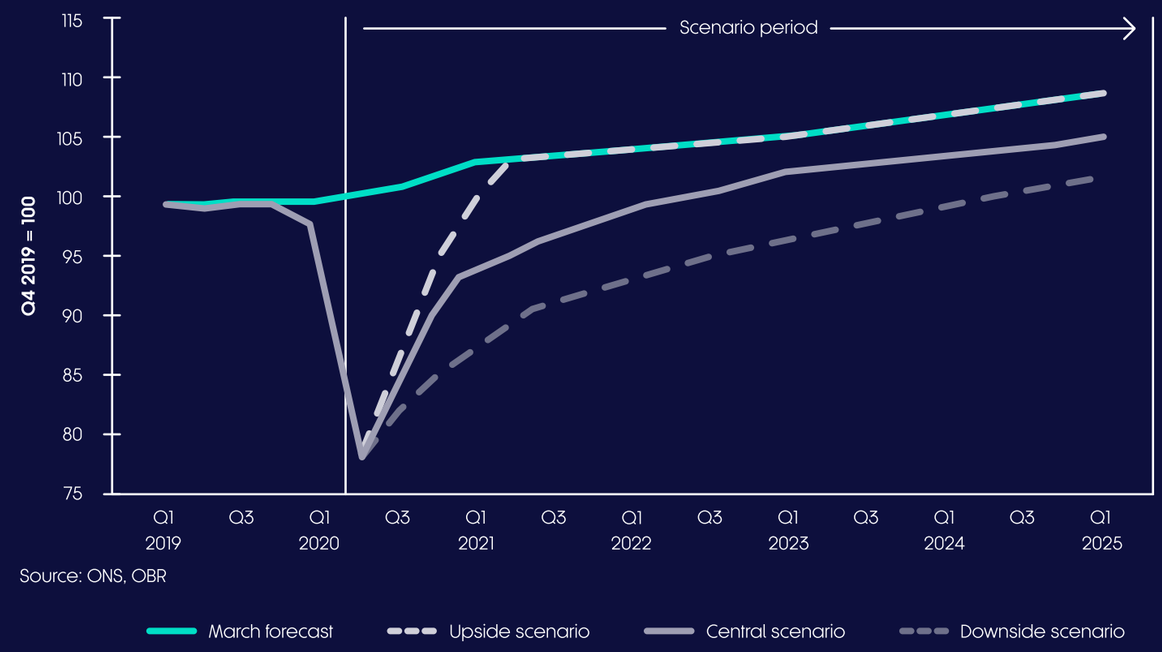
- ⇒ Level of remote working is likely to remain significantly higher than in 2018 for people in sectors who are able to work from home.
- ⇒ Economic growth is likely to be substantially reduced in the short term. Though the significance of this out to 2050, compared to longer term trends and other potential economic shocks, is unclear.

Additional narratives for each scenario, explaining specifically what would need to happen to get from the present situation to each future world. We have provided additional narrative across four key areas:

- ⇒ Health policy and technology. Some scenarios may only be plausible if society successfully adapts to Covid-19, for example through a vaccine, new treatments or if there is some other solution to effectively manage outbreaks. Similarly, some scenarios may be more plausible if there are difficulties developing effective solutions to the pandemic.
- ⇒ Economic stimulus. Pre-pandemic, the scenarios already had different assumptions about the level of economic stimulus, given the potential for different national approaches to the 'levelling-up' agenda. In a deep recession, the nature and scale of economic stimulus is likely to be even more critical in determining future outcomes, so it is important to provide additional narrative about what form this stimulus would take in each scenario.
- ⇒ Spatial planning and preferences for place types. The lockdown has led to a reduction in activity in city centres and raised questions about the longer-term viability of the agglomeration economies that thrive in dense urban centres. There is an ongoing debate about whether attitudes to remote working could lead to population shifts away from urban areas towards more rural settings with improved access to green space. Outcomes will depend on a range of strategic factors related to spatial policy and individual preferences, and it is important that each scenario addresses what would need to happen in these areas in each case.
- ⇒ National transport policy. The pandemic has also created a shock in the world of transport policy. For example, public transport revenues are under extreme pressure and active travel policy has received additional funding. The UK Government has acted during the pandemic and could take several different approaches to addressing these issues in the longer-term. It is important that our scenarios explain what approach would be most plausible in each future state.

To ensure our scenarios are based on the most up-to-date available economic data, we have commissioned Oxford Economics to update the economic inputs which underpin our Future Travel Scenarios so that they reflect the latest forecasts from the UK Office for Budget Responsibility (OBR), published in July 2020. Figure 9 illustrates that these forecasts assume a reduction in economic growth as a result of the pandemic, and we assume this affects all economic scenarios equally.

Figure 9: OBR real GDP July scenarios versus March forecast[14]



Source: ONS, OBR

It is important to acknowledge that the path we follow as we emerge from the pandemic is not entirely an external uncertainty from TfN's perspective. The lockdown has demonstrated the power of public policy to change people's behaviour, at pace and scale, in support of a societal objective, and TfN has a role to play in ensuring that it provides advice to Government and evidence to local partners that recognises this. This point will be addressed in a report on TfN's Decarbonisation Pathways being developed for publication in spring 2021, in which we will establish a series of routes to decarbonise the Northern transport network before 2050.

[14] https://obr.uk/fsr/fiscal-sustainability-report-july-2020/

Identification of drivers of change and agreement of key uncertainties for the North of England

Identifying key drivers of change for the North of England

Our Advisory Panel Theme Technical Notes[15] provided a (pre-pandemic) snapshot of current thinking and perspectives. They identified potential drivers of change across our five external strategic factors[16], as well as their potential end states, and the strategic challenges or choices for each driver. These drivers formed the basis of our scenario development. The drivers of change and their descriptions are outlined in Figure 10 below.

We used the Theme Technical Notes to inform our partner workshop exercises and challenge sessions, to highlight areas of agreement, disagreement or sensitive issues needing careful consideration. Our LTA partners and delivery partners (Highways England, Network Rail and UK Government), provided a wealth of valuable expertise, intelligence and viewpoints regarding national and local strategies and visions, to build consensus around the key uncertainties for the future of travel in the North of England.

Figure 10: Drivers of change (developed November 2019)

#	Driver of change	Description
1	Climate change response (Gov't)	Strength of Government commitment to decarbonising the UK economy
2	Climate change response (social)	Extent of public commitment to address decarbonising the economy
3	Attitudes to health	Importance of addressing public health individually and collectively including walking and cycling
4	Attitudes to shared mobility	Willingness to share journeys and reduction in vehicle ownership
5	Changes in working patterns	Extent of flexible working and its effects on commuting
6	Urbanisation	The proportion of the population living in urban areas
7	Changes in income and wealth distribution	Distribution of economic prosperity across the population
8	Inclusive prosperity	Growth that is distributed fairly across all regions
9	Changes in industry	Makeup of the economy across sectors
10	Robotics/artificial intelligence in industry	Extent of automation effects on employment
11	Housing growth	Extent and distribution of housing
12	Government transport spending	Extent of public expenditure on transport
13	How we pay for transport	Forms of payment for consuming mobility including distance or tax-based
14	Economic shocks	Degree of economic stability nationally and regionally
15	NPIER – private sector investment	Extent of private sector investment in the North
16	NPIER – labour supply	Nature and extent of labour supply serving the North
17	Data and connectivity	Influence of data on delivery of services across sectors
18	Automation in transport	Change in share of manually controlled motor vehicles
19	Clean transport technology	Rate of diffusion of lower carbon transport technologies
20	New transport modes	Changing modal mix of mobility with new modes entering the industry
21	Last-mile connectivity	Local transport plans/strategies and degree of intra-North connectivity beyond the private car

Applying intelligence provided by our Advisory Panel, TfN and partners identified the key drivers of change deemed as most important and uncertain and plotted these on the chart seen in Figure 11. Importance was assessed on how important the driver would be in defining the future of transport demand in the North and certainty was assessed on how certain/uncertain the outcome for each driver would be.

[15]Our Advisory Panel Theme Technical Notes are provided as a separate annex to this report and can be found here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/
[16]Growth in the population and economy; Spatial planning policy and economic distribution; Technological advancement and uptake; Social and behavioural change; and National policy on environment and sustainability.

Identifying key drivers of change for the North of England

Figure 11: Mapped drivers agreed by stakeholders (developed November 2019)

From these, our stakeholders selected 15 drivers of change to take forward to the next group exercise. The drivers taken forward are presented in Figure 12:

Figure 12: Most uncertain and important drivers

- Last-mile connectivity
- Climate change response (Gov't)
- Data connectivity
- Inclusive prosperity
- Automation in transport
- Change in work patterns
- How we pay for transport
- Energy and land-use policy
- Urbanisation
- Attitudes to shared mobility
- Aging population
- Robotics/artificial intelligence in industry
- Housing growth
- Community and place
- Climate change response (social)

Mapping how identified drivers of change might evolve in the future

Having determined 15 drivers thought to be the most important/uncertain drivers of change in the mapping process, the next step was to identify how the uncertainty associated with each driver could play out in the future.

Drawing upon expert insight from the Advisory Panel, TfN and stakeholders explored the varying plausible future states for each driver of change. Stakeholders were asked to consider two opposing representations of how each driver of change could play out in the future, to build scenarios that explore alternative ways the policy area might develop (creating axes of uncertainty for each driver of change). By considering the different directions in which these drivers of change could unfold, a series of plausible future states for each driver was developed, which in turn provided the building blocks for our Future Travel Scenarios.

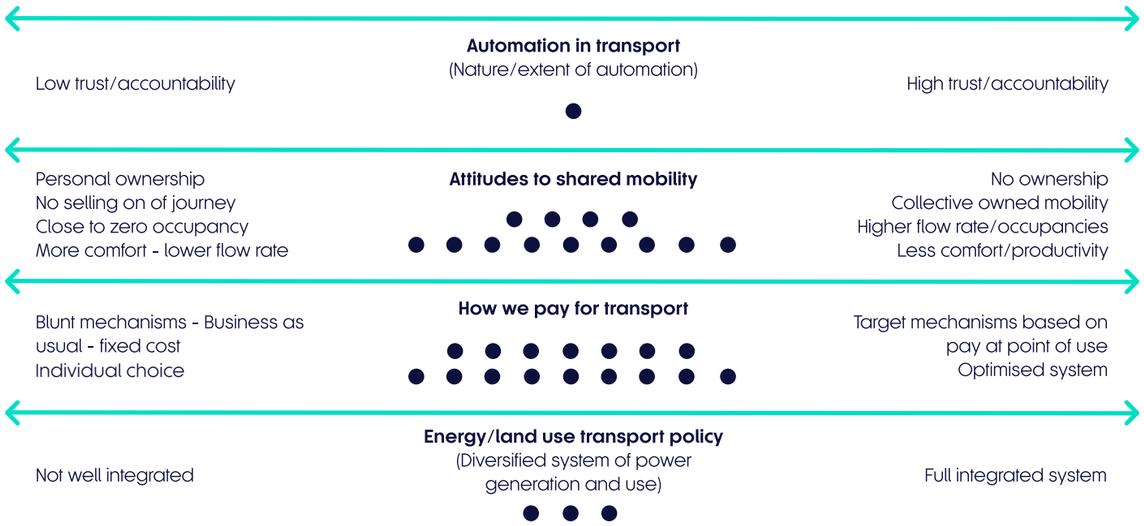
A three-step process was undertaken during this workshop exercise:

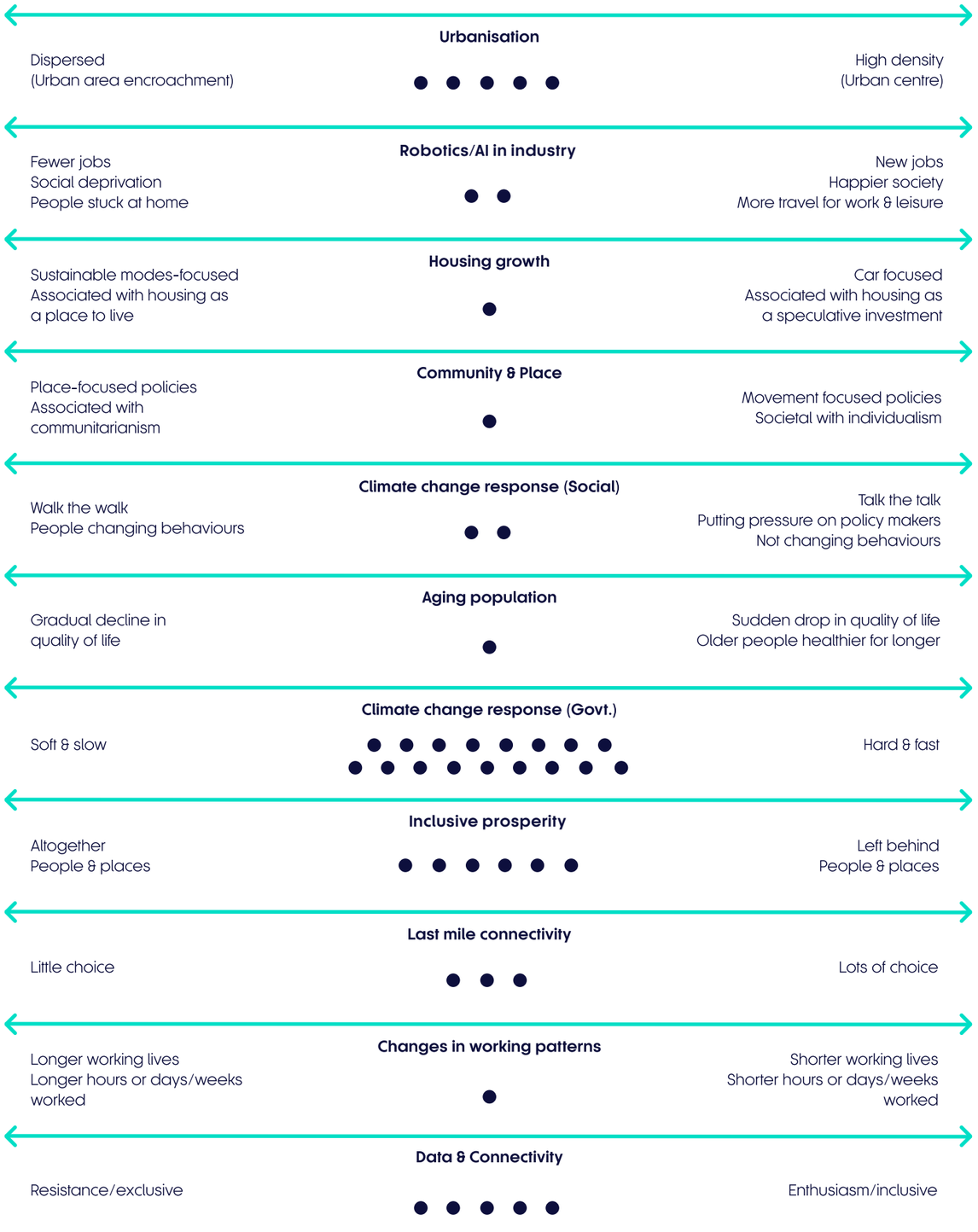
i. **Develop a long list of axes of uncertainty** - stakeholder groups worked to develop two alternative axes of uncertainty for each of three chosen drivers of change. We asked each group to develop two axes for each driver to stretch stakeholder thinking. This also mitigated any tendency for a dominant individual in a group to push forward a single idea without others being fully considered.

ii. **Shortlisting –** groups then chose their preferred axes out of the two options they created for each driver of change and presented to the wider group (three axes/drivers for each group). The 15 axes were placed on to flipcharts.

iii. **Identify which axes resonated most with stakeholders** - after hearing each group report back on their reasoning behind their choice of axes of uncertainty, the stakeholder group identified and agreed the key drivers of change which resonated most with the stakeholders following the discussions in workshop exercises. Stakeholders voted on their key driver preferences and this is indicated by the navy dots in Figure 13.

Figure 13: Axis of uncertainty assessments produced for the key drivers of change identified





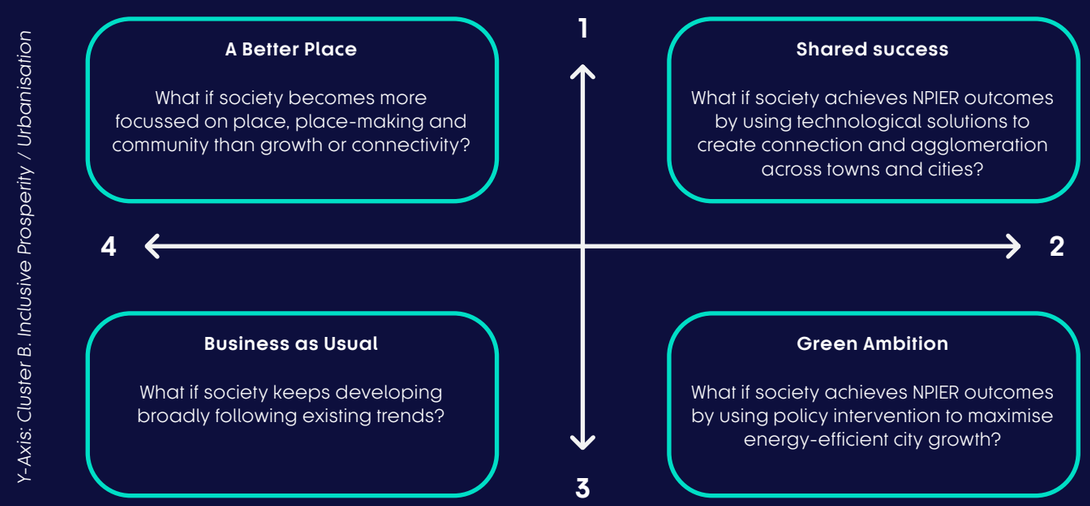
Mapping how identified drivers of change might evolve in the future

Three drivers of change had considerably more votes than the others and were chosen as key drivers of interest. Three more drivers of change also gained a significant portion of votes and were classified as secondary drivers of interest.

Figure 14: Primary and secondary drivers

Primary	Secondary
Climate change response (Government)	Inclusive prosperity
How we pay for transport	Urbanisation
Attitudes to shared mobility	Data and connectivity

Figure 15: Emerging scenarios and considerations during development (based on key drivers of change and their potential future paths)



Exploring the dynamics of change to construct scenarios

We utilised the results from stage two to develop preliminary scenarios in a process of desktop analysis and a series of workshops to begin to assemble the mapped uncertainties into a set of coherent scenarios. Initial scenario set testing showed that there was significant overlap between the uncertainties of the top drivers of change and that some combinations of these drivers of change led to less plausible scenarios.

This testing suggested the following combinations would be helpful to consider when developing a framework for our scenarios.

Cluster A: How we pay for transport + Attitudes to shared mobility + Data and connectivity + Climate change response (Gov't)

Cluster B: Inclusive prosperity + Urbanisation

Taking the axis of uncertainty outputs developed earlier, we constructed the emerging scenarios seen in Figure 15. For each of the four scenarios we took the concept and framed it as a 'what if' question to ensure that each scenario had a plausible and coherent narrative that would allow it to be easily understood.

Draft scenario sets developed during test phase. Scenario names were considered further and changed during the course of development.

1. Fairer North.
Dispersed growth.
De-urbanisation.
Investment and intervention targeted across the region.
Focus on place-making.

2. Hard / fast regulation and taxation drives climate response beyond NetZero.
Coupled with acceptance of data and digital life.
Transport costs much higher – particularly personal car, drives acceptance of shared mobility.

3. Trend land-use.
High density urbanisation.
Investment and intention targeted on cities.
Focus on agglomeration.

4. Trend responses to climate change (struggle to meet NetZero), coupled with resistance to data and digital life.
Transport costs status quo.
Little acceptance of shared mobility.

Exploring the dynamics of change to construct scenarios

To enhance our emerging scenarios at this stage, we applied morphological analysis[17] to explore the effects of capturing more drivers identified by stakeholders in Figure 15 on page 48/49, increasing plausibility and improving the development of narrative. This maximised the range of uncertainty and captured the breadth of drivers of change identified by stakeholders.

The four emerging scenarios were then taken forward, tested with stakeholders, and further developed through an iterative series of refinements with feedback from partners and thematic advisors at each stage. The aim of this was to produce a set of scenarios closely aligned to the principles set out in 'How has TfN developed the scenarios' section, including plausibility, coherence and representing a variation in outcomes.

Key refinements included:

- ⇒ Update and agreement of scenario titles to best reflect the concepts and future states referred to in each.
- ⇒ Application of a more equitable view of towns recognising that there are different types of urban areas, geographies and place types across the North. This includes urban (cities and towns), semi-urban, semi-rural, rural, coastal.
- ⇒ Embedding the idea that community and placemaking can be applied anywhere, whether it is villages, towns or cities.
- ⇒ Consideration of whether an additional scenario was needed; and whether the exercise was trying to fit too much into too few scenarios. This was raised by our stakeholders and is an important thought-provoking check of our scenario development. This indicates a growing awareness and shift towards understanding the multi-dimensional nature of mobility and society; away from historic forecast-led single 'most likely' projections as used in the past for transport plans and studies.
- ⇒ On this occasion, it was agreed to refine the four emerging scenarios rather than add a fifth scenario. However, all stakeholders indicated that they would be uncomfortable returning to a single scenario against which to test investment decisions. This signalled an encouraging level of support for the purpose and approach of this work and it's intended application to our planning and decision-making for transport investments.

This work with stakeholders, significantly enriched our consideration of change dynamics, strengthened the scenario narratives and fostered consensus on agreeing the final set of four scenarios. Our scenarios and associated impacts are set out in the next section.

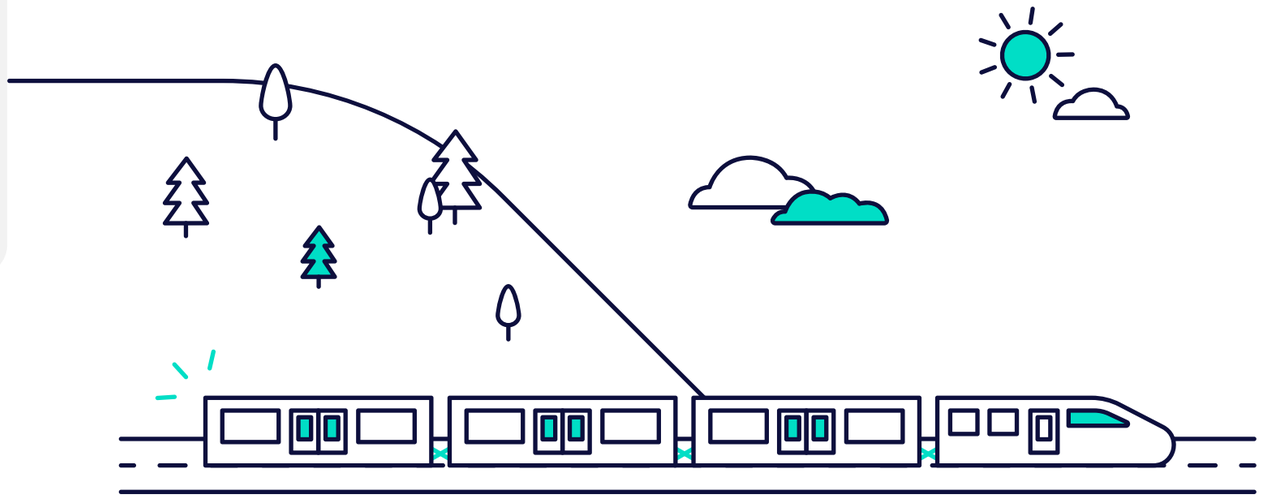
[17]Morphological analysis (or problem-solving) is a method for exploring solutions to a multi-dimensional, non-quantified problem.

4. Describing what the future might be like – Our Future Travel Scenarios

Our scenarios are stories that describe alternative ways the external environment might develop in the future. Each future scenario allows us to explore how different conditions might support or constrain delivery of transport strategies and measures, driven by a combination of global trends and national and local policy.

The scenarios are depicted in narrative form, and this is accompanied by quantitative estimates of patterns of demographic change, economic activity and travel (modelling using TfN's Analytical Framework). The scenario narratives draw extensively on research and detailed systems mapping conducted during their development with our partners. The detail on representing and applying the scenarios in TfN's Analytical Framework is described in the 'How will TfN use the scenarios' section, and the Future Travel Scenario Technical Annex found here: transportforthenorth.com/future-travel-scenarios/

By describing what the future may be like, this visioning exercise allows us to agree common strategic activities to achieve our aims and objectives; and consider the opportunities and threats involved.



What could the future look like across the five external factors?

We undertook the intelligence gathering outlined in Chapter 3 to open out and understand the detail and context behind our five key external themes. This has, in turn, driven our scenario development. To provide context to our scenario descriptions, it is helpful to summarise what our considerations mean for variations of our five overarching external factors.

Economic growth

Description: The economic climate of the North of England.

Transformational economic growth – in line with the NPIER (850,000 jobs and £100bn GVA over and above the 'business as usual' forecast).

'Business as usual' economic growth – Economic growth in line with business as usual economic forecasts.

Technology advancement and uptake

Description: The pace of innovation for developing new or existing technology and the uptake of these solutions by users.

Enthusiasm for new and innovative methods – Transport and mobility become fully low/zero emission (battery, hydrogen and other sources), digitised and increasingly autonomous. Users actively engage with digital solutions to manage travel, handing over their data for services. Data may become a requirement for transport use, forcing acceptance as people weigh up the benefits. Contactless takes over and we become a cash-less society. New modes become a reality and mobility is considered as a utility, informed decision-making, turn up and go, pay on account is the norm.

Tempered innovation and uptake – Users have little interest or limited means to choose alternative transportation methods. The user pushes back on digital and lacks trust in new technology. People are data-resistant and protective over data use due to privacy breaches. Cash and analogue remain important. Physical human interactions are valued. Regulation and policy restrict development and new transport modes fail to materialise or are commercially unsuccessful.

Spatial planning policy and economic distribution

Description: The level at which growth, housing and commercial developments are concentrated in existing urban areas, or are more evenly spread between cities, towns and rural areas.

Dispersed – A spatial framework and targeted strategy which encourages growth beyond the core cities and reduces inequality across the North (and wider UK generally). People disperse to suburban, rural and coastal areas due to larger proportion of agile and remote working practices; rapid changes in mobility provision; or find employment in these locations. Changes in industrial and logistics supply chains increase pressure to release sites on the edges of urban areas. Regeneration of town centres to increases quality of place.

Spatially compact – Continued growth of larger conurbations due to agglomeration and increased external investment. Regeneration of communities within urban areas; some green belt release to accommodate growth. More people continue to flock to high density urban centres due to increased economic opportunity resulting in high-rise housing and better transport links within the city. Money is spent on regenerating communities within urban areas rather than encroachment on green belt land. Some rural places may be left behind.

Behavioural change

Description: The level of user interest in changing their behaviours in response to income, working patterns, location of jobs and housing, ownership models and attitudes to the environment.

Fundamental change to user attitudes and wants – Digital benefits are widely accepted socially as immersive home and hub working, networks, vehicles and customers are connected. User attitudes change and proactively shift to sharing assets and usership, as ownership models become obsolete. Subscriptions, demand for integrated public and private systems and on-demand services are more common. Climate change impacts lead to increasing environmental awareness and action, with more user emphasis on health.

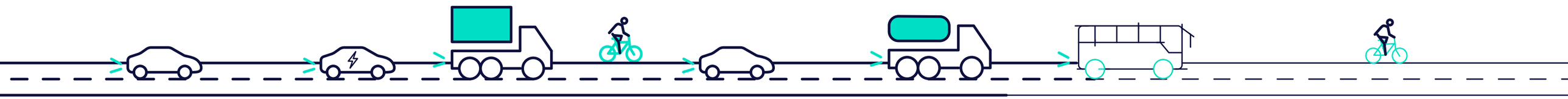
Steady trend continuation and some resistance – Transport gradually evolves using the same broad modes without much change to ownership or payment models. Ownership and aspiration to own continue to rule with personal transport becoming even more important. Push back from all-encompassing digitised future due to security breaches. The trend of people becoming more protective over their data becomes more prevalent. Cash and analogue remain important as privacy and anonymity becomes a luxury. Human interactions are valued.

National environmental and sustainability policy

Description: The level of operationalised policy, legislation and overall strategy to encourage transport decarbonisation and meet UK carbon budgets and; the private sector and social willingness for sustainable change.

'Hard and fast' – Social movement demands greater action. Climate emergency sees the UK Governments take clear, robust and timely action to meet or better carbon budgets; leading the way to maintain its global leadership position in the race to carbon zero. Transport and mobility become fully electrified through various sources. Either complete transport payment reform where transport is paid for per use or per km, with externalities of transport usage accounted for in the price; or hard limits which stop or postpone some investments. Public opinion and policy also take full account of spatial factors such as environmental and biodiversity net gain (protection and enhancement).

'Soft and Slow' – Social appetite for change reaches its maximum; subsides due to other external factors; or UK policy action results in failure to meet carbon budgets as part of uneven progress globally. Liquid carbon-based fuels remain widespread for transport propulsion. Delayed policy direction; and continuation of incentive regimes and current central tax system, market frameworks or other subsidies (e.g. national vehicle taxation policy or local parking policy).



Just About Managing

This scenario sees a state of inertia, although this should not be taken as neutral.

In this future, economic growth continues at a moderate rate, but it is largely consumption-led and unequal, both geographically and socially. The economy is also relatively rigid, lacking agility, and vulnerable to shocks.

The scenario sees a future where people are not willing to change their behaviours or give up certain luxuries, although there is a gradual continued trend towards virtual interaction. The main influences on technology uptake are global trends in costs and capabilities, meaning a reasonably widespread uptake of electric vehicles (EVs) and a modest uptake of autonomous vehicles and shared mobility services by 2050. Low levels of regulation and Government policy to shape the use of technology mean its main impact is to increase travel demand for those who can afford vehicles and mobility solutions with lower operating costs. A mixed fleet of technology and fiscal policies results in a challenging transport payment landscape.

Gradual uptake of active travel is seen in this scenario, driven by the health agenda, although any further step change increase would require a continued and committed impetus.

There are clear winners and losers. Those who lose are most likely people in remote areas, who are left behind as conurbations perform relatively well, as well as some workers whose jobs are replaced by machines. Some public transport outside conurbations struggles due to lack of subsidisation and adequate commercial models, whilst services in urban areas increase due to urbanisation.

The main consequence of this scenario is that highway networks become increasingly congested, and public transport levels remain similar to today. Whilst there is climate change awareness throughout the globe, as people become more conscious of regular disasters, the policies introduced are not radical enough to meet the UK carbon budgets and the net zero target of 2050. This is also reflected at the global scale, meaning that extreme weather events become more common in the UK, leading to frequent disruption to transport networks.

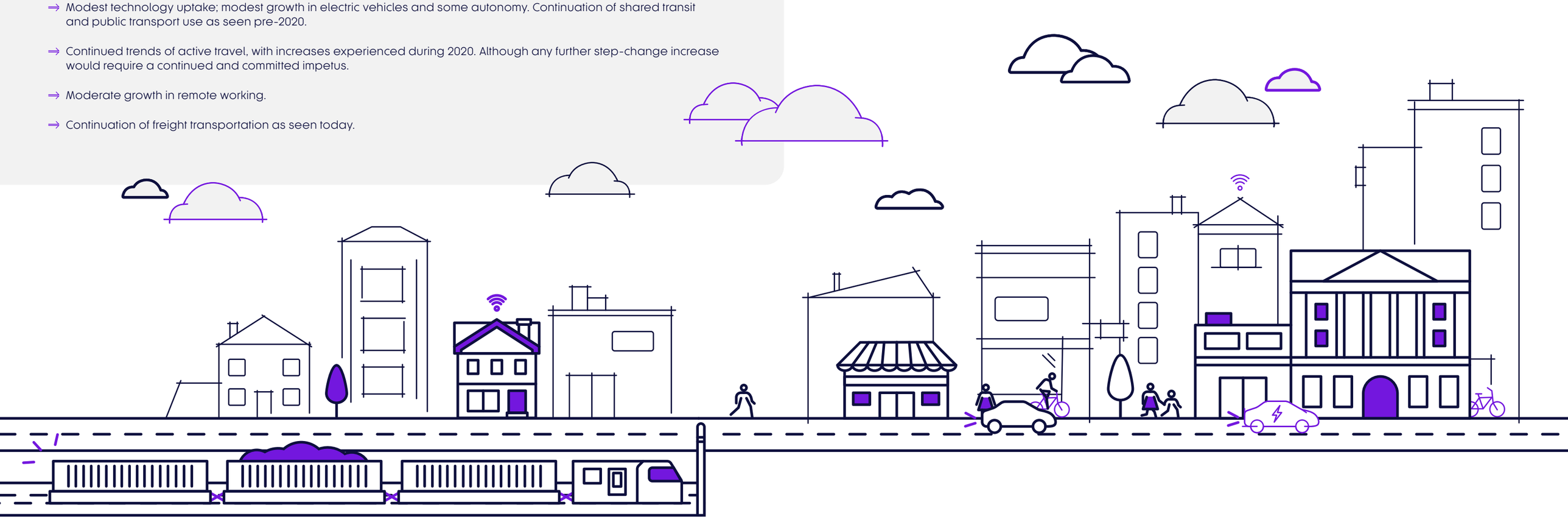
This scenario is led by markets, without much political direction of the themes considered, with its biggest driver being economic.

Just About Managing

This scenario sees a state of inertia, although this should not be taken as neutral. It sees a future where people do not alter their behaviours much from today, or give up certain luxuries, although there is a gradual continued trend towards virtual interaction. Economic growth continues at a moderate rate, but it is largely consumption-led and unequal, lacking agility and vulnerable to shocks. This scenario is led by markets, without much increase in political direction, with its biggest driver being economic.

What if society continues to develop in line with existing trends?

- ⇒ Existing trend of urbanisation and growth distribution continues. Little change in demographics and travel behaviour seen today.
- ⇒ No transformation in level of economic growth. Reactive political direction results in a rigid economy, lacking agility and vulnerable to economic shocks.
- ⇒ Net Zero 2050 target not met – climate change and travel disruption becomes more extreme.
- ⇒ Modest technology uptake; modest growth in electric vehicles and some autonomy. Continuation of shared transit and public transport use as seen pre-2020.
- ⇒ Continued trends of active travel, with increases experienced during 2020. Although any further step-change increase would require a continued and committed impetus.
- ⇒ Moderate growth in remote working.
- ⇒ Continuation of freight transportation as seen today.



Just About Managing

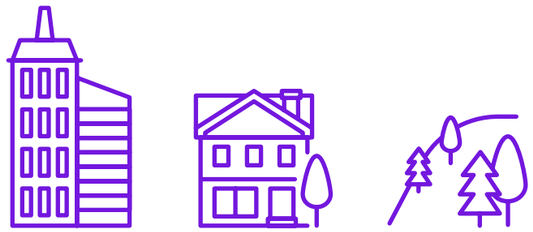
Growth in the population and economy

Growth to 2050, 2018 level illustrated by a dotted line

Population in 2050: **16 million** with **7.3 million** in jobs. GVA: **523 billion**

Spatial planning policy and economic distribution:

Population growth



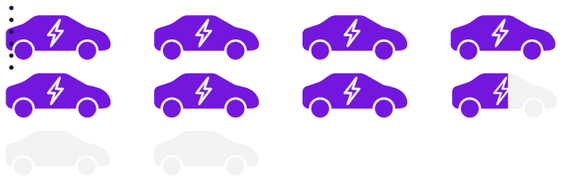
Urban: **6%**

Suburban: **7%**

Rural: **5%**

Social and behavioural change

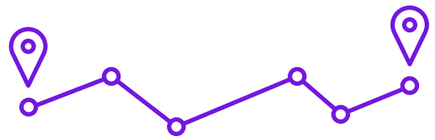
Technological advancement and uptake



Share of fleet:
Zero emission vehicles: **76%**
Autonomous vehicles: **25%**

Remote working average **2 days per week.**

Change in total trips by area type, 2018-2050



Urban: **9%**

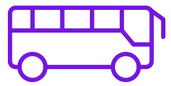
Suburban: **6%**

Rural: **0%**

National environment and sustainability policy:

Demand growth (in number of trips made)

Rail: **83%**



Bus and shared mobility: **-3%**

Change in transport carbon emissions: **-71%**

Car: **6%**

Active travel: **4%**

Total vehicles kilometres growth: **28%**

Key potential implications of this scenario:

- ⇒ Climate change awareness throughout the population as people become more conscious due to regular climate change disasters. Government policies on climate change, however none are radical enough to meet carbon budgets.
- ⇒ Action will be required to manage potential for increased emissions produced by more people working from home.
- ⇒ Economic and inclusivity divides remain across the UK.
- ⇒ High levels of transport network congestion and pressure on road and rail networks.
- ⇒ The transport network does not adapt to provide efficiency, reliability, integration and resilience to its users.
- ⇒ The health agenda will spur policies on active travel but with only very gradual change similar to what we have seen in the last 20 years.
- ⇒ Freight mode share tends towards increase on the Major Road Network.
- ⇒ Paying for transport becomes more challenging due to a mixed fleet of electric and fossil-fuelled vehicles, resulting in some paying fuel duty and others not.
- ⇒ There are likely to be missed opportunities from failing to embrace new mobility technology.
- ⇒ Regional and social inequalities persist and risk of further disparity.

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Prioritised Places

Focus on work-life balance and social equity within and between places.

This scenario sees the UK significantly shifting the political and economic direction to ensure that no place is left behind. Every area, including cities, towns and rural and coastal areas, has a bespoke local economic strategy, supported by investment in local assets and economic and social infrastructure.

This investment needs a certain level of economic growth to be financially sustained, but there is more emphasis on the quality and the equity of the growth. There is a prioritisation of job satisfaction, quality of life and a sense of community. People become less materialistic and willing to live with less. Whilst there is a reduced focus on total economic output, there are some important economic benefits delivered by placemaking, enabling distinct, sustainable economic models for different local areas.

National Government is active in supporting employment opportunities in smaller towns, particularly in rural and coastal areas. This is done through policies such as freeports and enterprise zones, which make these areas more attractive to young people seeking work. Policies to promote the circular economy and modular manufacturing lead to more goods being produced locally, which also creates job opportunities. These new economic models create new patterns of demand for freight and logistics networks to adapt to.

More leisure time is available to the people of the North, due to shorter commutes and policies to promote work-life balance, such as shorter working weeks. People spend more time and money in their local communities, boosting local economies. Tourism is likely to increase as people have more leisure time to visit destinations across the North, which also means a reduction in international flights in favor of UK holidays.

People continue to prioritise meeting face-to-face, rather than via technology. Places continue to be connected, but through traditional public transport modes and private mobility solutions. Cities may see a modest growth in take-up of transport technology solutions, where they fit with the local place-based strategies. Within all communities, active travel becomes more prevalent and important to the population.

Although an emphasis on localising activity and use of public transport helps to reduce emissions at a more rapid rate, a failure to sufficiently embrace technology sees continued private mobility ownership and a struggle to realise a fully zero-emission transport network before 2050.

This scenario is led by a change in priorities, with its biggest driver being the push for a fairer redistribution of economic prosperity.

Prioritised Places

This scenario sees a significant shift in political and economic direction to ensure that no place is left behind. Every area, including cities, towns and rural and coastal areas, has a bespoke local economic strategy, supported by investment in local assets, specialisms and economic and social infrastructure. Community, localism and place-making across the North is applied to build a sense of local identity to improve local economies. There is a focus on work-life balance and social equity within and between places. This scenario is led by a change in priorities, with its biggest driver being the push for a fairer redistribution of economic prosperity.

What if society becomes more focused on place, place-making and community than growth or connectivity?

⇒ Bespoke local strategies, focusing on quality of life, place-making and community, rather than primarily economic growth. Slower growth in cities, more in towns and rural/coastal areas.

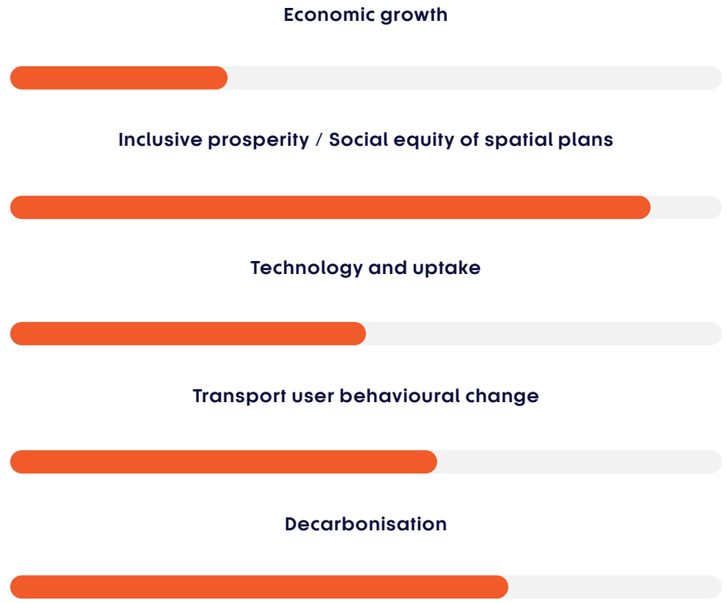
⇒ No transformation in level of economic growth, but society is more equitable and there is a fairer distribution of prosperity across the region.

⇒ Moderate growth in electric vehicles (and other Ultra-Low Emission Vehicles (ULEVs)) and some autonomy, especially in cities. Realisation of benefits for vulnerable groups, people with disabilities and extending Autonomous Vehicle (AV) networks to more isolated areas.

⇒ Continued private mobility ownership sees a struggle to realise a zero-emission transport network.

⇒ More active and public transport within communities. People value face-to-face interaction.

⇒ Focus on work-life balance and social equity within and between places.



Prioritised Places

Growth in the population and economy

Growth to 2050, 2018 level illustrated by a dotted line

Population in 2050: **16 million** with **7.3 million** in jobs. GVA: **524 billion**

Spatial planning policy and economic distribution:
Population growth

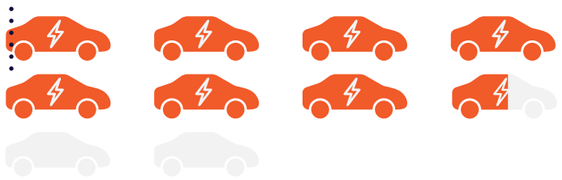
Urban: **3%**

Suburban: **5%**

Rural: **20%**

Social and behavioural change

Technological advancement and uptake



Share of fleet:
Zero emission vehicles: **76%**
Autonomous vehicles: **25%**

Remote working average **1 day per week.**

Change in total trips by area type, 2018-2050

Urban: **7%**

Suburban: **7%**

Rural: **15%**

National environment and sustainability policy:

Demand growth (in number of trips made)

Rail: **122%**

Bus and shared mobility: **19%**

Change in transport carbon emissions: **-73%**

Car: **1%**

Active travel: **13%**

Total vehicles kilometres growth: **27%**

Key potential implications of this scenario:

- ⇒ Progress on climate change targets compared to 'Just About Managing', but not significant enough due to lack of urgency in technological transformation.
- ⇒ New policies for integrated transport and land-use planning would need to be introduced early on with regular spatial planning.
- ⇒ Potential for growing car dependency in rural and remote areas. Increased localised car trips (as the main connectivity option in suburban and rural areas) may offset potential reductions in longer journeys.
- ⇒ Investment and measures likely needed on both road and rail networks to link towns to each other and to city areas.
- ⇒ Greater need for strong pan-Northern Major Road Network and local road networks to support a variety of modes.
- ⇒ Communities may be too isolated from one another.
- ⇒ Uncertainty over whether new focus on quality of life is fiscally sustainable – need to balance these new priorities with supporting businesses to create jobs and tax receipts.
- ⇒ Investment likely needed to start chain of specialisms and job creation, with early intervention key.
- ⇒ Connections to UK tourist and cultural spots, leisure facilities and Areas of Natural Beauty become important due to changes in work/life balance.
- ⇒ Freight mode share tends towards increase on the Major Road Network.

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Digitally Distributed

This scenario sees a future where digital and technological advances accelerate, transforming how we work, travel and live. In general, we embrace these technological changes and the move towards a distributed, service-based transport system.

By 2050, autonomous vehicles are relatively widespread, levels of private car ownership are very low, and all cars are electric. Optimised road pricing and higher levels of online interaction mean that some trips are discouraged, although congestion persists in places, particularly in the short to medium-term.

Travel is more accessible through shared mobility, but those willing to travel individually can pay extra for the benefit. In some cases, attitudes and abilities with regards to technology, sharing and data are challenged by the changing market. Low levels of Government support could lead to certain groups being excluded from opportunities.

As people increasingly work from home, the UK becomes less city-centric relative to some of the other scenarios, and benefits from shared growth between smaller conurbations. Levels of growth consistent with the NPIER scenario are realised through polycentric agglomeration as towns and cities become more interdependent.

The number of trips per person falls, but distributed lifestyles mean trip lengths increase. An increase in working from home provides some individuals with more free time.

In some cases, this leads to more short local trips by foot or by bike, but others use their 'travel time budget' for virtual interactions instead.

For those who can't work from home, there is an increase in employment in out-of-town business parks, which become more accessible through an optimised highway network. Freight and logistics distribution centres are also more dispersed than other scenarios, but efficient, autonomous freight options are available, and innovative delivery mechanisms such as drones are increasingly common.

Long-term climate change targets are met, but there is slow progress in the short-term due to a general preference for individualised mobility over traditional public transport.

This scenario is led by technology, with the biggest drivers being technical advances and a willingness to embrace mobility-as-a-service and shared mobility.

Digitally Distributed

This scenario sees a future where digital and technological advances accelerate, transforming how we work, travel and live. In general, we embrace these technological changes and the move towards a distributed, service-based transport system. Long-term climate change targets are met, but there is slow progress in the short-term due to a general preference for individualised mobility over traditional public transport. This scenario is led by technology, with the biggest drivers being technical advances and a willingness to embrace mobility-as-a-service and shared mobility in the long-term.

What if society achieves NPIER outcomes by using technological solutions to create connection and agglomeration across towns and cities?

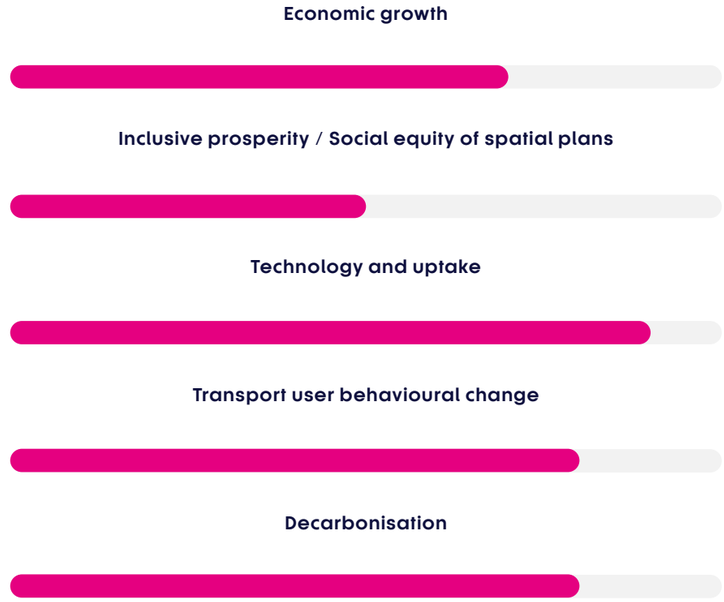
⇒ Growth dispersed between cities and towns and less city-centric.

⇒ High uptake of EV, ULEVs, Zero Emissions Vehicles (ZEVs) and driverless vehicles means zero emissions before 2050 (but slow progress in short-term). Some fiscal and regulatory action to influence technology use, but congestion persists in places due to availability of transport options. Increased digital remote working and dispersed employment means trip lengths are longer but less often.

⇒ General willingness to embrace Mobility-as-a-Service (MaaS) and shared mobility - through technology acceptance which supports increased efficiency and use of road capacity.

⇒ Freight warehousing, distribution and logistics centres are distributed.

⇒ Transformational economic growth as towns and cities see polycentric agglomeration and become more interdependent, due to better skills-matching within geographical areas.



Digitally Distributed

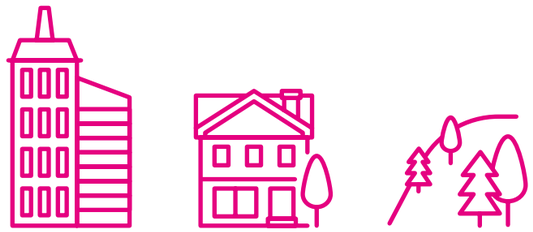
Growth in the population and economy

Growth to 2050, 2018 level illustrated by a dotted line

Population in 2050: **17 million** with **8.0 million** in jobs. GVA: **677 billion**

Spatial planning policy and economic distribution:

Population growth



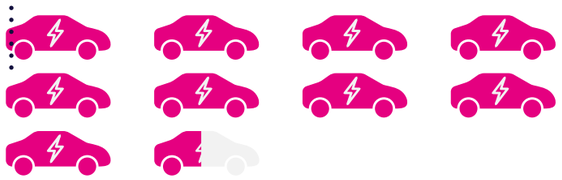
Urban: **10%**

Suburban: **16%**

Rural: **17%**

Social and behavioural change

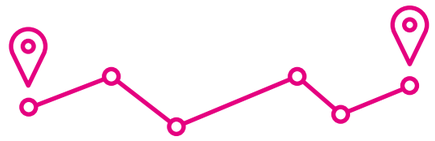
Technological advancement and uptake



Share of fleet:
Zero emission vehicles: **95%**
Autonomous vehicles: **75%**

Remote working average **3 days per week.**

Change in total trips by area type, 2018-2050



Urban: **7%**

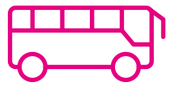
Suburban: **10%**

Rural: **6%**

National environment and sustainability policy:

Demand growth (in number of trips made)

Rail: **78%**



Bus and shared mobility: **11%**

Change in transport carbon emissions: **-96%**

Car: **8%**

Active travel: **6%**

Total vehicles kilometres growth: **44%**

Key potential implications of this scenario:

- ⇒ Whilst zero emissions targets are met by 2050, there is slow progress during early periods due to lack of urgency in demand management.
- ⇒ Actions are taken to manage increased emissions produced by more working from home. Smarter homes may move to a microgrid system for electricity storage and low carbon generation, moving away from a centralised energy system but still enabled by the National Grid.
- ⇒ Funding of travel must change due to fewer drivers paying Vehicle Excise Duty and Fuel Duty as cars become electric or other low/zero emission fuels.
- ⇒ Risk that transport network congestion persists due to good availability of new transport solutions which provide additional connectivity options for users, particularly in urban areas in the short to medium-term.
- ⇒ Increased localised car trips for non-commuting reasons (as the main connectivity option in suburban and rural areas) may offset potential reductions in longer commuting journeys due to increased digital and remote working.
- ⇒ Is digital connectivity an adequate replacement for face-to-face?
- ⇒ Adequate digital infrastructure will be required to support the population changes across area types and increased remote working.
- ⇒ Some people may be excluded if they are unable or unwilling to embrace technology.
- ⇒ Relatively more out-of-town employment, such as in the energy sector and manufacturing due to specialisation clusters.
- ⇒ Services may shift significantly to online, resulting in fewer shopping trips. However, this may be offset by the reduced time commuting and lower travel costs of Connected and Autonomous Vehicles (CAVs), providing will mean increased leisure time and trips (i.e. change of trip purpose rather than trip number).
- ⇒ Road network efficiency will need to be improved to ensure all AV vehicles are connected and the road network will still require space to park AV vehicles.
- ⇒ Does active travel and the importance of health decrease as reliance on technology and multiple connectivity options increase?
- ⇒ If people are further apart rather than centralised in key cities freight will have to travel further.
- ⇒ Fewer trips by rail may result in commercial impacts.

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Urban Zero Carbon

This scenario sees a significant shift in public attitudes towards action on climate change, and a strong Government response to meet it.

At a national level, strong fiscal and regulatory policies are brought in during the early 2020s to set us on a pathway to deliver a zero-carbon transport system before 2050. At the same time, leaders in cities and large towns persuade national Government to provide more devolved powers to regulate their transport networks and more funding for public transport infrastructure and new shared mobility solutions. Road pricing is also used to manage demand, and this has the biggest impact outside cities and towns, where there are fewer active travel and public transport options.

This scenario also sees a boost to economic productivity to levels consistent with the NPIER, primarily through a combination of urban agglomeration and place-making. Most growth will be in core cities and larger towns, with the Government embracing policies that encourage dense but liveable urban development, making cities and towns attractive places to live for many people.

For more remote rural and coastal settlements, there is a mixed picture of outcomes. Some larger settlements, with existing assets and connections to employment centres, may benefit from the national emphasis on placemaking. Others may experience a reduction in population and employment without any national policy to support their growth. Smaller towns within city regions do relatively well as they are supported by strong local governance and investment.

Technological solutions are available and adopted where appropriate, but urban living and working makes face-to-face interaction with friends and co-workers easy. Transport users demand and embrace an increase in the use of publicly available transit and active travel options. Non-traditional shared mobility systems become increasingly integrated with traditional public transport in a well-regulated urban mobility system, with a blurred line between 'public' and 'private'.

Freight and logistics networks move towards a model of urban consolidation centres, with smaller freight vehicles bringing goods into dense urban centres, although lower-consumption lifestyles begin to reduce demand for material goods.

Transport and energy planning and systems are adapted and integrated to deliver effective clean networks. All road transport is powered by electric drivetrains ahead of 2050, with an increasing supply of low-carbon hydrogen available for some vehicles.

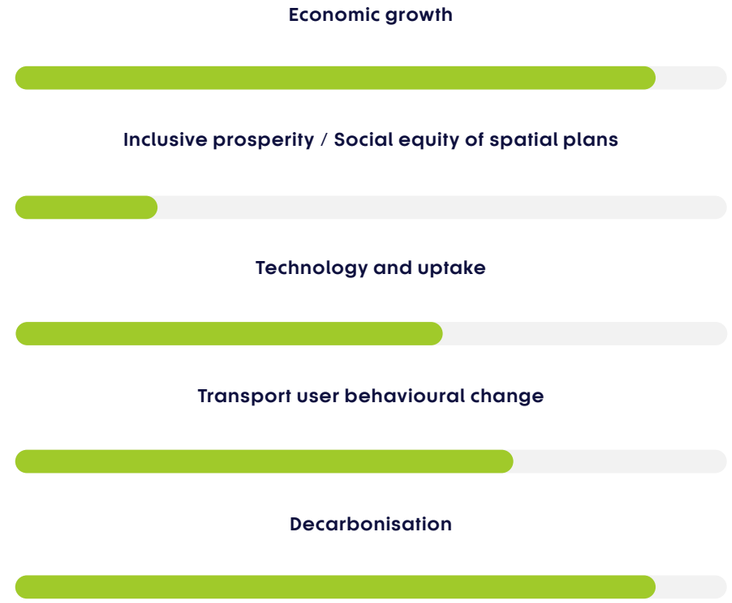
This scenario is led by attitudes to climate action and urban placemaking, with the biggest drivers being strong Government policy and urban densification.

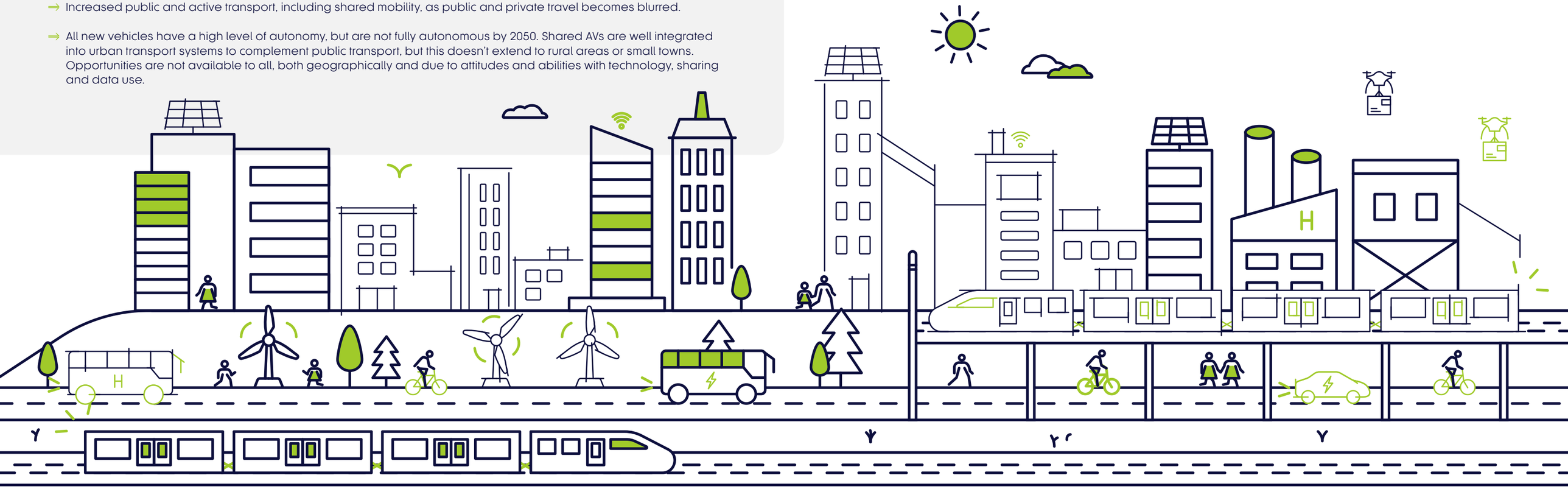
Urban Zero Carbon

This scenario sees a significant shift in public attitudes towards action on climate change, and strong national Government response to meet it. There is a boost to economic productivity to levels consistent with the NPIER, primarily through a combination of urban agglomeration and place-making. Transport users demand and embrace publicly available transit and active travel options, as there is a blurring of the line between 'public' and 'private' with increasing shared mobility systems online. This scenario is led by attitudes to climate action and urban place-making, with the biggest drivers being strong Government policy and trends of urban densification.

What if society achieves NPIER outcomes by using policy intervention to maximise energy-efficient city growth?

- ⇒ Cities and large towns become more dense but attractive places to live. Large rural settlements may benefit, others will see reduction in population and employment without support of national policy.
- ⇒ Transformational economic growth primarily through urban agglomeration and place-making.
- ⇒ Strong fiscal and regulatory action set us on a pathway to zero carbon before 2050. Increased devolution leads to integrated transport and energy systems which deliver clean networks.
- ⇒ Urban living reduces remote working and increases urban freight consolidation centres.
- ⇒ Increased public and active transport, including shared mobility, as public and private travel becomes blurred.
- ⇒ All new vehicles have a high level of autonomy, but are not fully autonomous by 2050. Shared AVs are well integrated into urban transport systems to complement public transport, but this doesn't extend to rural areas or small towns. Opportunities are not available to all, both geographically and due to attitudes and abilities with technology, sharing and data use.





Urban Zero Carbon

Growth in the population and economy

Growth to 2050, 2018 level illustrated by a dotted line

Population in 2050: **17 million** with **8.0 million** in jobs. GVA: **680 billion**

Spatial planning policy and economic distribution:

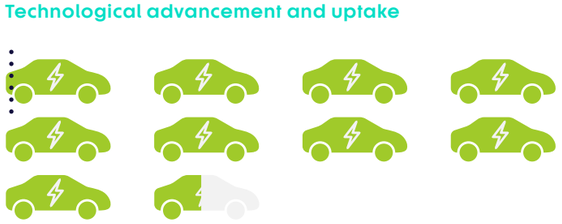
Population growth

Urban: **33%**

Suburban: **10%**

Rural: **5%**

Technological advancement and uptake



Share of fleet:
Zero emission vehicles: **95%**
Autonomous vehicles: **50%**

Remote working average **2 days per week.**

Social and behavioural change

Change in total trips by area type, 2018-2050

Urban: **34%**

Suburban: **5%**

Rural: **-7%**

National environment and sustainability policy:

Demand growth (in number of trips made)

Rail: **193%**

Bus and shared mobility: **21%**

Change in transport carbon emissions: **-96%**

Car: **-6%**

Active travel: **30%**

Total vehicles kilometres growth: **13%**

Key potential implications of this scenario:

- ⇒ This scenario requires strong national and local policy to be in place for urban land to be made available to support sustainable densification.
- ⇒ Planning authorities will need to act (and have the power and support) to increase the liveability of cities in terms of services available, quality of life and sustainable transport modes, making cites highly attractive places to live.
- ⇒ More remote settlements need a sustainable economic model to avoid decline.
- ⇒ If most economic activity is concentrated within cities, there is a risk that important connections between cities are neglected and important business connections are not embraced.
- ⇒ The skills and opportunities gap grows between places across the region.
- ⇒ The rail network is required to support increased freight and passenger connectivity between cities, particularly as demand reduction policies are introduced early and extensively in the scenario. This contributes to the reduction in road traffic and uptake of public and shared transport overall.
- ⇒ Less new infrastructure is required on the Major Road Network and local roads, but maintenance remains vital to provide flexibility and efficiency for active modes and new mobility solutions.
- ⇒ This scenario depends on a clean resilient energy supply and strong integrated planning of energy, land use and transport to meet the net zero goal. A comprehensive charging network across the UK would be required, supported by the National Grid.
- ⇒ There will need to be increased action from businesses to supply the increasingly environmentally conscious consumer as the public strive for sustainability in their goods and services.

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Scenario comparisons

Figure 16: What changes our scenarios imply for key transport related developments, policies and measures

Just About Managing

2020

Remote working 1 day/week
In occupation types where working from home (WFH) is possible

2025

Uptake in electric vehicles
New car and van sales 60% fully electric and 40% plug-in hybrid

2030

Increase in adoption of micro-mobility
Micro-mobility included in walk/cycle travel time with average speed of 10kph

Uptake in electric vehicles
New car and van sales 100% fully electric

Increase in adoption of shared transport and mobility-as-a-service (MaaS)
Increased bus connectivity for local movements

2035

Remote working 2 days/week
In occupation types where WFH is possible

Improvements to autonomous and connected vehicles
Assumed 25% of fleet penetration

Rail decarbonisation
Fully decarbonised network

Freight consolidation and modal shift
Significant improvements in compact warehousing

2040

2045

2050

Prioritised Places

2020

Remote working 1 day/week
In occupation types where WFH is possible

Public transport fare subsidisation
Lower fares for local movements

2025

Sustainable transport access
Reduction in bus general journey time (GJT) for intra-sector trips and lower GJT for walk/cycle trips

Sustainable access to rail station
Lower access/egress

2030

Uptake in electric vehicles
New car and van sales 80% fully electric and 20% plug-in hybrid

2035

Uptake in electric vehicles
New car and van sales 100% fully electric

Public transport fare subsidisation
Further reduction in fares for local movements and other regional movements

2040

Increase in adoption of shared transport and MaaS
Increased bus connectivity for local movements

2045

Further increase in adoption of shared transport and MaaS
Bus connectivity for all flow types

Improvements to autonomous and connected vehicles
Assumed 25% fleet penetration

Increase road user costs
Demand reduction policies to improve use of roads

2050

Rail decarbonisation
Fully decarbonised network

Digitally Distributed

2020

Remote working 2 days/week
In occupation types where WFH is possible

2025

Improvements to autonomous and connected vehicles
Assumed 25% fleet penetration

Increase in adoption of shared transport and MaaS
Increased bus connectivity for local movements

2030

Uptake in electric vehicles
New car and van sales 100% fully electric

2035

Further increase in adoption of shared transport and MaaS
Bus connectivity for all flow types

Further improvements to autonomous and connected vehicles
Assumed 50% fleet penetration

Increase road user costs
Demand reduction policies to improve use of roads

2040

Hydrogen vehicles
Available for HGVs

Rail decarbonisation
Fully decarbonised network

2045

Remote working 3 days/week
In occupation types where WFH is possible

Further improvements to autonomous and connected vehicles
Assumed 75% fleet penetration

Further increase in adoption of shared transport and MaaS
Bus connectivity for all flow types

2050

Further increased intra-sector road user costs
Demand reduction policies to further improve use of roads

Urban Zero Carbon

2020

Remote working 1 day/week
In occupation types where WFH is possible

2025

Sustainable access to rail stations
Lower access/egress

Sustainable transport access
Reduction in bus GJT for intra-sector trips and lower GJT for walk/cycle trips

Increase road user costs
Demand reduction policies to improve use of roads

2030

Uptake in electric vehicles
New car and van sales 100% fully electric

2035

Public transport fare subsidisation
Further reduction in fares for local movements and other regional movements

Increase in adoption of shared transport and MaaS
Increased bus connectivity for local movements

Improvements to autonomous and connected vehicles
Assumed 25% fleet penetration

2040

Further increased road user costs
Demand reduction policies to further improve use of roads

Freight consolidation and modal shift
Significant improvements in compact warehousing

2045

Hydrogen vehicles
Available for HGVs

Rail decarbonisation
Fully decarbonised network

Remote working 2 days/week
In occupation types where WFH is possible

2050

Further improvements to autonomous and connected vehicles
Assumed 50% fleet penetration

Scenario comparisons

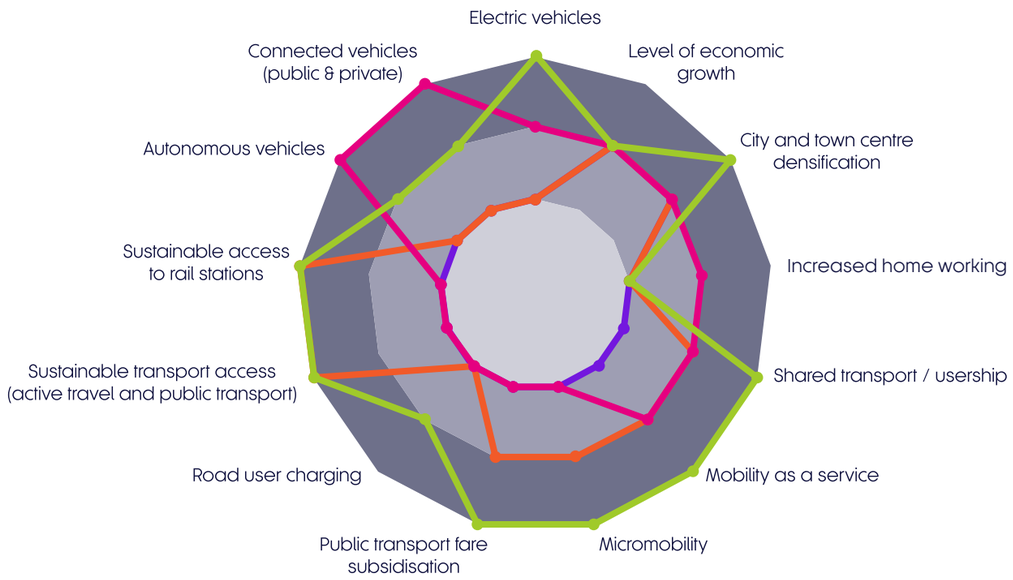
Through the creation of our Future Travel Scenarios, the TfN partnership has formed a shared understanding of range of travel-related developments, policies and measures which could aid delivery of the North's vision and our Investment Programme. This involved mapping the uptake or success of these across our scenarios, creating a plausible picture of which solutions are supported within each scenario. The transport measures are fed into our modelling tools as levers which affect future travel demand. It is our intention that this foresight provides thought leadership towards the national, regional and local conditions under which the right transport-related measures thrive. Developing our own regional evidence base and embedding that within our own decision-making processes, via the Future Travel Scenarios, is a key first step to achieving this.

Further information on each future transport measure, and their potential uptake across our Future Travel Scenarios, can be found within our Future Transport Solution Annex available here: transportforthenorth.com/future-travel-scenarios/

Figure 17: Radar plots showing qualitative variation between scenarios, across key drivers of change, in 2025, 2035 and 2045

Low **Medium** **High**

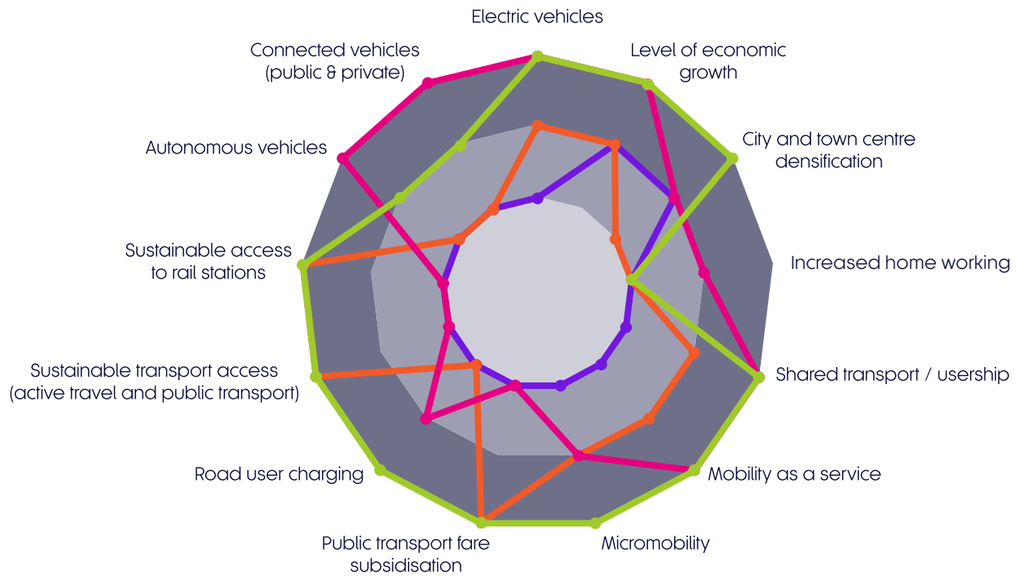
Scenario levers in 2025



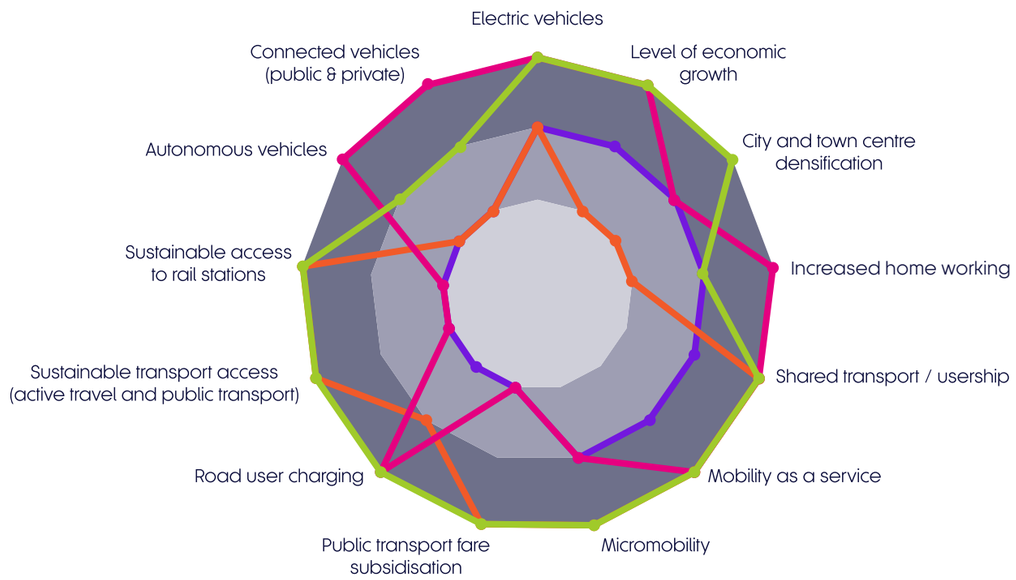
Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Just About Managing **Prioritised Places** **Digitally Distributed** **Urban Zero Carbon**

Scenario levers in 2035



Scenario levers in 2045

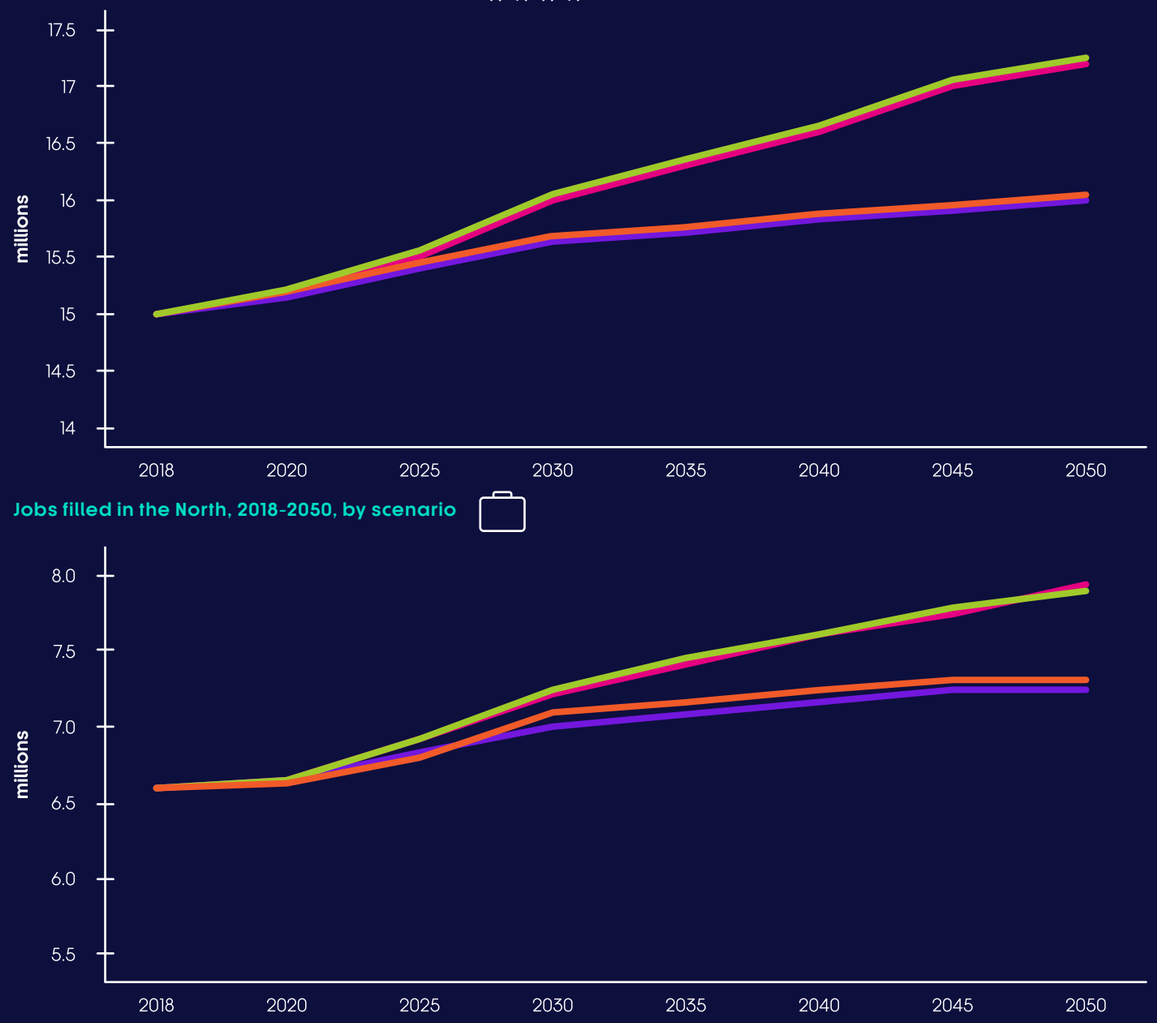


Scenario comparisons

Results of our scenario modelling are presented within the graphs below. Further detail is available in the Technical Annex.

Figure 18: Population and employment in the North, 2018-2050, by scenario

Population in the North, 2018-2050, by scenario



Jobs filled in the North, 2018-2050, by scenario

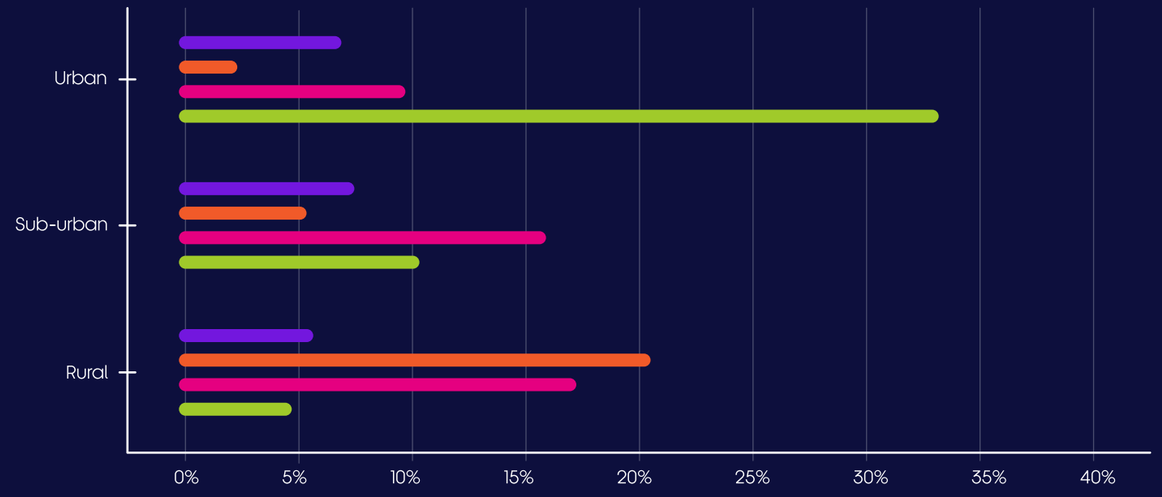
Figure 18 shows the next 30 years of population growth in the North. The differences are due to the two different NPIER economic and population forecasts used in our scenarios. The two scenarios (Digitally Distributed and Urban Zero Carbon) based on transformational NPIER assume a fixed amount of additional growth above the business as usual scenarios (Just About Managing and Prioritised Places).

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here:
https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Just About Managing **Prioritised Places** **Digitally Distributed** **Urban Zero Carbon**

Figure 19: Change in population and jobs across different area types, 2018-2050, by scenario

Population change by area type, and by scenario, 2018-2050



Jobs change by area type, and by scenario, 2018-2050

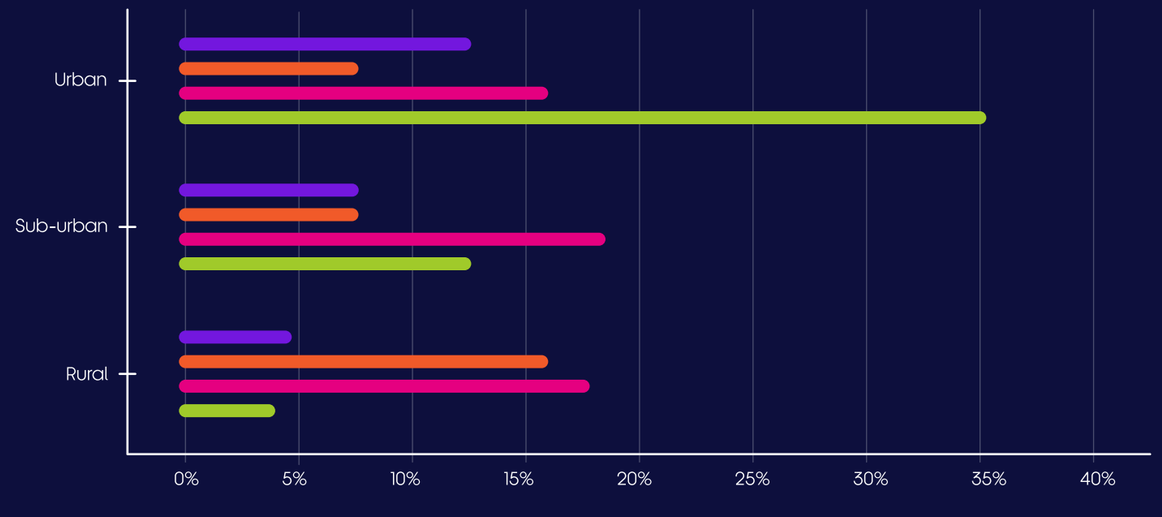


Figure 19 shows growth distribution across different area types across the North – urban, suburban and rural. The local detail in population change is also shown in Figure 20 where it can be observed that scenarios Prioritised Places and Digitally Distributed are more dispersed compared to Just About Managing and Urban Zero Carbon where growth is concentrated in the cities.

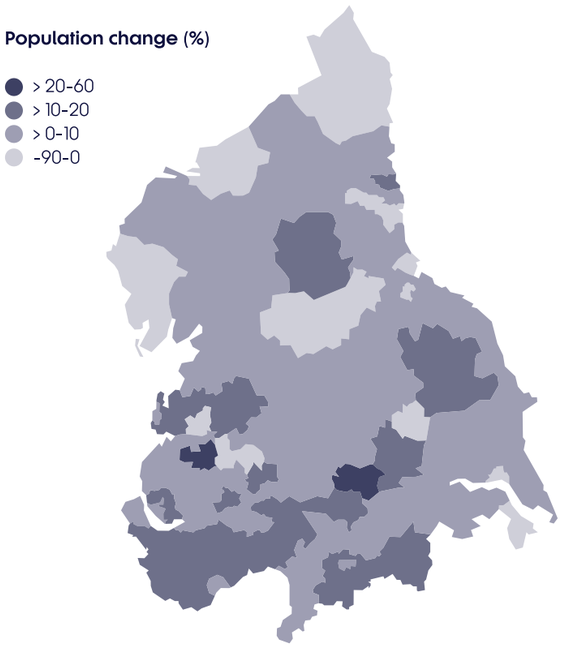
Scenario comparisons

Figure 20: Percentage growth in population, 2018-2050, by zone and scenario

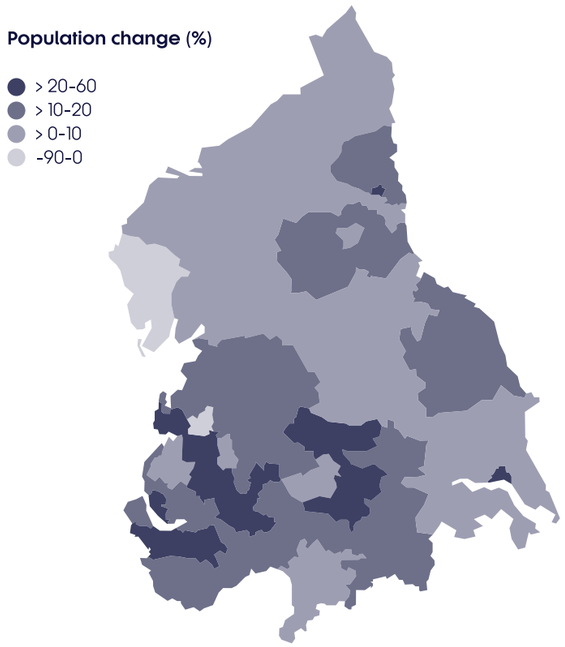
Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Just About Managing **Prioritised Places** **Digitally Distributed** **Urban Zero Carbon**

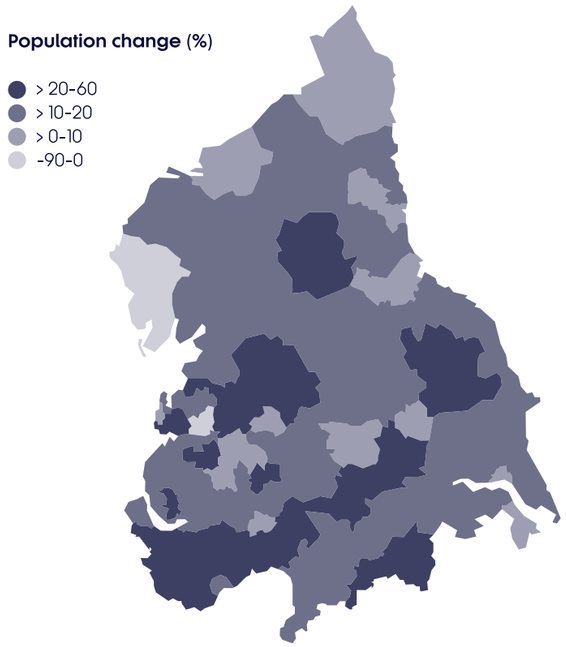
Scenario 1: Just About Managing



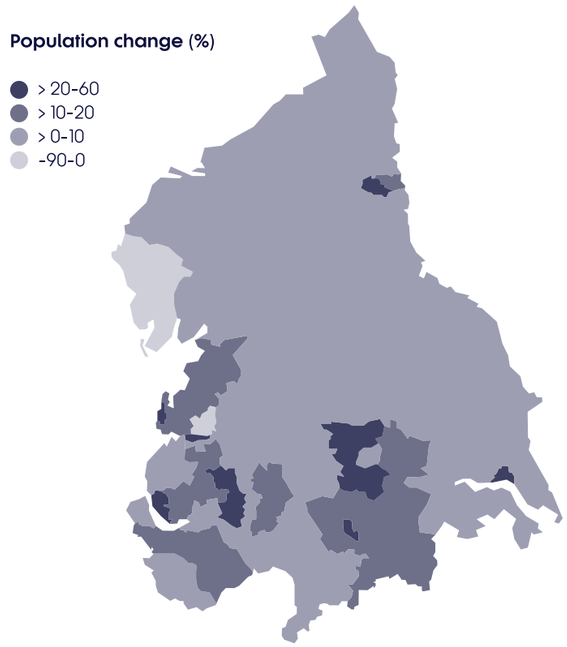
Scenario 2: Prioritised Places



Scenario 3: Digitally Distributed



Scenario 4: Urban Zero Carbon



Scenario comparisons

Figure 21 shows change in trips across the scenarios, with Figure 22 highlighting the effect on mode share and Figure 23 on mode share by area type.

Active mode trips grow significantly in Urban Zero Carbon, where the highly urbanised and compact world reduces the distance people need to travel. This is also to some extent, observed in Prioritised Places.

Rail trips increase quite significantly across all the scenarios, however this should be considered alongside the mode share in Figure 22, where we observe that this increase does not translate to a much higher mode share.

Car trips increase in Just About Managing and Digitally Distributed where there is limited incentive towards sustainable modes and growth is more dispersed. However, Prioritised Places and Urban Zero Carbon see static or reducing car trips, due to the support for sustainable modes. Figure 23 shows car remains the dominant mode in all scenarios, except in urban areas.

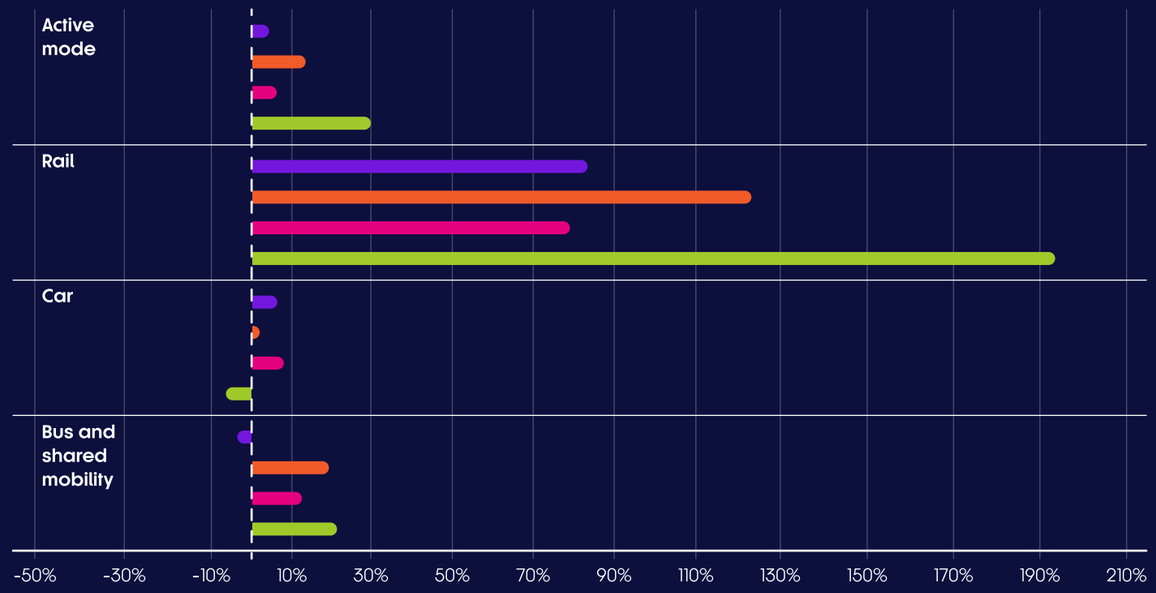
Bus and shared mobility trips increase in all scenarios except Just About Managing, but for different reasons. In Prioritised Places and Urban Zero Carbon, there is more support for traditional, public transport, but in Digitally Distributed, new shared private mobility solutions become available.

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

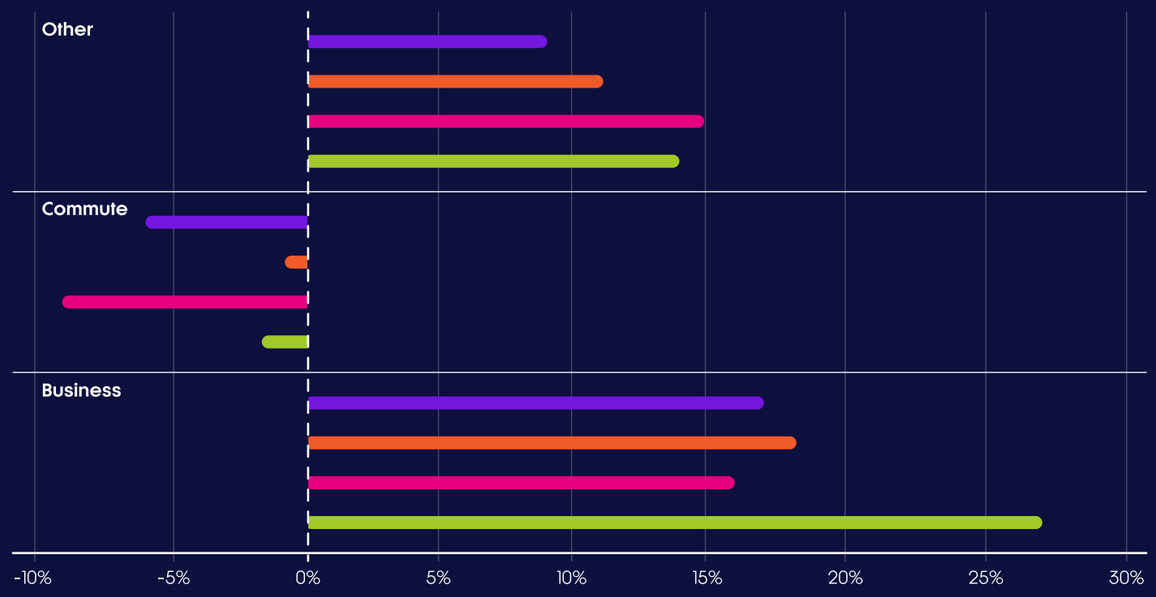
Just About Managing · Prioritised Places · Digitally Distributed · Urban Zero Carbon

Figure 21: Change in trips by mode and purpose, by scenario, 2018-2050

Change in demand, by mode, 2018-2050, and by scenario

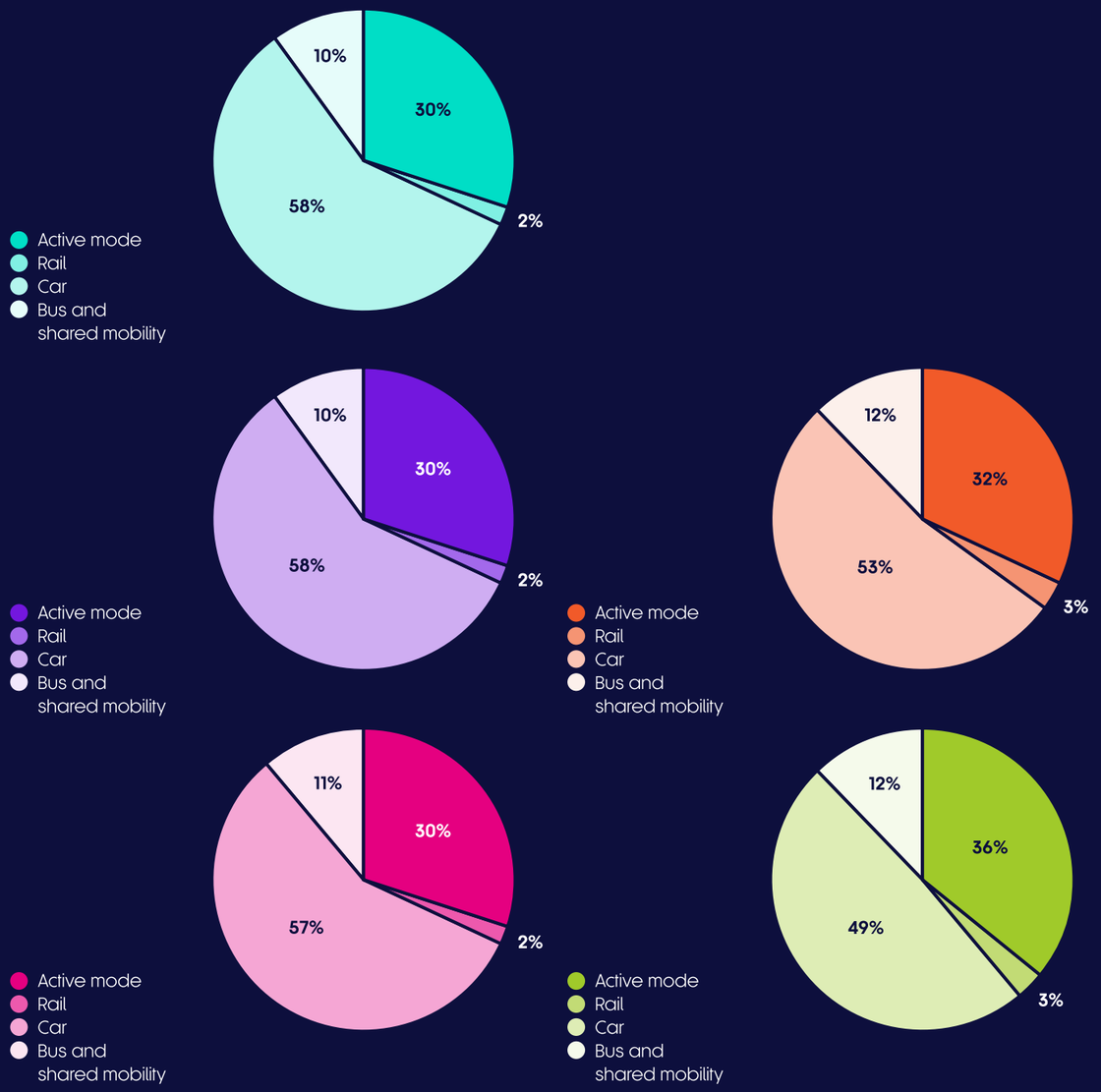


Change in demand, by purpose, 2018-2050, and by scenario



Scenario comparisons

Figure 22: Mode share (in number of trips) by scenario, 2050

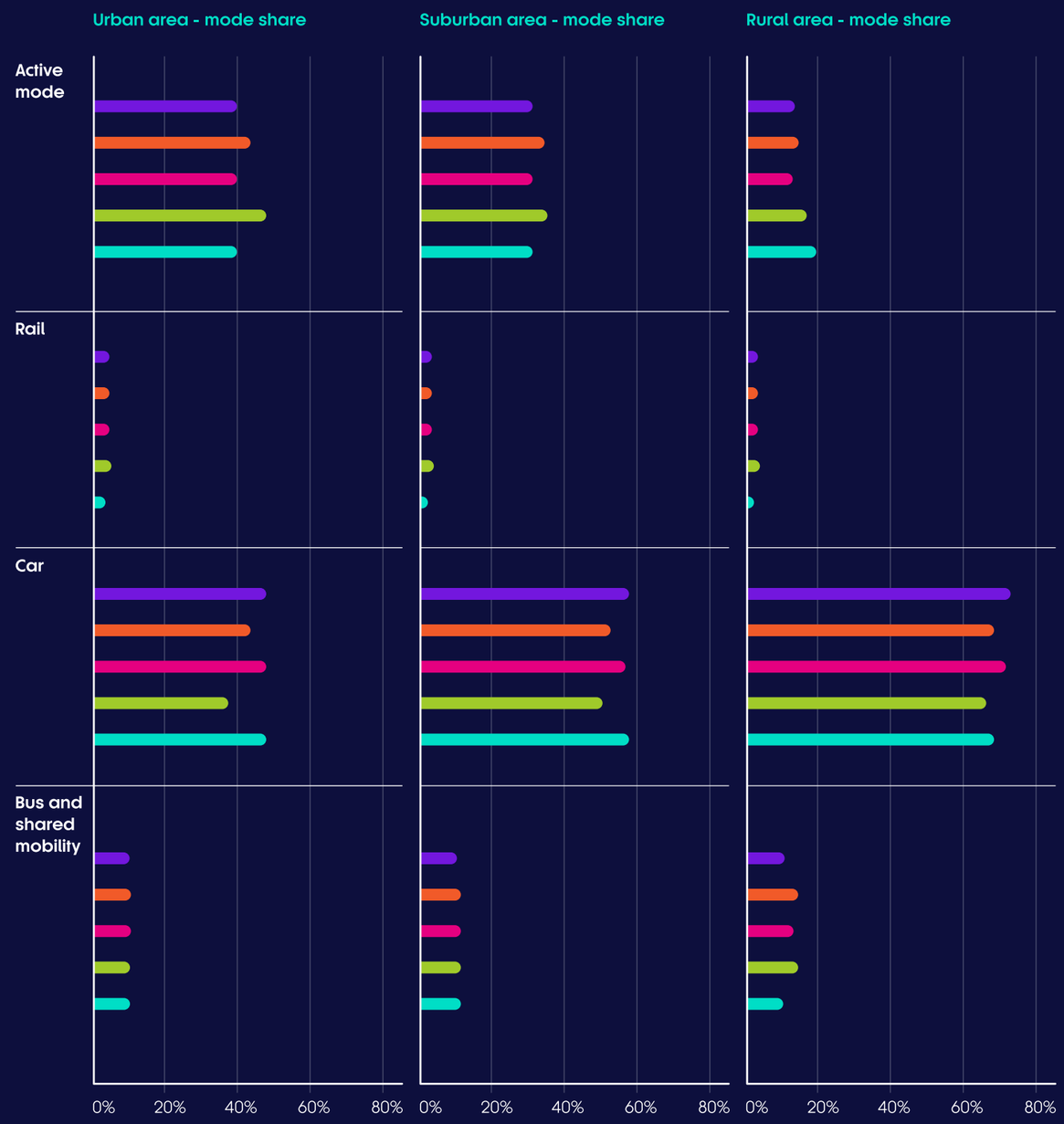


For Digitally Distributed and Urban Zero Carbon, non-traditional shared mobility systems become increasingly integrated with traditional public transport, with a blurred line between 'public' and 'private'. The increase in technology brings about increased sharing of car which is captured by the car segments of the graphs.

Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Just About Managing **Prioritised Places** **Digitally Distributed** **Urban Zero Carbon** **Base**

Figure 23: Mode share by area type



Scenario comparisons

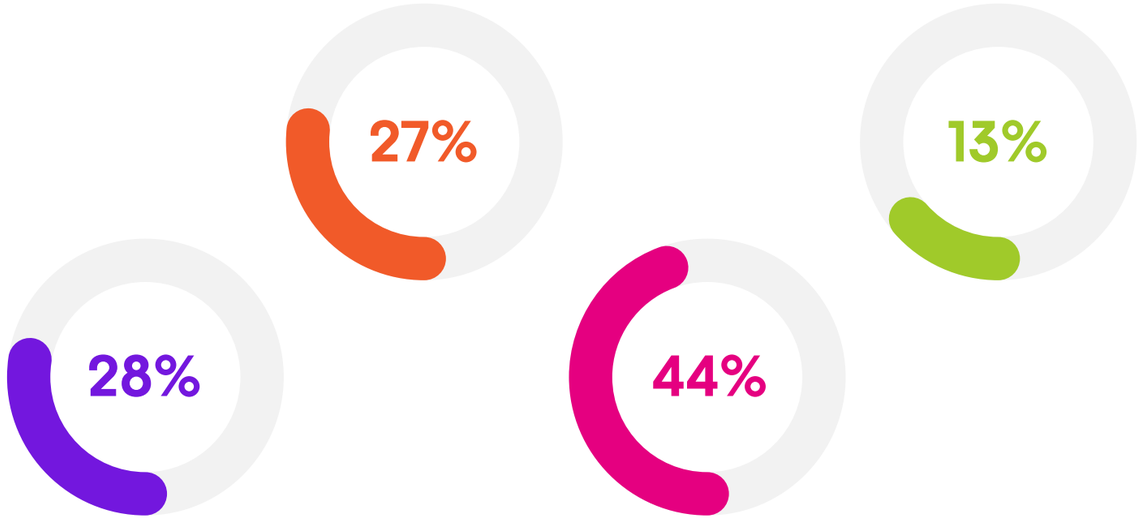
Figure 24 shows what the scenarios mean for distance travelled and trip length, a measure of energy demand, and then how this translates into carbon emissions in each scenario.

Vehicle-kms (distance travelled) by car, van and HGV increases in all four scenarios. The same is true for trip length, as illustrated by the switch from intra to inter-district travel. The increase is lowest in Urban Zero Carbon as this scenario experiences the most policy activity to drive such a change, compared to Digitally Disputed which does not. Prioritised Places also shows an increase above Just About Managing, largely due to more of the population living in rural locations where there is a need to travel further to reach destinations.

Emissions decrease most in Urban Zero Carbon as lower car demand is combined with high uptake of zero emission vehicles. Digitally Distributed combines higher car demand with high zero emission vehicles uptake, meaning emissions are higher in the short term. Prioritised Places has some zero emission vehicles uptake and Just About Managing has the lowest.

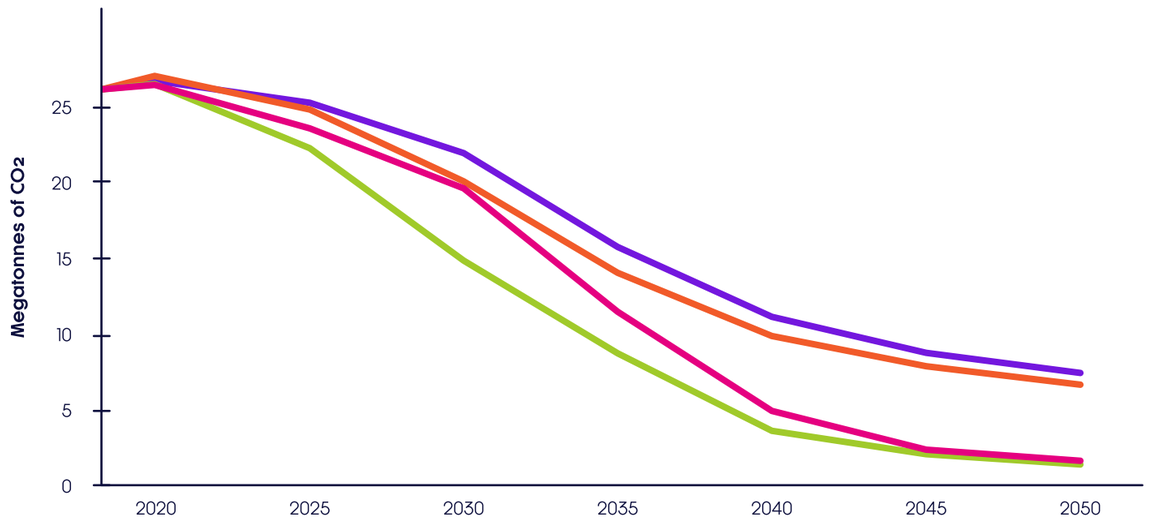
Figure 24: Change in vehicle kms, trip length and total emissions, by scenario

Percentage change in vehicle kms for each scenario, 2018-2050

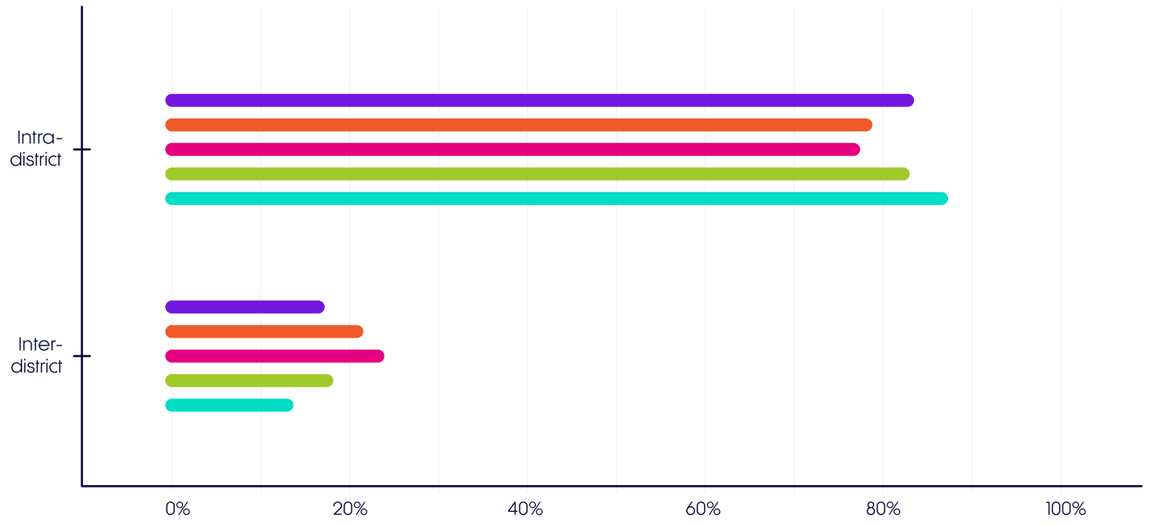


Data Source - TfN Analytical Framework. See Future Travel Scenario Technical Annex for more details here: https://transportforthenorth.com/economic-growth/future-transport-scenarios/

Total emissions in each scenario



Distribution of trips across intra-districts and inter-districts



5. How will we use the Future Travel Scenarios?

This chapter sets out how TfN will use the Future Travel Scenarios to help identify the right strategies in delivering the STP, Investment Programme and policy positions. In this section we focus on:

- What are TfN's strategies and programmes?
- How will the Future Travel Scenarios be integrated to test our strategies and programmes?
- Testing individual interventions
- A case study: Using scenarios to appraise alternative infrastructure options
- Refining TfN policy positions on future transport solutions and measures
- Developing TfN's Pathways to Decarbonisation
- Use of TfN Future Travel Scenarios to inform national decision-making

What are TfN's strategies and programmes?

TfN is responsible for providing statutory advice to Government on a prioritised pipeline of investments for the North's transport network that will support the economic, environmental and social objectives agreed by TfN and its elected Board. Our Investment Programme is a programme of potential multi-modal (road and rail) schemes for a 2050 horizon identified in collaboration with TfN's partners. It includes NPR, a major programme of improvements to the inter-city spine of the North's rail network. TfN also has wider transport policy roles in relation to management of rail franchise agreements through the Rail North Partnership, and improvements to public transport information and ticketing through the IST programme.

TfN has identified a series of options for delivery of our Investment Programme, in terms of which interventions are delivered and when they are delivered. For NPR, this consists of options for how the different cities are connected by new or upgraded rail links. For the wider Investment Programme, this consists of a set of sequencing strategies that consider different balances of road and rail schemes, and different rates of delivery.

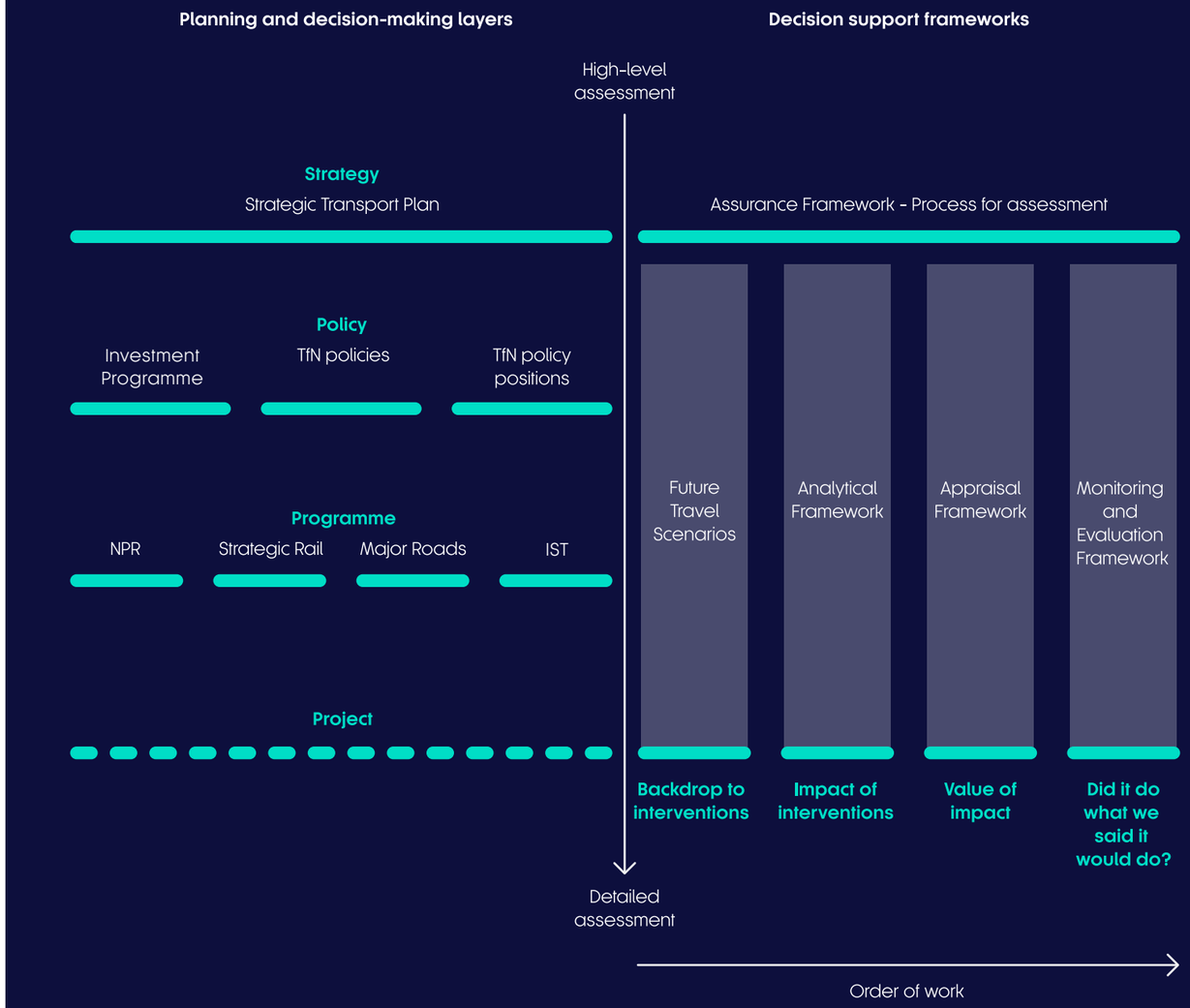
TfN also has an active evidence and thought leadership role in developing data and advice on policies outside this remit, such as active travel, EVs and supporting integrated land-use/transport planning. This is done through providing additional evidence and thought leadership that can be drawn upon by national and LTA partners when developing their own policies and strategies. Our Future Travel Scenarios are a key tool in helping TfN develop its role in this area, as they provide evidence on how these policies could interact with the interventions covered by the core remit.

Our aim is to deliver an Investment Programme which tackles the challenges identified and enhances the opportunities available. The preferred option for the Investment Programme will be identified by testing each one in each of the Future Travel Scenarios and assessing their performance against TfN's strategic objectives.

What are TfN's strategies and programmes?

Application of the Future Travel Scenarios is not a one-off exercise but is being integrated into TfN's wider planning and decision-making processes. The scenarios form one of five decision support frameworks used by TfN to develop its strategy, policies, programmes and projects towards delivery of our vision and objectives. The Future Travel Scenarios Framework sits alongside the Analytical, Appraisal and Monitoring and Evaluation Frameworks, all of which are guided by the Assurance Framework, which represents a step-by-step process for making decisions on transport interventions.

Figure 25: How our Future Travel Scenarios form part of TfN's planning and decision-making processes



How will the Future Travel Scenarios be integrated to test our strategies and programmes?

TfN has developed and is continuing to refine an Appraisal Framework, linked to the objectives established in the Strategic Transport Plan:

- ⇒ Transform economic performance and rebalance the economy
- ⇒ Improve access to opportunities across the North
- ⇒ Increase efficiency, reliability and resilience in the transport system
- ⇒ Promote and support the built and natural environment

Different 'transport strategies' (an umbrella term used in this report for infrastructure interventions and transport policy options) can be assessed and compared against each other using our Appraisal Framework. The principle is that specific quantitative or qualitative transport strategy performance criteria are identified, linked to each of these objectives. An example for NPR is shown in Figure 26 below.

Figure 26: Summary of the NPR scheme objectives and performance criteria, linked to TfN STP objectives

STP Objective	NPR Criteria
N1: Transforming Economic Performance and Rebalancing the Economy	Progress towards achieving the ambition of the IER through impact on jobs, GVA, trips and accessibility to hubs and airports
N2: Improve access to opportunities across the North	Catchment analysis, opportunities for released capacity and interchange
N3: Increase efficiency, reliability and resilience in the transport system	Improvements in perceived journey time through increased reliability, resilience and seating capacity
N4: Promote and support the built and natural environment	Equivalent number of cars taken off the road through modal shift, scale of additional land now available for development
N5: Deliver value to the UK taxpayer and passenger	Benefits, costs, total value for money, and operating position
N6: NPR is deliverable and acceptable	Phasing, constructability, acceptability, impacts on the environment

Each TfN programme or policy will have its own set of criteria that are particularly important to compare, and this approach can be adapted to meet specific requirements or areas of interest in each case. Furthermore, additional high-level objectives can be added where appropriate, as can be seen in the N5 and N6 objectives above.

As noted above, TfN has developed the Analytical Framework which provides a new suite of software tools and a consistent approach to data, modelling and appraisal across travel modes and regions of the North. The Analytical Framework can represent both Future Travel Scenarios and transport strategies and provide quantitative data on performance metrics to allow a comparative appraisal. This provides an estimate of how the impact of each strategy option, relative to a reference case, would vary from scenario to scenario. Further detail on our Analytical Framework and how the scenarios are represented in the modelling tools is provided in the Future Travel Scenario Technical Annex found here: transportforthenorth.com/future-travel-scenarios/

How will the Future Travel Scenarios be integrated to test our strategies and programmes?

Figure 27 below shows how different Transport Strategy options are tested in the four different Future Travel Scenarios. The green, amber and red cells represent an aggregated assessment of scheme performance (against both the STP objectives and agreed programme performance criteria) using our Appraisal Framework. Green indicates good performance against the objective, amber indicates moderate performance, and red indicates poor performance. Underpinning each cell will be a more detailed assessment with a score against each objective and sub-criteria, as illustrated.

Figure 27: Use of the Appraisal Framework across strategies and scenarios

Assessment in Appraisal Framework

		Without-policy plausible scenarios			
		1	2	3	4
Strategy options tested	A				
	B		□		
	C			○	
	D				

□ Performance of strategy Option B in Scenario 2	
Objective	**Score**
N1: Transform economic performance and rebalance the economy	9
N2: Improve access to opportunities across the North	8
N3: Increase efficiency, reliability and resilience in the transport system	7
N4: Promote and support the built and natural environment	9

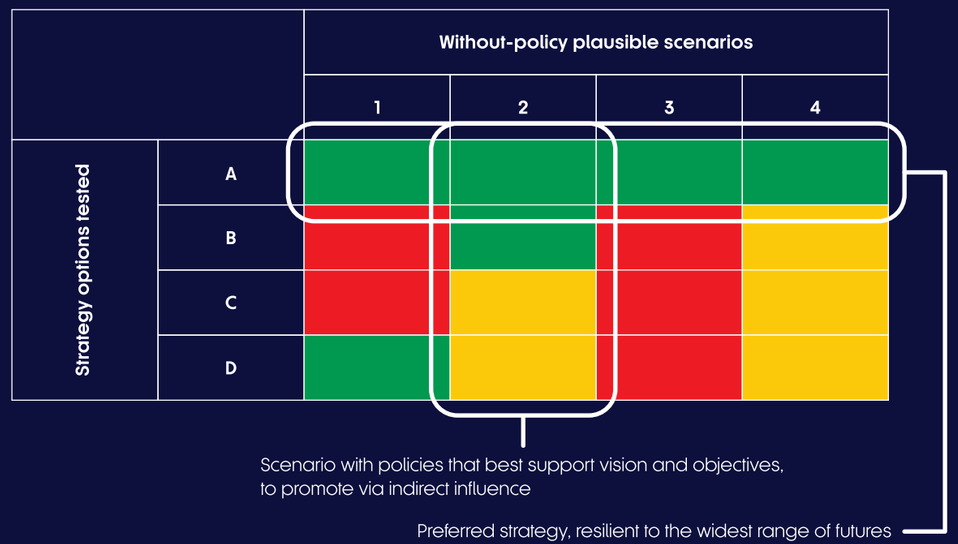
○ Performance of strategy Option C in Scenario 3	
Objective	**Score**
N1: Transform economic performance and rebalance the economy	4
N2: Improve access to opportunities across the North	6
N3: Increase efficiency, reliability and resilience in the transport system	3
N4: Promote and support the built and natural environment	2

This relatively high-level description is provided here for illustrative purposes, but TfN recognises the importance of providing transparency over how these systems are used. Each time TfN uses this approach to make a policy or investment decision, more detail will be made on the specifics of the Appraisal Framework used, including detailed descriptions of sub-criteria and how scoring systems are implemented.

Once the assessment has been made, an option selection process will be undertaken by TfN and its partners and stakeholders. In most circumstances, the transport strategy option which performs best in the widest range of Future Travel Scenarios will be selected as the preferred option to be taken forward, although in some cases options may be complementary and may warrant being delivered together or in sequence. This is illustrated in Figure 28. In some circumstances, identifying this strategy may not be obvious, if for example two strategies perform similarly overall, but differently in different scenarios. In these cases, a judgment must be made by TfN, partners and stakeholders, and the rationale for this judgment must be clearly explained and recorded.

How will the Future Travel Scenarios be integrated to test our strategies and programmes?

Figure 28: Identification of the preferred transport strategy and Future Travel Scenarios in which wider policies contribute most to the overall vision and objectives



It is also important to consider which scenarios lead to the best strategy performance overall, as this will help TfN to identify wider supporting policies that are not within its remit but help to support its overall strategic vision and objectives. This is illustrated in Figure 28 above. These policies can be promoted by TfN through indirect influence by including this evidence in advice to Government and through the evidence base shared with local partners.

As an example, elements of the Urban Zero Carbon scenario linked to spatial planning and national fiscal support for local public transport and active travel lead to positive carbon reduction outcomes. The results of this scenario provide evidence to inform TfN's policy positions on measures to decarbonise transport that we will use to help make the case to UK Government for further support to our LTA partners to roll out these measures.

A case study: Using scenarios to appraise alternative infrastructure options

This section outlines a qualitative case study to help illustrate how our Future Travel Scenarios will be used to appraise alternative infrastructure options on a hypothetical corridor that illustrates some of the connectivity decisions to be made in the North. Figure 29 on the following page shows three different infrastructure solutions that could be used to improve the connectivity within this corridor:

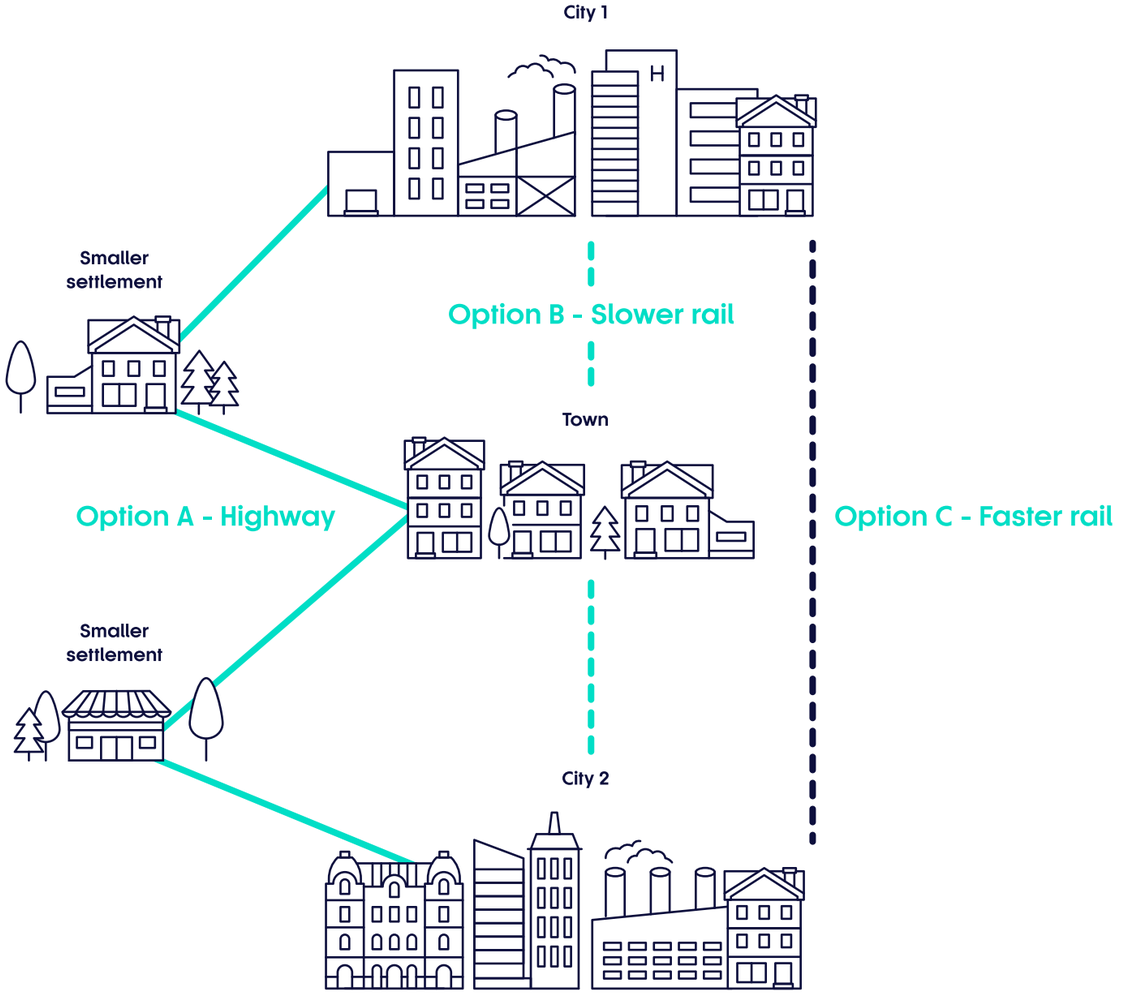
- **Option A –** A highway intervention that reduces the journey time between the two cities, as well as a mid-sized town and several smaller settlements within the corridor. This intervention will benefit a wider range of people in different types of place, but without wider supporting policies it will also increase road traffic, carbon emissions and may create additional congestion, particularly within the two cities.
- **Option B –** A rail intervention that reduces the journey time and increases rail capacity between the two cities and the mid-sized town. This intervention will not provide the highest possible speed between the cities, but it will allow people to commute from the mid-sized town into the cities and vice versa.
- **Option C –** A high-speed rail intervention that significantly reduces the journey time between the two cities. This intervention will transform journeys for people who want to travel between the cities, but its reach will be limited and the benefits to people living in the mid-sized town and smaller settlements will be limited without wider supporting connectivity investment.

A case study: Using scenarios to appraise alternative infrastructure options

In this case study, the policy question is how these proposed interventions should be prioritised and what external conditions or supporting policies would be needed to ensure delivery of interventions that meet TfN's objectives.

The tables on the right-hand side of Figure 29 show the appraisal of each option against TfN's objectives in each scenario. As noted above, green indicates good performance against the objective, amber indicates moderate performance, and red indicates poor performance. Performance for each intervention varies because of the range of future uncertainty mapped by our scenarios. For example, variation in performance can be caused by differences in the distribution of population between the different settlements, or the range of carbon impacts of road vehicles mapped by our scenarios.

Figure 29: A case study of using TfN's Future Travel Scenarios to appraise alternative infrastructure options



Performance of Strategy Option A	JAM	PP	DD	UZC
Objective	**Score**			
N1: Transforming economic performance and rebalancing the economy				
N2: Improve access to opportunities across the North				
N3: Increase efficiency, reliability and resilience in the transport system				
N4: Promote and support the built and natural environment				

Performance of Strategy Option B	JAM	PP	DD	UZC
Objective	**Score**			
N1: Transforming economic performance and rebalancing the economy				
N2: Improve access to opportunities across the North				
N3: Increase efficiency, reliability and resilience in the transport system				
N4: Promote and support the built and natural environment				

Performance of Strategy Option C	JAM	PP	DD	UZC
Objective	**Score**			
N1: Transforming economic performance and rebalancing the economy				
N2: Improve access to opportunities across the North				
N3: Increase efficiency, reliability and resilience in the transport system				
N4: Promote and support the built and natural environment				

The broad conclusions of this analysis are as follows:

Option A delivers accessibility improvements for smaller settlements not provided by Option B. However, it only performs well in specific futures, and should only be implemented contingent on:

- ⇒ policies that support higher levels of zero-emission vehicle uptake, or demand management measures such as charging or shared mobility (see Digitally Distributed and Urban Zero Carbon); and
- ⇒ population being more highly concentrated outside cities (see Prioritised Places and Digitally Distributed).

Option B performs best overall and should be implemented as a low-regrets intervention that is likely to perform well in most scenarios.

Option C provides better city-to-city connectivity than B, but it is not clear that this advantage is significant enough to favour the scheme, given the overlap with B and the likely high capital cost. The first step should be to optimise the design of Option B to deliver as much city-to-city connectivity as possible.

A case study: Using scenarios to appraise alternative infrastructure options

The Future Travel Scenario Technical Annex (published here: transportforthenorth.com/future-travel-scenarios/) outlines our plans to apply TfN's Analytical Framework to our business case and strategic development. This includes information on how we have represented the Future Travel Scenarios in our models and the detailed results of this process. Any application of our scenarios within future business case development will include a more detailed commentary and explanation concerning the assessment of strategies and options within this Future Travel Scenario Framework, to support resilient decision-making.

Refining TfN policy positions on future transport solutions and measures

Through the creation of our Future Travel Scenarios, the TfN partnership has formed an understanding of a range of travel-related developments, policies and measures which could aid delivery of the North's vision and enhance the outcomes of our Investment Programme. This involved mapping the uptake of transport solutions across our scenarios, creating a plausible picture of which solutions are supported within each scenario (i.e. which national and local policies; the different market conditions).

It should also be recognised that a single set of scenarios cannot be expected to offer a full depiction of the nature and extent of uncertainty faced. This is particularly the case for future transport measures and technologies, which evolves differently across our four scenarios. Even within the two higher technology scenarios, which see a pace of innovation for developing new or existing technology and the uptake of these solutions by users, there are subtle differences around which transport measures come to the fore. For this reason, TfN will monitor future changes as they occur and make updates were necessary as potential change becomes more apparent.

The travel related developments, policies and measures mapped by our Future Travel Scenarios are summarised within Figure 30. Further information on each future transport measure, and their potential uptake across our Future Travel Scenarios, can be found within our Future Transport Solution Annex found here: transportforthenorth.com/future-travel-scenarios/

These are intended to describe how we would expect various solutions to play out across our scenarios; and also to support the connection of foresight to future strategic application within Stage 5 of our Future Travel Scenarios cycle.

Refining TfN policy positions on future transport solutions and measures

Figure 30: How future travel related developments, policies and measures are mapped within TfN's Future Travel Scenarios

Policy or exogenous change	Notes	Just About Managing			Prioritised Places			Digitally Distributed			Urban Zero Carbon		
		2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Economic growth	Uses updated post-COVID NPIER scenarios	BAU			BAU			NPIER			NPIER		
City and town densification		Most growth in urban and suburban areas			Growth more evenly shared, with shift towards rural areas from 2025 onwards			Growth highest in suburban areas, but also some growth in urban and rural areas			Growth mainly weighted towards urban areas with very little growth in rural areas		
Increased home working	In occupation types where WFH is possible	WFH 1 day/ week	WFH 1 day/ week	WFH 2 days/ week	WFH 1 day/ week	WFH 1 day/ week	WFH 1 day/ week	WFH 2 days/ week	WFH 2 days/ week	WFH 3 days/ week	WFH 1 day/ week	WFH 1 day/ week	WFH 2 days/ week
Electric car and van sales		60% BEV, 40% PHEV	100% BEV	100% BEV	80% BEV, 20% PHEV	100% BEV	100% BEV	100% BEV	100% BEV	100% BEV	100% BEV	100% BEV	100% BEV
Electric small HGV sales		15%	60%	80%	15%	60%	80%	20%	100%	100%	20%	100%	100%
Hydrogen large HGV sales		0%	0%	0%	0%	0%	0%	0%	70%	90%	0%	70%	90%
Rail electrification	Measured as impact on 2018 emissions	-25%	-50%	-50%	-25%	-50%	-50%	-50%	-100%	-100%	-50%	-100%	-100%
Sustainable access to rail stations		No change			10% lower perceived costs for access/egress			No change			20% lower perceived costs for access/egress		
Sustainable transport access	GJT = Generalised Journey Time	No change			15% lower bus GJT for intra-sector trips 10% lower GJT for walk/cycle trips			No change			10% lower bus GJT for intra-sector trips 10% lower GJT for walk/cycle trips		
Micro-mobility	Active travel in modelling used to represent both traditional and new micro-modes	No change	Include micro-mobility in walk/ cycle travel time with average speed of 10kph		Include micro-mobility in walk/ cycle travel time with average speed of 10kph		Increase speed to 20kph	No change	Include micro-mobility in walk/ cycle travel time with average speed of 10kph		Include micro-mobility in walk/cycle travel time with average speed of 20kph		
Shared transport / MaaS	Bus travel in modelling used to represent both traditional and new shared transport solutions	No change	Bus connectivity for all intra-sector pairs		Bus connectivity for all intra-sector pairs		Bus connectivity for all flow types	Bus connectivity for all intra-sector pairs	Bus connectivity for all flow types		Bus connectivity for all flow types		
Public transport fare subsidisation		No change			10% lower fares for intra-sector trips	20% lower fares for intra-sector trips. 10% lower for other flow types		No change			20% lower fares for intra-sector trips 10% lower fares for other flow types		
Connected vehicles (public and private connected)	GJT = Generalised Journey Time	3% car GJT reduction	4% car GJT reduction	5% car GJT reduction	3% car GJT reduction	4% car GJT reduction	5% car GJT reduction	5% car GJT reduction	7% car GJT reduction	10% car GJT reduction	4% car GJT reduction	5% car GJT reduction	5% car GJT reduction
Autonomous vehicles (shared publicly) and privately owned	Represented as a change in effective capacity of highway links	0% fleet penetration		25% fleet penetration	0% fleet penetration		25% fleet penetration	25% fleet penetration	50% fleet penetration	75% fleet penetration	0% fleet penetration	25% fleet penetration	50% fleet penetration
Demand reduction policies and measures to improve use of roads	RUC = Road user cost	No change	No change	No change	No change		5% RUC increases applied intra sector	No change	5% RUC increases applied intra sector	10% RUC increases applied intra sector	10% RUC increases applied to all zone pairs	15% RUC increases applied to all zone pairs	20% RUC increases applied to all zone pairs
Logistics improvements, consolidation centres and freight modal shift	km reduction relative to initial forecast	0%	0%	0%	-5%	-5%	-5%	0%	0%	0%	-5%	-10%	-10%

Refining TfN policy positions on future transport solutions and measures

It is our intention that this foresight work helps to inform the debate on the national, regional and local conditions under which the right transport solutions thrive. Developing our own regional evidence base[18], via the Future Travel Scenarios, is a key first step to achieving this. This has already contributed to our advice to the UK Government's Future of Transport call for evidence during 2020[19].

Existing, emerging and innovative transport solutions will be important, alongside the infrastructure interventions highlighted in our Investment Programme, to delivering TfN's overall vision. The benefit of having different levels of uptake, for different solutions, across our Future Travel Scenarios is that we can explore the different interaction of these solutions with potential interventions within the Investment Programme.

Our LTA partners are responsible for improvements to their local transport networks in line with local growth and place-based strategies. Action has been accelerated to deliver some of these transport solutions during 2020, with the Covid-19 pandemic acting as a stimulus for acceleration of Government intervention in areas such as active travel.

Our aim is to support and complement local work and priorities. We intend to complete further assessment of which solutions require more support and what this support might entail. This may be TfN and partners taking further steps in specific areas, or considering whether additional national Government support is required. This could be in the form of additional national policy or Government provision of more devolved funding or powers. The relevant current roles and responsibilities of TfN and its partners are set out on the following page in Figure 31.

[18] https://transportforthenorth.com/wp-content/uploads/TfN-response-to-Future-of-Transport-call-for-evidence.pdf
[19] See Figure 5 earlier in the report for the full Future Travel Scenario cycle approach.

Refining TfN policy positions on future transport solutions and measures

Figure 31: Future transport solutions and measures and their key influences

Future transport solutions	Policy measures	TfN (STB) direct influence	TfN partner influence	National Gov't influence	Private sector influence
Placed based strategies (including remote working)	Address emissions at a local level through local management of transport solutions. Spatial planning policies and economic development strategies that incentivise high density development in city and town centres or support LA in delivering sustainable transport solutions and good place making. Flexible working policies, business practices and digital communications technologies that enable remote working. An agreed method of calculating the carbon benefits of remote working.	x	x	x	x
Uptake of electric vehicles (and other low emission technology i.e. hydrogen)	Evidence and intelligence of requirements.	x	x	x	x
	Fiscal incentives for the purchase of electric and other low/ultra-low options where suitable, alongside disincentives for petrol/diesel vehicle purchase.		x	x	
	Ensuring effective energy supply which supports an effective charge network across the North. Ensuring changes in energy use have fully coordinated and integrated planning of supply, distribution and demand management.		x	x	x
	Whole network coverage which reduces range anxiety; wider increase in larger and faster charging stations; alignment with housing and spatial planning.			x	
	Funding trials and infrastructure for hydrogen (H2) HGVs.			x	x
Measures to improve use of car (taken alongside ULEV measures)	Regulations and fiscal disincentives for fossil fuel vehicle purchase and new vehicle standards (i.e. VED). Banning of sales of new petrol, diesel and hybrid vehicles (2035). Vehicle occupancy incentives. Restrictions on petrol/diesel vehicles within local areas. Low emissions zones; work parking levies etc. Road user charging		x	x	
	Road user charging to recognise the essential nature of freight movements. Road design manuals to include infrastructure for platooning of vehicles to aid move to automation e.g. specific lanes, appropriate surfacing to cope with HGV loads on similar tracking to avoid rutting.				
Connected & autonomous vehicles	Availability and costs of connected and autonomous vehicles.			x	x
Sustainable transport connectivity (active travel, micromobility, intermodal hubs)	Improved infrastructure and accessibility.	x	x	x	x
	Road re-allocation to encourage active mode connectivity, safety and uptake.		x	x	
	Refined national regulations and guidance which enhance use, but ensure safe delivery and integration alongside other modes.			x	
	Traffic regulation orders – local regulation of vehicle speeds, numbers and behaviours.		x	x	
	Trials/test beds for both regulations and physical activities.		x	x	
	Use of intermodal hubs to encourage sustainable access to rail stations and other public transit.		x	x	
	Incentivising in places where limited alternative sustainable modes.		x	x	
	Integration of smart ticketing mechanisms to ensure interoperability of data across modes and broaden active travel options.	x	x	x	x
	Mobility credits – incentivising in places where limited alternative sustainable modes e.g. rural/coastal communities.		x	x	x

*Aspects currently influenced directly by TfN are set out within TfN's Strategic Transport Plan, Investment Programme and associated work packages with our delivery partners Highways England and Network Rail. These are treated as internal strategies for the purposes of the Future Transport Scenarios.

Refining TfN policy positions on future transport solutions and measures

Figure 31 continued: Future transport solutions and measures and their key influences

Future transport solutions	Policy measures	TfN (STB) direct influence	TfN partner influence	National Gov't influence	Private sector influence
Rail decarbonisation	Electrification, hydrogen (H2), or bi-mode trains. Ensuring changes in every use have fully coordinated planning of supply, distribution and demand management.	x	x	x	x
Increased use of public transport, mobility as a service and shared transit	Improved infrastructure and accessibility.				
	Improved connectivity and service quality.				
	Reduced fares relative to the costs of car travel.				
	Availability through sharing schemes and commercial tools.	x	x	x	x
	Demand responsive transit, car clubs and car sharing.				
	Contactless ticketing and enhanced customer information.				
Increased use of digital connectivity	Policies to support enhanced home working and remote working; as well as supporting adaption of commuter patterns.		x	x	x
	Data strategies and interoperability to support open data.	x	x	x	x
	Infrastructure (digital and physical) to support uptake of connected and autonomous vehicles.		x	x	x
	Supporting technology providers to develop new innovative infrastructure solutions through grants, competitive funding routes, incentives, tax.		x	x	
Freight transport and logistics improvements	Use of inter-modal hubs.		x	x	x
	Freight consolidation centres and warehouse clustering.		x	x	x
	Platooning			x	x
	Use of drones			x	x
	Spatial planning and urban development to support delivery vehicles, segregation and business access.		x	x	

One area where this approach is particularly important is decarbonisation. TfN has set an ambitious Decarbonisation Pathway for the North's transport system, but many of the solutions and policies required to achieve this fall outside TfN's direct remit at present. TfN can play an important role in carbon reduction through our Investment Programme, and also has a role to play in thought leadership and support, providing evidence and advice to national and local partners to make the case for the solutions and policies that will be needed. More information on TfN's Decarbonisation Pathways is provided below.

When defining a future for the North's transport system, we also need to ensure that we embrace the diverse range of needs of our 15 million people and the environment that sustains them. To achieve mass implementation of new solutions as part of our transport mix, and ensure opportunities for all, these solutions need to be accessible. These solutions may impact places differently and should be implemented to maximise local benefits, but integration across a wider geographical area will be important to deliver improved accessibility to jobs and other opportunities. This is particularly relevant across the North where we see a range of urban, semi-urban, rural and remote place types.

*Aspects currently influenced directly by TfN are set out within TfN's Strategic Transport Plan, Investment Programme and associated work packages with our delivery partners Highways England and Network Rail. These are treated as internal strategies for the purposes of the Future Transport Scenarios.

Developing TfN's Pathway to Decarbonisation

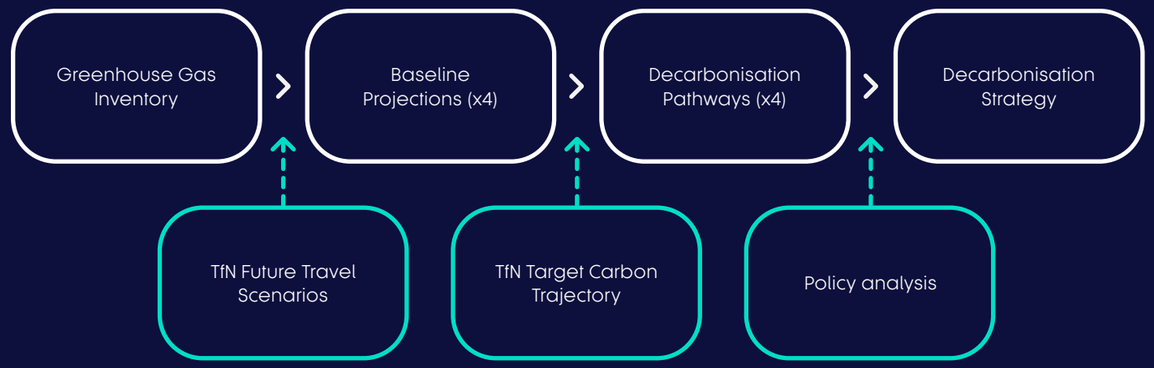
TfN's STP commits to lead the scoping and development of a 'Decarbonisation Pathway to 2050' so that a zero-carbon transport network is at the heart of public policy-making and future investment decisions in the North.

TfN will publish a parallel report on its Decarbonisation Strategy to show which policies and measures are likely to be required to achieve TfN's target of a zero-emission transport system before 2050. The level of additional action required to achieve this target will vary depending on which TfN Future Travel Scenario is being considered. In each scenario, the level and distribution of travel demand is different, as is the level of national Government ambition and support for decarbonisation. Assessing the decarbonisation 'policy gap' in each scenario will allow TfN to develop a resilient Decarbonisation Strategy that can adapt to different future circumstances.

Use of the Future Travel Scenarios to develop our Decarbonisation Pathways recognises that there remains significant uncertainty in the level of national policy that will be brought forward to reduce emissions and in the wider drivers of demand and technology that can indirectly affect emissions. The result will be a series of pathways, rather than one single pathway, but there will be many common features across these that will allow us to develop a coherent, resilient Decarbonisation Strategy. TfN is currently developing Decarbonisation Pathways and a related Decarbonisation Strategy for publication in spring 2021. A brief summary of the approach is shown in Figure 32 and the key components are described in the bullets on the following page.

Developing TfN's Pathway to Decarbonisation

Figure 32: Flowchart of process for developing Decarbonisation Pathways and Strategy using the TfN Future Travel Scenarios



- **Greenhouse Gas Inventory.** A Greenhouse Gas Inventory is an estimate of the current or historic emissions from a specific set of sources. We have established an inventory for emissions from land transport, covering all travel within the North of England with a base year of 2018 (in line with new TfN transport models).

- **Baseline projections.** Taking the inventory as a starting point, baseline projections show how emissions could change in future. Our Future Travel Scenarios are fundamental in providing the assessment of external drivers and related travel demand for these baseline projections. This means there are four different projection assessments that TfN will use to develop its Decarbonisation Pathways. Due to the spread of plausible scenarios, a range of projections can be developed, from limited progress made towards decarbonisation targets, to those in which there is a more concerted national effort and progress is consistent.

- **Target trajectory.** The target trajectory is the overall annual emissions trajectory to which the Decarbonisation Pathways will be aligned. The specific details of this will need to be agreed by TfN Board, but the end point will be a zero-emission transport system before 2050, and an interim trajectory aligned to the rate of progress in the Climate Change Committee's Carbon Budgets as a minimum.

- **Decarbonisation Pathways.** The pathways will show what additional measures are required to get from each baseline projection (based on each of the four TfN Future Travel Scenarios) to the target trajectory. Measures will cover changes that affect both demand and the emissions intensity of vehicles. For some scenarios, the required additional measures will be significant, because of a deficit in national action, whereas in other scenarios more limited additional action will be required.

- **Policy analysis.** The final step will be to analyse the policies required to roll out the additional measures in each scenario and assess the extent to which TfN and partners can take these steps without national support, or whether additional support is required. This support could be in the form of additional national policy or Government provision of more devolved funding or powers. This analysis will provide TfN and partners with further evidence of what new policies are required for the North to realise its objectives.

Use of TfN Future Travel Scenarios to inform national decision-making

DfT has been developing a set of Future Travel Scenarios which aims to allow scheme promoters to represent the sensitivity of scheme performance to several key drivers of change, enabling comparability between business cases.

TfN recognises the value of this, but there are several reasons why we have opted to develop our own scenarios in addition to these DfT scenarios:

- A key exogenous driver of uncertainty for TfN is the direction of national policy, whereas this is in some cases not considered as part of DfT scenarios as it is not a truly exogenous driver.
- TfN and partners chose to adopt the concept of morphological scenarios, to explore the effects of combining different drivers, enhance plausibility and improve the development of narrative. DfT scenarios are developed using an approach in which the only difference between one scenario and the next is adjustment of a single input assumption.
- There was a need to represent more granularity and additional drivers of change not covered by DfT scenarios, particularly those associated with TfN local partner objectives, such as the level of urban densification.

TfN is working closely with DfT to align and reconcile its business case work with DfT scenarios by:

- Running DfT scenarios as further sensitivity tests, particularly for high profile business case submissions.
- Drawing evidence to support plausible ranges for change driver assumptions from the research and evidence base underpinning DfT scenarios.
- Quantitatively comparing TfN scenarios to DfT scenarios across a range of travel demand outcomes to illustrate where they are similar and can perhaps be used as a substitute.

As an initial benchmarking exercise, we have compared the results of our Future Travel Scenarios to DfT's Road Traffic Forecast 2018. In these DfT scenarios, car miles travelled are estimated to increase between 11% and 43% between 2018 and 2050. The equivalent car traffic growth in the TfN Future Travel Scenarios is between 8% and 41%. These forecasts are not directly comparable, due to the reasonable adjustments we have made to account for the initial impacts of the Covid-19 pandemic and other changing circumstances in the UK since 2018, as well as the wider range of drivers of change considered in the TfN Future Travel Scenarios. However, the fact that the TfN scenarios cover a similar, albeit slightly wider range of growth factors suggests that these scenarios can be used in similar contexts to the DfT scenarios, such as infrastructure business case development. A more detailed breakdown of car traffic growth in the TfN Future Travel Scenarios is provided in the Technical Annex.

We will continue to work with our LTA partners across the North, as well as the DfT and other Government departments to ensure our scenarios reflect the future uncertainties which impact travel in the North; and the latest activity around the strategic factors we have considered.

6. What next?

Our refreshed Future Travel Scenarios will form an integral part of TfN's decision-making processes over the coming months. In conjunction with our Analytical Framework and Appraisal Framework, they will be used to test and refine TfN transport strategies, policies and programmes so that we support transport interventions, solutions and policy measures that meet our objectives across a range of futures.

Integration with TfN's wider decision-making processes

- **Analytical Framework:** Before the end of 2020 we plan to build on advances to our modelling tools to date, embedding the scenarios and their more detailed representations into other Analytical Framework tools. We will do this for both NorTMS, our detailed conventional transport modelling system, and the Great Britain Freight Model, which we use to produce forecasts of freight movements associated with changes in future potential land-use, economic growth and different policy outcomes.

- **Appraisal Framework:** Our Appraisal Framework will take a rounded view on the performance of different interventions in each scenario against our strategic objectives. In parallel, we are also continuing to develop and refine the criteria and performance metrics underpinning our high-level strategic objectives. This includes developing distributional analysis and person-centred metrics using user personas[20], to help bring to life what different interventions mean in practice for different groups of people and how this could change from scenario to scenario.

- **Monitoring and Evaluation Framework:** We have designed a robust Monitoring and Evaluation Framework to measure and report annual performance against TfN's objectives. It is our intention that indicator analysis will be broken down to look at demographic, socio-economic and geographic factors. This data will form a critical input into the process of updating our scenarios, as it will provide evidence to support our assessment of whether new trends are emerging and whether specific factors have become more or less uncertain.

Development of programmes and policies: Our Future Travel Scenarios will be applied in TfN's programme and policy development workstreams to ensure robust, resilience interventions are selected. Key forthcoming applications include:

- **Decarbonisation Pathways:** As noted above, TfN is currently developing a new publication on Decarbonisation Pathways, which will use the Future Travel Scenarios as baseline projections. The Decarbonisation Pathways are intended to show what additional transport solutions and policy measures are likely to be required to achieve TfN's target of a zero-emission transport system before 2050. Assessing the decarbonisation 'policy gap' demonstrated in each scenario will allow TfN to develop a resilient Decarbonisation Strategy (in spring 2021) that can adapt to different future circumstances.

- **NPR SOC and IPBA:** We will apply the scenarios within TfN's Investment Programme Benefits analysis (IPBA). TfN is developing a new Strategic Outline Case (SOC) for NPR during winter 2020/21 and a prioritised assessment of TfN's potential road and rail Investment Programme during the remainder of 2021. We will apply the scenarios to help decide which variants of these potential interventions most closely align to TfN's strategic objectives and inform our statutory recommendations on investment in the regional transport network.

- **Future transport measures:** Our scenarios provide a vehicle for discussion and evidence towards future transport and innovative solutions, to inform the future of transport debate. We can use the scenarios, embedded within our analytical and assurance frameworks, to explore the impacts of changes in future transport mobility due to technology, behavioural change and mode shift. This, alongside our Decarbonisation Pathways, will allow us to determine which combination of future transport measures should be supported to ensure an Investment Programme (infrastructure and non-infrastructure) which delivers on a broad range of objectives. We will consider TfN's role in provision of suitable supporting activities for the uptake of future transport measures across the region.

[20] https://transportforthenorth.com/wp-content/uploads/User-Insight-in-to-Pan-Northern-Travel-Report-min.pdf

Scenarios as a tool for developing vision and objectives.

- **Northern Transport Charter:** Building on the STP, in September 2019, the TfN Board approved a draft NTC which sets a future direction for TfN framed around four strategic ambitions. One of these ambitions, 'championing inclusive and sustainable growth', includes a workstream on further developing TfN's appraisal system to target investments that balance transformational economic growth with environmental and social outcomes. The Future Travel Scenarios will help us explore how different external strategic factors will affect our ability to realise those outcomes and will also help us to refine our strategic objectives in line with these outcomes, discussed below.

- **Using scenarios to help refine TfN's objectives:** TfN's objectives are currently defined in broad qualitative terms, but we are working with our partners to define more specific objectives against which we can monitor our progress and appraise strategies. A good example of this is the Target Decarbonisation Trajectory, agreed by TfN Board as one of the organisation's objectives in 2020. In other areas, TfN is aiming to define a more comprehensive and specific set of objectives, quantified as targets where possible, to allow investments to be appraised against those objectives. Our Future Travel Scenarios have been a useful mechanism for facilitating discussion around these objectives with more specifics around growth, sustainability, inclusivity or other strategic issues for North to tackle. As such, the work on our Future Travel Scenarios provides one of the building blocks for future statutory advice and updates of our STP.

Wider use and engagement:

- The Future Travel Scenarios have been developed in partnership with LTAs across the North and represent a collective view on the key uncertainties and range of plausible futures the North faces. Through TfN's wider work to publish and share its analytical tools with partner organisations, we intend to support the use of the Future Travel Scenarios to help partners develop their own strategies and policies. We are aware that some partners already use their own scenarios for this type of work and we are not suggesting that these should be replaced by TfN scenarios, but if we can make it easy and low-cost for partners to undertake this analysis, it will provide advantages in terms of consistency and comparability.

- TfN and LTA partner engagement with individuals, transport users and communities will be fundamental to informing our Investment Programme and implementing any future policies or strategies. This is key to delivering our broader consideration of the economic, environmental and social aspects which will affect the future travel patterns, but also the opportunities available to people, business and goods across the North. A key example of this is how our Future Travel Scenarios (including their use in our Assurance Framework, programmes and projects, and strategic development) can complement spatial planning. We will work in collaboration both at national level, informed by the Planning White Paper (led by the Ministry of Housing, Communities and Local Government), and with local authority members across the region with regards to their spatial planning and frameworks.

- Finally, we are planning to establish a Transport Citizens' Panel and undertake user insights exercises, to better understand the experiences of people across the region, and to continue our business engagement alongside engagement with the Northern LEPs through the TfN Board.

TRANSPORT FOR THE NORTH

2nd Floor
4 Piccadilly Place
Manchester
M1 3BN

Ground Floor
West Gate
Grace Street
Leeds
LS1 2RP

0161 244 0888

engagement@transportforthenorth.com

transportforthenorth.com