Major Roads Report

TRANSPORT FOR THE
NORTH

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Abbreviations

AI – Artificial Intelligence
BCR – Benefit-Cost Ratio
CAV – Connected & Autonomous Vehicles
CAZ – Clean Air Zone
CV – Connected Vehicles
DfT – Department for Transport
DRT – Demand Responsive Transport
EV – Electric Vehicles
FMZ – Future Mobility Zones
GVA – Gross Value Added
HS2 – High Speed 2
IST – Integrated and Smart Travel
ITS – Intelligent Transport Systems
KRN – Key Route Network
LEZ – Low Emissions Zone
LHA – Local Highways Authority
LLM – Large Local Majors
LRN – Local Road Network
MaaS – Mobility as a Service
MoU – Memorandum of Understanding
MRN – Major Road Network
MRR – Major Roads Report
NPIER – Northern Powerhouse Independent Economic Review
NPR – Northern Powerhouse Rail
NRF – National Roads Fund
REB – Regional Evidence Base
RIS – Road Investment Strategy
SDC – Strategic Development Corridor
SRN – Strategic Road Network
STB – Sub-National Transport Body
STP – Strategic Transport Plan
TCF – Transforming Cities Fund
TfL – Transport for London
TfN – Transport for the North
TIS – Transport Investment Strategy
ULEV – Ultra Low Emissions Vehicle
ULEZ – Ultra Low Emissions Zone
VfM – Value for Money

Foreword

Our highways are at the heart of our communities, including, as they do, our footpaths, cycle ways and roads. They are critical to a modern functioning society, connecting people and places with services and opportunities. Each and every one of us uses some part of the highway when making a journey.

An efficient, reliable and safe highway network is essential for modern supply chains: enabling raw materials to be received, finished goods to be dispatched, food stores to be supplied, office complexes to be serviced.

In the last century motorised transport revolutionised our way of life, and as we move towards the second quarter of the 21st century our highways will continue to be a fundamental part of our transport system.

However, as we look to address climate change, we will need to make choices about how we use the available highway space, with greater priority given to pedestrians, cyclists and public transport.

New highways will continue to be built, needed to provide access to new housing and employment sites. We will continue to invest in our highways, ensuring that

existing roads are maintained, and that new roads are designed and delivered in ways that minimise their impact on our environment.

And we will need to consider and agree on how we will pay for that investment and indeed on how we pay to use our roads. The electrification of road vehicles means that, as a nation, we will lose the revenues from Vehicle Excise Duty and fuel duty that pays for new roads. We need to do things differently, but at the same time ensure that our way forward does not disadvantage those for whom travel by car is the only practical option.

If we're to have that debate then we must seize the opportunity to look at how the relative cost of motoring, bus travel and rail travel influences the choices we make. For only by looking at transport in the round will we be able to ensure that our investment choices are sustainable for the longer term.

This Major Roads Report outlines the critical role that the North's strategic roads play in enabling our residents and businesses to go about their daily lives. It sets out the scale of the challenge as we look to enhance their safety and reduce their environmental impact.

Our highways will continue to be at the heart of our communities: they will continue to be an essential component of a sustainable, connected transport system.

As the 'one voice' for the North, TfN is committed to ensuring that our roads are fit for purpose. We will work with Government and its agencies to identify a way forward that is fair and sustainable, as part of a multimodal transport system that is truly fit for the 21st century.

Martin Tugwell
Chief Executive

TRANSPORT FOR THE NORTH

Executive Summary

Roads were first developed in the Iron Age and have had an important role in moving people and goods for millennia. In the last hundred years the internal combustion engine (ICE) has provided the automotive power to transform our society, opening up opportunities for longer distance travel to access jobs, a wide range of services, and leisure activities, and enabling the movement of vast quantities of freight. Motorised transport has delivered many benefits, but also brought with it some significant social problems, particularly air and noise pollution, severance, and social exclusion for those without access to a car. In an era of climate emergency, it may seem counter-intuitive to be investing in the future of our roads. However, as can be seen from the evidence in this report, the majority of journeys now and in the future will be continue to be on our roads – whether this is driving zero emission vehicles, walking, cycling or getting the bus or tram.

Within the context of the North's Strategic Transport Plan and Northern Transport Charter, TfN's goal is for multi-modal policy measures and transport investment to achieve the optimum balance and integration of environmental, social equity and economic outcomes.

To be fit for the future, how we manage, operate and invest in our transport networks, including the 85,000km of roads in the North (7,899km of MRN) should reflect the needs and priorities of our communities in the 21st century.

With 97% of personal journeys and 88% of freight movements in the North made using our highways, roads are central to our way of life. And with close to 70% of all vehicle kilometres on the Major Road Network, our Major Roads have a vital role in underpinning economic activity, opening up access to jobs, goods and services and in enabling growth in new employment and housing.

To function well the Major Road Network must be seen as a fundamental part of an integrated transport network where people and businesses can make well informed choices on the best forms of transport for their journey. And where for many journeys there are a range of good quality options in place of travel by private car. TfN promotes a 'total network' approach to improving transport, and sees improvements for pedestrians and cyclists, investment in rail, light rail and bus, as critical to delivering more efficient and sustainable transport choices for people and businesses in the future.

Transport for the North

Transport for the North (TfN) is a Sub-national Transport Body (STB) with a statutory requirement to advise UK Government on the transport priorities for the North of England.

Our role is to add value through statutory advice to UK Government, ensuring value-for-money funding and strategic decisions regarding transport in the North are informed by our local knowledge, expertise and needs. Our advice reflects the views of our Members, bringing the region's political and business leaders together to consider transport solutions which connect the economic assets across the North, both internally to create an economic mass, but also externally as part of a global marketplace. We published our Strategic Transport Plan (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

Developed as a position statement to support TfN's statutory function, the Major Roads Report focuses on the role of major roads in achieving TfN's ambitions and objectives. The report draws upon TfN's Strategic Transport Plan (2019) and TfN's more recent work on Future Travel Scenarios, Decarbonisation Strategy and Freight & Logistics Strategy. The report also reflects upon the Government's Road Investment Strategy 2 (RIS2) announced in 2020, and the Major Road Network (MRN) programme.

Strategic Context

Inclusive and more balanced growth is a key priority for the Government and Local Authorities in the North. As the country emerges from the profound economic and social impacts of the Covid-19 pandemic, the Government has reiterated its commitments to 'building back better' and the levelling up agenda.

Future investment in the North's transport network must be considered within the context of the UK's productivity challenge; the long-term opportunities for a more inclusive and balanced UK and Northern economy; and, critically, the need for rapid and concerted action on reducing transport carbon emissions.

The North has around 1.1 million businesses[2] and prior to the impact of Covid-19 around 7.4 million jobs[3] and is currently home to more than 15.5 million people[4]. For the last 30 years, the North's economic value per person (measured as Gross Value Added, GVA) has been consistently around 15% below the average for the rest of the UK, excluding London[5]. Most recent data reveal the gap has widened further, with the economic value (GVA) per person in the North now 18% below the UK average[6].

The Northern Powerhouse Independent Economic Review (NPIER), published in 2016, identified the drivers underpinning the North's current economic position and factors constraining its performance. The NPIER highlighted the clear links between transport investment and the productivity and performance of the North's economy, identifying the potential, by 2050, for the North's economy to generate an additional £100 billion GVA and 850,000 additional jobs.

Good transport connectivity is fundamental to achieving our vision for a thriving North of England, however that must be balanced against environmental goals, the most urgent being the need to deliver rapid and substantial reductions in carbon emissions.

The Northern Powerhouse Independent Economic Review (NPIER), published in 2016, highlighted the clear links between transport investment and the productivity and performance of the North's economy, identifying the potential, by 2050, for the North's economy to generate an additional £100 billion GVA and 850,000 additional jobs. The report shows there are major opportunities for growth in Advanced Manufacturing, Energy Sector including low carbon technologies, Health Innovation and Digital sectors and in Logistics, Education and Financial & Professional services. Advanced Manufacturing, Energy Sector and Logistics businesses are particularly reliant supply chain movements by road, whilst all sectors require good road connectivity for business travel and access to labour markets.

TfN has adopted a Decarbonisation Strategy[7], setting out a decarbonisation trajectory and set of TfN actions towards achieving a near-zero date of 2045 for carbon emissions from surface transport in the North.

Why We Need Roads

Safe, reliable and efficient road transport forms a critical part of our transport system, with travel by road accounting for more than three-quarters of all miles travelled, and with around 90% of freight transported by road.

Roads are used by pedestrians, cyclists, horse-riders, motorcyclists, drivers of cars and vans, and passengers in cars, buses and coaches. In total, 96% of all personal journeys are made by these modes, amounting to 88% of distance travelled.

% of trips in the North

Using roads in the North

| 59% by car | 26% by foot | 9% by bus | 2% by bicycle | 2% by taxi |

Other

| 2% by rail/ metro | <1% by other |
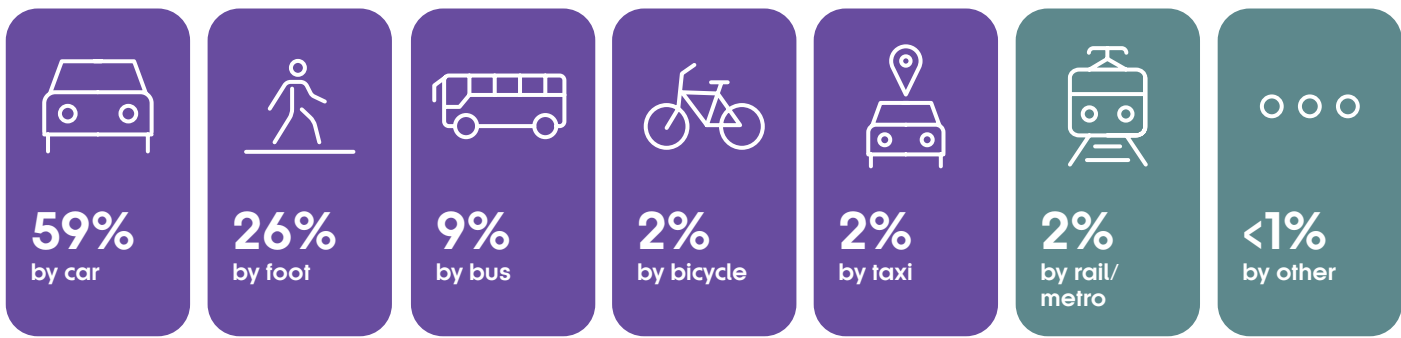
Roads are flexible in that they can be adapted to support different transport needs and modes, for example the expansion of provision for active travel during the Covid-19 pandemic.

Historically, demand for road travel has grown substantially over many decades, prior to the 2020 pandemic, with the UK experiencing a 40% growth in vehicle kilometres travelled in the last 25 years.

More than 90% of the distance travelled in the North takes places on roads, with 75% of commuters travelling to work by car, and for most of the 2.25 million people living in rural areas of the North there are no substantive alternatives to using the car, with only 4% of trips by bus and 2.2% by rail.

Figure 1 – Snapshot of travel in the North (2018 data).

7% bus

4% rail

14% other

75% car

13km Average commute

26 minutes Average travel time to work

126 billion Vehicle KM's on our roads

1.54 Vehicle occupancy

+8% increase in road trips between 2012-2016

222.9 million Passenger rail journeys

Further analysis by TfN shows that 69% of vehicle kilometres driven take place on the MRN in the North (7% of our roads including the National Highways[8] Strategic Road Network). This means it is critically important that we ensure the programme of policies and investment on the MRN support our vision for an inclusive North delivering sustainable economic growth, excellent quality of life and improved opportunities for all. This should be viewed within the context of our ambition to support more sustainable and healthier communities and to meet our commitments to reduce transport-related carbon emissions.

Planning for future transport investment, including on new improved roads, should take a holistic and hierarchical account of all options for improving access for people and goods.

Figure 2 – Initial appraisal of transport options.

1

Is there a need to travel or could activities take place remotely or locally?

2

Increasing local Active Travel is the most practicable option

3

Increased use of Micromobility is an option e.g. e-bike or e-moped

4

Better local public transport is a good option
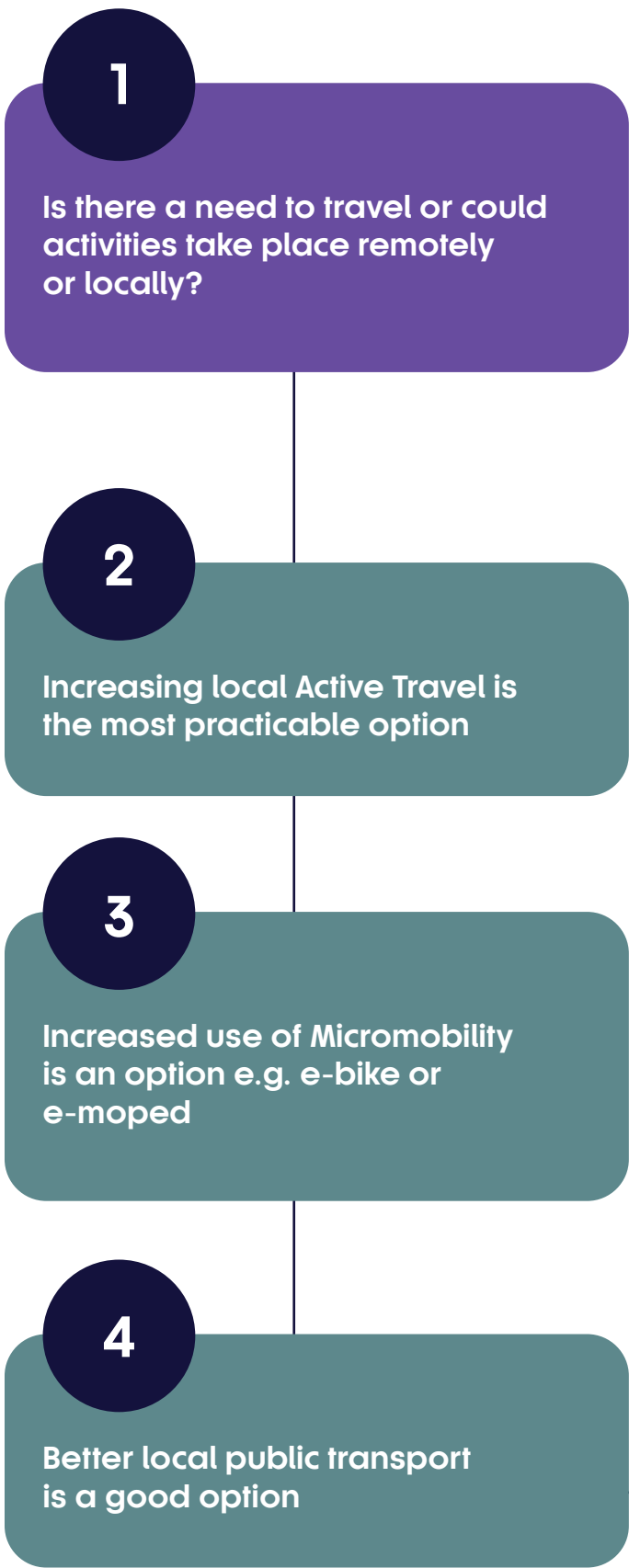
Figure 2 outlines the recommended process for considering an initial transport options appraisal, starting with the question on whether there is a need to facilitate more travel, followed by consideration of a range of options before deciding on whether there is a need for new road capacity.

Section 8 of this report provides more detail on TfN's approach to assessing the economic, social, and environmental outcomes from transport investment, including how our proposed investment programme performs in different future travel scenarios, for example with different levels of travel demand on rail and road.

" *TfN's ambition is for the North's Major Road Network to support fast action towards achieving net zero for transport, whilst maintaining a vital role in enabling safe, reliable and resilient multimodal journeys.*"

6

Driving is the only practicable option - but there is potential for increasing car sharing

5

There are opportunities for more long distance rail travel

7

Private car is the only realistic option, but there is an opportunity to influence peoples choices on travel time of day to reduce peak periods of congestion

8

Measures to improve the efficiency and reduce the environmental impacts of motorised road transport

How roads support people and communities in the North

People rely on our roads to access jobs, homes, services, leisure facilities, and visit friends and family. Most goods are transported by road, and many businesses are dependent on reliable deliveries to support 'just in time' supply chains.

Rural residents make up 8% of the North's population

David and Sara live in North Yorkshire. Sarah works full time in the agri-food sector and Peter works part time for the National Park Authority.

They live in a medium-sized village with just two buses per day, so both use a car to commute to work and drive to get to shops and other services. Although they would like to drive less they can't see any way they could use public transport more often. Recently they and their neighbours have started ordering more shopping online, reducing their personal car mileage, though increasing the number of vans traveling to/from the village.

Access by car is always likely to be important to rural residents like David and Sara. Measures which would support reductions in vehicle kilometres include improved rural bus services, integrated public transport tickets and reasonably priced fares, shared mobility options, good broadband connectivity enabling home working and online shopping, and encouraging the provision of local shops and other key services. Incentives to promote use of a low or zero emission vehicle could help reduce transport-related carbon emissions. TfN will work with local authority partners on developing the evidence to support new measures and investment to improve options for rural mobility.

Case studies are fictional examples based on the lived experiences of people in the North.

Around 13% of the population live in similar circumstances to Matt and Rebecca

Anthony and Rebecca and their three school-aged children live in Sunderland. They own one car which Anthony uses to commute to his production line job in the manufacturing industry. Rebecca walks with her younger children to the local school, then continues to her part-time job at a local retail park. Their teenage son catches a bus to secondary school. Shopping is done at the local supermarket, a 10-minute drive from home. At weekends they sometimes drive to the coast for a family day out. Car ownership is a significant cost to the family, reducing levels of disposable income for other activities, however it is seen as essential in reducing travel time to work and providing more freedom for family leisure and shopping trips.

For people like Anthony and Rebecca, reliable access to a car through a car club could be an alternative to personal ownership, particularly if improved public transport and/or active travel routes provide good access to Anthony's workplace, the school, local shops, and other facilities. The transition to electric or hydrogen vehicles could be an opportunity to encourage higher levels of car sharing, and the greater utilisation of more efficient low or zero emission vehicles. TfN will work with local authority partners on developing the evidence to support new measures and investment to improve travel options within urban and metropolitan areas, and strongly support further devolution of funding for delivery of local transport improvements.

Keith is close to retirement age and lives alone on the outskirts of Halifax. Although there are bus services through the day, he finds it more convenient to travel by car, particularly when visiting friends in Leeds. At weekends he likes to travel further afield to the Peak District and Yorkshire Dales.

People like Keith might also benefit from access to a car club, and the introduction of a simpler, better integrated public transport ticketing system might persuade him to drive less, particularly if local authorities introduce measures to discourage cars from entering urban areas.

Around 13% of the population live-in small-town suburbs

Visitor economy

The North of England boasts five National Parks, significant areas of Outstanding Natural Beauty (AONB) and nationally important coastal areas and resorts.

Research prior to the Covid-19 pandemic identified that the North of England attracts 369 million visitors annually, comprising 4.54 million overseas overnight visitors, 28.88 million domestic overnight visitors. and 336.17 million-day visits.

Many of the North's key natural landscapes have relatively poor access to public transport, with the majority of visitors traveling by car. For example, 93% of those who travel to the National Parks do so in their own car.

The five National Park Authorities (Lake District, Northumberland, North York Moors, Peak District, and the Yorkshire Dales), face an ongoing challenge in balancing the need to accommodate millions of visitors with the ambition to minimise the impact of visitor traffic on the environment and local communities.

The car is likely to continue to be the dominant mode of travel to and within National Parks. Measures to reduce car reliance being considered or trialled in some locations include: improved rail and bus services linking urban areas to National Parks; development of 'gateway' destinations where visitors can transfer from private car to bus, coach or car sharing; investment in substantially improved active travel facilities coupled with improved sustainable travel options; and increased parking fees in some locations.

The Lake District National Park has set a target of reducing the percentage of people arriving by car from 83% to 64% by 2040.

Business travel

Business-related travel is particularly reliant on the road network, with evidence from 2018[9] showing that, for the average weekday, there were 1,194,272 trips by road and more than 32.4 million kilometres travelled by road for business purposes between 7am-7pm, with an average distance per trip of 27.1 kilometres. Better utilisation of space is particularly important with light goods vehicles (LGVs), which have grown rapidly in number in recent years.

Business sectors that are heavily reliant on private cars or vans for business travel include[10]:

→ Agriculture, forestry and fishing

→ Mining and quarrying

→ Manufacturing

→ Electricity, gas, steam and air con supply

→ Water supply, sewerage, waste managementand remediation

→ Information and communication

→ Construction

→ Health and social work

The impact of the pandemic has reduced overall levels of business-related travel, though sectors most reliant on travel by car/van, such as those above, are less able to switch to remote working. Some of these, for example manufacturing and quarrying, are more prevalent in the North than the UK average.

TfN user insight research[11] completed in 2021, aimed at gaining a better understanding of the current and future transport use, and transport requirements, of different types of businesses in the North of England showed that:

→ Three-quarters (74%) of employees were estimated to be commuting to work using a private car/van pre-pandemic; 11% travelled by public transport; and 9% by active travel.

→ Almost three-quarters (72%) of businesses anticipate that there will be no change in the levels of use of private modes for commuting journeys in two to three years' time compared to pre-pandemic. 15% anticipate an increase; 9% anticipate a decrease.

→ 57% of businesses felt they will not travel more frequently for business in two to three years compared to now, while 38% anticipate travelling more frequently.

→ 52% of businesses with a significant need for transporting goods anticipate receiving more deliveries in two to three years' time, while 35% predict no change in their number of deliveries received.

Measures to reduce the amount, and impact, of business travel, should include support for remote working, for example through improved digital connectivity, and improved rail and express inter-urban bus services, integrated with local transport provision.

Freight and logistics

In the UK a total of 1.65 billion tonnes of freight are lifted by all modes per year, with a little more than of a third of freight activity taking place in the North of England. Around 90% of the tonnage lifted is moved by road in the North. For commodities such as food products, including beverages and tobacco, textile, leather and wood products, and machinery and equipment and consumer durables (such as furniture), more than 98% of movement is by road.

The North is directly served by a number of major international gateways – both ports and airports – which play a major role in facilitating trade and exports, for the North and the UK as a whole, as well as generating significant local employment. There are also a growing number of national and regional distribution centres serving a wide variety of commodities including fast-moving consumer goods (FMCG), construction, and support for the energy supply chain.

Sections of the road network carrying the greatest volumes of freight are the M6 south of Warrington, the M62 between Manchester and Leeds, the M1 south of Sheffield, and the A1(M) in Yorkshire. challenges for both freight industry and planning of infrastructure.

Measures to reduce the environmental impacts of freight movements are particularly challenging. In 2018 the National Infrastructure Commission (NIC) report 'Future of Freight' emphasised the importance of regulatory certainty and consistency in driving positive innovative changes in the freight and logistics sector. A regulatory framework that sets out policies that consider and encourage technological advancements is fundamental to achieving the net-zero pathway. Uncertainty on future freight regulations, such as the type of alternative fuels technology to adopt, creates significant challenges for both freight industry and planning of infrastructure.

Major Road Network (MRN)

Through collaboration with our transport and highway authority partners, TfN has defined the MRN as the roads that are crucial to supporting economic activity and growth in the North.

Including the Strategic Road Network (SRN), the MRN accounts for about 7% of the roads in the North - 2,444miles of Strategic Road Network (SRN) managed by National Highways plus 5,454miles of major roads managed by local highway authorities.

The MRN connects important economic centres and planned centres of economic growth, as well as the major transport hubs supporting multimodal journeys. Together they provide the functionality needed to support end-to-end journeys, connecting people, connecting businesses and moving goods within and to/from the North of England.

It is important to note that the MRN defined by TfN differs from the MRN defined by the DfT. The key differences are that the TfN MRN encompasses the SRN, and a number of additional MRN links.

The North's important centres of economic activity include:

→ Ports and airports, supporting imports, exports and the visitor economy.

→ Clusters of the prime and enabling capabilities as defined in the Northern Powerhouse Independent Economic Review.

→ Major population centres, which are generally over 50,000 residents.

→ Enterprise zones, universities and other key employment sites.

→ Major centres of tourism.

Good reliability and journey time performance of the SRN and wider local authority managed MRN is critical to supporting higher levels of productivity, time sensitive supply chains and good access to jobs.

TfN will periodically **review** and **adapt** the MRN for the North, to meet the needs of the North in the future.

Figure 2: Major Road Network in the North
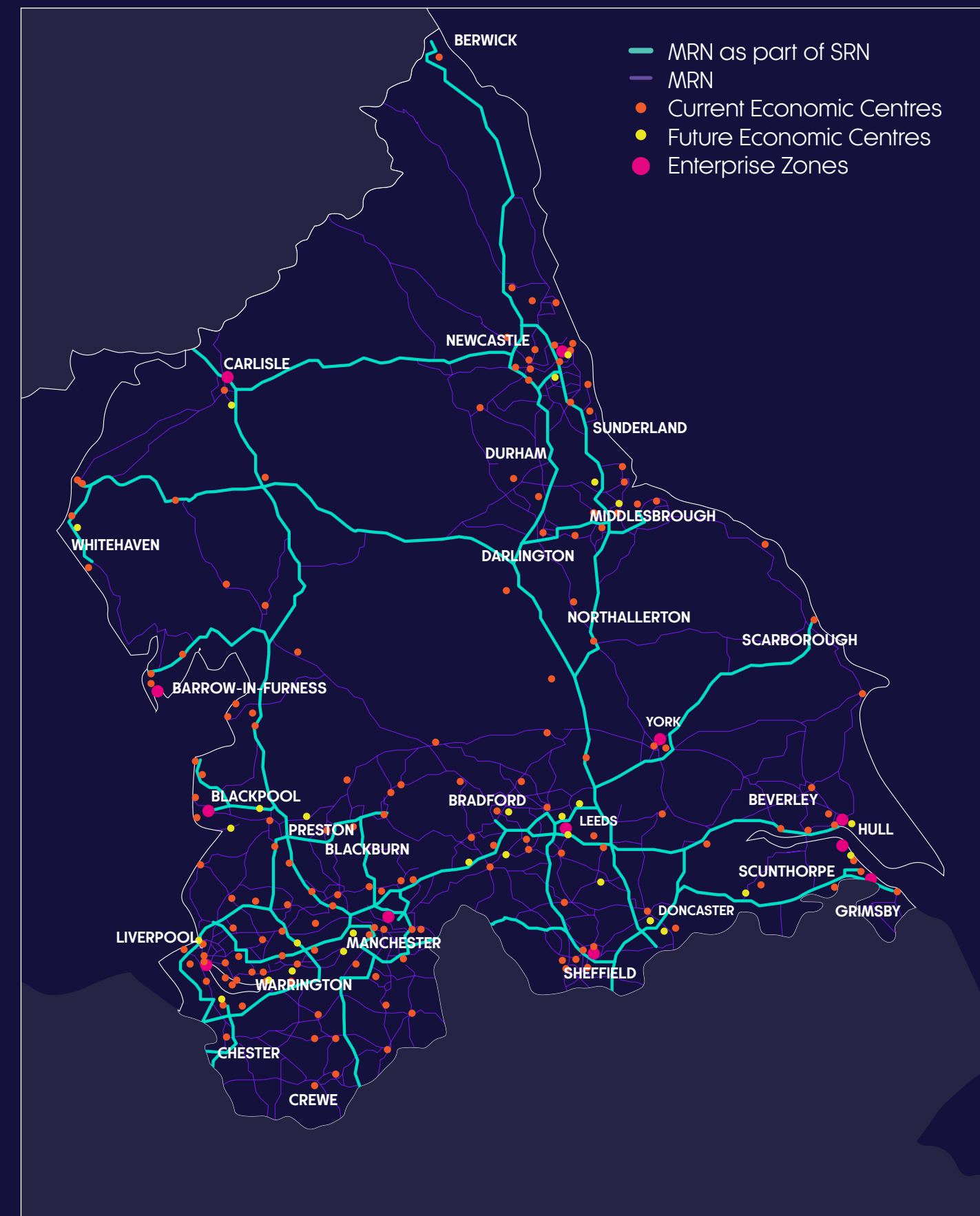
Monitoring the Major Road Network - Conditional outputs

TfN and our partners have agreed a set of pan-Northern conditional outputs against which we aim to monitor the MRN and will use to identify issues and develop proposed actions to improve performance. These are:

→ **Journey reliability:** Where drivers on 90% of the MRN should experience an average peak hour delay of no more than 25% in relation to the 'free-flow' travel time.

→ **Network efficiency:** Aiming to ensure that the MRN contributes to a sustainable and inclusive transport system. This includes reducing carbon emissions through optimising the efficient flow of people and goods on the MRN; encouraging travel behaviour change; and supporting new technologies to reduce emissions of pollutants and greenhouse gases.

→ **Network resilience:** Aiming to reduce the number of MRN route closures leading to severe journey delay. This will require a focus on infrastructure maintenance, renewals, and adaptation to mitigate for impacts of climate change.

→ **Journey quality:** Improving the experience of using the MRN, including the quality and availability of travel information.

→ **Carbon emissions:** Reduction in carbon emissions from road transport in the North in line with TfN's trajectory for achieving net zero emissions.

Section 4.2 of this report provides further detail on each of the MRN Conditional Outputs, and the measures used to evaluate performance.

In addition to the pan-Northern conditional outputs above, improving safety and air quality are fundamental objectives for TfN partners in managing their road networks, are reported by National Highways and local highway authorities, and are captured as part of TfN's Monitoring and Evaluation Framework. The Monitoring and Evaluation Framework also includes measures of:

→ **Air pollution:** The proportion of the population exposed to high levels of PM2.5 and NOX12 emissions, to which vehicles are a significant contributor.

→ **Noise pollution:** The proportion of the population exposed to high levels of day and night-time noise pollution from vehicles.

→ **Road incidents:** The number of road incidents resulting in fatalities or serious injuries.

→ **Physical inactivity:** The proportion of adults walking or cycling for travel at least three days per week.

Future changes in travel demand
- what it could mean for the MRN

Even before the pandemic during 2020/21, 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.

Recognising the need to ensure that our policymaking and statutory advice should account for a sophisticated range of future uncertainties, in 2020 TfN completed work on updating our approach to future uncertainty, identifying four plausible future scenarios looking ahead to 2050. Our Future Travel Scenarios take a comprehensive, whole-system view by capturing social, spatial, economic, technology and sustainability factors, and how they may influence what we demand of our transport connectivity in the future. Each scenario experiences different results in terms of population and employment, our economy and our ability to reach targets such as those for decarbonisation. For further information see the **TfN Future Travel Scenarios report.**[12]

1 In a **Just About Managing** scenario we see a gradual shift in lifestyles and travel – we do not alter our behaviours or give up certain 'luxuries', leaving major developments and change to be shaped by market forces.

2 In a **Digitally Distributed** world we fully embrace technological change, work remotely, and use an accessible service-based transport system with connected and autonomous shared mobility options.

3 **Urban Zero Carbon** sees urban agglomeration and there is a fundamental refocus by both the public and Government towards action on climate change, resulting in fast action on zero-emission transport systems and places, with integrated planning across energy, spatial and other sectors.

4 A **Prioritised Places** scenario sees a focus on people and place, with strategies and investments in local assets, specialisms and economic and social infrastructure. This scenario also sees a change in priorities, a focus on work-life balance and community.

TfN is using our Future Travel Scenarios to estimate future travel demand associated with the particular future states. We are applying these within our Analytical Framework tools to evidence and inform policy recommendations and future transport investment priorities in the North. The scenarios are built for the long term, with pathways out to 2050, however we have adapted these to reflect change and uncertainty resulting from the Covid-19 pandemic.

Next Steps

Through application of TfN's Analytical Framework[13], including application of the Future Travel Scenarios, TfN is assessing the transport benefits and wider social, economic and environmental outcomes of our proposed programmes of transport investment. This uncertainty testing will provide robust, resilient and agile evidence underpinning our recommendations for future policy decisions and transport investment, including investment on the MRN. See section 8.2 for further detail.

This report identifies how, alongside investment in rail, active travel and public transport, the right types of investment and future management of the MRN will support the Strategic Transport Plan objectives and ambitions of the Northern Transport Charter.

1. Introduction

Local Transport Authorities

Transport for the North

National Connectivity

Transport for the North (TfN) is a Sub-national Transport Body (STB) with a statutory requirement to advise UK Government on the transport priorities for the North of England.

TfN is a statutory body of elected leaders and a partnership of business leaders who collectively represent the region's 15 million citizens. As a partnership, TfN brings 20 Local Transport Authorities (LTAs) and 11 Local Enterprise Partnerships (LEPs) together with Network Rail, National Highways, and HS2 Ltd; as well as central Government.

Through its statutory powers, TfN acts as 'one voice' for the North, communicating pan-Northern priorities to the Secretary of State for Transport. We have a clear remit to identify the transport infrastructure required to support transformational economic growth in the North, and to prioritise that investment. This places TfN and partners in a strategic position to identify the transport infrastructure and policy measures that are required to achieve the North's ambitions.

Through a strong governance structure and the strength of the partnership, TfN ensures that funding and strategy recommendations about transport in the North are informed by local knowledge and requirements. This

fits in with the devolution agenda that draws powers and funding down from central Government, not up from local Government.

The publication of TfN's Strategic Transport Plan (STP) in February 2019 represented the first time that the North had come together to outline the regional vision for the future; this document draws upon strategic objectives set out in the STP and on the vision of:

> **"A thriving North of England, where world class transport supports sustainable economic growth, excellent quality of life and improved opportunities for all."** [14]

The Major Roads Report (MRR) presents a refreshed strategic context and evidence base for the Major Road Network[15] (MRN) focusing on the role of major roads in achieving the North's vision, with challenges on reducing carbon emissions, supporting inclusive economic growth and ensuring good and inclusive access to jobs, goods and services central to our thinking.
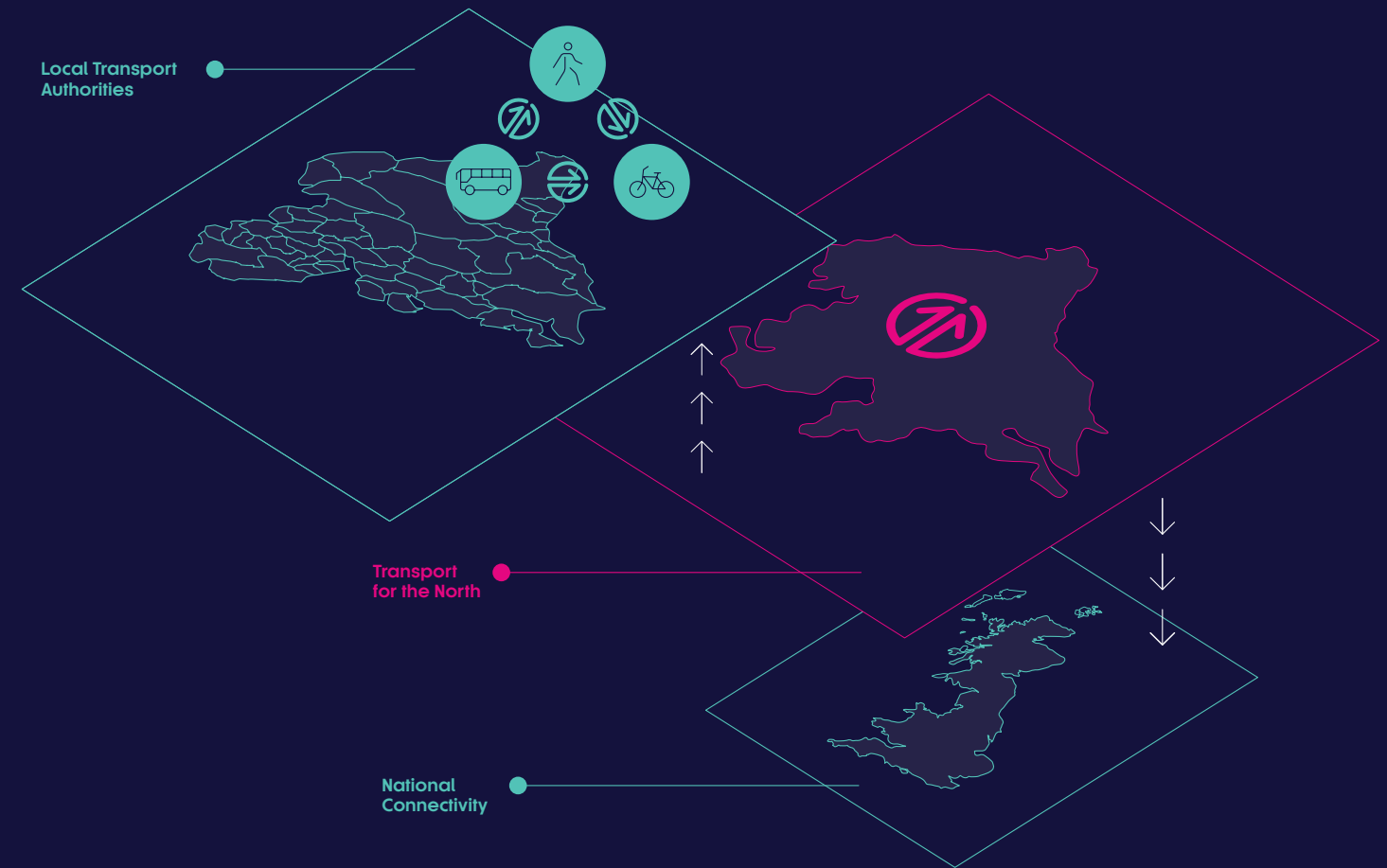
Road transport has a critical role in our society and will continue to do so in the future, particularly in more rural areas where public transport and active travel are not practicable options. For the MRN, good connectivity means safe, reliable, resilient, responsive and efficient journeys; excellent integration with rail and other public transport modes; and ensuring that where needed there are safe, secure, direct and coherent access routes for pedestrians and cyclists.

This report provides an update on investment plans for major roads, accounting for the Road Investment Strategy announcement (RIS2) and planned investment through the

National Roads Fund (NRF), and details TfN's approach to developing recommendations for future decision making on how we ensure our major roads contribute to achieving sustainable economic growth.

The report also outlines TfN's approach to monitoring the performance of the North's major roads, in line with TfN's Monitoring and Evaluation Framework, which will be used to support the evaluation of transport investment in the North.

2. Strategic Context

2.1 Overview

The Major Road Network (MRN) is the network of major roads which enables the movement of goods and of people needed to support economic activity across the North and connectivity both within and beyond the boundaries of the North.

The MRN is economically important in supporting the North's productivity and growth, both now and in the future.

More than 80% of commuting trips and 87% of freight movements in the North use the road network, equating to more than 120.4 billion km travelled across the North's road network every year.[16] While total traffic volumes are greatest on roads operated and managed by National Highways - the Strategic Road Network (SRN) - this network only accounts for 2% of the road network in the North.

A focus on the SRN alone in defining pan-Northern strategic highway improvements will not meet TfN's ambitions and objectives; investment is also required off the SRN, on economically important local roads providing 'first and last' mile connections to business parks, ports, airports and to other important centres of economic activity.

The MRN has a crucial role in supporting end-to-end journeys, efficiently and reliably connecting people, connecting businesses, and moving goods within and to/from the North of England.

TfN and our partners have agreed a set of conditional outputs against which we aim to monitor the MRN and will use to identify issues and develop proposed actions to improve performance. These are:

→ **Journey reliability:** Where drivers on 90% of the MRN should experience an average peak hour delay of no more than 25% in relation to the 'free-flow' travel time. This equates to a delay of 15 minutes or less on a 60-minute journey.

→ **Network efficiency:** Aiming to ensure that the MRN contributes to a sustainable and inclusive transport system. This includes reducing carbon emissions, through optimising the efficient flow of people and goods on the MRN, encouraging customer behaviours, and supporting new technologies to reduce emissions of pollutants and greenhouse gases.

→ **Network resilience:** Aiming to reduce the number of incidents of MRN route closures leading to severe journey delay.

→ **Journey quality:** Improving the customer experience of using the MRN, including the quality and availability of travel information.

→ **Carbon emissions:** Reduction in carbon emissions from road transport in the North in line with TfN's trajectory for achieving net zero emissions.

In addition to the pan-Northern conditional outputs above, improving safety and air quality are fundamental objectives for TfN partners in managing their road networks; are reported by National Highways and local Highway Authorities; and are captured as part of TfN's Monitoring and Evaluation Framework.

TfN's Monitoring and Evaluation Framework also includes measures of:

→ **Air pollution:** The proportion of the population exposed to high levels of PM2.5 and NO2 emissions, to which vehicles are a significant contributor.

→ **Noise pollution:** The proportion of the population exposed to high levels of day and night-time noise pollution from vehicles.

→ **Road incidents:** The number of road incidents resulting in fatalities or serious injuries.

→ **Physical inactivity:** The proportion of adults walking or cycling for travel at least three days per week.

TfN published the Strategic Transport Plan (STP) in 2019. Section 6 of this report outlines TfN's programme of activities encompassing investment in rail, active travel and public transport, which alongside improvements to the MRN are critical to achieving TfN's vision.

2.2   National Policy

2.2.1   National Infrastructure Strategy 2020

The National Infrastructure Strategy sets out plans to deliver on the governments ambition to "deliver an infrastructure revolution: a radical improvement in the quality of the UK's infrastructure to help level up the country, strengthen the Union, and put the UK on the path to net zero emissions by 2050" and how "the Government wants to use infrastructure to unite and level up the UK, delivering a stronger Union, thriving regions, cities living up to their full potential and revitalised towns and communities."

Key commitments most relevant to TfN and the MRN include:

→ Expanding devolution within England and implementing the devolution deal in West Yorkshire.

→ Changing the way projects are appraised to support levelling up through the Green Book Review.

→ Record investment in strategic roads (over £27bn), including the A66 between Penrith and Scotch Corner.

→ Delivering a Union Connectivity Review reviewing options to improve transport links across the four nations of the UK.

→ Backing High Speed 2 (HS2) phase 2 to deliver essential North-South connectivity, with an Integrated Rail Plan to deliver transformational rail improvements in the Midlands and the North.

→ Investment in local infrastructure through a £4bn 'Levelling Up' fund.

→ £5bn investment in buses and cycling.

→ Development of Freeports and backing for 'green growth clusters', with several locations in the North well placed to benefit. For example, Freeports in Liverpool, Teesside, and on the Humber.

2.2.2   Planning White Paper

The Government White Paper 'Planning for the Future' August 2020, sets out proposals for a radical reform of the planning system, identifying proposals to:

→ "Streamline the planning process with more democracy taking place more effectively at the plan-making stage."

→ Take a radical, digital-first approach to modernise the planning process. This means moving from a process based on documents to a process driven by data.

→ Bring a new focus on design and sustainability. To do so the White Paper states that Government will ensure the planning system supports efforts to combat climate change and maximises environmental benefits, by ensuring the National Planning Policy Framework targets those areas where a reformed planning system can most effectively address climate change mitigation and adaptation. Also, that there will be a "greater focus on placemaking and 'the creation of beautiful places' within the National Planning Policy Framework."

→ Improve infrastructure delivery in all parts of the country and ensure developers play their part, through reform of developer contributions.

→ Ensure more land is available for the homes and development people and communities need, and to support renewal of our town and city centres.

Key points from TfN's response to the White Paper are detailed in section 5.1.1.3. The Government is expected to respond to consultation on the White Paper within the next few months.

2.2.3   Levelling Up White Paper

The Government's Levelling Up White Paper, scheduled to be published towards the end of 2021, is expected to set out "plans for strengthening local accountable leadership". This is expected to be an important policy document setting proposals for future devolution of powers to local and regional authorities.

2.2.4   Transport Decarbonisation Plan

The Government published its Transport Decarbonisation Plan: 'Decarbonising transport: A better, greener Britain' in July 2021.

The plan sets out the Government's approach to reaching net zero transport in the UK, including its projections (or trajectories) in terms of overall emissions from the transport sector, and also by mode, to 2050. The plan contains a number of commitments related to encouraging modal shift and increasing car occupancy and places an emphasis on Local Transport Plans delivering quantifiable reductions in transport emissions. However, the plan does not give an indication of a reduction in vehicle mileage (for cars, vans or HGVs) being required to achieve its trajectories.

Similarly, although the plan acknowledges the major reduction in tax revenues that will result from a shift to electric vehicles, it does not touch on any proposed solutions or the need for road user charging.

The plan identifies a number of policy commitments directly relevant to planning for major roads, these include:

→ A commitment to review the National Networks National Policy Statement in light of changing patterns of work, shopping and business travel due to the Covid-19 pandemic.

→ The phasing out of new internal combustion engine (ICE) larger HGVs (over 26 tonnes) by 2040 and smaller HGVs (up to 26 tonnes) by 2035.

→ Reiteration of a commitment to establishing a rail freight growth target.

→ Confirmation that the existing approach to carbon valuation is under review, and that the Department for Business, Energy & Industrial Strategy (BEIS) will publish new carbon values later this year, which will be reflected in DfT business case and transport appraisal guidance.

The plan also acknowledges that planning decisions are often not achieving requirements in relation to sustainable travel and states that DfT is working with the Department for Levelling Up, Housing & Communities and the Local Government Association (LGA) to ensure the need for sustainable transport is key within planning decisions.

The role of the seven Sub-National Transport Bodies (STBs), in terms of decarbonisation, is highlighted specifically within the plan. The Government sees STBs as working to turn national priorities into actionable plans and as able to help join up local plans across their regions for the purposes of:

→ Capitalising on economies of scale.

→ Ensuring coherence across local authority boundaries.

TfN has already started this work through development of our Decarbonisation Strategy and associated workstreams.

2.2.5 Union Connectivity Review

Set up by Government to "assess current transport connectivity within and between the nations of the UK and to make recommendations that will maximise economic potential and improve quality of life", the Union Connectivity Review was published in November 2021.

Key findings of the review are:

→ That "devolution has been good for transport with many forward-thinking transport developments taking place regionally in the nations of the UK" and there is "no doubt that regional authorities are best placed to understand the needs of local communities and deliver real change locally to improve people's lives."

→ However, "there is a gap in UK-wide strategic transport planning and to address this the review recommends the creation of UKNET – a strategic transport network for the whole United Kingdom" and that this "would be a multimodal, pan-UK network based on a series of principal transport corridors. This would support long term economic growth, jobs, housing and social cohesion, the UK Government's levelling up agenda and net zero ambitions."

→ The review sets out the UKNET corridors which are most relevant for Union connectivity and makes recommendations for infrastructure improvements. These include east-west corridors Humber to Holyhead and the North East to Cumbria and onto Cairnryan, also north–south corridors encompassing routes from South Yorkshire to Scotland and the Cheshire/Merseyside/Greater Manchester to Scotland.

2.2.6 Transport Investment Strategy (2017)

Published by Theresa May's government in 2017, the Transport Investment Strategy (TIS) sets out the Government's plan for investment in Britain's transport system. The TIS outlines core goals to be achieved through investment:

→ To build a stronger more balanced economy.

→ To enhance global competitiveness.

→ To support the creation of new housing.

→ To create a more reliable, less congested, and better-connected transport network for the users who rely on it.

The TIS states that Britain's transport networks are ageing and face increasing demand which causes delay and harms reliability.

This is reflected in Road Investment Strategy 2020-2025 (RIS2), where a significant proportion of the budget is focused on renewals.[17] Similar investment is needed on the Major Road Network.

2.2.7 Bus Strategy

In March 2021 the Government published 'Bus Back Better', the long-term national bus strategy for England outside London. The bus strategy places a new duty on LTAs and bus operators to work together on developing an Enhanced Bus Partnership. This applies in all areas other than Metropolitan Combined Authorities which have started the process of franchising bus services. Linked with publication of the strategy, the Government announced £3bn in funding for a range of measures to improve bus services, reduce emissions, and deliver bus priority schemes. Most improvements are likely to be on local highways, though in some areas there may be a need for measures on the MRN, particularly within more urban neighbourhoods.

2.2.8 Future of Mobility

In March 2019 Government published 'Future of Mobility – Urban Strategy'.

The strategy highlights the opportunities arising from advances in data science, artificial intelligence, and sensing technologies, and what they could mean for future modes of travel, transport business models, and the future mobility of people, goods and service. The strategy states that: "In facilitating innovation in urban mobility for freight, passengers and services, the Government's approach will be underpinned as far as possible by the following principles."

These principles are:

1 New modes of transport and new mobility services must be safe and secure by design.

2 The benefits of innovation in mobility must be available to all parts of the UK and all segments of society.

3 Walking, cycling and active travel must remain the best options for short urban journeys.

4 Mass transit must remain fundamental to an efficient transport system.

5 New mobility services must lead the transition to zero emissions.

6 Mobility innovation must help to reduce congestion through more efficient use of limited road space, for example through sharing rides, increasing occupancy or consolidating freight.

7 The marketplace for mobility must be open to stimulate innovation and give the best deal to consumers.

8 New mobility services must be designed to operate as part of an integrated transport system combining public, private and multiple modes for transport users.

9 Data from new mobility services must be shared, where appropriate, to improve choice and the operation of the transport system.

Government is working towards publishing a 'Future of Transport - Rural Strategy' in 2021. This is expected to consider how the same nine principles can be applied to support improved rural mobility.

Future plans for investment in major roads will need to take account of transport innovation and mobility trends, including what that means for future infrastructure requirements and changes in future travel demand.

2.3 TfN Strategic Transport Plan (STP)

The STP sets out the evidence on how improved transport connectivity will deliver greater prosperity and a better quality of life for citizens in the North of England. The plan, which is the culmination of an unprecedented collaborative effort between TfN and partners, is a blueprint for the transport connectivity needed to achieve transformational and sustainable economic growth by 2050, delivering 850,000 extra jobs and £100bn GVA to the UK economy.

The STP sets out TfN's vision:

"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 have informed the development of the STP and TfN's work programmes:

→ **Increasing efficiency, reliability, integration, and resilience in the transport system:** Improving the performance and integration of the transport network. The North's strategic transport networks, and connections with more local networks, must meet the needs of its users, 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 multimodal 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 support the Government's levelling up agenda. Enhanced connectivity between the important urban and rural economic centres and assets of the North will deliver agglomeration and productivity benefits and facilitate the transformational growth identified in the Northern Powerhouse Independent Economic Review, helping to re-balance our economy and create a prosperous and sustainable future.

→ **Improving inclusivity, health, and access to opportunities for all:** Economic growth in the North should be as inclusive as possible, avoiding transport poverty and limits to accessing 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.

→ Promoting and enhancing the built, historic, and natural environment: Protecting and enhancing the natural, historic and built environment, making sure that the North's transport system is as sustainable as possible. This includes the need to provide sustainable travel choices for the movement of people and goods, reduce air pollutant and carbon emissions from transport, and make 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 result 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.

These objectives align closely with the five foundations of productivity set out in the Government's Industrial Strategy.

2.4 Northern Transport Charter[18]

Alongside TfN's vision and objectives, TfN's Board Members have developed and agreed the Northern Transport Charter, which will underpin TfN's work on taking forward plans for improvements to the North's transport networks by:

Championing an inclusive and sustainable North

Long-term Northern funding settlement

Leading strategic transport delivery

Putting rail passengers first

2.5 TfN Decarbonisation Strategy[19]

TfN and our Northern partners believe that acceleration towards a zero-carbon transport network must be at the heart of public policy-making and investment decisions. In 2021 we agreed that our ambition for the North is to travel faster and further than national policy and maximise the clean growth opportunities that decarbonisation can provide for the North. Through the Decarbonisation Strategy, TfN and our partners are committing to a regional near-zero carbon surface transport network by 2045.

The decarbonisation strategy sets out the requirements to meet the trajectory for reducing emissions, 95% of which come from road transport. Headlines are:

→ A 55% reduction in emissions from 2018 to 2030, achieved mostly through mode-shift and demand reduction.

→ A 95% reduction in emissions from 2018 to 2040, reflecting longer-term decarbonisation measures, such as a high proportion of zero-emissions vehicles in the vehicle fleet.

→ A close-to-zero date of 2045 for carbon emissions from surface transport in the North.

Development of the Decarbonisation Strategy has been underpinned by TFN's work on identifying four plausible future scenarios looking ahead to 2050. Our Future Travel Scenarios take a whole system view to capture social, spatial, economic, technology and sustainability, and their potential effects on future travel.

→ In a **Just About Managing** scenario we see a gradual shift in lifestyles and travel – we do not alter our behaviours or give up certain 'luxuries', leaving major developments and change to be shaped by market forces.

→ In a **Digitally Distributed** world we fully embrace technological change, work remotely, and use an accessible service-based transport system with connected and autonomous shared mobility options.

→ In an **Urban Zero Carbon** future there is a fundamental refocus by both the public and Government towards action on climate change, resulting in fast action on zero-emission transport systems and places, with integrated planning across energy, spatial and other sectors.

→ A **Prioritised Places** scenario would see a focus on people and place, with strategies and investments in local assets, specialisms and economic and social infrastructure. This scenario also sees a change in priorities, a focus on work-life balance and community.

For further information on the scenarios see Section 5.4 and TfN's Future Travel Scenarios Report.[20]

2.6 TfN Freight & Logistics Strategy[21]

The Northern Powerhouse Economic Review (NPIER) identified freight and logistics as a key enabling sector to underpin the growth of the North's economy. The TfN Freight & Logistics Strategy sets out the baseline position with respect to the existing freight market and policies, and how freight moves on the transport network today. It sets out aspirations for growing the Northern freight market and what that means for the transport network, and identified priorities for investment on improving freight connectivity, such as upgraded rail freight capacity, particularly on east-west routes; improved reliability for road freight on key corridors (including M6, M1, A1, M62) and for last/first mile connections to ports, airports and distribution centres and good access to/from multimodal freight distribution centres.

Reducing emissions of carbon and other pollutants from road freight is a key priority, though there is still significant uncertainty on the adoption of future technologies for zero emission HGVs. As the technology develops TfN will promote the regulatory and infrastructure changes needed to support the freight and logistics sector in moving to low and zero emission vehicles.

2.7 National Highways[22] Net Zero Highways plan

National Highways' 'Net Zero Highways: Our 2030/2040/2050 plan' sets out why road transport is important now and will continue to be in the future, and makes three strong commitments to achieving "an ambitious programme putting roads at the heart of Britain's net zero future." These are:

→ Net zero for National Highways' own operations by 2030

→ Net zero for maintenance and construction by 2040

→ Net zero carbon travel on our roads by 2050

TfN will continue our collaborative working with National Highways on supporting actions to reduce carbon emissions from the Strategic Road Network, and work with all our partners, including National Highways, to share knowledge and examples of good practice on reducing emissions. For example, this includes measures to reduce supply chain emissions in the future procurement of maintenance and construction works, and actions to reduce road user carbon emissions.

2.8 Major Road Network Strategic Themes

Through engagement with TfN partners we have identified and agreed nine MRN strategic themes which are important in contributing to the delivery of TfN's STP objectives, Northern Transport Charter ambitions, and MRN Conditional Outputs. Potential measures as to how to the MRN can contribute to these strategic themes are set out in later in the report (notably Chapter 5 'Current and Future Requirements of the MRN').

Strategic Themes

Climate change and carbon emissions	Inclusive growth and rebalancing the economy	Reliability and resilience
Quality and efficiency	Sustainability and integration of modes	Role in urban areas-active travel compatibility, intramodality and integration
Role in urban areas - role of the stret	Local high street	Levels of governance

2.8.1 Climate change and carbon emissions

Transport is the largest contributor to UK domestic GHG emissions, contributing 28% of UK domestic emissions in 2018, with UK emissions from road transport amounting to 109 megatonnes CO_2e per annum and 88% of domestic transport carbon emissions.[23] Policies to reduce emissions from road transport are therefore critical to achieving ambitions for net zero carbon by 2050 or earlier. TfN is committed to working with partners to support the shift towards low carbon transport to reduce the impact of harmful emissions on the environment, and as by far the largest transport emitter of carbon, TfN recognises that road transport has a critical role in meeting UK targets for decarbonisation.

DfT's 'Decarbonising Transport: Setting out the Challenge' (2020) identifies the task of achieving net zero emissions across all modes by 2050. The report highlights how other sectors have gone further and faster than transport, resulting in transport being the largest contributor to domestic greenhouse gas emissions.[24]

Although since 1990 there have been dramatic improvements in the efficiency of passenger cars, reduced carbon emissions have almost completely been offset by increases in miles driven. Evidence from the last 30 years demonstrates the critical need to introduce appropriate demand management policies in parallel with new technologies reducing carbon (tailpipe and energy source) emissions per mile driven.

TfN's analysis of surface transport emissions in the North shows that 26 megatonnes of CO2 were emitted from surface transport in 2018, representing

nearly one-quarter of UK road emissions and 6% of total UK emissions. Over half of those emissions were generated by cars, with HGVs and vans producing 28% and 11% of surface transport emissions respectively. Bus and rail, on the other hand, represent just 5% of emissions.

The MRN has an important role in supporting more sustainable transport behaviours, for example through better integration with public transport and the provision of high-quality infrastructure for active travel modes, particularly where these tie in with wider local cycle and footpath networks. Measures to improve integration should also encompass provision of inter-modal freight, linking the MRN with rail freight and local freight depots responsible for last mile deliveries within an urban area. The MRN will also need to adapt to accommodate zero emission vehicles (ZEVs) and improved vehicle guidance and communication technologies.

Policy measures to reduce travel by car and future investment to make the use of our roads less carbon intensive will also be vital in meeting emission reduction targets. TfN analysis of what is required to meet the Northern decarbonisation trajectory demonstrates that we will need:

→ **55% of all new car sales to be zero emission vehicles by 2025, reaching 100% by 2030.**

→ **To reduce distance travelled by car, van and HGV.**

Figure 2.1 Headline figures related to surface transport emissions in the North in 2018.

26 million tones of CO2

126 billion vehicle kms

Total megatonnes of CO2 by mode

→ **6% of total UK emissions**
→ **23% of UK road emissions**

Car kms per person by area type

→ **23% of vehicles kms in the UK**
(Cars, LGVs, HGVs)

% of car emissions by distance
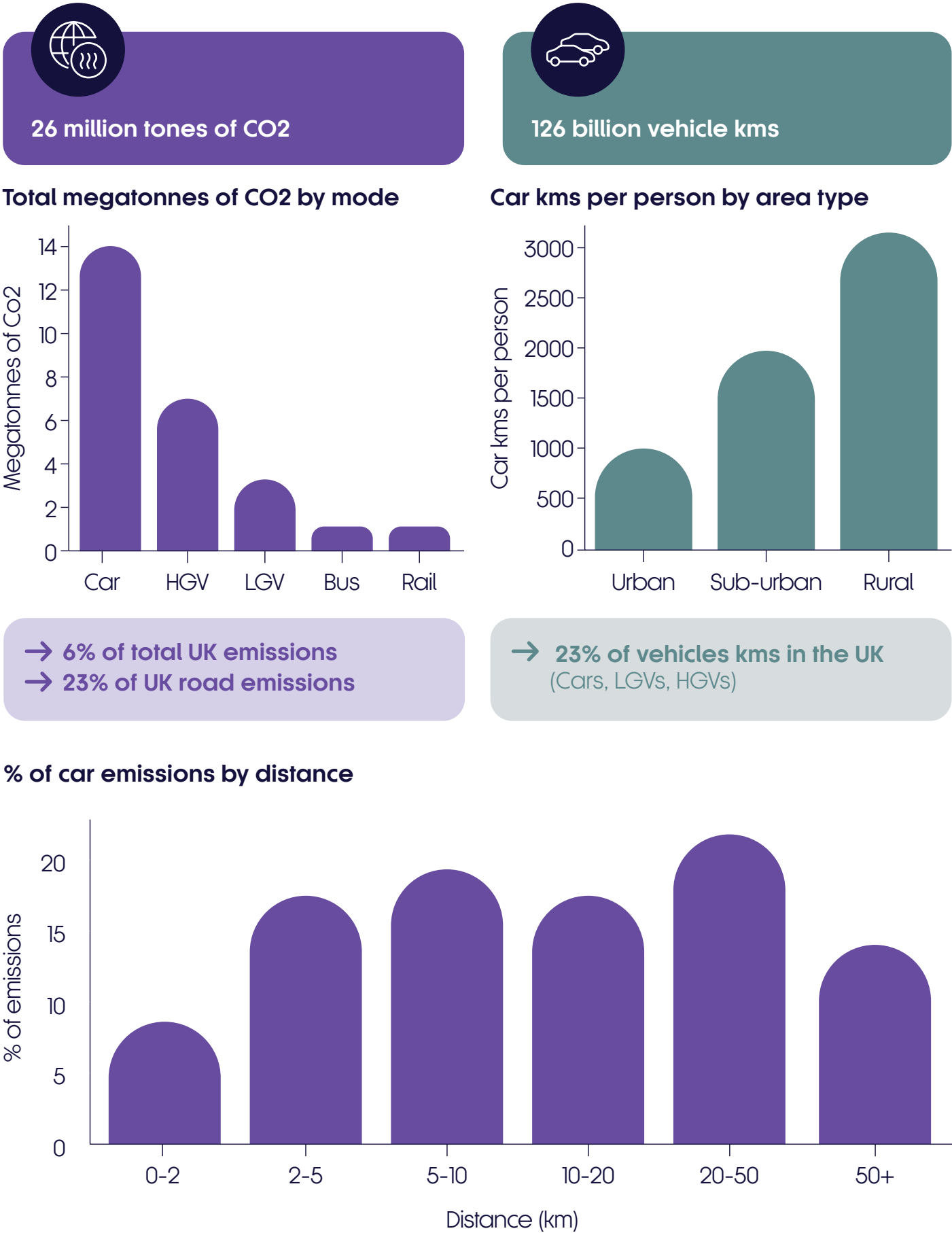
Early reductions in distance driven are particularly important in delivering the earlier reductions in emissions needed to keep within the overall carbon budget, with our evidence suggesting car kilometres in 2030 need to fall by between 3-14% relative to baseline growth. Achieving this in a sustainable and inclusive way is critical to achieving TfN's ambitions.

Prior to the 2020 pandemic, societal changes, such as increasing levels of people working from home, were supporting a small-scale reduction in commuter journeys and associated greenhouse gas emissions. The impact of the pandemic has substantially accelerated this change with the percentage of people recently home-working in the North increasing from just 6.3% pre-Covid-19 to 14.9% across 2020.[25] 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.[26]

Before the pandemic there was also clear evidence that young people were moving away from car ownership and using public transport and on-demand mobility services, supported by digital connections and devices, to meet their travel needs. The reasons for this are likely to be multifaceted, and to include the growth in high density urban living, greater concern for the environment, higher levels of debt, and lower spending power of young people. As we emerge from the pandemic it is unclear if this trend will continue or if the desire for social distancing will encourage higher levels of private car ownership for those who can afford it.

As well as impacts on home-working, the Covid-19 pandemic has driven forward the rapid rise in internet commerce and home delivery. Over the past five years vans were already the fastest growing vehicles in percentage terms of any motor vehicle type, with around 360,000 new vans registered in the UK every year between 2015 and 2019.[27] This trend looks set to continue with the proportion of online sales at 29.4% in April 2021.[28]

The North East exemplifies this growth, where the number of vans (light goods vehicles) has grown rapidly in the last decade, with indexed growth in registrations outstripping the steady increase of cars in the area.[29] The rising ecommerce sector is anticipated to result in additional movements associated with deliveries, including just-in-time, and returns for goods ranging from groceries to electrical items; the overall net impact on vehicle kilometres is uncertain, and will depend on the efficiency of delivery services in optimising route planning and on consumer use of the time they previously used for shopping trips. There is also potential to consider an expansion of freight consolidation centres facilitating more efficient deliveries.[30]

Extreme weather conditions are more frequent as a result of climate change and the North has experienced the consequences, particularly from severe flooding, in recent years. Future investment in the MRN will need to mitigate against the impact of more frequent and potentially more severe extreme weather occurrences.

TfN's Decarbonisation Strategy[31] sets out actions to help achieve transport decarbonisation in the North. And in Chapter 5 of this report, we set out options for mitigating against the effects of climate change and for the adoption of less carbon intensive construction processes to contribute towards reducing embedded emissions.

2.8.2 Inclusive growth and rebalancing the economy

The North has around 1.1 million businesses[32] and, prior to the impact of Covid-19, around 7.4 million jobs[33]. The region is currently home to more than 15.5 million people[34], with a population growth of 9% from 1999 to 2020[35]. The North's economic gross value added (GVA) is around £364bn, 19% of UK total[36]. However, overall productivity in the North still trails behind the UK average. For the last 30 years, the North's economic value per person (measured as GVA), has been consistently around 15% below the average for the rest of the UK, excluding London[37]. Most recent data reveal the gap has widened further, with the economic value (GVA) per person in the North now 19% below the UK average[38].

The widening gap can be attributed to the North generally experiencing slower GVA growth rates over the last decade compared to the UK average.[39] It is also recognised that lack of investment and interventions in improving public transport has restricted some opportunities for communities, especially those without access to a car, and is likely to have contributed to a lack of inclusive growth to date.

The Northern Powerhouse Independent Economic Review (NPIER) (2016)[40] identified the drivers underpinning the North's current economic position and factors constraining its performance, which are opportunities to improve upon. The review sets out that productivity accounts for the largest proportion of the North's 'performance gap' with the rest of England, the main factors being:

→ Insufficient high-skilled workers and too many low-skilled workers.

→ Not enough exploitation of innovation and technology.

→ Lower levels of investment.

→ Lower levels of enterprise (measured by business start-ups per capita).

→ Lack of agglomeration.

→ Sub-optimal transport links and underinvestment in transport.

The NPIER highlighted the clear links between transport investment and the productivity and performance of the North's economy. TfN's Strategic Transport Plan sets out three key aims to support and strengthen productivity across the North:

→ **Connecting people** – improving access to leisure and tourism assets and work opportunities, while widening the labour market for businesses.

→ **Connecting businesses** – improving connections to collaborations, clients and competitors, including those within the prime and enabling capabilities.

→ **Moving goods** – supporting businesses to move freight and goods efficiently and across modes.

In addition to the productivity and economic benefits, transport is a form of social infrastructure which should support inclusive growth for all users by connecting people to opportunities and minimising severance of communities.

The North's strategic transport network should be designed and developed to be accessible, so that users have a choice of services and opportunities to access work, education and leisure.

To achieve transformational and inclusive economic growth, significant investment in the North's road and rail network, including the MRN, will be required.

Highway investment should be outcome-focused and consider a wide range of potential options rather than simply increasing general road capacity, so that a positive balance of all strategic themes, including climate change and decarbonising the road network, is achieved.

2.8.3 Reliability and resilience

Reliability and resilience are critical themes for transport users, particularly for businesses with tight profit margins competing within a global marketplace, where poor transport connectivity can form a major barrier to business investment and unreliable journey times impact on productivity, for example resulting in missed just-in-time deliveries in the manufacturing and food supply sectors.

Better and more reliable transport connectivity supports greater opportunities for employment, collaboration and knowledge sharing.

The MRN depends on investment to make it reliable for users and resilient to change, key areas of focus should be:

→ Adaption to the impacts of climate change essential in mitigating for increased frequency and severity of severe weather events.

→ Ensuring that existing and new roads support technological innovation and change; for example, connected and autonomous vehicles, and accelerating move towards electric and hydrogen powered vehicles.

→ Supporting behaviour change including an increase in shared mobility and active travel for local trips.

In 2019 TfN commissioned work on developing a journey time, journey reliability and origin/destination monitoring tool for the MRN.[41] This is the first time we have been able to provide a coherent pan-Northern dataset for the whole of the MRN and has provided a 2019 baseline against which we can monitor and evaluate future changes in journey time and reliability. This builds upon earlier work using Trafficmaster GPS data (2016 -2018) to monitor journey times between the North's Important Economic Centres (IECs).

The MRN mobile phone data provides important additional evidence to support TfN and our partners in developing policies and investment proposals for the improving the Major Road Network.

Average traffic speed

Headline findings on traffic speed from the 2019 data are shown in Table 2.1

Average Speeds (mph)	07:00 – 08:00	08:00 – 09:00	16:00 – 17:00	17:00– 18:00	10:00– 16:00	Free-flow 22:00 – 06:00
Motorway	54.3	53.4	53.8	52.7	56.7	59.7
SRN A Roads	48.2	46.8	47.0	46.9	48.1	53.2
MRN (excluding SRN)	33.0	31.6	31.3	31.4	31.8	36.8

Congestion Efficiency index

The Congestion Efficiency (CE) index is a measure of the ratio of the average travel time for a given time period (Th) against the free-flow travel time (Tf),[42] which can be used as a useful indicator of journey reliability on the MRN.

Congestion efficiency is defined as:

$$CE = \frac{T_f}{T_h}$$

TfN analysis of the 2019 mobile phone data shows that, after filtering out a small percentage of low counts and user weighting,[43] around 60% of hourly periods (05:00 -22:00) for the 560 MRN paths monitored showed an average congestion index of 0.8 or above.

As an illustration, the equivalent congestion related delay for a 60-minute journey would be up to an additional 15 minutes journey time.

Working with Atkins and BT, TfN has developed a set of online MRN data tools available to TfN partner authorities. These can provide bespoke data outputs for specific sections of the MRN, times and dates, including mapping origin and destination of trips to district level.[44]

Figure 2.2 Example congestion index map of the MRN 17:00 – 18:00 [45]
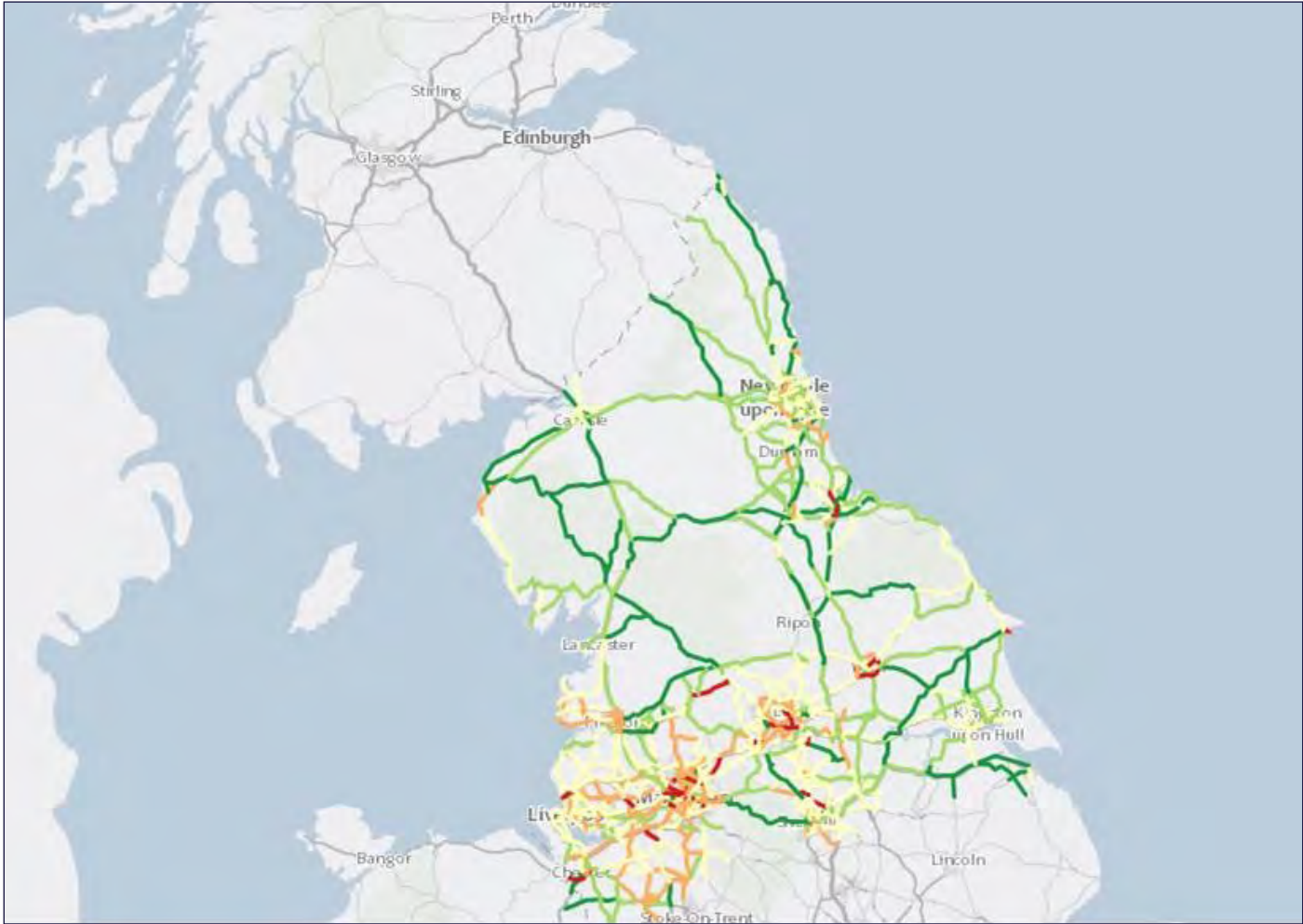
Figure 2.3 Example origin map, showing origin of eastbound traffic on the A628 Woodhead Pass.[46]
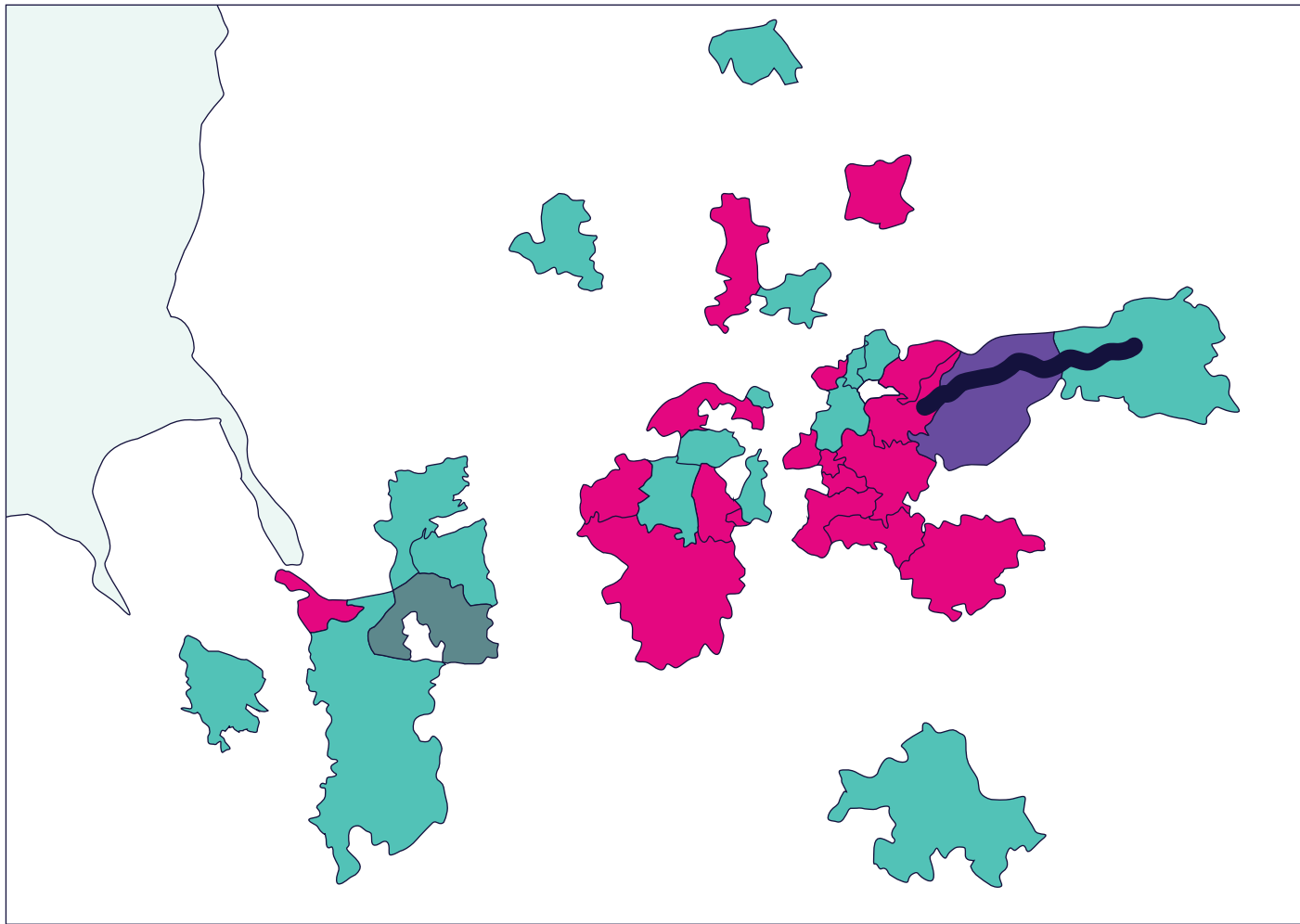
Trip origins in the AM period travelling east via A628_1

- 1 - 2%
- 2 - 5%
- 5 - 10%
- 10%+
- A629_1 link

Quality and Efficiency

Evidence on user perception of the SRN from the Transport Focus Strategic Roads User Survey[47] shows that the following factors have the greatest influence on road users' overall levels of satisfaction:

→ Satisfaction with journey time

→ Whether delays were experienced (this excludes delays through roadworks)

→ Journey time compared to the expectation

→ Level of traffic

→ Satisfaction with roadworks management

There is no equivalent survey for road users on the wider geography of the MRN, though given that local authority-managed MRN routes also support strategic longer distance trips, it is likely drivers would demonstrate a similar response and investment in the MRN should consider how to improve user experience for these factors.

As highlighted earlier in this report, the MRN must also play a role in facilitating safe, coherent and high-quality active travel trips. Research into what is important for cyclists and pedestrians demonstrates the need for improved road crossing facilities, more segregated cycle paths/lanes, better lighting, and improved road surfaces.[48]

When planning investment in the MRN it is also important to think about how mobility might evolve. For example, the MRN will need to accommodate trends such as shared mobility, automated and connected systems, and electrification for energy systems, public transport and infrastructure. Chapter 5 provides further insight into how mobility might change.

2.8.4 Sustainability and integration of modes

Delivering transformational, inclusive economic growth will require complementary investment at a local and pan-Northern level to achieve 'whole journey' and 'total network' improvements. There is a need to better integrate local systems and all transport modes such as light rail, bus rapid transit, underground metro, local bus services, and walking and cycling in the network. This would have significant social benefits, reducing severance and connecting local communities to employment and wider services including health, leisure and education opportunities.

With respect to the MRN, investment could include improved access to public transport hubs, particularly where located away from urban centres, and should include better access to existing hubs and where appropriate new transport interchanges, for example on the HS2 and Northern Powerhouse Rail (NPR) networks.

Examples include proposals for a new 'Roseberry Parkway' Park and Ride station in the Tees Valley, accessed via A171, A172 and A1043, and a new Leeds Bradford Airport Parkway station serving residents of north West Leeds and improving public transport access to the airport. MRN links such as the A660 and A658 would support access into this proposed station.

2.8.5 Role in urban areas – Active travel compatibility, intramodality and integration

The North's MRN needs to deliver future mobility which is right for the user and provides a seamless A to B travel experience. This includes making active travel an attractive choice for a whole journey or as part of a journey. For many people, choice and ease of the first and last mile connection is the main determinant of which mode to use.

The STP outlines how active travel can play a significant role in the multimodal mix of travel options when integrated properly, providing more access and choice for the user and unlocking economic growth potential. Promoting active and sustainable travel will improve people's health, reduce air pollution, and improve the environment.

As described in the Government's second Road Investment Strategy (RIS2), National Highways is currently undertaking a study into the role of the Strategic Road Network (SRN) in urban areas. This study is exploring the role of roads that form part of the SRN in the urban environment and considering their function as strategic roads, as well as looking at how they support and integrate with wider local transport networks, including how to best manage the SRN in urban areas to support the important aspirations of local communities. Initially looking at 25 study areas across England (nine in the North), this work is due to conclude in summer 2022, the core outputs being a series of case studies and framework or toolkit on how to best manage the SRN in urban areas in the future.

In 2020 the Government announced the establishment of Active Travel England as part of a new cycling and walking plan called 'Gear Change: A bold vision for cycling and walking'. This sets out a vision for achieving "a step-change in cycling and walking in the coming years."

TfN is a strong advocate for long-term sustained investment improving the active travel offer in the North. While the delivery and enhancement of active travel, such as walking and cycling, falls under the remit of Local and Combined Transport Authorities, these improvements should be integral to MRN investments. More people walking and cycling more often will improve the health and wellbeing of our citizens, improve local air quality, reduce carbon emissions and, where travel by car is the most viable option, help improve journey reliability for essential traffic.

2.8.6 Role in urban areas – Role of the street

In urban areas there is a changing view of the role of our streets with greater focus on the movement of people and quality of the local environment.

Where the MRN (including SRN) interfaces with urban areas, planning for the MRN should reflect the priorities of local authorities and communities in improving the quality and liveability of their local urban environment.

In Greater Manchester 'Streets for All' explores the critical role that streets play in creating sustainable, healthy and resilient places, focusing on people (everyone who uses the street) rather than vehicles. It has been developed to address a range of issues and conflicts arising from the desire to accommodate a wide range of activity across multiple modes within the limited space available on most of our urban streets. Streets for All seeks to rebalance streets where possible, delivering new and improved facilities for sustainable travel including walking and cycling, increasing public realm and greenery, and mitigating impacts of severance and air and noise pollution from road transport.[49]

2,220 kilometres (37%) of the MRN is within an urban area, including 386 kilometres of the SRN (20% of SRN).[50]

2.8.7 Local high street

The MRN's primary role is to facilitate inter-urban journeys, with a general presumption that MRN routes should not extend directly into the main urban centres (city and town centres). However, urban development over many decades has resulted in a network of major roads extending into urban areas. TfN will work with Local Highway Authorities to support plans for the MRN that are aligned with local objectives of supporting local high streets, and thus the local communities which they serve.

The role of the high street is evolving, with changes in patterns of consumption and social needs, while still being important spaces at the heart of local communities. It is important that greater consideration of future mobility and accessibility for all users is given to accessing high streets. This includes integration with sustainable modes to support the social, economic and environmental benefits across local areas in the North. The Government's Future High Streets Fund aims to help to support and regenerate local high streets to achieve these goals. The Stronger Towns Fund has allocated more than £500m to be invested in towns in the North to boost long-term economic growth through investment in connectivity, land use, economic assets and enterprise infrastructure.[51]

2.8.8 Role of MRN in rural areas

Around 15% of the North's population live in areas classed as rural[52], with 4,200km of rural MRN routes directly serving those communities. Rural areas are extremely diverse across the North, with challenges including poor access to education and employment, health inequalities, high per capita carbon emissions, shortage of affordable homes, older population profiles, and social isolation. There are also areas which are significantly more affluent, with higher than average levels of car ownership and distance travelled.

Rural communities tend to have limited access to local services through active travel or by public transport, and are therefore more reliant on the private car to access everyday activities, with distance travelled by car per person significantly higher than in urban areas.

TfN recently contributed to the DfT's 'Future of Transport: Rural strategy call for evidence' in partnership with the other STBs, setting out key priorities for a rural mobility strategy. These include:

→ Promoting a place-based and customer-centric approach, based on understanding the specific challenges within a local rural area, and identifying appraisal principles to establish what 'good looks like', before identifying and testing solutions.

→ Reducing carbon emissions needs to be prioritised through the development of solutions for rural areas, but with due consideration for other core outcomes including social inclusion and access to employment.

→ Better digital connectivity and new innovations (for example rural hubs) have considerable potential to deliver place-based outcomes and should be considered alongside any mobility solutions.

The MRN and local roads have, and will continue to play, a vital role in supporting rural communities, and in many parts of the North good road access is also critical to underpinning the success of the visitor economy, with £21n of tourism related spending in the North supporting around 600,000 jobs.[53]

2.8.9 Governance for our road infrastructure

Existing and emerging responsibilities for road governance at local, regional, sub-national and national levels are intricate and therefore a systems approach, including effective collaboration across organisations, is needed to deliver the vision for the MRN.

In addition to the Major Road Network, a number of Key Route Networks (KRN) have been identified in some local areas across England by metropolitan and county bodies, including Greater Manchester, Liverpool City Region, West Yorkshire, North East, Cumbria and Lancashire. The KRN, similar to the MRN, is not a public facing road classification, but is a network of the key local road network routes identified for investment to support economic growth in several key metropolitan and county-wide areas in the North.

From the user's perspective, a driver or passenger will just want to get from A to B, and as such are less concerned as to who manages the road.

Table 2.2 – Governance of our road infrastructure.

Road Network	Description
Strategic Road Network (SRN)	National A roads and motorways form part of the SRN managed by National Highways. Funding through the Road Investment Strategy (RIS) is almost exclusively directed to investment in the SRN. The RIS2 programme has a budget of £27bn.
Major Road Network (MRN)	The MRN as defined by Department for Transport and Transport for the North comprises the most economically important routes that support the Strategic Road Network (SRN) and link to economic centres. The roads that make up the MRN are operated and maintained by local highway authorities. In 2019 the Government introduced the National Roads Fund, and at the time allocated £3.5bn to MRN funding (2020-2025).
Key Road Network (KRN)	Key Route Networks (KRNs) have been identified in some local areas across England by metropolitan and county bodies, including Greater Manchester, Liverpool City Region, West Yorkshire, North East, Cumbria and Lancashire. Local highway authorities are responsible for the operation and management of this network.
Local Road Network (LRN)	Local roads form the vast majority of the region's network and are fundamental to everyday journeys. These are managed by local highway authorities.

3. Transport's Role in Contributing to Sustainable & Inclusive Growth

3.1 Sustainability in the North

The UN World Commission on Environment and Development defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Within the context of the North's Strategic Transport Plan and Northern Transport Charter, TfN's goal is for policy measures and transport investment to achieve the optimum balance and integration of environmental, social equity and economic outcomes.

As highlighted earlier within this report, good road transport is critical to the functioning of our economy and society, however there are major downsides to reliance on fossil fuel-powered road traffic, with substantial negative impacts on carbon emissions, on peoples' health, and on the natural and built environment.

TfN's ambition is for the major roads in the North (both the Strategic Road Network and Major Road Network) to act as a seamless network of roads, enabling more efficient, sustainable, safe, reliable and resilient

multimodal journeys. This will provide a better end-to-end customer experience and respond to societal, environmental, and technological challenges and opportunities.

TfN aims to assume a leadership role in recommending development of a transport network that is sustainable, working with our partners to promote the design construction and operation of transport infrastructure in a sustainable way.
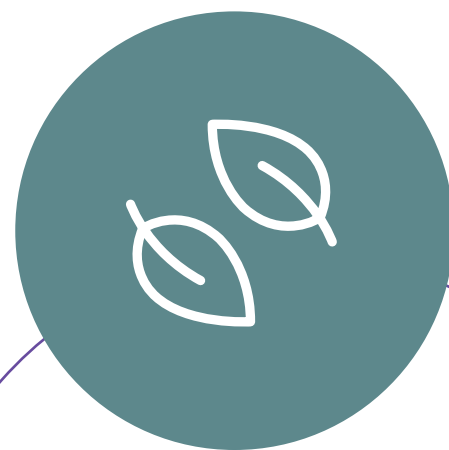
3.2 Carbon Emissions

There has been a ground-breaking political shift towards setting targets for a low emission future, with the UK committed to bring all Greenhouse Gas Emissions to net zero by 2050. Many partners in the North (six Combined Authorities and more than 50 Local Authorities) have declared a climate emergency and called for urgent collaborative action to tackle emissions.

TfN's Northern Transport Charter makes it clear that reducing greenhouse gas emissions from the transport network, at a pan-Northern and a local level, is a key priority for TfN as the Sub-national Transport Body for the North.

Although TfN does not have the powers to enforce targets and policies on carbon reduction, through our Future Travel Scenarios[54] work and development of the Decarbonisation Strategy, we have worked with our partners to develop and strengthen an evidence-based approach to meeting carbon reduction targets. We will use this to inform and influence TfN decisions and those of our partners, including national Government. This will include, but not be limited to, influencing future travel demand, the rate of adoption of lower emission fuel technologies, and use of active travel and shared mobility in place of the private car.

Through our evidence base work TfN will make recommendations on the measures needed to reduce carbon emissions in line with targets, and while our local partners have the powers to implement local demand management policies, it is Government which must set the national policy direction, and which has the powers to set demand management policies for the SRN.

Our response to consultation on the 'Green Paper on a New Road Vehicle CO2 Emissions Regulatory Framework for the United Kingdom'[55], calls for Government to consider how vehicle technologies can support new revenue-raising business models needed to underpin future transport investment, and to respond to the financial impact of the loss of tax revenue that will come with the phasing out of petrol and diesel vehicles.

Alongside measures to manage traffic demand, investment in the MRN infrastructure should seek to support the acceleration of uptake in zero emissions vehicles (ZEVs).

As long as vehicles use fossil fuels, it will not be possible to achieve near-zero emissions in the North's surface transport network. The typical life of a car is around 15 years, with some lasting longer in the fleet, meaning it will take roughly this long for ZEV vehicles to tip the balance and deliver the deep emissions reductions required to meet decarbonisation targets. It is therefore critical to introduce policies that will rapidly increase ZEV uptake as soon as possible.

In November 2020, the Government announced the phase-out of the sale of new petrol and diesel cars and vans by 2030, and hybrid cars and vans by 2035. Our analysis (see TfN Decarbonisation Strategy) suggests that we need to go further, with a phase out of petrol, diesel and hybrid car and van sales by 2030 and an ambitious uptake of ZEV cars (55% of new sales) and vans (40% of new sales) by 2025.

Table 2.3 ZEV share of new car sales needed to meet contribution to transport decarbonisation trajectory.

Road Network	Road Length in KM
National Highways Strategic Road Network	2,634
Major Road Network (excluding SRN)	5,319
Major Roads (SRN + MRN)	7,953

Working together with delivery partners, TfN will promote sustainable approaches to the design and construction of transport infrastructure. The STP outlines five key sustainable principles, which build on pan-Northern objectives, to establish sustainable values in the TfN Investment Programme. These principles are set out in further detail in Section 8.2 'Principles for developing the Investment Programme' of this Major Roads Report.

Construction practices also involve carbon emissions; therefore, standards need to be enhanced to seek to enable carbon-neutral construction.

TfN supports work being undertaken by National Highways and partners to deliver the best sustainable design through infrastructure development and will work to promote this being undertaken across the Major Road Network.

3.3   Air Quality

Clean Air Zones (CAZ) with targeted actions to improve air quality and reduce significant levels of air pollution have been proposed in Greater Manchester, Leeds, Bradford, Newcastle and Sheffield. An example of this in practice is the London Low Emission Zone (LEZ), introduced in 2008 to improve the air quality in London by preventing the most polluting vehicles from being driven into the City. Evidence

suggests a positive impact from the London LEZ, including the reduction of black carbon by over 40% and NOx emissions by 2.4%.[56] To further improve air quality, an Ultra-Low Emission Zone (ULEZ) was introduced in April 2019. The ULEZ imposes a daily fee on all but the latest diesel cars and vans, as well as lorries that are more than five years old. The ULEZ is expected to contribute to improved air quality for millions of people in London and reduce exhaust NOx emissions by up to 45%.[57]

The need to improve air quality is vital for many of our towns and cities, and although new technologies support the reduction in reduced emissions from exhausts, particulate emissions from non-exhaust sources are becoming increasingly important, particularly due to the potential for road traffic to increase in the future. In some cases, the particulate matter emissions from brake wear, tyre wear and road wear may be more than that from the exhaust. TfN will work with local partners, National Highways, and the Government to promote measures to reduce non-exhaust particulate emissions.

National Highways published an 'Air Quality Strategy' in 2017 which outlines their approach to minimising harm and improving air quality, by delivering a cleaner Strategic Road Network that improves the health of its neighbours and

customers. The strategy sets out the desire to have an electric charging point every 20 miles across 95% of the network to accelerate the uptake of ZEVs. In addition, innovative approaches outlined in the strategy include the trialling of polymer barriers to absorb oxides and clean the air; modernisation of the HGV fleet; studies to understand causes of poor air quality; and an electric van demonstrator project seeking to find ways to accelerate the uptake of these cleanest vehicles.[58] TfN recognises the steps taken by National Highways to improve air quality on the SRN, and we are keen to explore how this strategy could be expanded to also cover the MRN through future investment on the network.

3.4   Local and Sustainable Transport

TfN's remit is focused on the identification and recommendation of pan-Northern strategic transport interventions that are generally longer distance trips between other economic centres. However, there needs to be complementary and supporting investment at a local as well as a pan-Northern level to provide a 'whole journey' and 'total network' approach to improving transport.

Taking a 'whole journey' approach not only supports transformational economic growth and carbon reduction, it has significant social benefits, through reducing severance and better connecting local communities with employment and other services.

Active travel should, wherever possible, be the first choice for short urban trips, and in many urban areas' trips of up to 1 mile on foot and 5 mile by cycle can be quicker than an equivalent trip by car, particularly when considering the need to park a car, before proceeding to a final destination. Using our evidence base, TfN will support partners in developing their

plans for improving walking and cycling networks, and where appropriate ensure that investment in the strategic network, including the MRN, incorporates high quality provision for active travel, which should be designed in accordance with the latest best practice guidance.[59]

Further development of core bus networks will be essential for providing effective and efficient access to and within urban areas. These should use new engine technology, reducing emissions from the bus fleet as part of the drive towards a zero-carbon public transport network, and incorporate the latest techniques in providing bus priority in congested networks.

TfN welcomed the publication of the Government 'Bus Back Better' long-term national bus strategy for England outside London, and will work to support our local partners in their work with bus operators to develop enhanced bus partnerships or, if they choose to do so, the introduction of franchising to improve local bus services. This could include investment in bus infrastructure on the MRN as well as on local roads.

In addition to bus services, investment in the MRN can support access to train stations, including proposed Park and Ride stations in the North such as the proposed Roseberry Parkway and Leeds Bradford Airport Parkway located in close proximity to the MRN. Improvements to the MRN in locations close to stations and Park and Ride sites will support strategic public transport movements and help reduce of car travel in central urban areas. Where appropriate, MRN investment could also support the introduction of Demand Responsive Transport (DRT) solutions, a form of shared, on-demand transport service in some locations. For example Tees Flex is an on-demand service linking rural areas to key towns centre destinations in the Tees Valley.

4. Major Road Network

4.1 MRN in the North

We all rely on a well-functioning road network to access jobs, goods and services. It is the whole network, including the 'last mile' of a journey and the vital connections with other transport hubs, which make the difference to whether or not people or goods arrive on time. The smallest delay can have negative impacts on business performance and people's mental wellbeing. A focus on the SRN alone will not allow the North to achieve its aspirations for improved connectivity and economic growth, which is why, working with our partners, TfN has identified a Major Road Network (MRN) for the North.

Our MRN identifies a network of roads that are crucial to driving economic growth in the North. It includes current and future economic centres, as well as major transport hubs, which enable multimodal journeys. With local connections alongside strategic roads, it accounts for about 7% of the roads in the North.

Table 4-1 summarises the MRN, SRN and combined road lengths of both road networks.

Table 4-1 - SRN and MRN road lengths.[60]

Road Network	Road Length in km
National Highways Strategic Road Network	1,889
Major Road Network	4,957
Combined TfN MRN	**6,844**

It is important to note that the MRN defined by TfN differs from the MRN defined by the DfT. Key differences are that the TfN MRN includes the SRN, and additional MRN links.

Figure 4-1 below visualises the differences in the MRN between TfN and DfT. The red lines define the DfT MRN, which is also covered by the MRN for the North, and green lines represent additional links in the MRN for the North agreed with TfN partners in 2018.

Figure 4-1 – MRN for the North compared with DfT adopted MRN.
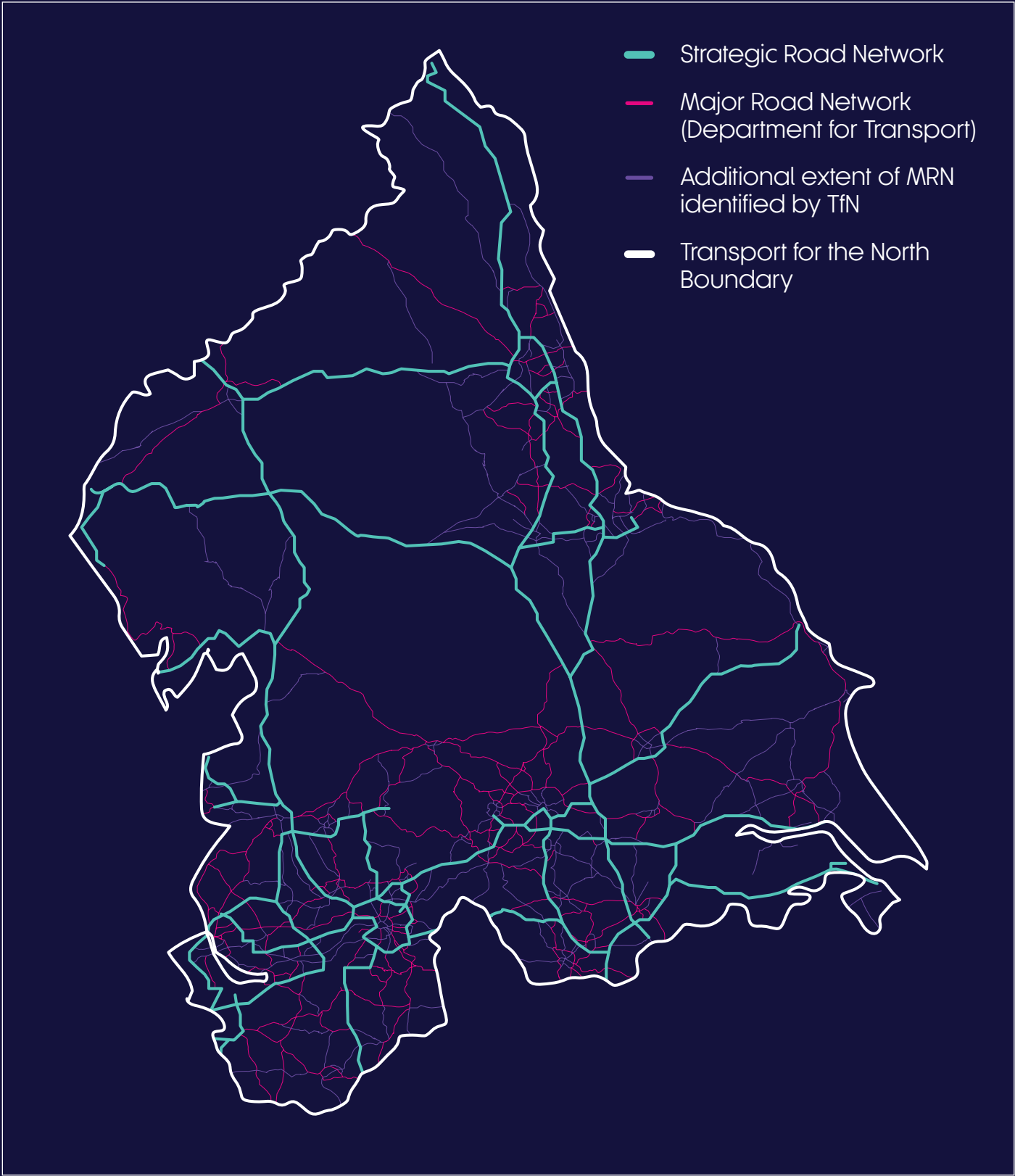
Legend:
- Strategic Road Network
- Major Road Network (Department for Transport)
- Additional extent of MRN identified by TfN
- Transport for the North Boundary

TfN will periodically review and adapt the MRN for the North, to meet the needs of the North in the future.

4.2 Ambition for the MRN and Conditional Outputs

Improvements to the SRN commenced across the North as part of the Road Investment Strategy 1 (RIS1) in the period 2015-2020 and are continuing as part of RIS2 (2020-2025).

The Strategic Transport Plan outlines our ambition for the MRN in the North to be *a seamless network of roads, enabling safe, reliable and resilient multimodal journeys.* And this must be within the context of fast action towards achieving net zero for transport.

For the North's major roads to fulfil this role they must in combination:

→ Support agglomeration economies by providing more rapid and reliable journeys to bring businesses closer together.

→ Release growth in key employment and housing sites.

→ Increase the resilience of the economy to outside opportunities and threats.

→ Enable the most efficient journeys across multiple transport modes.

→ Improve access to opportunities for the citizens of the North.

→ Enable international connectivity by improving access to airports, ports and associated economic clusters, where an appropriate rail connection or other more sustainable access is not possible.

Although managed separately by National Highways and local transport and highway authorities, TfN will aim to ensure that evidence gathering, network planning, the provision of journey information, and traffic and performance management decisions, are developed and delivered collaboratively. This fully rounded approach will achieve better 'whole journey' travel experiences and improved safety, economic, environmental and community outcomes.

Memorandums of Understanding (MoUs) between TfN, Midlands Connect, DfT and other transport bodies within the TfN area acknowledge the need for effective communication, collaboration and knowledge sharing between neighbouring regions. These MoU provide a principal-led agreement between bodies that, while each have their own strategy and economic goal, share a similar vision for "vibrant, sustainable and growing economies in their areas". TfN and the other STBs meet regularly to coordinate working on common workstreams, share knowledge, and, on shared priorities, to communicate with a strong sub-national voice to Government. Adopting this level of coordination and best practice supports collaborative and effective working.

In respect to the Major Road Network for the North, TfN has agreed pan-Northern Conditional Outputs against which the performance of the MRN will be monitored, as data becomes available. These five conditional outputs for the MRN are detailed in Table 4-2, including the metrics and data requirements to measure these outputs.

Table 4-2 - MRN Conditional Outputs.

Conditional Output	Metrics	Data requirements
Reliability	% of acceptable journeys in the North (car, LGV, HGV)	Mobile Phone Data
Efficiency	Minutes of delay per hour travelled in the North (car, LGV, HGV)	Mobile Phone Data
	All vehicle occupancy in peak hours	
	% of network that is adaptive	Survey
	Greenhouse gas emissions per person trip/mile	DfT is looking to develop a universally recognised measure[61]
Resilience	Number of road closure events* per annum on defined corridors of the MRN	National Highways/Local Highway Authority
Journey Quality	Business perceptions of journey information provision and road condition	Transport user survey
Carbon emissions from road transport	GHG emissions from road transport for journeys on the MRN within the North.	Metrics calculated by TfN Northern Carbon Model (NoCarb)

*Road closure events include emergency or planned occurrences where road space is partially or fully closed leading to diversion.

In addition to the pan-Northern conditional outputs above, improving safety and air quality are fundamental objectives for TfN partners in managing their road networks, are reported by National Highways and local highway authorities, and are captured as part of TfN's Monitoring and Evaluation Framework. This framework is a set of impacts and indicators by which TfN measures progress towards the four objectives of the Strategic Transport Plan and includes a number of indicators that are directly relevant to the nature and management of the road network, such as:

→ **Air pollution:** The proportion of the population exposed to high levels of PM2.5 and NO2 emissions, to which vehicles are a significant contributor.

→ **Noise pollution:** The proportion of the population exposed to high levels of day and night-time noise pollution from vehicles.

→ **Road incidents:** The number of road incidents resulting in fatalities or serious injuries.

→ **Physical inactivity:** The proportion of adults walking or cycling for travel at least three days per week.

TfN and partners have developed a pipeline or 'route map' for transport investment, developed and assessed against the strategic transport objectives.

Table 4-3 sets out the four pan-Northern objectives identified in the STP, and how the MRN can contribute to meeting the STP objectives.

Table 4-3 – STP objectives

Pan-Northern objectives	Summary of objective in the STP	Role of the MRN
Transforming economic performance	Securing investment in transport between the important urban and rural economic centres and assets supports sustainable transformation of the North's economic performance, and addresses the opportunities identified in the Northern Powerhouse Independent Economic Review. This includes securing investment in transport interventions, which improve productivity, unlock investment and deliver agglomeration benefits. 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.	69% of all vehicle-km and over 90% of HGV-km take place on the MRN in the North (7% of our roads including the SRN). Improving journey time reliability and efficiency on the MRN will help better connect people, businesses and goods. Improved MRN performance will subsequently support improved business productivity, new business investment, increased labour supply, better job matching and greater labour market resilience.
Increasing efficiency, reliability, integration, and resilience in the transport system	The objective aims to improve the performance and integration of the transport network by improving efficiency, reliability and resilience. The North's strategic transport networks, and connections with more local networks, must meet the needs of its users, whether they are residents, businesses or visitors. The network must adapt to changing demands over the period to 2050, such as shifting commuter patterns, changing leisure aspirations, more extreme weather conditions resulting from climate change, and the emergence of new technologies, such as connected and autonomous vehicles. TfN will also identify opportunities to improve travel choices for the movement of both people and freight and to boost the resilience and sustainability of pan-Northern networks across the whole journey. This includes promoting measures that help support modal shift making more sustainable and efficient use of our existing networks.	'Within the context of fast action towards achieving net zero for transport TfN's ambition is for the Major Roads in the North (SRN and MRN) to act as a seamless network of roads, enabling more efficient, sustainable, safe, reliable, and resilient multi-modal journeys. The MRN Conditional Outputs align with this STP objective, these being: → Journey reliability → Network efficiency → Network resilience → Journey quality → GHG emissions
Improving inclusivity, health, and access to opportunities for all	The STP must work for everyone who lives and works in the North through improved access to opportunities. Economic growth in the North should be as inclusive as possible, avoiding transport poverty where the transport network limits access opportunities in communities. Investment in the strategic transport network should enable better access to key opportunities, including employment, health, social activities and education, regardless of the individuals' 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 coordinated approach is required to ensure strategic and local transport investment programmes and policies are aligned and complementary.	Integrating the MRN with local networks, public transport and active travel will have significant social benefits by reducing severance and connecting local communities to employment and wider services including health, leisure and education. Improving the first and last mile of the journey will deliver future mobility which is right for the user and provides a seamless travel experience. Transport, and as such the MRN, is a form of social infrastructure which should support inclusive growth for all users. The MRN should be designed and developed to be accessible so that users have a choice of services and opportunities to access work and leisure. Investment in the MRN should seek to cater for all road users by facilitating the improvement of the highway network not just for vehicles, but for pedestrians, cyclists and public transport users.
Promoting and enhancing the built, historic, and natural environment	Through collaboration with TfN's partners, stakeholders and communities, transport interventions across the strategic transport system must protect and enhance the natural, historic and built environment, making sure that the North's transport system is as sustainable as possible. This includes the need to provide sustainable travel choices for the movement of people and goods, reduce air pollutants and carbon emissions from transport, and make best use of existing transport infrastructure before investing in new capacity. It also ensures that new infrastructure is designed to minimise the negative impacts on the natural, historic and built environment, including biodiversity, and results in new environmental gains where possible. Promoting access to the natural and green environment will also promote physical and mental health.	To achieve national and our Northern trajectory for transport decarbonisation it is vital that the North works towards decarbonising the road network, including the MRN. This requires improved infrastructure to support sustainable public transport, and for the shortest trips in our conurbations, walking and cycling, utilisation of new technologies, such as e-bikes scooters, e-cargo bikes/drones combined with policies to encourage greater use of these modes in place of the car, HGV or LGV. Investment on increasing high capacity should only be targeted where impacts of por connectivity, congestion and delay cannot be resolved through other measures. TfN is committed to accelerating the shift towards low carbon transport and supporting the introduction of new vehicle technologies, accelerating the update of zero emissions vehicles, encouraging a shift of freight from road to rail and supporting the development of connected and autonomous vehicles.

4.3 Governance of the Major Road Network

From the user's perspective roads are a single network, with the quality of a door-to-door journey by road judged by whether the user arrived safely, on tim,e and having experienced a coherent and comfortable journey.

In defining the MRN for the North, TfN has identified the most economically important roads connecting population centres, international gateways, business parks and other important economic centres across the North. This makes up around 7% of the road network in the North - 2% on the Strategic Road Network, managed and operated by National Highways, and 5% on the roads managed and operated by local highway authorities. The 93% of remaining roads, including local streets, local distributor roads and most rural roads. are managed by local highway authorities.

With the announcement of the National Roads Fund (NRF) available to local highway authorities for improvements to routes they manage on the DfT-defined Major Road Network, the Department for Transport recognised the important role of Sub-national Transport Bodies in coordinating a Regional Evidence Base (REB) for the MRN.

"STBs or regional groupings will be responsible for coordinating the development of their region's REB, working with their partners and constituent members. This must include consulting with local and combined authorities (including planning authorities), LEPs, local MPs and National Highways to ensure collective decision making on the region's top priority recommendations for MRN investments."[62]

Looking to the future, the governance of, and planning for, our roads should adapt to better meet the significant economic, societal, environmental and technological challenges ahead.

For example, how to deliver a more efficient and reliable road network, supporting greater opportunities for all citizens, while facilitating improvements in air quality, reducing carbon emissions, and enabling more people to make use of active travel and public transport as their first transport choice. This will require both policy changes and transport interventions, explored in more detail through the TfN Future Travel Scenarios work, see section 5.4.

With further devolution there is an opportunity for TfN, and the other Sub-national Transport Bodies, to play a critical role in working with national delivery partners (National Highways and Network Rail) and local partners (transport and highway authorities) in coordinating the development of a shared vision, evidence base and delivery programme for transport, including a coordinated approach to the operation of and investment in the Major Road Network.

The Northern Transport Charter advocates the need for TfN to have a much stronger role in developing and owning a Northern infrastructure pipeline with a clear set of objectives, aligned with transport priorities for the North of England, as set out in the Strategic Transport Plan.

For the road network in the North this would see TfN, with partners, act as an 'intelligent client' for the Major Road Network for the North (SRN and locally managed major roads), with local transport and highway authorities continuing to lead on responsibility for local networks (93% of roads).

Critically, through the TfN partnership, TfN is well placed to work with national and local partners facilitating an integrated approach to optimising delivery of a highway network that supports the economic, social and environmental needs of transport users and communities in the North.

TfN has a strong working relationship with National Highways and both organisations are committed to working collaboratively in the development of the future pipeline of SRN schemes. The HE-TfN Joint Engagement and Action Plan sets out the framework for our collaborative partnership in the future. TfN is also actively engaged in the HE Route Strategies[63] work programme, which will inform future investment decisions on the SRN.

4.4 National Roads Fund investment in the MRN

There has been significant underinvestment on our roads in the North, which has led to unreliable and slow journey times.

In 2019 TfN submitted a pan-Northern Regional Evidence Base (REB) bid for £700m of Major Road Network investment in the region's roads over the next five years (2020-2025) as part of the £3.5bn National Roads Fund (NRF) allocation. Our evidence shows that these schemes will help unlock economic growth, deliver new homes, deliver improved facilities for active travel, and benefit public transport. This investment aligns with our call for Government to commit to a Northern Budget to rebalance decades of underinvestment and deliver a necessary boost to infrastructure in the North, which would support growth and further unlock the North's potential.

The July 2019 REB is the first such document in relation to MRN schemes.

TfN's assessment of proposed schemes in the REB considered alignment with:

→ DfT's MRN objectives.

→ TfN's STP objectives.

→ Local strategies, including plans to support public transport, walking and cycling.

→ The viability of the proposal as a scheme ready to take forward into construction during the period 2020-2025.

TfN welcomes the approach to working with STBs on prioritisation of MRN schemes and would support further steps to move away from inefficient competitive bidding processes.

In July 2021 Government pledged to review the National Networks National Policy Statement (NNNPS), which outlines the strategy for major spending on transport infrastructure including on our road networks. TfN will seek to work with Government in providing a northern view on priorities for updating the NNNPS.

For further rounds of funding for the MRN, schemes will also be considered in line with recommendations in TfN's Investment Programme and assurance processes.

Beyond the submission of the REB, TfN and partners are working together to oversee the delivery of the MRN and LLM programme, to promote and enable sharing of good practice and provide a forum for dialogue with DfT.

Figure 4-2 – Proposed schemes in TfN Regional Evidence Base MRN and LLM pipeline.

MRN & LLM schemes – TfN Regional Evidence Base Pipeline			
1.	A595 Bothel	9.	A689 Wynyard
2.	A595 Grizebeck	10.	Sunderland Transport Corridor phase 4
3.	Kendal Northern Access Route	11 & 12.	A1237 phase 1 & phase 2
4.	A1079 at Wilberfoss	13.	Shalesmoor Gateway
5.	A582 dualling	14.	Dawsons Corner Junction & Stanningley Bypass
6.	The Rocket Junction	15.	A650 Tong Street
7.	Blyth Relief Road	16.	Wigan East-West
8.	Tyne Bridge & Central Motorway	17.	A34 Cheadle

5. Current and future requirements of the MRN

Our society is undergoing a seismic change, largely as a result of advances in digitisation, with the effects being felt across many sectors including transport and mobility. This change has been accelerated by the Covid-19 pandemic, with an unprecedented switch to home working for 30-40% of the workforce, a rapid rise in online shopping, and, due to the risk of infection, a huge decline in use of public transport. At the time of writing, it is uncertain to what degree changes in behaviour will be embedded over the long term, however it seems certain that the pandemic has accelerated the trend towards higher levels of digital interaction.

For the North's MRN to be effective and futureproof, it must be resilient and capable of adapting to external changes facing our environment, economy and society. The MRN network must be ready to exploit the opportunities presented by evolving transport technology including connected and autonomous vehicles.[64]

The way that people live and work is changing, with shifting commuter patterns, changing leisure aspirations, a trend pre-Covid-19 towards higher density urban development in cities, and population growth adding further pressure on the transport network. In addition, the MRN must support the decarbonisation of transport, in line with Government and wider global agendas to reduce carbon emissions and combat climate change. Alongside this, the increasing frequency and severity of extreme weather events resulting from climate change mean that improved resilience of infrastructure, including the MRN, is a priority.

It should also be noted that every region, city, town, community or site in the North has a different set of needs, challenges and potential opportunities, and therefore when considering the future requirements of the MRN it is important to highlight the geographical disparities between places and emphasise the need to tailor potential solutions to local circumstances in order to meet the desired outcomes. TfN's work on Future Travel Scenarios considers how future change could impact differently on the diverse range of communities across the North and provides an evidence base to support TfN and our partners in actively engaging with the challenges of future uncertainty, to shape policy and investment decisions which best support our vision for the North.

5.1 Place, people and activity mega-trends

At the core of understanding the current and future requirements of the MRN is understanding the people who use the network, the day-to-day activities they undertake, and the places they visit.

5.1.1 Place

5.1.1.1 Climate change

The relationship between weather and road network operations, such as that on the MRN, is well established, but designing-in greater resilience is required to avoid increasing disruption and closures of key links in areas prone to flooding. Infrastructure, including flood barriers and dams, as well as softer measures including design measures and management of catchments through tree planting, are essential in reducing the environmental, social and economic costs of such events in the future. In addition, maintaining existing infrastructure, including drains and culverts, is vital in mitigating the potential impacts of severe weather.

Planning for the MRN needs to account for extreme weather events both in terms of mitigating their impact and reacting to events as they happen, so that the MRN supports network resilience. There is also a need to put in place adequate communications to guide drivers, before and during such events.

In the RIS2 funding settlement Government has recognised the need for higher levels of investment in maintenance and improved resilience allocating £11.9bn to renewals and maintenance of the SRN. Certainty on funding levels for renewals and maintenance on the wider MRN, is less clear, with local highway authorities required to compete for challenge funding.

Since May 2019, when the UK Parliament declared an 'environment and climate emergency', environmental issues have been propelled to the top of all government agendas. MRN governance will need to account for this shift by ensuring that the network supports the move to zero or low emission vehicles, more efficient use of vehicles and road space through shared mobility, and

autonomous vehicle technologies. Government will also need to consider new fiscal models for managing demand and generating revenue which could be reinvested in the network.

Investment in the MRN should focus on supporting decarbonisation of transport and improving air quality, for example through supporting more local journeys by public transport, walking and cycling, and through promoting new technologies and zero emission vehicles. The National Highways Air Quality Strategy[65] commits
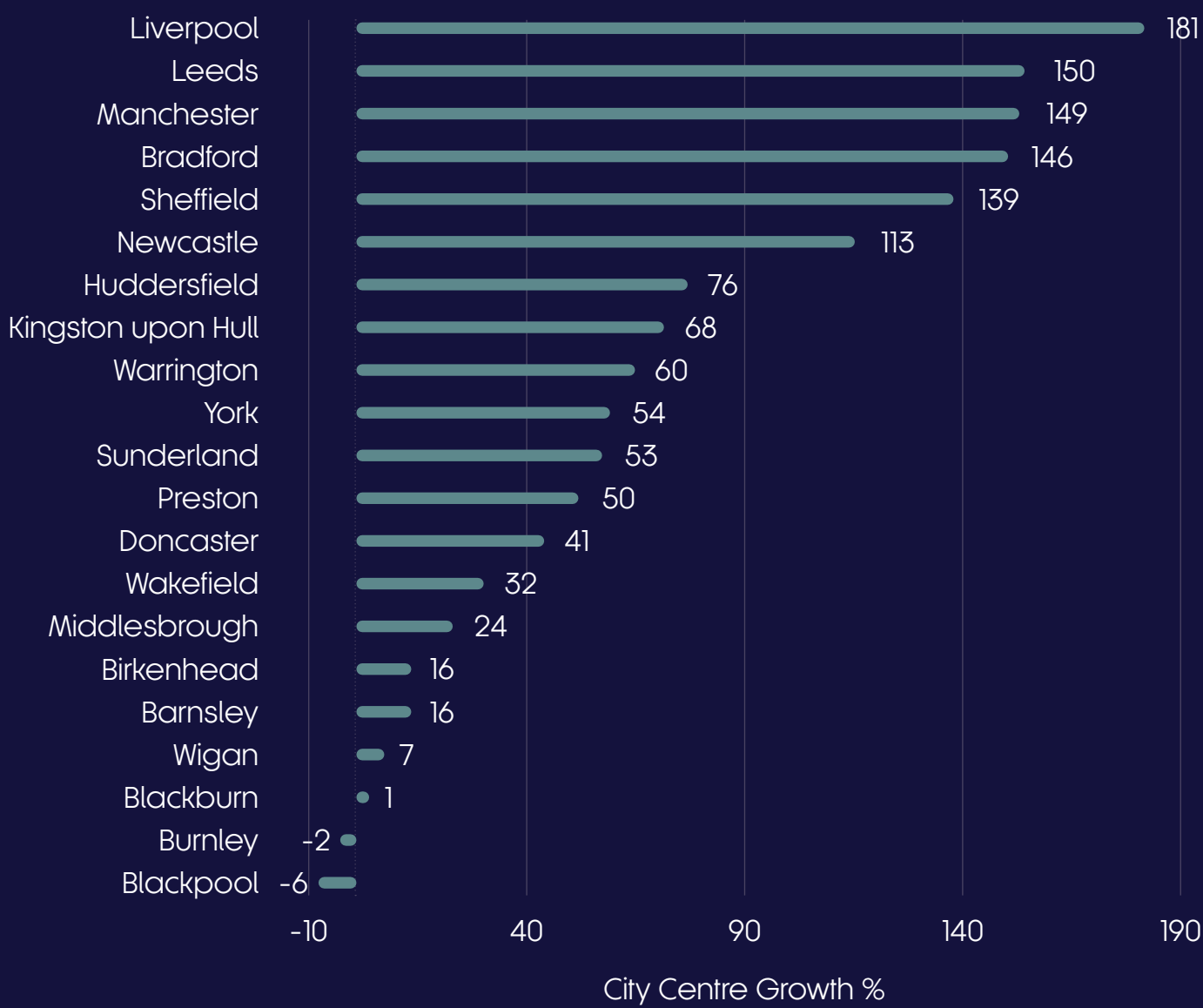
to improving air quality through policy, planning, monitoring and operational management and TfN is keen to promote good practice in this area across all major roads.

The UK is working with international partners to develop regulation for particulate emissions from tyres and brakes and once any recommendations or regulations have been formulated, they will need to be accounted for when planning for the MRN going forward.[66]

5.1.1.2 Urbanisation

Figure 5-1 compares the city centre growth for 21 towns and cities in the North with 135,000 or more residents between 2002 and 2015.[67] It shows that the populations of 12 out of these 21 urban centres in the North have more than doubled in size since the dawn of the century, while in

the same period the population of the UK has increased by only 10%. Liverpool has experienced the most significant increase in city centre populations since 2002 at 181%, whilst of the 21 areas Burnley and Blackpool are the only Northern urban centres to reduce in population size.

Figure 5-1 - City centre* growth between 2002-2015 (Source: Centre for Cities, 2018).

City	City Centre Growth %
Liverpool	181
Leeds	150
Manchester	149
Bradford	146
Sheffield	139
Newcastle	113
Huddersfield	76
Kingston upon Hull	68
Warrington	60
York	54
Sunderland	53
Preston	50
Doncaster	41
Wakefield	32
Middlesbrough	24
Birkenhead	16
Barnsley	16
Wigan	7
Blackburn	1
Burnley	-2
Blackpool	-6

*City centre defined as:
- 0.8mile radius from the centre of cities with 550,000 to four million residents
- 0.6mile radius from the centre of towns and cities of 135,000-550,000 residents

These high-density urban areas with higher proportions of young people are typically more sustainable, with many towns and cities having comparatively strong public transport offers and lower levels of car use per capita than the national average.

The MRN encompasses various road classifications and area types across the North, including arterial routes in urban areas. It is important that investment on the MRN accommodates sustainable travel such as public transport, walking and cycling across the entire network; and particularly in high density urban areas where there are more opportunities to access jobs and services within the local area.

An emerging trend from the Covid-19 pandemic is greater prevalence of home-working and an increase in popularity of suburban living. While the long-term effects of this trend are still unclear, there is potential for a reversal in the trend towards greater urbanisation, with consequent impacts on future travel behaviours and demands on the transport network. Using our Future Travel Scenarios TfN is providing evidence on the requirements of our transport networks in different futures, and supporting decisions on future transport investment.

5.1.1.3 Placemaking

The road network, including the MRN, can have a significant impact on the aesthetic appearance and diverse functions of local areas, particularly within the urban environment. Placemaking offers a holistic approach that combines spatial planning, design, management and transport elements of public spaces. The intention of placemaking is to create well designed places that all members of the public can benefit from by promoting active health, wellbeing and good quality spaces.

Placemaking also supports sustainable travel and modal shift by creating spaces that cater for multiple modes of travel, not just the car. Investment on the MRN should consider local placemaking strategies to ensure that development is bespoke to the area and respects its local character so that attractive places are created.

The Government White Paper 'Planning for the Future', published in August 2020, sets out suggestions for a radical reform of the planning system, identifying proposals to:

→ "Streamline the planning process with more democracy taking place more effectively at the plan-making stage."

→ Take a radical, digital-first approach to modernise the planning process. This means moving from a process based on documents to a process driven by data.

→ Bring a new focus on design and sustainability .To do so the White Paper states that Government will ensure the planning system supports efforts to combat climate change and maximises environmental benefits, by ensuring the National Planning Policy Framework targets those areas where a reformed planning system can most effectively address climate change mitigation and adaptation. Also, that there will be a "greater focus on placemaking and 'the creation of beautiful places' within the National Planning Policy Framework."

→ Improve infrastructure delivery in all parts of the country and ensure developers play their part, through reform of developer contributions.

→ Ensure more land is available for the homes and development people and communities need, and to support renewal of our town and city centres.

TfN has responded to consultation on the White Paper, and although in support of the overall thrust of the proposals has pointed to several areas for improvement, including:

→ The need for greater consideration of the implications for transport at the plan-making stage, including the benefits of ensuring that sub-national transport plans have a formal status within the planning framework.

→ The importance of ensuring decisions on large, strategic sites are not always confided to a single local planning authority boundary, as many social, infrastructure, environmental and economic issues can only be effectively addressed over several local authority administrative boundaries.

→ The need for more thought to how housing requirements are determined, including consideration of the UK2070 Commission proposal that England requires a spatial plan to guide its future development, bringing it into line with Scotland, Wales and Northern Ireland, who all have spatial frameworks that play a "key role" in helping to shape their future development.

→ The appropriateness of using affordability as an indicator of the quantity of development to be accommodated, which could accentuate regional disparities in growth across the country and undermine the Government's Levelling Up agenda.

5.1.2 People

5.1.2.1 Population growth and ageing

Population growth is expected to lead to an increase in road users across the North. The draft Greater Manchester Spatial Framework published in 2019, as an example, set out a target of at least 201,000 additional dwellings in Greater Manchester by 2037 (10,580 per annum), of which nearly 50,000 new dwellings are to be delivered within the city centre.[68]

In addition to the fact that the UK population is growing, ONS data also indicates that it is ageing. In 2020 the over-65 population resident in the North is predicted to account for 18.9% of the population (based on the 2011 census), however by 2040 this is set to increase to 24.3%.[69] The oldest of the older population, classed as 85 years or older, are the fastest growing age group in the UK, with planned increases to state pension retirement ages for both men and women (expected to be 68 by 2039). Additionally, people in the UK are increasingly taking on large financial burdens as housing affordability reduces. With mortgage debt held by 65-year-olds projected to nearly double by 2030 from 2014 levels, this could mean that homeowners are paying off mortgages at a later age.[70] Consequently, an increasingly financially burdened ageing population, who still need to commute to work, will have different expectations and needs of the MRN. Consideration of their requirements in the design and development of the MRN and the services it facilitates in the North is essential. This is particularly important as new technology is implemented to improve the efficiency and safety of the network.

In 2018, one in five people in the UK's Family Resource Survey reported a disability, defined as "a long-standing illness, disability or impairment which causes substantial difficulty with day-to-day activities."[71] This represents a 17% increase over the past 10 years. Reporting of mental health, learning and memory disabilities has increased in particular. The growth in disabilities in the UK has important implications for the way people travel, especially in terms of access and ability to access different modes of transport.

Disability prevalence by region (2017/2018) indicates that the North East, North West and Yorkshire & the Humber have a higher proportion of registered disabilities compared to the rest of the country. In the North East, one in four people has a disability.

Transport systems, from planning right through to making a trip, are largely designed around an increasingly digitally enabled set of able-bodied customers. This in turn leaves a myriad of interconnected barriers that increase traveller stress for those with particular needs or challenges and contributes to reduced access. Future planning of the MRN provides the opportunity to re-think how barriers can be overcome, not only improving the physical design but also in the built and digital environments upon which we all rely.

Population growth and projected demographic changes will require new and innovative approaches to accommodating future transport demand.

Technology can facilitate the efficient operation of the MRN, including providing information to the network operator regarding conditions on the road such as congestion to enable better decision-making; allowing the network operator to influence traffic conditions such as setting speed limits; and providing information to road users to allow them to make more informed choices to manage demand. This information can be populated through technology such as CCTV, average speed cameras, and queue protection for managing traffic flows safely. The potential role of technology in influencing behaviours and managing the MRN is explored further in section 5.2.

5.1.2.2 Social inequalities

The investment in, and expansion of cities centres in the North, has put pressure on smaller conurbations as well as less desirable areas within cities and city regions. There is an argument that the dawn of smart technologies and the requirement for new energy infrastructure has the potential to polarise areas further. Research by Localis highlights that despite smart technologies having the potential to result in more equitable outcomes for all, those people in higher income areas could be more willing and able to engage with smart technologies, in turn encouraging wider area re-investment in energy infrastructure. Within the context of transport systems, the upgrading of infrastructure to enable smart energy solutions and the roll-out of electric vehicles must be done fairly to support equitable opportunities for all households and safeguard against exacerbating existing socioeconomic disparities.[72]

Gross disposable income per person data indicates that the average disposable income per person in all areas in the North (apart from Cheshire) is lower than the average for the whole of England.[73] These communities could potentially miss out on the benefits of the technology if the development of the infrastructure is solely market driven, without public sector intervention to proactively deliver solutions in less commercially attractive locations.

TfN and partners can play an important role in delivering an inclusive approach to delivering new transport solutions supporting the North's ambition for a thriving North of England, where world class transport enables sustainable economic growth, excellent quality of life and improved opportunities for all.
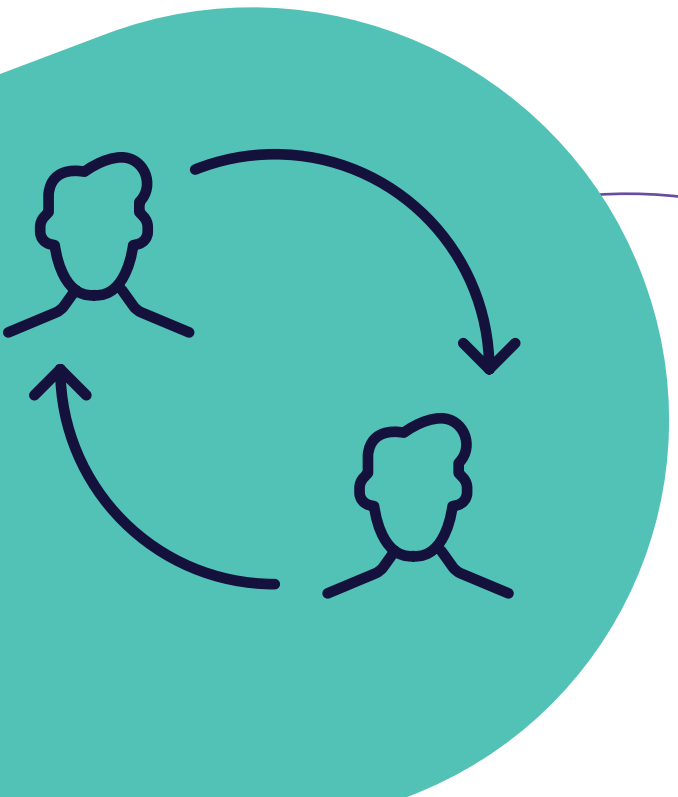
5.1.3 Activities

5.1.3.1 Health

As outlined in 5.1.2.1, the population in the North is growing, ageing and becoming more diverse. There are already pressures on the social care system in terms of care provision, which provides an impetus for digital and remote care provision for some conditions. The use of automation, sensors and Artificial Intelligence (AI) in caring will help in part reduce the need for human intervention but there will still be considerable transportation needs for social, patient care and home visit needs.

Healthy and sustainable transport options are required to reduce the negative impact of current transport patterns on human health. As stated in the DfT publication 'Stepping up a Gear - A bold vision for Cycling and Walking' "increasing cycling and walking can help tackle some of the most challenging issues we face as a society – improving air quality, combatting climate change, improving health and wellbeing, addressing inequalities and tackling congestion on our roads."

Consideration of sustainable and active travel should be an early part of the design stages for all schemes on the MRN, with decisions on a route-by-route and location-by-location basis as to the most appropriate type of provision in each locality. Investment in active travel should be designed and maintained in accordance with the principles contained within 'Stepping up a Gear' and as described in more detailed within Local Transport Note (1/20) Cycle – Infrastructure.[75]

Low levels of walking and cycling, coupled with concerns over obesity levels, which has increased from 15% of the whole UK population to 26% since 1993, has led to an increased focus on the need to encourage more people walk and cycle more often.[76]

5.1.3.2 Workplace and employment

The future requirements of the MRN will also need to accommodate changes in workplace and employment, as how (or if) we commute has been changing rapidly to accommodate new business models, practices and structures.

Measures to tackle the Covid-19 pandemic have accelerated what was already a growing trend towards more remote working, particularly for office-based employment. Between 2010 and 2018 the ONS Labour Force Survey recorded that the number of people working from home for their main job had almost doubled in the UK.[77] The survey demonstrated that all main regions have seen an increase in the proportion of their working population working from home. Yorkshire and Humberside have seen the biggest increase in home working over the past decade with an increase of 2.9% since 2008, up to 5.4% of the working population, which is larger than the national average of 4.7%. Data for the period from April to May 2020 shows that during the height of the Covid-19 restrictions on travel, 36% of employees in the North were working remotely, with wide variations in remote working across different sectors.

Figure 5.2 shows the proportion of employees in the North in each sector who shifted their working activities to a remote workspace during May 2020.

Employee Working Arrangements of the Firms Still Trading 4 May – 17 May

Legend:
- Working at Normal Place of Work
- Working Remotely Instead
- Other
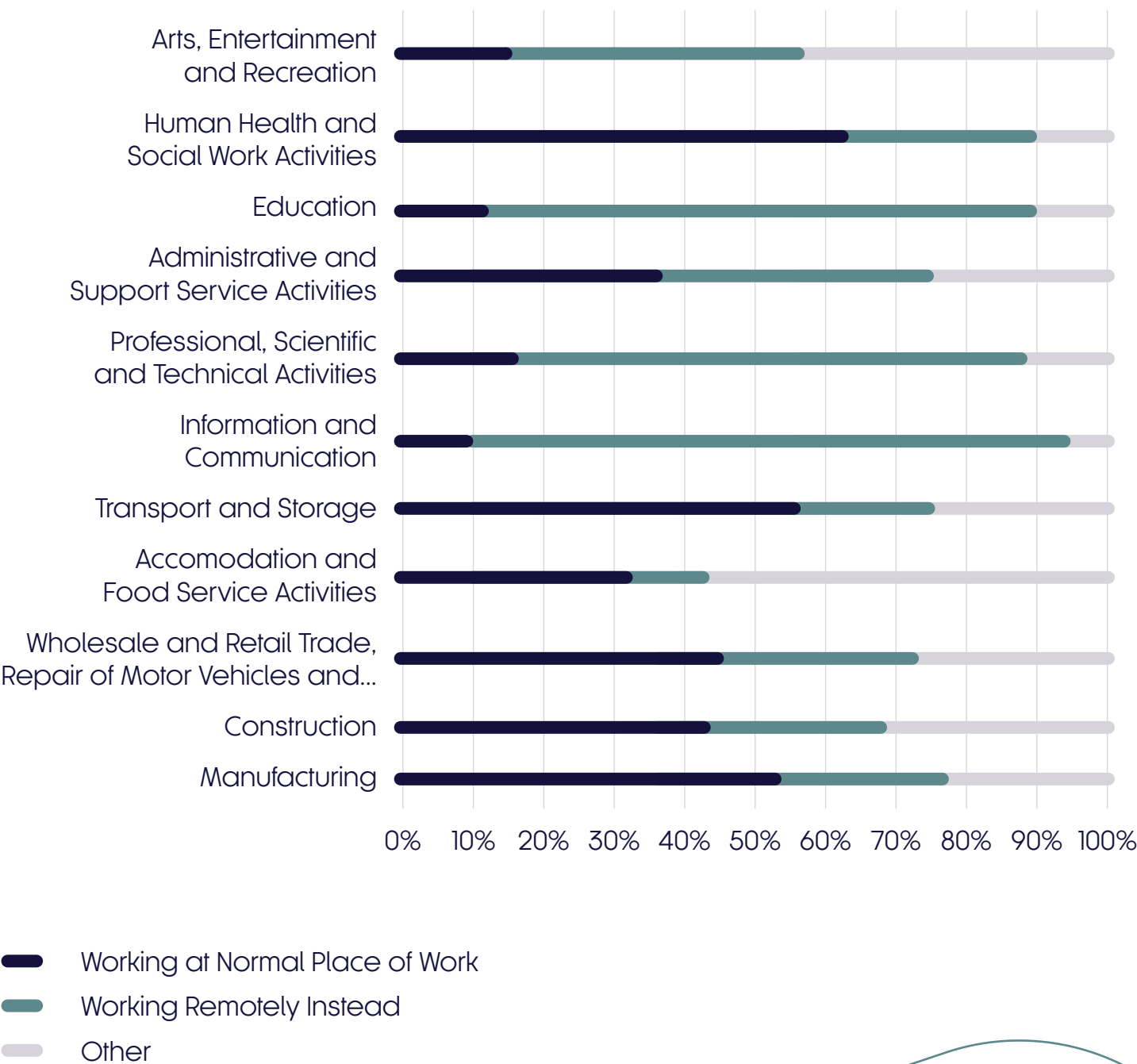
Over the long-term, transport solutions and policy measures will need to adapt to future changes in travel behaviour which are very likely to include more remote working, although the level at which digital substitution will replace the everyday commute is currently unclear.

More flexible working patterns do not necessarily reduce total trips; however, they do have the potential to impact on both time of travel and the transport modes that may be used during the workday – particularly if working locations are more local. Increases in walking and cycling during the pandemic have shown there is a real opportunity and appetite for more active travel.

Changes in employment types also have the potential to impact upon the future requirements of the MRN. For example, over recent years there has been a rise in the 'gig' economy where individuals are paid for the tasks they undertake (e.g. ride-hailing, food delivery services) rather than being traditional 'salaried' roles. It is estimated that 4.7 million people in the UK currently work this way and while gig workers are found in the strongest concentrations in Greater London (24%), 15.5% of the working age population in the North is estimated to be employed in platform work.[78] This shift in employment may result in increased trip making depending upon the location and type of 'gigs' undertaken.

Types of employment are also projected to change as a result of the impacts of automation (both robotic and digital artificial intelligence) on the existing jobs market. PwC's analysis for example indicates that more than 30% of existing

UK jobs are susceptible to automation.[79] In the short term, data-driven industries such as financial services are likely to be most affected by automation using algorithms, however, in the long run, those industry jobs in retail, transportation and storage, manufacturing and construction are at a higher risk of automation. Those less at risk in turn include education, human health and social work and accommodation and food services. Research indicates that this risk to jobs is not spread evenly across the country, with jobs in southern cities threatened less than cities elsewhere.[80] A Centre for Cities report highlights that five out of the top 10 locations in the UK most vulnerable to job automation are in the North (Sunderland, Wakefield, Doncaster, Blackburn and Huddersfield). There is therefore a need to ensure that investment in transport networks for the future support citizens in adapting to the changing nature of the employment market.

Technological and socio-cultural change is a key factor in influencing various future scenarios due to its potential impact on attitudes towards travel and digital connectivity. The uncertainty of the future has resulted in TfN establishing four different scenarios of the future situation in the North, all of which are impacted to different extents by factors such as technological and socio-cultural change, which can often be out of TfN's direct influence.[81]

5.1.3.3 Education and learning

The future requirements of the MRN will also need to accommodate changes in education and learning, as similarly to workplace trends, where, when and how people learn in the North is changing. With rapid changes in digital technologies and automation there is a need for learning to be undertaken throughout or at regular intervals during an elongated work life.

Digital learning and technology in education (EdTech) are driving changes in campuses, courses, work patterns, behaviours and achievements. Technology has the potential to give students of all ages more flexibility when it comes to education and training and therefore has the potential to impact network usage by giving people flexibility on when they travel or if they need to travel at all. Akin to the workforce trends, impacts of life-long and increasing remote learning could have potential impacts on the future investment in transport capacity.

The skills needed to support a growing transport technology sector will also require a big shift in what training is available. As an STB, TfN recognises that it needs to have an influence in closing the potential skills gaps in the workforce that is needed to meet emerging transport and mobility demands and that it should have a view to shaping future training requirements and specifications.

5.1.3.4 Retail and leisure

Future requirements of the MRN in the North will also need to reflect the seismic shifts that the retail and services sectors have seen over last two decades with the

advent of home shopping (home delivery, click and collect) and digital access to services (banking, local authority services etc.). As with the workplace the impact of the pandemic has been to rapidly accelerate these changes, with a 72% year-on-year increase from June 2019 to June 2020 in online retail.[82]

Even before the pandemic the move towards e-commerce was clear, with almost 20% of UK retail sales being recorded online.[83] Decisions have subsequently been made to improve the efficiency of an e-commerce business overall and keep up with customer demands which have knock-on effects on transport.

Changes in e-commerce have significant impacts on the transport network, for example just-in-time manufacturing and same day/same hour deliveries have resulted in substantial increases in the distances goods are transported and the frequency of trips across the UK. This in turn has led to lower average payloads and more movements on UK road networks. This is particularly the case in terms of last-mile van trips in urban areas and exacerbated by missed deliveries and multiple returns. The consequences of this on freight movements are significant for the MRN in the North, particularly in urban areas.

Trip making has been impacted with a shift from consumer trips to retailer led trips, however this revolution has not yet completely negated the need for people to visit 'bricks and mortar' retail establishments to browse, compare and in many cases still purchase. Retailers have recognised this trend with a move

to a more 'experience' led approach where food, drink, entertainment and other activities are embedded within the shopping experience. Within the service sector, online access has impacted the need for a high street presence in many places, with 2019 PwC analysis of high street composition revealing that the TfN area suffered a net loss of 202 retail stores on the high street between January and June of 2019.[84] This trend, which has been accelerated by the impact of Covid-19, looks set to continue, though human interactions are still likely to be important for many transactions, especially for those uneasy or unable to engage with online solutions. Trip making will continue to evolve, particularly as retailers move to longer opening hours with more diverse offers. It should also be noted that the logistics industry is evolving rapidly to meet demands with 24/7 operations, locational trends and automation in warehousing impacting trip making.

5.1.3.5 Tourism

The North of England boasts five National Parks, significant areas of Outstanding Natural Beauty (AONBs), and nationally important coastal areas and resorts. Research prior to the Covid 19-pandemic identified that the North of England attracts 369 million visitors annually, comprising 4.54 million overseas staying visitors, 28.88 million domestic staying visitors, and 336.17 million-day visits.

Many of the North's key natural landscapes have relatively poor access to public transport with the majority of visitors traveling by car. For example, 93% of those who travel to the National Parks do so in their own car.

The five National Park Authorities (Lake District, Northumberland, North York Moors, Peak District, and the Yorkshire Dales), face an ongoing challenge in balancing the need to accommodate millions of visitors with the ambition to minimise the impact of visitor traffic on the environment and on local communities.

The Lake District National Park has set a target of reducing the percentage of people arriving by car from 83% to 64% by 2040. The National Park attracts nearly 20 million visitors per year and generates more than £2bn for the local economy, with the A591 on the MRN providing vital access for visitors from the M6 to the major visitor destinations of Windermere and Keswick. Maintaining good visitor access, while reducing mode share by car, will require careful coordination of a package of policy and infrastructure measures.

However, the car is likely to continue to be the dominant mode of travel to and within National Parks, and the MRN is critical in enabling many millions of people enjoy our natural assets.

Measures to reduce car reliance being considered or trialled in some locations include improved rail and bus services linking urban areas to National Parks; development of 'gateway' destinations where visitors can transfer from private car to bus, coach or car sharing; investment in substantially improved active travel facilities coupled with improved sustainable travel options; and increased parking fees in some locations. Improved integration between travel modes and transport operators also has an important role to play in simplifying wayfinding, ticketing and payments, as well as supporting improved connectivity.

Tourism is an essential part of the economy in the North and the MRN provides access to major cities, National Parks and world heritage sites that attract people from across the globe. Key Northern international gateways such as Manchester and Newcastle airports and the ports of Liverpool and Hull, provide both inward and outward journey opportunities not only for tourism but for business purposes and international connectivity.

5.1.3.6 Freight and logistics

More than 87% of freight movements use the road network in the North, with a high proportion of freight vehicle-kilometres on major roads, including the SRN. Most freight journeys will start and finish on local roads, therefore efficient first and last mile links are also vital for the timely and efficient movement of goods.

Supporting businesses to move freight and goods efficiently and across modes is a key aim for TfN, this includes improved provision for transporting freight by rail, particularly for east-west movements across the Pennines.

The MRN can contribute to facilitating this shift by improving access to rail freight hubs and distribution centres, helping to minimise overall journey times and supporting reliable end-end deliveries.

For heavy goods vehicles, there is considerable research and development into hydrogen fuel cell powered lorries and vans, as well as freight platooning using Connected Vehicle technology, urban consolidation centres and last mile deliveries using sustainable modes.

Tees Valley in the North East produces more than half of the UK's hydrogen, with two hydrogen refuelling stations planned to be built in Middlesbrough and Redcar. These will initially be used by a fleet of hydrogen fuelled cars which use the hydrogen technology for long-range travel (300+ miles) and fast refuelling capability. There is clearly still a long way to go before 'green' hydrogen[85] becomes an important source of fuel, but also potentially significant economic and environmental opportunities from adopting hydrogen technologies early and diversifying this within the transport industry to create jobs and savings.

Platooning demonstrates an example of potential freight innovation, whereby heavy goods vehicles use platoon technology to communicate with each other and form a combined line following each other in the fleet. This enables a single, predictable file of large vehicles rather than being spread across the highway network, with potential for fuel savings and environmental benefits through the reduction of CO2 emissions, while decreasing the distance between vehicles increases road network capacity. The DfT has recently funded[86] a trial of three platooning Heavy Goods Vehicles (HGVs) travelling in close proximity at speed, with the lead driver controlling the speed, acceleration and breaking of the whole platoon.

The launch of the Uber Freight initiative demonstrates the evolving and changing logistics industry and has now expanded into Europe. Innovative schemes such as Uber Freight bring opportunities to benefit from technology by reducing administrative time, improving efficiency and increasing transparency for the logistics industry.[87]

Wider on-demand manufacturing and 3D printing trends could also have an impact on future freight movements on the MRN in the North. Plastics, metals and even food can now be 3D printed and some products such as books are now produced on demand. Subsequently, it is likely that supply chains reliant on the movement of large volumes of intermediate goods and outsourced component suppliers may no longer be necessary. These developments could alter the traditional movements of raw materials and products but could also lead to re-manufacturing where logistics and high-speed digital networks converge.

With most freight travelling by road the MRN is absolutely critical to the efficient movement of goods and raw materials. Future plans for the MRN should seek to maximise opportunities for switching freight to ultra-low/zero carbon vehicles, support improved efficiency through new digital/connected technologies and, where there is market potential, facilitate freight movements by rail and inland shipping.

5.2   Mobility changes: DfT six key changes

Britain is on the verge of a transport revolution whereby new technologies are emerging that will transform everyday journeys within a generation. Fundamental change is happening within a relatively short period of time, which is likely to happen first and fastest in urban areas where transport is busiest, economic opportunities greatest and space most restricted. [88]

Ultimately, technological trends represent opportunities to improve the transport network, and the MRN, in the North, but also present risks, challenges and uncertainties. There is currently a vast number of case studies and small-scale pilot studies across the UK and the globe, however mass implementation of innovative technologies may still be years away.

As technology is constantly evolving and changing there will always be gaps in evidence, as new research may become available. Yet it remains vital that interventions on the MRN are future proofed and tailored specifically to the MRN and the North.

As demonstrated previously and illustrated within TfN's Future Travel Scenarios (see section 5.4) there are a myriad of societal changes underway that will impact upon how, where and why people travel, with resulting impacts on the current and future requirements of the MRN. How we are travelling is also changing, and as outlined by the Department for Transport in the 2019 publication of the 'Future of Mobility – Urban Strategy', the transport revolution being observed is being enabled largely by six key changes:

1. **Cleaner transport** - Rapidly falling battery prices, improvements in energy density and electric motors and alternative fuels developments have the potential to significantly reduce emissions.

2. **Data and connectivity** - Increasing availability of data and improved connectivity are allowing travellers to make more informed journey choices, providing real-time information to operators and fuelling machine learning advances.

3. **New business models** - The emergence of new digitally enabled models of transport provision.

4. **Automation** - Improved sensing technology, computing power and software engineering are leading to increasing levels of automation in transport.

5. **New modes** - Technology is enabling new ways of transporting people and goods.

6. **Changing attitudes** - Rising customer expectations are driving passenger transport and delivery services that are increasingly affordable, convenient and personalised.

5.2.1 Cleaner transport

Widespread decarbonisation of the transport sector, in terms of energy production, storage and consumption, is imperative in ensuring a significant reduction in emissions that are harmful to the environment and people's health.

Low emission transport technologies such as electric vehicles, as well as other alternatives including hydrogen fuel cell power, represent innovative technological approaches to replace fossil fuel powered vehicles and reduce greenhouse gas emissions and air pollution. It is anticipated that in this decade vehicle manufacturing companies will substantially increase their production and sales of electric vehicles; zero emission buses will be rolled out within cities across the globe; and electric vehicle battery pack prices will continue to fall.[89]

Our analysis indicates that around £220m annual investment in Northern charging infrastructure is needed by 2025, and around £280m by 2030. This would deliver around 2.4 million installed charge points (of all types) across the region by 2030.

Figure 5-3 shows the growth in the number of licensed plug-in cars and LGVs in the North between 2011 and 2019 and illustrates how the electrification agenda is gathering pace in the region.[90] Registrations of pure electric and hybrid vehicles in Yorkshire and the Humber were almost four times those in the North East, demonstrating differentiated electric vehicle uptake across the North. The current overall fleet in the region is 112,000 (Summer 2021) vehicles in total, which represents 15.5% of the total in England.

Figure 5-3 - Number of licensed plug-in cars and LGVs in the North 2011-2019 (Source: DfT, 2021)
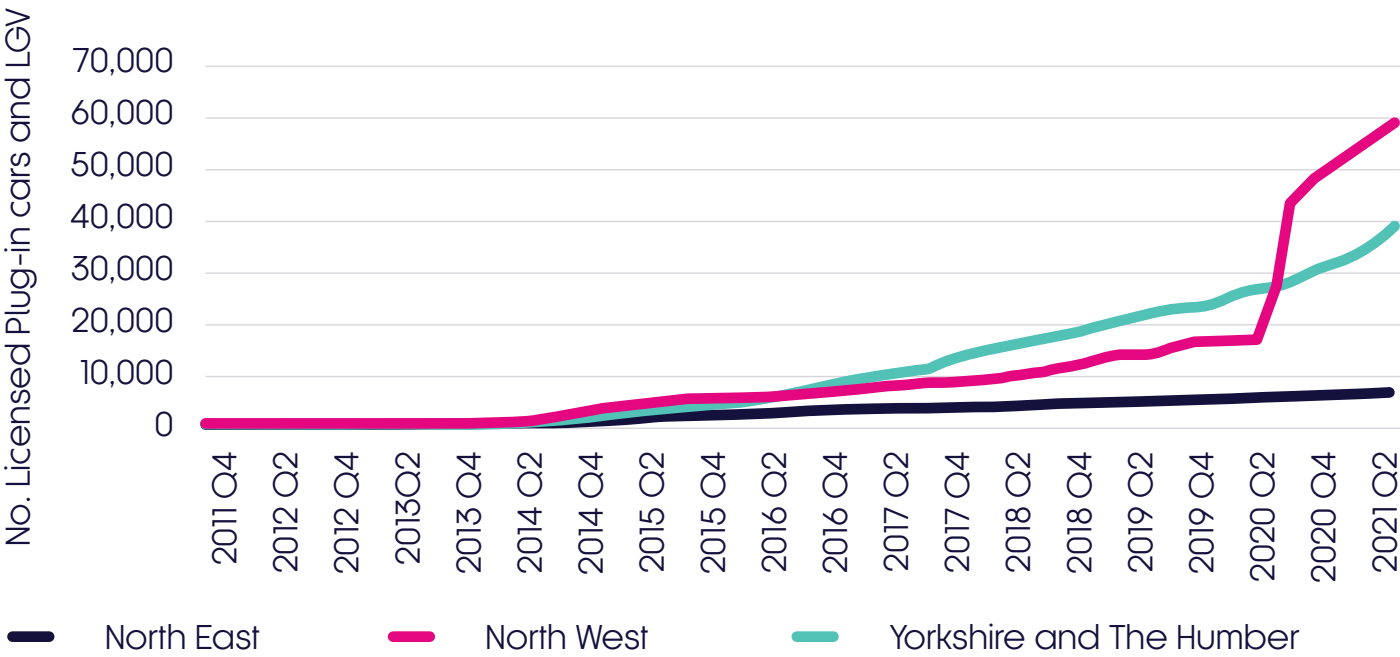
Note that North West shows a large jump in Q3 2020, this relate to registration of vehicles by one of the UK's largest car lease processing centres, based in Stockport

This shift away from fossil fuels, driven in part by policies such as taxation, low emission zones and the planned phasing out of petrol and diesel, will lead to new infrastructure needs in terms of electricity generation, distribution and storage (particularly for high load vehicles such as freight) and in the case of hydrogen, new distribution and filling networks.
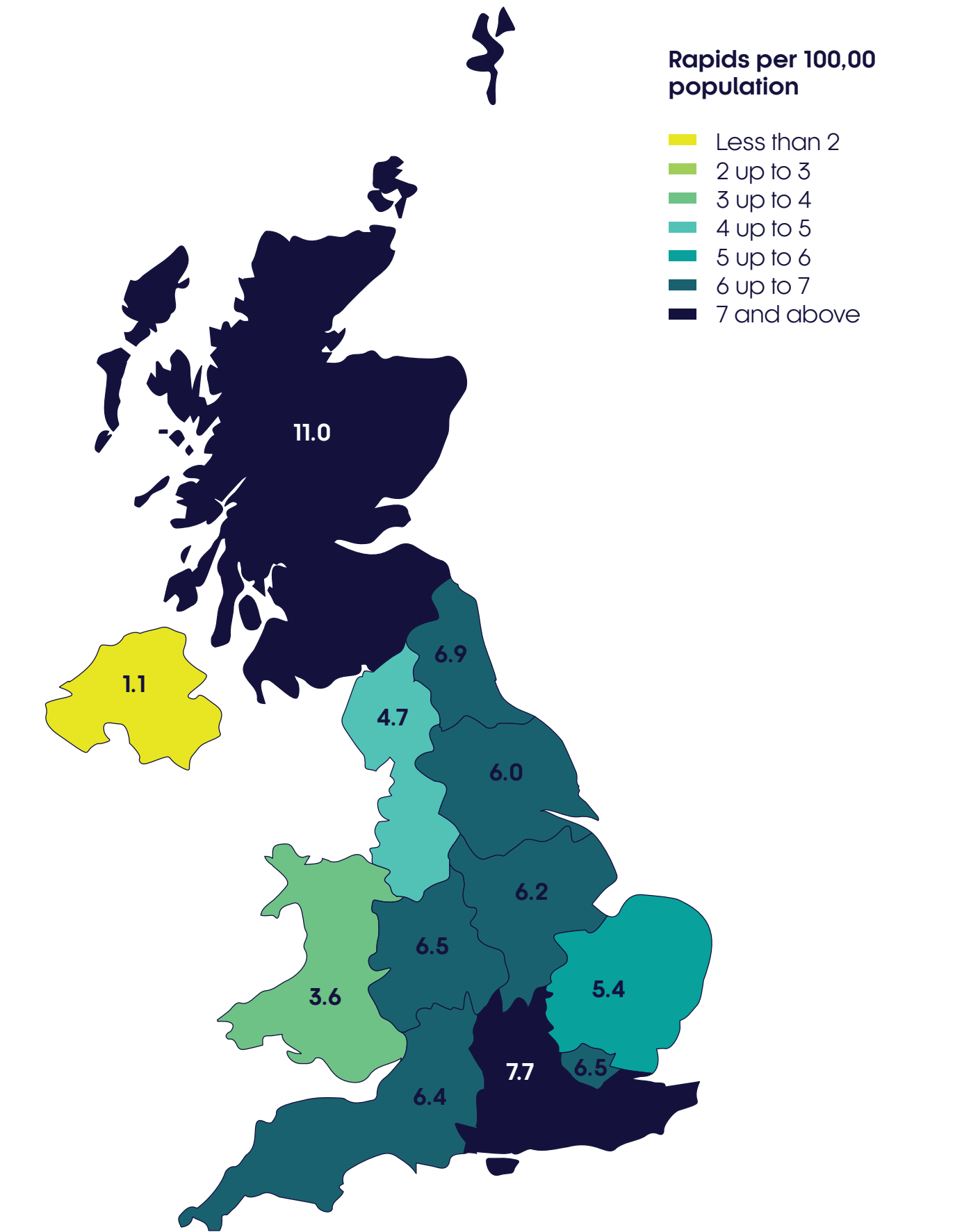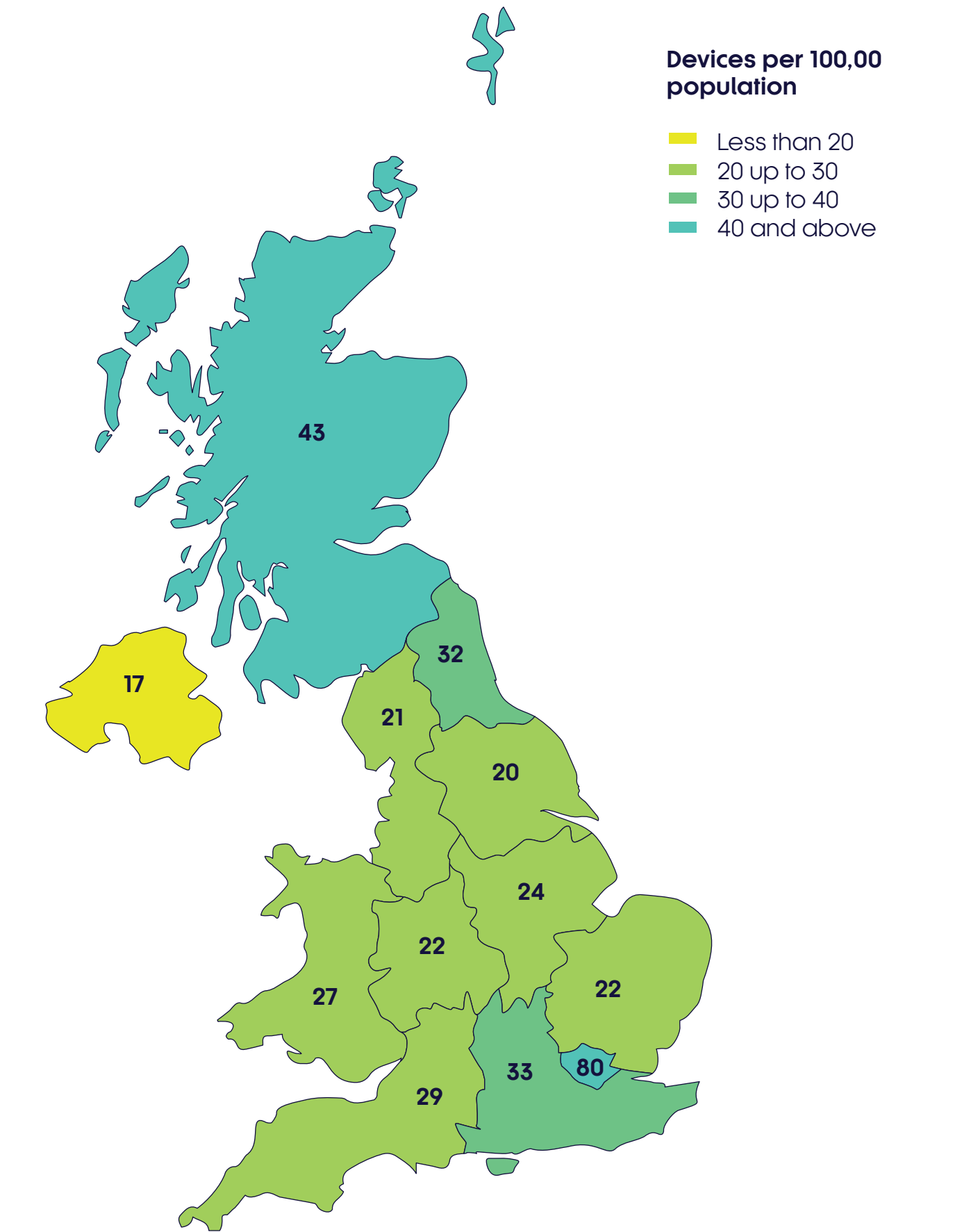
The demand for electric vehicle charging points for example must be accommodated on the whole road network, including the MRN, so that drivers do not suffer range anxiety due to limitations of battery life.[91] We must also consider social equity if we are to meet our decarbonisation targets. The wrong balance of charging could negatively impact on the affordability and inclusivity

of EV uptake. The transition to EV will be more challenging for people who cannot access off-street charging, particularly those of lower income groups. There may also need to be different service operating patterns to allow for difference in fuelling behaviours and frequencies.

As shown in figure 5.4, there is uneven geographical distribution of charging devices within the UK. TfN is working with our local partners, National Highways, Network Rail and the electricity Distribution Network Operators (DNOs) to develop a pan-Northern evidence base and tool to identify future charging infrastructure requirements. As of April 2021, there were around 6,000 publicly available charge points in the North of England, including 1,500 rapid charging devices.[92]

Figure 5.4 - Total and rapid public charging devices per 100,000 of population by UK region (April 2021). [93]

Devices per 100,00 population

- Less than 20
- 20 up to 30
- 30 up to 40
- 40 and above

Rapids per 100,00 population

- Less than 2
- 2 up to 3
- 3 up to 4
- 4 up to 5
- 5 up to 6
- 6 up to 7
- 7 and above

There also needs to be further development to the core bus networks, using new engine technology for green bus fleets across the North to improve air quality and reduction of emissions. Working towards a zero-carbon public transport network across the North and incorporating the latest techniques in bus priority on congested networks will be essential for access to urban centres. Decisions will need to be made on where bus priority routes will be located and how they will interact with the delivery of active travel. This will require close collaboration with bus operators and partners in the North.

Through analysis of National Charge Point Registry data, there are around 1,700 charging points within 100 metres of the MRN, which accounts for around 30% of total charging points across the North.[94] MRN routes also need to facilitate cleaner modes of travel by providing frequent charging points for buses and coaches throughout, or nearby to, the network where possible. Consideration must also be made in regard to where is best to locate charging points, for example bus or freight depots may be more suitable to accommodate charging points in urban areas, rather than on the MRN itself.

While the benefits are obvious there will be challenges and potential for unintended consequences of rapid and wide scale deployment of fossil fuel alternatives. For example, significantly increased levels of private car use by electric vehicle owners, and unsustainable demands on electricity supply networks.

To deliver a more sustainable transport system the roll out of zero emission vehicles must form part of a wider strategy, supporting people and business to make journey choices that work for them and at the same support our ambition for a high quality environment and net zero carbon emissions.

This key point of change provides an unprecedented opportunity for Government, Sub-national Transport Bodies, and local partners to work together on developing a strategy and a plan for the network of zero emission refuelling points.

The optimum network required across the region is likely to require a mix of charging types and approaches (i.e. at home, at destination, and on the go). There remains a need for further development of innovative, efficient and low-cost charging solutions, and for the energy sector to adapt to new patterns of electricity demand. Additionally, there is also a need for a standardised approach to electric vehicles, notably charging infrastructure, so that the experience is easier and more attractive for users of electric vehicles in terms of simplified payment methods and universal charging points (interoperability and interchangeability).

5.2.2 Data and connectivity

Digital connectivity and the increasing availability of data is already underpinning many normal daily activities in the North and is increasingly enabling new types of travel and new business models. Like many places in the UK, the North has seen significant investment in its digital communications in recent years. Future combinations of 4G, broadband and emerging 5G connectivity will provide the foundations for many technologies and associated services which will gather pace over the coming years.

The following map provides an overview of the current network coverage for Vodafone, one of the large network operators operating at present in the North.[95] Purple/dark red denotes strong 4G coverage whereas blue/green denote 2G or 3G coverage. Although not showing the total coverage from all network operators the map illustrates areas where coverage appears to be limited, potentially restricting the use of mobile communications for both services and assets.

Figure 5.5 - Vodafone network coverage in the North as of March 2020.
Source, NPerf, 2020)
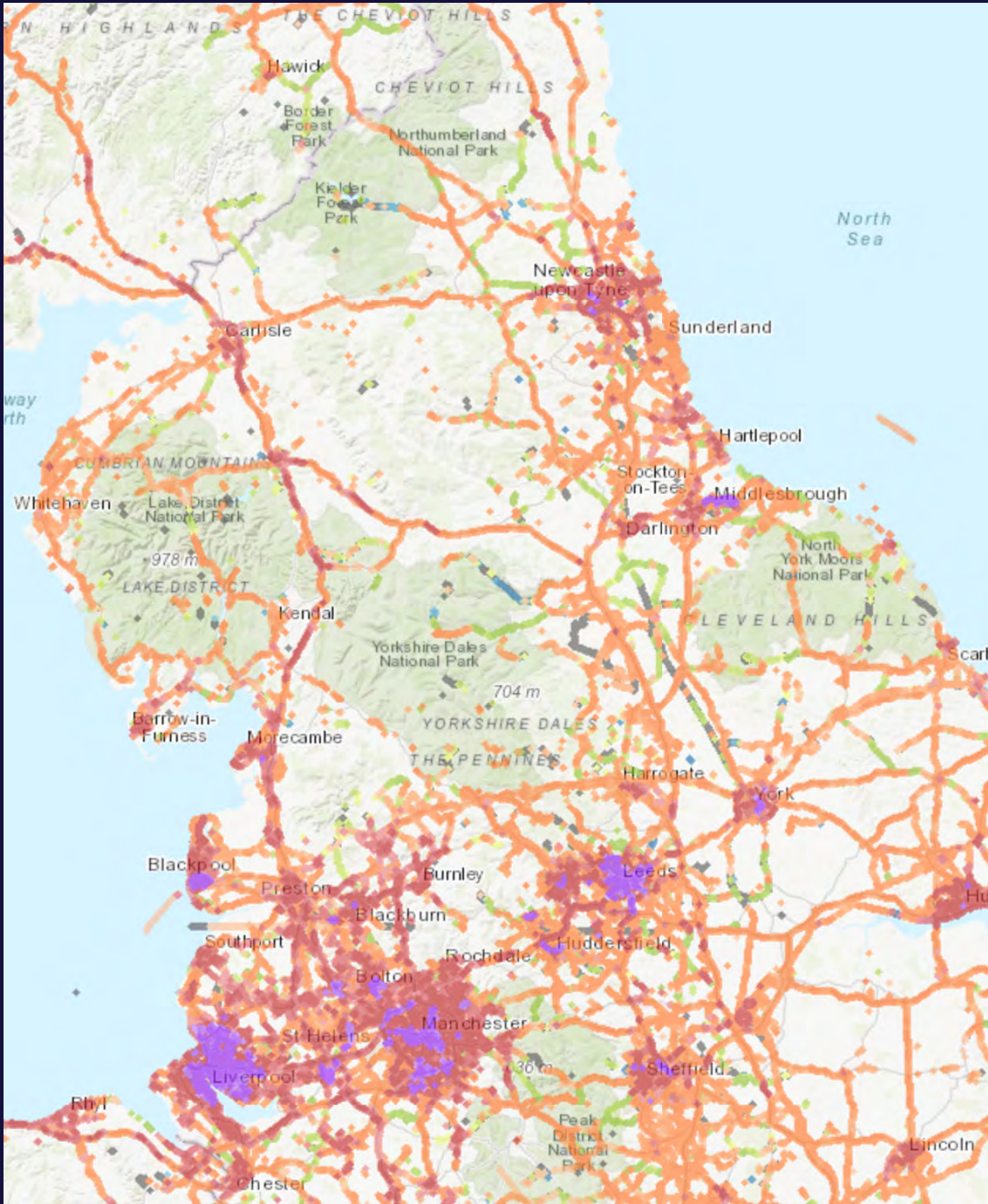
While next generation 5G networks are gradually being launched in the UK, with the first commercial roll outs starting in major Northern UK cities such as Manchester, Liverpool, Hull, Leeds, Newcastle, Sheffield, Sunderland and Wakefield, it is more infrastructure heavy and potentially costly to implement, certainly in the early days. However, with its low latency (speed of connection and data transfer) and high capacity, 5G promises to herald a step-change in connectivity, enabling the Internet of Things and for some applications, facilitating autonomous modes. It should be noted that for autonomous applications various approaches exist and it is not yet clear if ubiquitous digital connectivity is a necessity. In August 2020 DfT announced a call for evidence on using new technology for automated driving at low speeds.[96]

With regards to vehicle connectivity in general, many new models of cars, vans, trucks and buses are now equipped with always-on digital connectivity allowing them to share and receive data with other vehicles, the road infrastructure, and the wider world on the move. The ability to link vehicles to the MRN and to each other provides potential benefits to both

users and operators. Benefits of these connected technologies include safety benefits to enable users to better respond to incidents and avoid potential collisions; efficient traffic flows through more direct traffic information which in turn enhances the customer and user experience; and reduced vehicle emissions through improvements to fuel consumption and travel efficiency.

Estimates suggest that in 2018 there were at least 3 million vehicles with internet connectivity on UK roads, accounting for 7.6% of the 39.6 million vehicles licensed on UK roads.[97] Figure 5-5 provides a projection of anticipated uptake of Connected Vehicle technology between 2018 and 2030 for new vehicles, reflecting a normalisation of the technology in new vehicles and gradual fleet penetration.[98] By 2030 almost 60% of new vehicles are expected to feature at least 'level 2' autonomy, providing steering and braking/ acceleration support to the driver. Figure 5-6 outlines different levels of driving automation.

New Connected Vehicles as Proportion of all Registrations

Not Connected   Connected
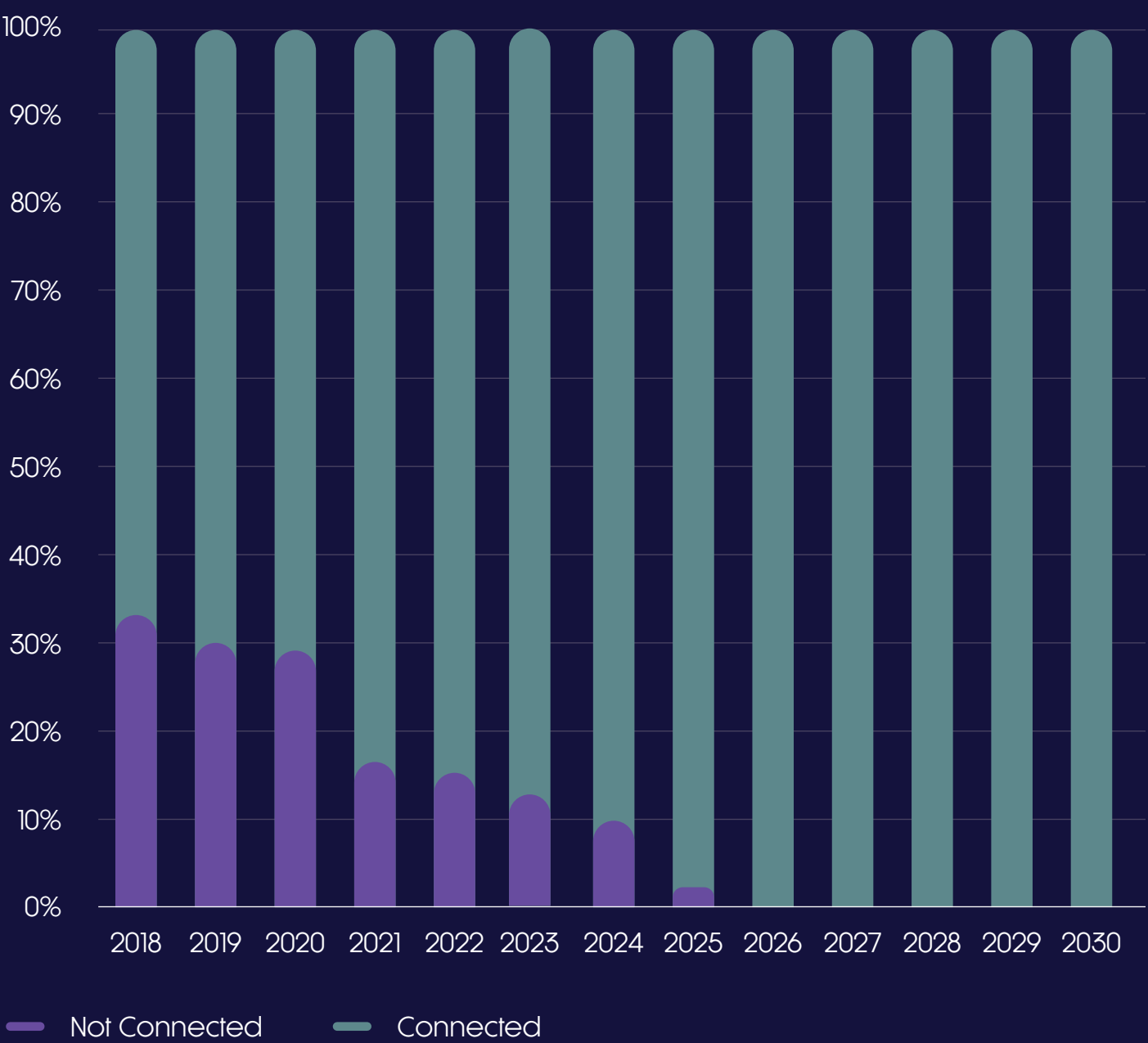
Equipping the MRN with high quality, continuous digital connectivity can aid the delivery of capacity, safety and productivity benefits and provide the foundations (in some use cases) for autonomous functionality. Digital connectivity will be essential in providing the digital backbone that will allow many other innovations to be fully developed in both mobility and wider applications across the economy.

5.2.3 New business models

A combination of socio-demographic and behavioural trends, in addition to technological advances, have created the environment for the emergence of digitally enabled platforms for mobility which are disrupting the transport landscape in the North. These new platforms for mobility are changing the booking, payment and access experience, providing customers with improved choice, flexibility and access to multiple modes and could impact the future requirements of the MRN.

Many new business models, such as ridesharing and asset sharing (e.g. car clubs), are centred around shared journeys and shared assets; shared services could lead to increasing vehicle occupancy and reduce the need to own multiple cars, with resulting impacts on the use of the MRN network. Facilitated by digital connectivity, solutions can help match demand (customers) with supply (available assets or journeys) generally via app-based solutions. Many feature on-account payment systems streamlining the customer experience, and some encourage feedback or incentivise positive customer behaviours. Shared access to mobility solutions in the form of bike hire, car hire, taxi or pooled transit and bus offer people alternatives to 'owning' a car, particularly in urban areas where these services are accessible most of the time. Alternative ownership models that are coming to market and gaining traction include fractional ownership and subscription services, with Forbes estimating that 10% of all new vehicle sales in 2025/26 will be accounted for by vehicle subscription services.[99] These shared mobility solutions are blurring traditional transport modes and testing existing regulatory and other frameworks.

Mobility business models, such as non-pooled ride-hailing (e.g. Uber), have the potential to worsen existing capacity issues on the MRN network. This is particularly the case in urban areas such as Leeds, Manchester, Liverpool, Newcastle and Sheffield in the North. There is evidence from the US for example, that 24% of riders that used ride-hailing services would have taken a lower-carbon mode such as bus, train, walked or cycled if the service had not been available.[100] Mobility business models could also increase overall trip making by offering an easily accessible means of travel for those without a private vehicle, access to high-quality mass transit, the opportunity or inclination to walk or cycle.

New consumer models of access, consumption and payments provide increasingly tailored and personalised multimodal travel information which is creating choice for many MRN users in the North. There is potential for these new business models to both exacerbate and improve performance of the MRN in the North and therefore behavioural change mechanisms should be considered to nudge people to travel in certain ways and at certain times e.g. through the introduction of new charging models/mobility credits.

This potential for conflicting outcomes from adoption of new technologies underpins the need for a coherent strategy-led approach to delivering an integrated set of solutions, enabling people and business to make mobility choices, which best support their needs and the needs of society as a whole.

Case Study: Arriva Click

Tees Flex, which operates in the Tees Valley, provides a Demand Responsive Transport (DRT) solution. This is a great example of an appbased on-demand public transport service that has the potential to tackle air quality issues and congestion while enhancing the user experience. The new innovative bus service is designed to benefit people and transform thousands of journeys by enabling passengers to order and track a vehicle from the app, with journeys determined by where passengers want to go and using an algorithm to match passengers travelling in the same direction.

5.2.4 Automation

The rate of adoption of Connected and Autonomous Vehicles (CAV) remains uncertain, with research and testing ongoing in the UK. Full automation of all vehicles operating on UK roads, as indicated by Figure 5-6, is still some way off to the future.[101]

Figure 5-7 - Forecast of new automated vehicles registered on UK roads as a proportion of all registrations. (Source: SMMT, 2019)

New Automated Vehicles as Proportion of all Registrations
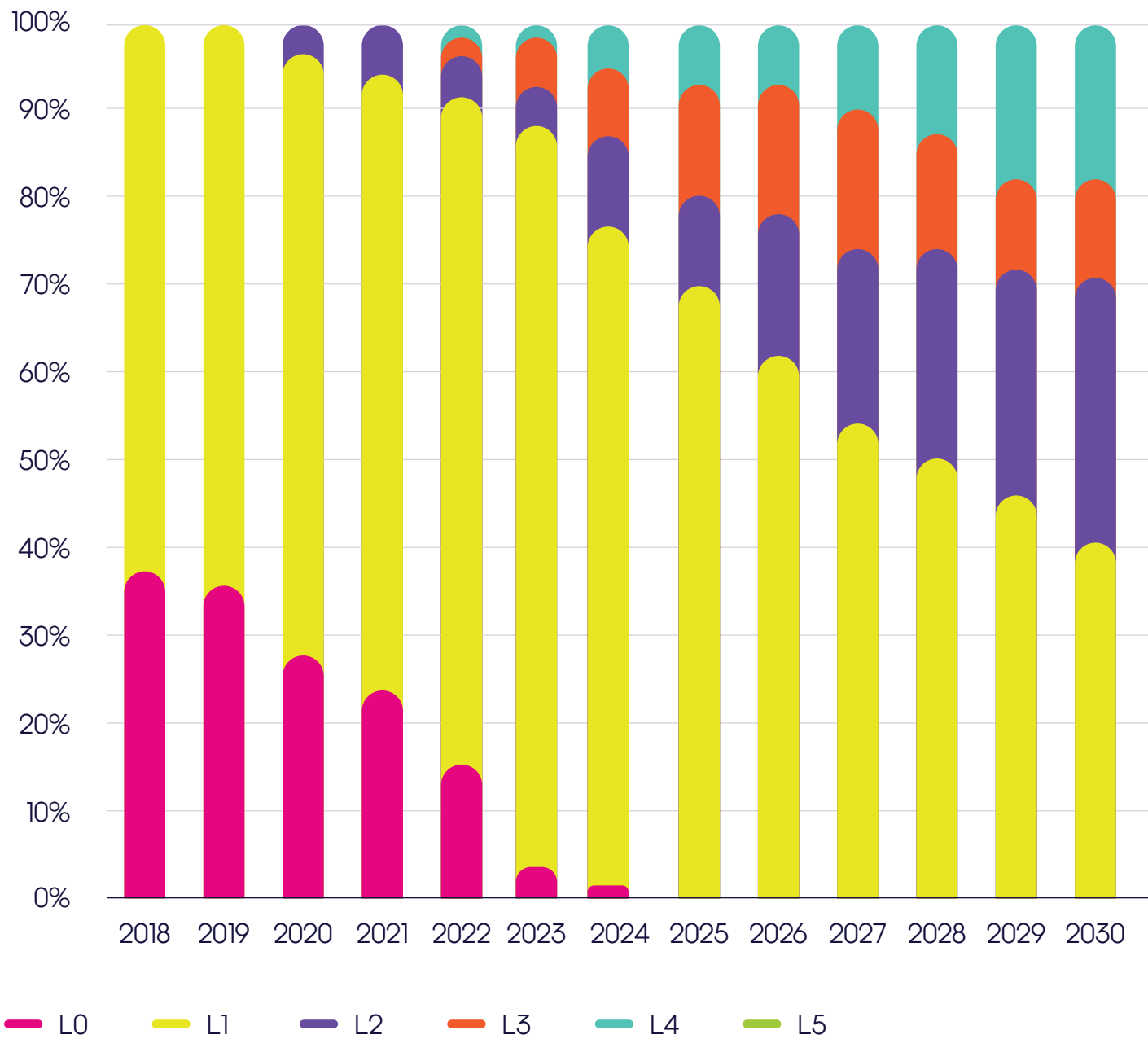
CAVs offer the possibility of delivering improved connectivity and a high level of service without building a significant amount of infrastructure. Connected Vehicle (CV) technologies 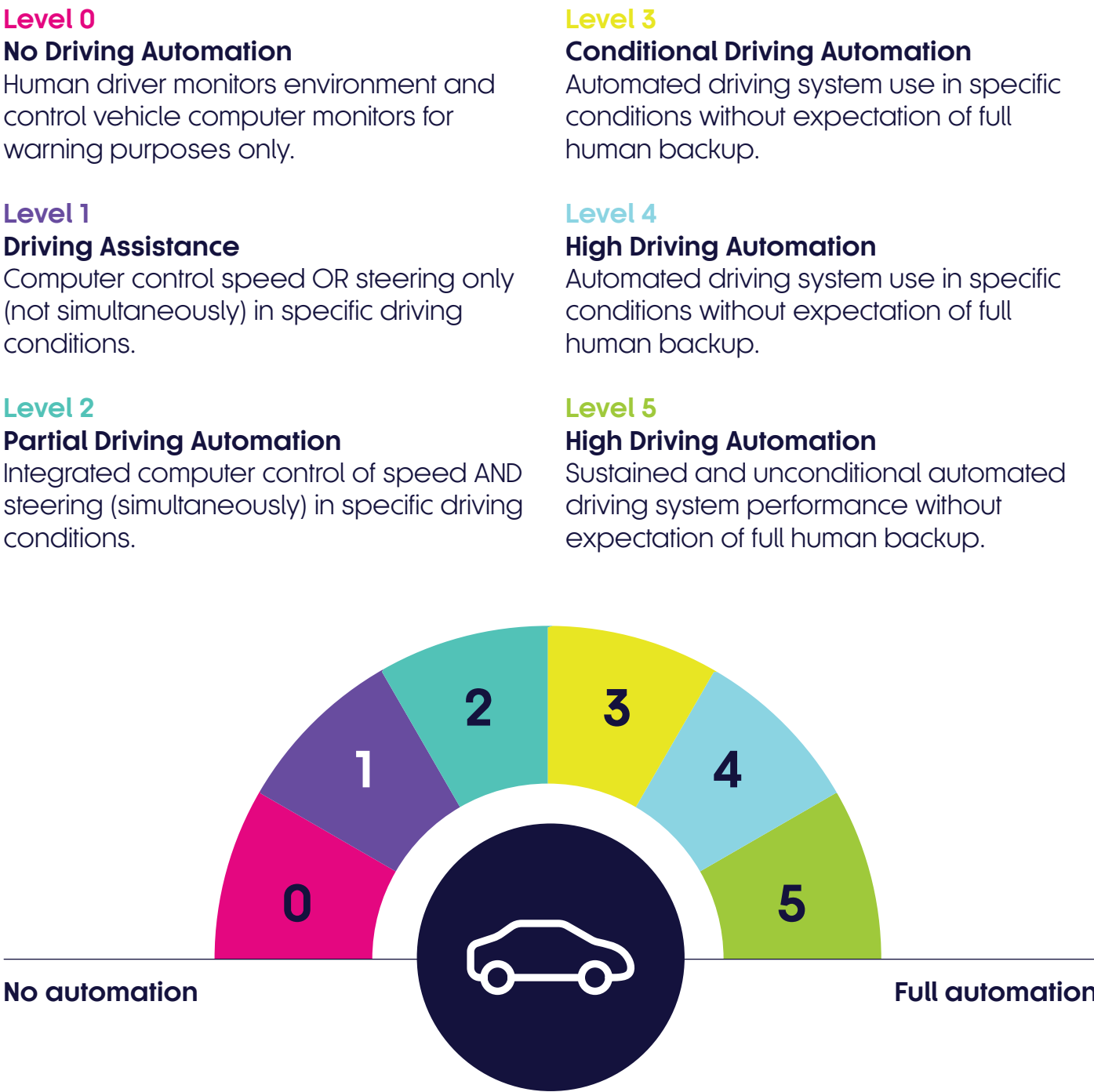will allow vehicles to communicate to each other and the surrounding infrastructure. There are six levels of the automation element of CAV, ranging from levels 0 to 5, with level 5 being full automation whereby automated driving undertakes all driving tasks without human interaction. Typical stages of automation are outlined in figure 5.7.[102]

Figure 5-7 - The spectrum of automation for road vehicles. (Source: Society of Automotive Engineers International)

Level 0
No Driving Automation
Human driver monitors environment and control vehicle computer monitors for warning purposes only.

Level 1
Driving Assistance
Computer control speed OR steering only (not simultaneously) in specific driving conditions.

Level 2
Partial Driving Automation
Integrated computer control of speed AND steering (simultaneously) in specific driving conditions.

Level 3
Conditional Driving Automation
Automated driving system use in specific conditions without expectation of full human backup.

Level 4
High Driving Automation
Automated driving system use in specific conditions without expectation of full human backup.

Level 5
High Driving Automation
Sustained and unconditional automated driving system performance without expectation of full human backup.

No automation   Full automation

Consideration needs to be given to the opportunities presented by connectivity and requirements of making the MRN future-ready for the deployment of CAV. Any CAV service will initially require basic connected vehicle technologies including a telecommunications network; power supplies; back-office systems; network performance information; and existing Intelligent Transport Systems or Urban Traffic Management and Control (UTMC) Centres that act as sources of traffic information.

The Government has recently launched consultation on 'Automated Lane Keeping Systems'[103] including seeking views on proposals to allow the use of this system on British roads at speeds of up to 70mph.

It is important to recognise that CAV represents a long-term initiative that requires further development and testing of autonomous vehicles and significant investment in connected infrastructure across the highway network. Also, that a one-size-fits-all approach would not be suitable across the MRN and specific requirements will need to be developed across sections of the network as CAV develops and gets closer to implementation.

The full rollout of CAV in the UK and the North is still some years away. In the short to medium term, improving digital connectivity, especially in poorly connected rural areas, should be a priority.

Ultimately, technological trends represent opportunities to improve the transport network, and the MRN, but also present risks, challenges and uncertainties.

5.2.5 New modes

The technology advances previously explained are enabling new ways of transporting people and goods and are providing a wider 'mobility' offer that is flexible and responsive to the growing needs and demands of users. Drones, droids, new forms of micro mobility, and underground logistics systems are just a few of the ways in which technological advancements are impacting transport. Emerging modes differ in their maturity and their ability to address local needs but have potential to alleviate congestion, reduce noise and emissions, and improve traffic flow on the MRN in the North.

There has been a global rise in the concept of micro mobility in urban areas, especially for last mile journeys. Micro mobility refers to a range of small, lightweight transportation modes, such as electric scooters and e-bikes, that generally operate at speeds above walking but below cars. These lightweight modes are usually associated with the sharing economy and docks. In 2020 the DfT conducted a review of regulations focusing on the need to introduce an up-to-date flexible regulatory framework addressing requirements to support emerging transport technologies. This includes a review of regulations on micro mobility, Mobility as a Service, and operation of buses, taxis and private hire vehicles.

TfN will monitor and respond to the rise in use of new micro mobility technologies, including where micro mobility trends applies to the use of the MRN.

Commercial unmanned aerial vehicles (or drones) are another example of a new mode being developed, for both small goods and heavier payloads, and could improve customer experience, create new jobs, and pioneer new sustainable delivery methods. Vertical take-off and landing services (VTOL) for passengers also have the potential to help with traffic congestion, reducing pollution and exhaust fumes. Despite the range of challenges, the technology faces, such as regulating air traffic, pilot licencing and high sunk costs, it has been estimated that VTOL services could be worth $1.5 trillion by 2040. [104]

5.2.6   Behavioural change

Future requirements of the MRN also need to consider behavioural change as public perceptions and willingness to engage with new technologies, modes and business models is a fundamental aspect of successful deployment of new transport technologies and should not be taken as a given.

In 2017 the DfT commissioned six waves of research to track public attitudes and behaviours relevant to transport in England. In December 2018 the third wave of surveys were conducted focusing on four overarching topics. Some 3,500 adults in England were interviewed in each wave to provide a representative sample. A few of the findings from Wave 3 conducted in December in 2018 relating specifically to the North include:

→ 57% of respondents from the North East cite that safety concerns are the biggest disadvantage of travelling with strangers while ride sharing.

→ Knowledge of electric vehicles was significantly lower in the North West (49%) and North East (46%) compared to all other regions in England.

→ Knowledge of autonomous vehicle in the North East was significantly lower (34%) than those living in other regions (47% or more).

Another key behavioural change that has been ongoing since the mid-1990s is the change in the proportion of people holding a full driver's licence. As Figure 5-8 shows, among the younger generations (17-20 and 21-29) there has generally been a decline in car use, which is evident both in terms of the proportion of young people holding a driving licence and in annual miles driven. This has been attributed to numerous factors such as urbanisation, increasing financial burdens, and a reduction in cultural affection for car ownership. Older age groups have conversely seen an increase in car ownership this period.

Figure 5-8 - Driving licence holders by age, 1992-2018. (Source: DfT, 2019)

% of Age group with Licence
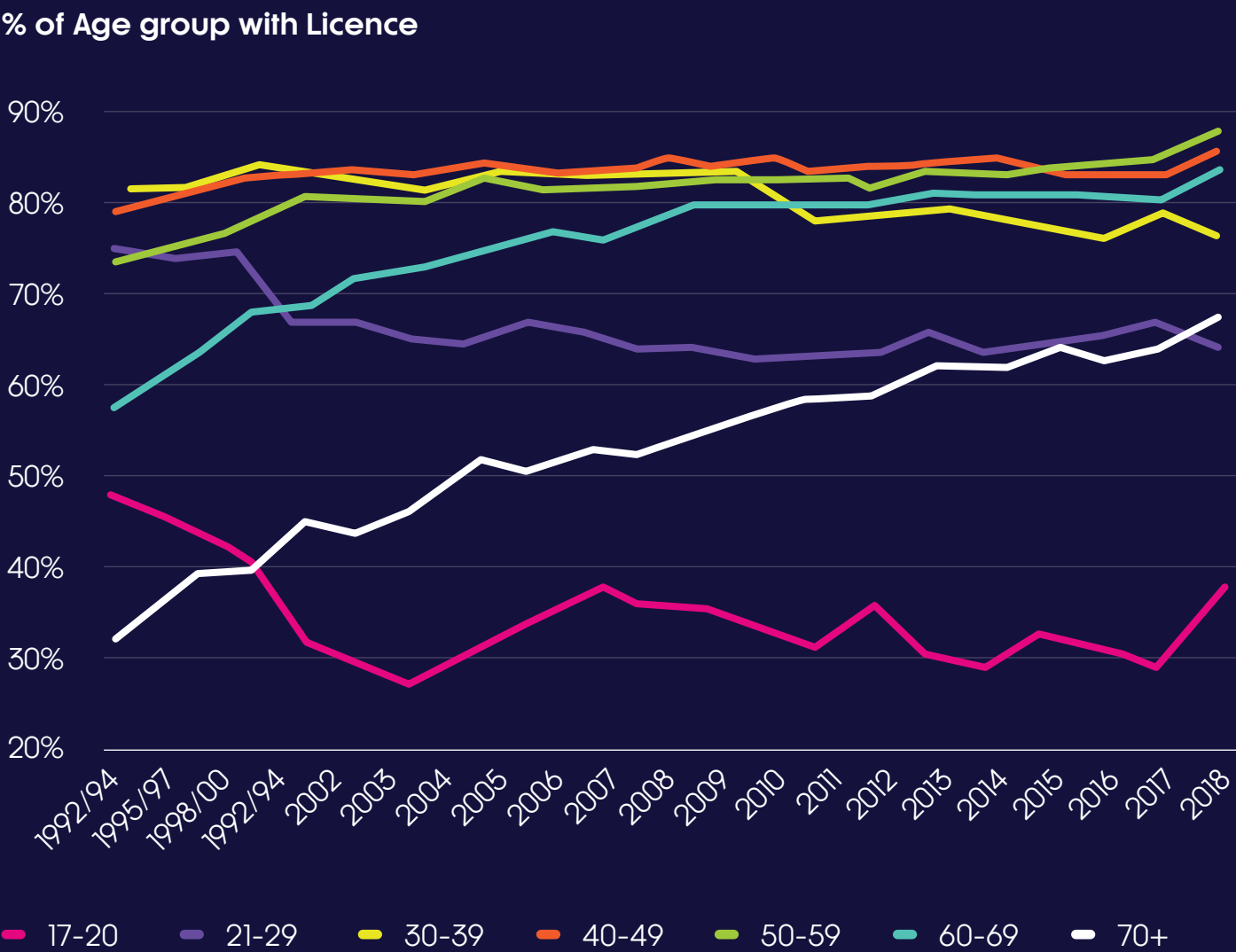
Behavioural change has the potential to significantly enhance sustainability and efficiency of the transport network and TfN will seek solutions to embrace positive behavioural change, such as promoting the continuation of more people working from home for at least part of the time, and working with national and local partners in encouraging the adoption of more sustainable travel choices. For example, this could include support for more active travel, greater use of public transport, uptake of local solutions such as Demand Responsive Transport (DRT), micro mobility and car clubs alongside the roll out of zero emission, connected and autonomous vehicles.

5.3   Policy evolution and funding mechanisms

5.3.1   Policy evolution

The MRN can respond to changes in local planning processes and emerging policy. This is exemplified by the ban on petrol and diesel car sales in the UK being brought forward to 2030 in response to the Government's target of net zero emissions by 2050; as such, there will be increased pressure for the highway network to accommodate electric or hydrogen vehicles in the future.

Potential funding for electric vehicle charging points is likely to be available from various sources (such as technology, transport and energy funds). Through work to develop enhanced pan-northern evidence and a strategy for optimum delivery, TfN will support partners in their efforts to install effective charging networks, whether that is through applying local funds, bidding for charging point infrastructure funding, or agreeing commercial approaches with the private sector. Funding opportunities could include, but are not limited to, those outlined in Chapter 7.

There is uncertainty in how local planning processes and policies will affect the key drivers of future transport demand including future housing development and employment growth in urban centres; and travel conditions within and between local transport authority areas.[105] As described in section 5.1.1.3 TfN has responded to the Government's 'Planning for the Future White Paper', published in 2020.

In summer 2020 Government published 'Stepping it up a gear - A bold vision for cycling and walking'. This sets out the ambition to "transform the role cycling and walking can play in our transport system, and get England moving differently." Published alongside this document, new cycling design guidance sets out higher design standards required in order to receive funding, which will be enforced by a new inspectorate, Active Travel England.

Through its role as the statutory STB, TfN will work with national and local Government towards achieving a truly integrated approach to the development and implementation of policy and infrastructure investment on the MRN and the wider transport network.

5.3.2   Future Mobility Zones

Transport is at a pivotal point in time and revolutionary transport technologies will provide opportunities for cleaner, cheaper, safer and more reliable journeys for users. The UK Government has committed to delivering £90m of funding for the creation of Future Mobility Zones (FMZ).

These zones will provide a platform for testing new ways of providing transport services. This will include initiatives such as encouraging the sharing and harnessing of data; smoother payment systems; improved travel information; and the use of innovative forms of transport such as electric scooters and autonomous shuttles.

Both West Yorkshire Combined Authority[106] and Transport for Greater Manchester[107] were shortlisted for the final stage of FMZ funding, however, were unsuccessful in their bids, with funding going to three areas outside of the North.
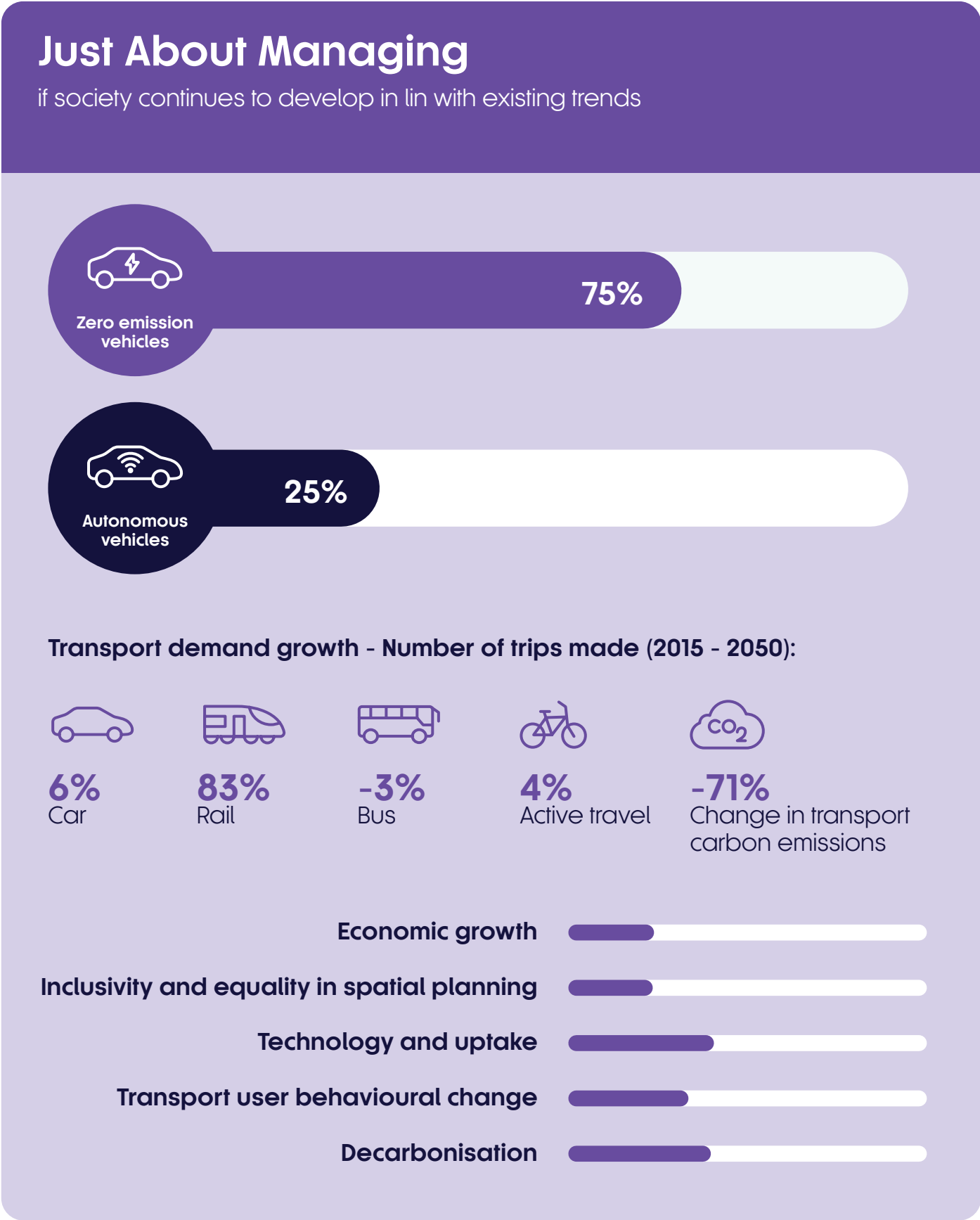
The future development of the MRN needs to consider and adapt to funding opportunities such as future FMZ opportunities or similar schemes, so that the network supports future innovative and technology-based schemes in the North.

5.4   Future Travel Scenarios

As outlined earlier in this report, even before the pandemic during 2020/21, 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.

Recognising the need to ensure that our policymaking and statutory advice should account for a sophisticated range of future uncertainties, in 2020 TfN completed work on updating and identifying four plausible future scenarios looking ahead to 2050. Our scenarios take a whole-system view to capture social, spatial, economic, technology and sustainability, and their potential effects on future travel. For further information see TfN's Future Travel Scenarios report.[108]

Figure 5.9 - Summary of the four Future Travel Scenarios.

Just About Managing

if society continues to develop in lin with existing trends

Zero emission vehicles 75%

Autonomous vehicles 25%

Transport demand growth - Number of trips made (2015 - 2050):

6% Car
83% Rail
-3% Bus
4% Active travel
-71% Change in transport carbon emissions

Economic growth

Inclusivity and equality in spatial planning

Technology and uptake

Transport user behavioural change

Decarbonisation

Digitially Distributed

If society achieves NPIER outcomes by using technological solutions to create connection and agglomeration across towns and cities
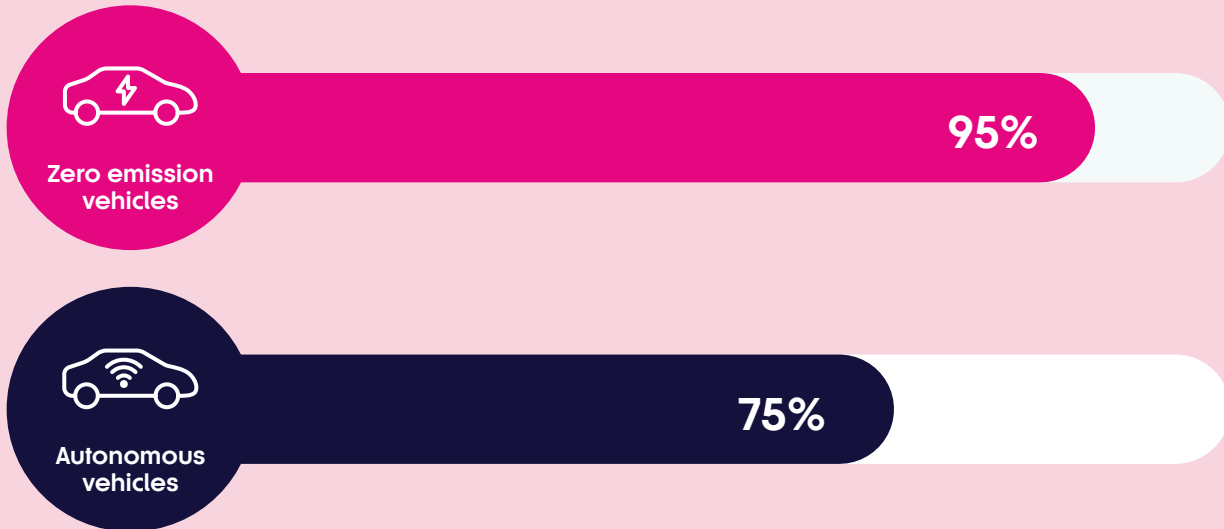
Zero emission vehicles 95%

Autonomous vehicles 75%

Transport demand growth - Number of trips made (2015 - 2050):

8% Car
78% Rail
11% Bus
6% Active travel
-96% Change in transport carbon emissions

Economic growth

Inclusivity and equality in spatial planning

Technology and uptake

Transport user behavioural change

Decarbonisation
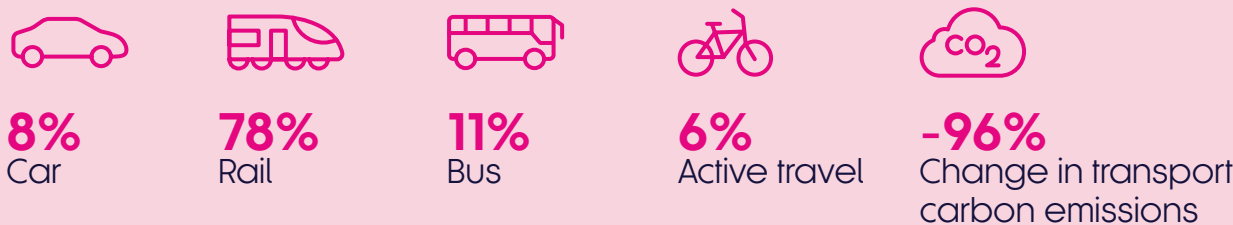
Figure 5.9 - Summary of the four Future Travel Scenarios. (continued)

Prioritised Places

If society becomes more focused on place, place-making and community than growth or connectivity

Zero emission vehicles **76%**

Autonomous vehicles **25%**

Transport demand growth - Number of trips made (2015 - 2050):

1% Car

122% Rail

19% Bus

13% Active travel

-73% Change in transport carbon emissions

Economic growth

Inclusivity and equality in spatial planning

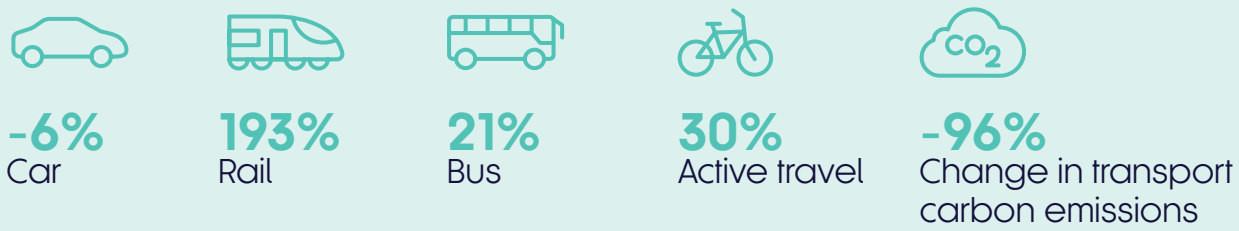Technology and uptake

Transport user behavioural change

Decarbonisation

Urban Zero Carbon

If society achieves NPIER outcomes by using policy intervention to maximise energy-efficient city growth

Zero emission vehicles **95%**

Autonomous vehicles **50%**

Transport demand growth - Number of trips made (2015 - 2050):

-6% Car

193% Rail

21% Bus

30% Active travel

-96% Change in transport carbon emissions

Economic growth

Inclusivity and equality in spatial planning

Technology and uptake

Transport user behavioural change

Decarbonisation
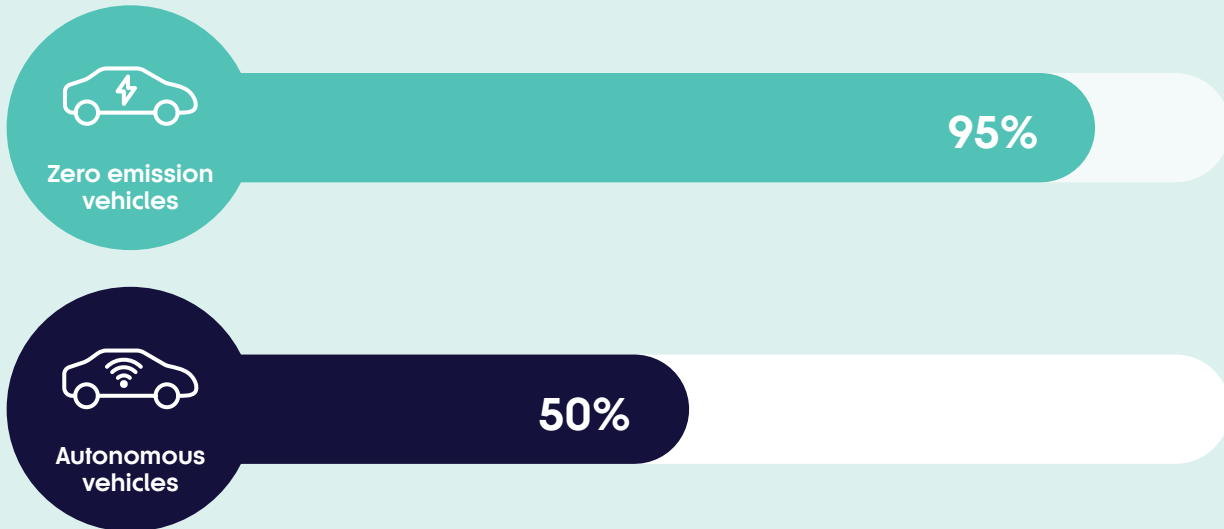
5.4.1 Using the scenarios

TfN is using our Future Travel Scenarios to estimate future travel demand associated with the particular future states. We are applying these within our Analytical Framework tools to evidence and inform policy recommendations and future transport investment priorities in the North. The scenarios are built for the long term, with pathways out to 2050, however we have adapted these to reflect change and uncertainty resulting from the Covid-19 pandemic. They focus on uncertainties outside of transport, and TfN's direct influence, which allows us to assess our transport plans against a comprehensive range of influencing factors.

The recent changes we have all experienced may evolve in different ways, affecting the way we travel. We might see continued high levels of home-working, for those who can; a rapid return of passengers on public transport, or ongoing reluctance to use shared mobility. Critically, the rate of economic recovery and introduction of new measures to boost the recovery, such as flexible season tickets, will impact on levels and types of travel demand. This makes it even more important to build tools that facilitate an assessment of how changing trends may affect transport networks in the North.

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 the aim of learning more about future change trends and evidence, to support an ambition of 'building back better' and TfN's ongoing vision and ambitions for the region.
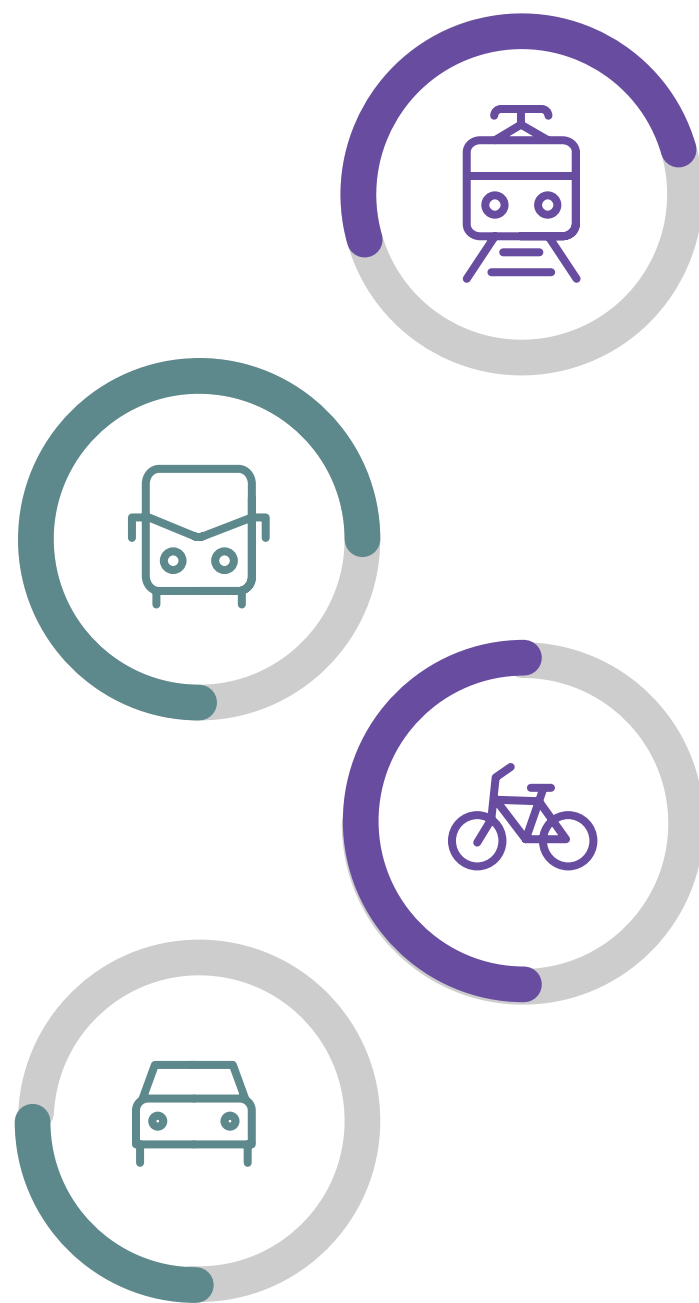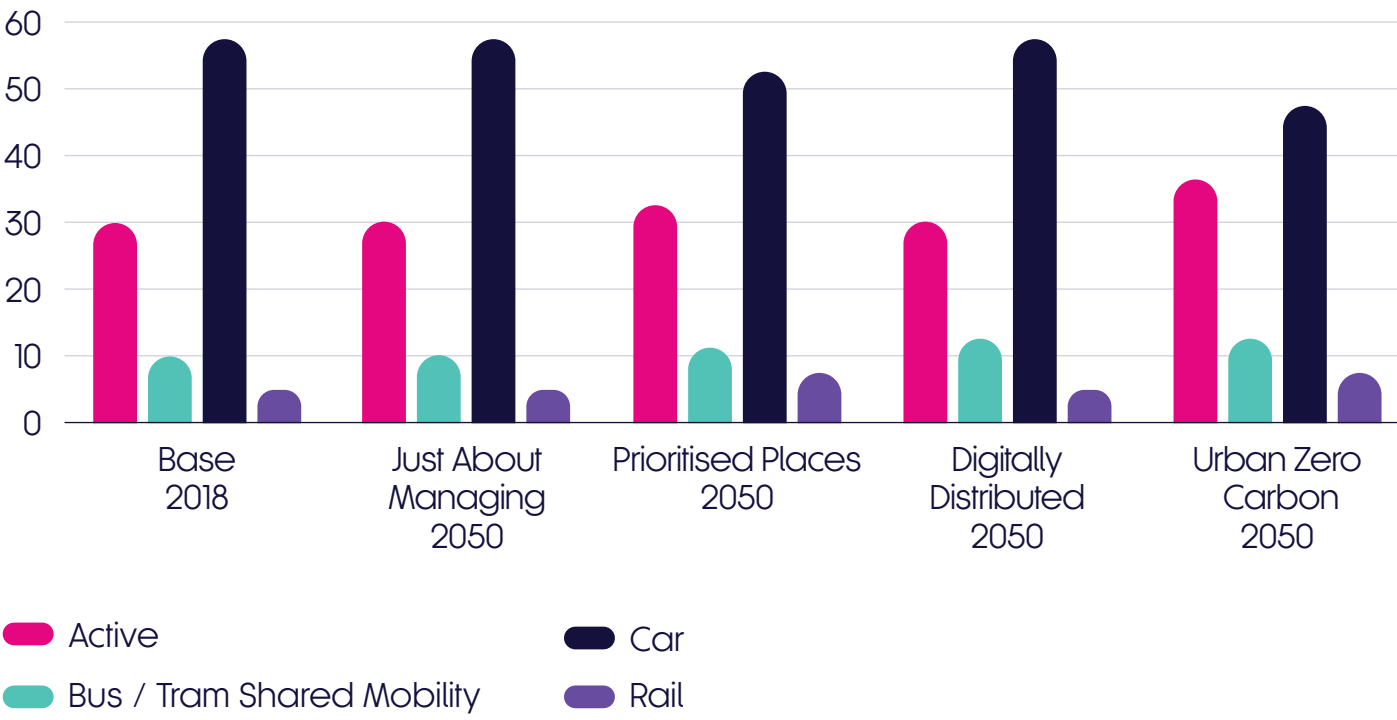
Mode Share % of Trips

Legend: Active (pink), Bus / Tram Shared Mobility (teal), Car (dark navy), Rail (purple)

In all four scenarios total vehicle-km in 2050, including car, van and HGV, is higher than for the 2018 baseline, and remains the dominant mode across all scenarios. Vehicle-km increase is lowest in Urban Zero Carbon as this scenario experiences the most policy activity to drive such a change (seeing lower road demand growth than the 15% advised by the Climate Change Committees 6th Carbon Budget). Digitally Distributed sees a slower shift towards sustainable policy and modal shift, and an increased access to road travel through uptake of advanced technology solutions.

Just About Managing sees a continued trend of road reliance due to longer journeys which are not feasible via other modes as it stands. Prioritised Places is driven by population and trip growth in rural and sub-urban areas, increasing shorter journeys made by bus, or journeys which people and goods still require a road vehicle to undertake.

Figure 5.11 – Forecast changes in vehicle-kms.

% ChangeVehicle - Kms
2018-2050
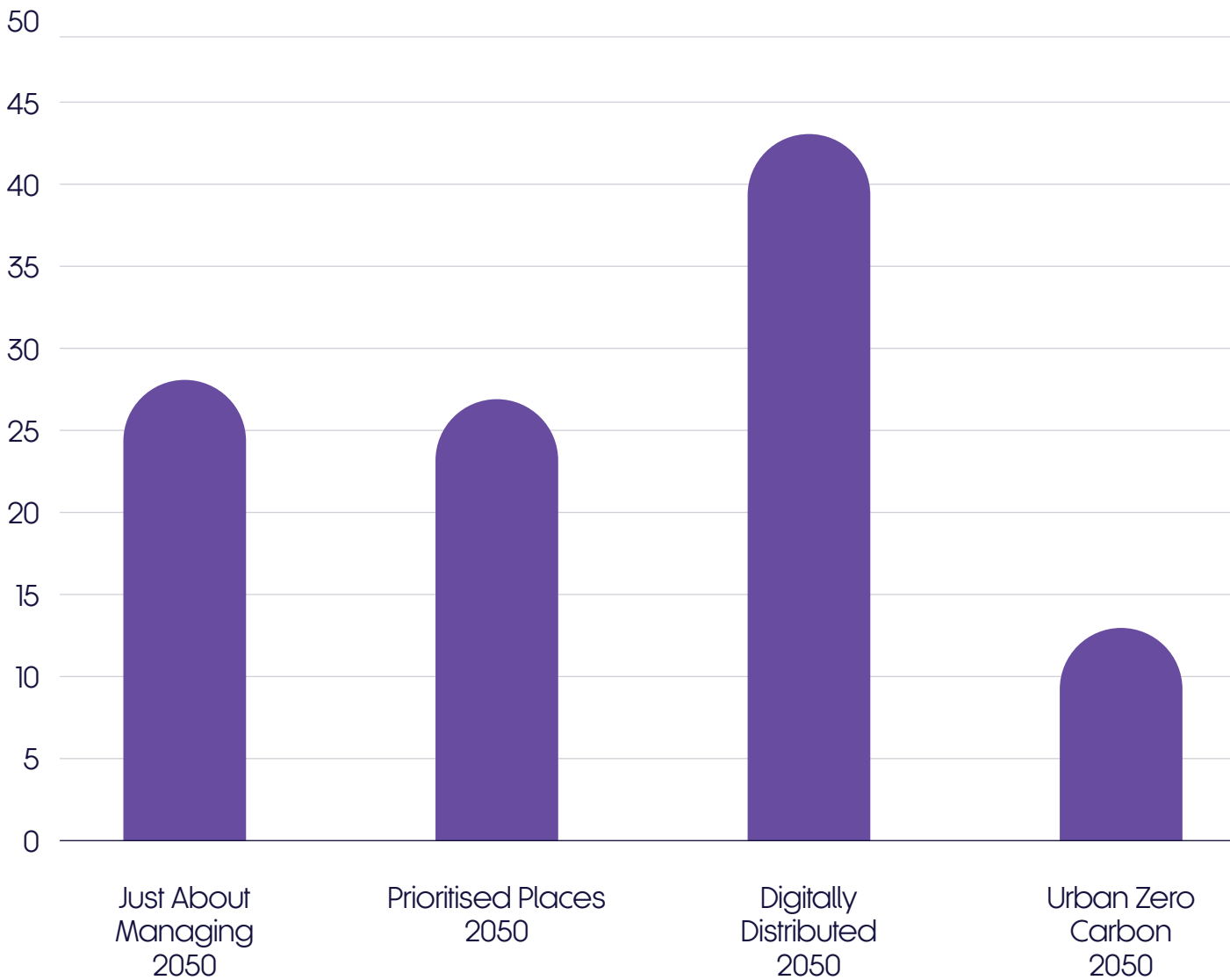
Through application of TfN's Analytical Framework, TfN is assessing the transport benefits and wider social, economic and environmental outcomes of our proposed programmes of transport investment. This will provide a strong evidence base, supporting development and assessment of recommendations for future policy decisions and transport investment, including investment on the MRN.
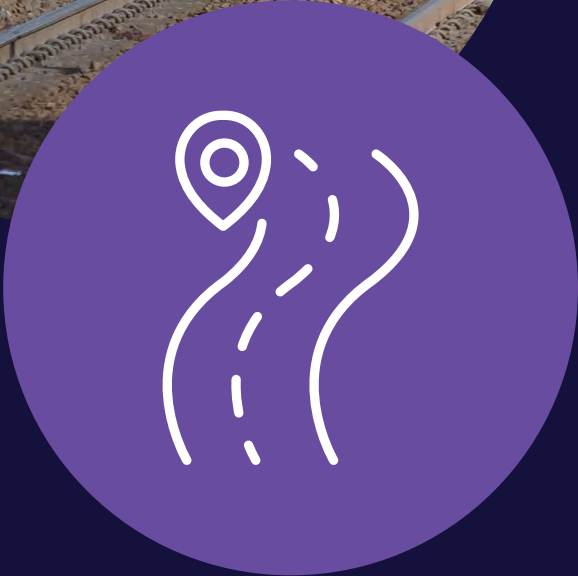
6. Wider transport investments and interface with the MRN

6.1 Introduction

To deliver transformational, inclusive economic growth, significant investment will be required on the transport network across the North. Integral to this is the proposed strategic wider investment on a national and regional level, including High Speed 2 (HS2) and Northern Powerhouse Rail (NPR) programmes.

Delivering transformational, inclusive economic growth will require complementary and supporting investment at a local as well as a pan-Northern level to ensure a 'whole journey' and 'total network' approach to improving transport. The start and finish of almost all journeys lies beyond the strategic transport networks and requires integration with local road networks and other modes such as local public transport, walking and cycling, and the use of the local road network.

MRN schemes proposed in the Regional Evidence Base (REB) include direct provision for improvements for pedestrians, cyclists and public transport users. In some cases, this is also through redistribution of motorised traffic, facilitating significant improvements for public transport, cycling or walking within adjacent urban areas currently impacted by high levels of traffic and associated congestion, poor air quality and severance.

This chapter sets out the wider (non-MRN) transport investments proposed that will have a significant impact on the North of the England's transport network.

6.2 Integrated & Smart Travel

Following the publication of the National Bus Strategy and the Williams-Shapps Review, the Department for Transport is now leading on a national programme to make it easier and quicker to plan, and pay for, travel on public transport, such as rolling out contactless payments. This will build on the previous work that TfN carried out with partners as part of its Integrated & Smart Travel (IST) programme.

This programme will transform the public transport passenger experience, working in partnership with our rail, bus light rail sectors and other key transport organisations to make simpler multi-mode, multi-operator journeys across the North.

The programme also seeks to make the same kind of information enjoyed by most rail passengers available to bus and light rail passengers. This improved information will allow passengers to plan journeys, obtain fares information, travel and avoid disruption more conveniently and quickly.

The MRN comprises many local roads that are used by public transport, as such providing a modern public transport ticketing system will support opportunities to encourage higher levels of public transport use and enable more efficient boarding of buses and trams.

6.3 Strategic Rail

Prior to the impact of the Covid-19 pandemic the rail system in the North accommodated more than 200 million rail trips per annum, accounting for 1.1% of all trips in the North, and around 7.4%[109] by distance travelled, emphasising the importance of rail to longer distance travel. Over the past 20 years, the number of rail passengers travelling entirely within the North has grown at a rate of 6.3% per year, with the number of passengers increasing three-fold in this time, over 2% higher than the national growth rate of 4.2%[110]. Much of that growth has been accommodated by the existing capacity, however pre-Covid-19 most of the North's key rail hubs were at or close to full capacity. As the country emerges from the pandemic, a rail system that is fit-for-purpose with strong North-South and East-West connections will be the backbone of a strong economy for the North and the UK.

An effective, efficient rail network in the North is vital for connecting people to jobs, health, education and leisure opportunities; connecting businesses to each other and employees; and allowing the efficient movement of goods and services. Rail is the fastest and most reliable method to carry significant numbers of people directly into city centres and economic clusters, although it cannot serve all areas or travel needs across the entire North. Nevertheless, it is one of the most effective ways to improve access to skills, training and opportunities for people in the North, due to its ability to significantly reduce journey times and enable passengers to travel more safely and more quickly over longer distances.

Rail is often the mode of choice for higher-skilled workers and younger people, who are demonstrating an increasing trend of using public transport, influenced by factors including the connected communications technology and the high initial costs of owning a car. The need for a significant change in the role and expectations in the rail network across the North is clear, and the Strategic Transport Plan provides, and NPR business case provide a basis for that change. Our aim is to ensure that, wherever practicable, all parts of the North are well connected to good quality rail services, with a minimum frequency of 2 trains per hour at all stations through the day, rising to far higher frequencies on busy routes serving the main transport hubs.

HS2 should be transformational for the North, is integral to the expansion of the existing rail network, to regenerating railway stations and their surrounding areas, and supporting the delivery of NPR, which will free up vital capacity for freight and passenger services in the struggling rail system. NPR is a transformational programme of rail investment that will build on current and planned investments to radically improve journey times and service frequencies between some of the major cities and economic clusters in the North, which unlocks capacity and capability to deliver a much more effective rail network overall.

While the Government's Integrated Rail Plan will deliver some benefits, TfN's vision for NPR and HS2 will deliver a step-change in the level of rail connectivity between some of the North's largest cities required to support agglomeration, access to opportunities for all, and provide choices for the next generation of workers and businesses. NPR will also bring significant improvements to key intermediate rail markets, including Warrington, Huddersfield, York, Darlington and Durham. Access to multiple economic areas is central to achieving the collaborative, unified economy needed to grow the North and rebalance the economy. Both HS2 and NPR will also significantly free up space on the existing rail network to improve rail capacity for freight, thus facilitating the transport of freight by rail rather than on our roads which supports one of the STP's key aims to shift freight from road to rail.
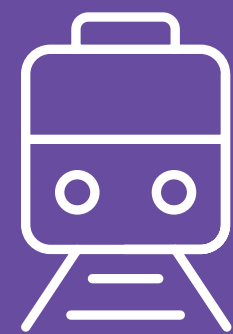
6.4   Light rail

Light rail systems in the North also offer sustainable alternatives to road travel and represent an important intra-urban public transport mode that can facilitate sustainable economic growth. Areas of the North served by urban rail, light rail, Metro and tram include Tyne & Wear, Greater Manchester, Liverpool City Region, and Sheffield, as well as Blackpool with its 11km coastal tramway.

These light rail/metro systems are vital in providing frequent and quick intra-urban services, typically supporting inner city commuting, which promotes sustainable travel and helps take significant numbers of cars off the road network. For example, Nexus calculates that the new Metro fleet (to be delivered by 2024) in the North East would take 11.2 million car journeys off the regions' roads, with one Metro taking 119 cars off the road based on a full laden metro and occupancy per vehicle of 4.2 persons.[111] Light rail also supports economic growth and contributes to the Gross Value Added (GVA) of urban and regional economies within the North through increased connectivity to opportunities and making it easier to travel around cities and regions.

As such, there are various proposals and aspirations for new and expanded light rail networks. For example, the Wirral Street Car is a proposed tramway from the planned Wirral Waters large scale development to the Mersey Rail network which represents an opportunity to provide a low cost, scalable and sustainable light rail service. The line seeks to use pre-existing rolling stock and the existing heritage tram system on the Wirral Peninsula.[112]

The North also hosts the pioneering government funded Tram Train, which is being trialled in South Yorkshire, providing a service from Sheffield city centre to Rotherham via street tramlines and the national rail network. The innovative technology allows passengers to make a single integrated journey connecting tram stops and rail stations, by operating on both the Supertram system in Sheffield and railway network into Rotherham with three services every hour throughout the week.[113] Transport for Greater Manchester is also considering potential future tram-train services which would link the Metrolink with conventional railway lines, with benefits including improved access to the city centre and increased capacity on the heavy rail network.[114]

7 Integration with Local Transport Networks

7.1 Introduction

The Major Road Network (MRN) is just one part of the transport system, therefore improved integration with local roads, with rail, light rail and bus is critical to delivering more efficient and sustainable transport choices for people and businesses in the future.

7.2 Key Route Networks

Key Route Networks (KRNs) have been developed in Greater Manchester, Liverpool City Region, West Yorkshire, Tees Valley, the North East and Lancashire.

KRNs have been developed to support more effective planning of road investment and operation of roads across district and unitary authority areas. In many areas the KRN encompasses key public transport corridors with investment targeted on supporting all road users, including provision of bus priority measures and improved facilities for pedestrians and cyclists. Local Highway Authority managed sections of the MRN are also likely to be designated as KRN in the respective local areas.

7.3 Public transport

Improved integration with public transport can deliver substantial benefits in terms of more efficient use of the transport network, reductions in levels of traffic and therefore congestion in urban areas, and support for better quality public transport services. Examples where this is already working include Park & Ride sites on the edge of major conurbations (e.g. York, Durham, Manchester and Leeds) and parking at rail stations (New Pudsey, Leeds and Callerton Parkway in Newcastle Upon Tyne).

TfN is developing a Policy Position on Multimodal Hubs and is working with local partners to identify and support development of new integrated transport hubs, for example supporting access to HS2 and Northern Powerhouse Rail stations and to local transport hubs for urban rail, Metrolink and bus services.

7.4 Active travel

Increasing cycling and walking can help tackle some of the most challenging issues we face as a society; improving air quality, reducing carbon emissions, improving health and wellbeing, and helping to address inequalities and congestion on our roads.

TfN has published a Policy Position on Active Travel and is working with partners to support them in investing in improved facilities for cycling and walking, this includes delivery of MRN-funded schemes, which, unless there are strong reasons otherwise, should include provision of upgraded facilities for pedestrians and cyclists.

7.5 Future mobility solutions

In March 2019 the Government published the 'Future of Mobility – Urban Strategy' and as outlined in section 5.2 we are on the verge of a transport revolution whereby new technologies are emerging that will transform everyday journeys within a generation.

The highway network, including the MRN, will need to adapt to meet the needs of new forms of travel, some of which, such as e-scooters and e-bikes, present new design challenges in delivering safe infrastructure for all users.

7.6 Freight hubs

The freight and logistics sector represents a key part of the North's economy, both today and in the future. By 2050 it could be worth more than £30bn and employ more than 500,000 people. The movement of freight is therefore critical to our economy and to support this we need an efficient multimodal freight network that is integrated across transport modes. This includes measures to:

→ Reduce the number of incidences of unplanned closures of Major Road Network routes leading to journey delay accessing/egressing freight hubs.

→ Maximise the utilisation of rail, inland waterways and local distribution hubs to improve efficiency and support the modal shift of goods from HGVs/LGVs on road to rail and, for short last-mile urban deliveries, greater use of cycle and electrically powered delivery vehicle options.

→ Increase freight capacity on the rail network, supporting increases in rail container freight from Northern ports and to/from the North's three Strategic Rail Freight Interchanges (SRFIs) at Ditton, Wakefield and Selby, and additional Intermodal Terminals at Trafford Park, Leeds, Garston, Doncaster and Widnes.

In 2021 the Government announced the location of eight freeports in England, including Humber, Liverpool City Region and Teesside. TfN will support our local partners on initiatives to establish Freeports as national hubs for global trade and investment, promote regeneration and new jobs, and support innovation, for example work in Teesside on carbon capture and production of hydrogen.

8. Highways Investment Programme

8.1 TfN STP Investment Programme

The Strategic Transport Plan (STP) sets out an ambitious vision for how transport can support transformational, inclusive growth in the North of England through to 2050. The accompanying Investment Programme comprises TfN's advice to the Government on the long-term, multimodal priorities for enhanced pan-Northern connectivity.

The successful delivery of the Investment Programme will require continuous close working with TfN's Constituent Authority Partners, national delivery partners (National Highways, Network Rail, and HS2 Ltd) and the Government; it will be dependent on the approval of funding at the appropriate time.

The Investment Programme is an evolving document, beyond the initial version; whereby future iterations will outline the progress on the current schemes and projects and based on future evidence could include both the removal of existing and inclusion of new interventions.

In recommending a long-term Investment Programme, TfN aims to provide greater certainty to local transport and highways authorities in delivering complementary investment and to give businesses the confidence to invest and grow, plan interventions, build up skills and collaborate across industries.

It is also vital that the Major Road Network receives sufficient funding for ongoing maintenance and adaption to the impacts of climate change. This has been recognised within RIS2 programme with £11.9bn set aside for maintenance and renewals on the SRN. More funding, and greater certainty on funding, is needed for locally managed roads, including important MRN routes, where resilience and reliability is critical to supporting the efficient movement of people and goods.

8.2 Development of the Investment Programme

TfN, working together with delivery partners, aims to assume a leadership role in developing a transport network that is sustainable. The principles below build on the objectives set out in the STP and outline how the Investment Programme, including investment in the MRN, should become an exemplar in supporting sustainable and inclusive communities:

→ Defines a broad set of infrastructure requirements to provide high-quality travel with high-quality environmental mitigation. This will help create an attractive, inclusive, and accessible environment for people to live, work and invest in.

→ Adopts future transport technologies, enabling environmentally friendly and efficient travel that contributes to the Government's target to reduce carbon emissions.

→ Ensures that improvements to the strategic transport network support inclusive growth, reduce social isolation, have health and wellbeing benefits, and provide affordable access to key opportunities.

→ Promotes confidence in businesses to invest in a skilled labour market to deliver the transport infrastructure required.

→ Explores opportunities for green and blue infrastructure to enhance landscapes, ecosystems, and habitats, and support a net gain in biodiversity.

8.2.1 Sequencing the Investment Programme

In July 2020 TfN completed the qualitative sequencing of the Investment Programme, sequencing investment over three time periods; pre-2027, 2027-2033 and post-2033. This work was completed using a multi-criteria analysis (MCA) framework and generated three versions of the sequenced investment programme, these are:

A **Strategy 1** – More funding in the period 2027-2033 and more public transport focused, resulting in a more rail-focused investment programme (£11.2bn)

B **Strategy 2** - More funding in the period 2027-2033 (£9.8bn)

C **Strategy 3** - Business-as-usual in the period 2027-2033 (£6bn)

S1, S2 and S3 are options rather than choices and the amount of funding required doesn't increase the overall investment programme, rather it allows acceleration of the programme in the period up to 2033.

In summer 2022 TfN will complete work on the Investment Programme Benefits Analysis - assessing the transport benefits and wider social, economic and environmental outcomes of our proposed programmes of transport investment. This will provide a strong evidence base, supporting recommendations for future policy decisions and transport investment, including investment on the MRN.

This will then form TfN's recommendation to Government on where work should commence on development of strategic schemes to be delivered over the period 2027-2033.

8.3 Funding the Investment Programme

TfN's initial Investment Programme identifies a funding requirement for strategic transport of around £60-70bn during the period to 2050, thus approximately £2.0-2.3bn is required per annum. Assuming the levels of committed strategic transport funding from Road Investment Strategy (RIS) and Network Rail's Control Period equating to around £39-43bn, additional funding of £21-27bn would still be required to gain the £70bn funding. When accounting for transport spend in towns and cities, the total requirement for transport is approximately £100-120bn. The MRN and LLM funding, where successful, would help contribute towards filling this funding gap. TfN welcomed the ground-breaking National Roads Fund (NRF) which has allocated £3.5bn specifically for local road funding.

TfN has developed a Funding Framework that outlines the parameters within which the allocation and management of the financial resources will be undertaken. The Investment Programme will need to be underpinned by public funding commitments that meet a very high proportion of the overall expenditure requirement; however, there may also be opportunities for private sector investment.

In the short term, TfN will work with the mechanisms currently in place to secure funding, though over time, TfN is seeking to move to the position where it becomes responsible for a combined regulatory settlement for strategic transport investment in the North. Ultimately, the local and regional knowledge and expertise of TfN and its partners illustrate they are best placed to identify the challenges and strategic opportunities arising from transport investment in the North.

Alongside the technical and financial considerations to be taken in relation to proposed interventions in the Investment Programme, TfN aims to embed sustainable return on investment and social value in the procurement and delivery of transport interventions, and will work with our partner delivery bodies in seeking to achieve a sustainable return on investment.

We will also promote innovative measures and encourage smart technology to support the delivery of objectives. As mobility evolves into a more on-demand and flexible service to meet the needs of the user, global trends and behaviours in the future pose risks and opportunities which requires strategic planning at a national and regional level. TfN is considering the potential impacts of these trends through our Future Travel Scenarios and will use the intelligence gained to evidence recommendations for investment in both traditional and more innovative transport solutions. Examples of the types of measure are detailed within the TfN Future Travel Scenarios report[115] and Future Travel Scenarios: Transport Measures and Solutions Annex.[116]

8.3.1 Current arrangements for transport funding

Support for transport investment currently comes from a wide range of national and local sources. Most of this is public funding available, with Government the main source of funding for major transport schemes, in most cases supplemented by a mixture of local or combined authority funding, and in some instances private sector funds, the latter usually linked to land use development opportunities.

With the exception of the RIS programme, Government funding for major road schemes is usually made available through competitive bidding processes, rather than through a long-term investment strategy. This leads to significant levels of uncertainty and a 'stop-start' approach to scheme development and delivery. TfN welcomes recent revisions to the Governments 'Green Book' and strongly advocates the need for a more strategic, cohesive and consistent outcome based approach to planning transport investment.

Sources of Government funding often operate in silos, with separate funding pots and different criteria, examples include RIS funding for the SRN, National Roads Fund for the MRN, Levelling Up Fund (open to transport schemes up to £50m), Housing and Infrastructure Fund, Pinch Point Funding, Highway Maintenance challenge funding, and funding streams such as Innovate UK, which within a transport context is aimed at supporting development of new transport technologies and business models. Table 8.2 summarises the common sources of capital funding for strategic transport investment.

Table 8.2 - Typical sources of funding for transport infrastructure.

Transport interventions[117]	Local Authorities	Combined authoroties/ City regions	Government funding (e.g. DfT, MCHGL and BEIS)	Private sector
High Speed 2			✓	
Northern Powerhouse Rail			✓	
Restoring Your Railway Fund	✓	✓	✓	
Wider strategic rail improvements			✓	
Light Rail/ Metro/Tram	✓	✓	✓	
Strategic Road Network (RIS)			✓	✓
Major Road Network (National Roads Fund)	✓	✓	✓	✓
Key Route Network	✓	✓		
Future High Street & Towns Fund	✓		✓	✓

Table 8.2 - Typical sources of funding for transport infrastructure. (continued)

Transport interventions[116]	Local Authorities	Combined authoroties/ City regions	Government funding (e.g. DfT, MCHGL and BEIS)	Private sector
Local Growth Deals		✓	✓	
Integrated Transport Block Fund inc highway maintenance	✓	✓		
Local road intervention schemes	✓			✓
Smart network projects	✓		✓	
Housing Infrastructure projects	✓		✓	✓
City Deals	✓	✓		
Transforming Cities Fund			✓	
Levelling Up Fund			✓	

Transport interventions[116]	Local Authorities	Combined authoroties/ City regions	Government funding (e.g. DfT, MCHGL and BEIS)	Private sector
Active Travel/Local Sustainable Transport Fund			✓	
UK Community Renewal Fund			✓	
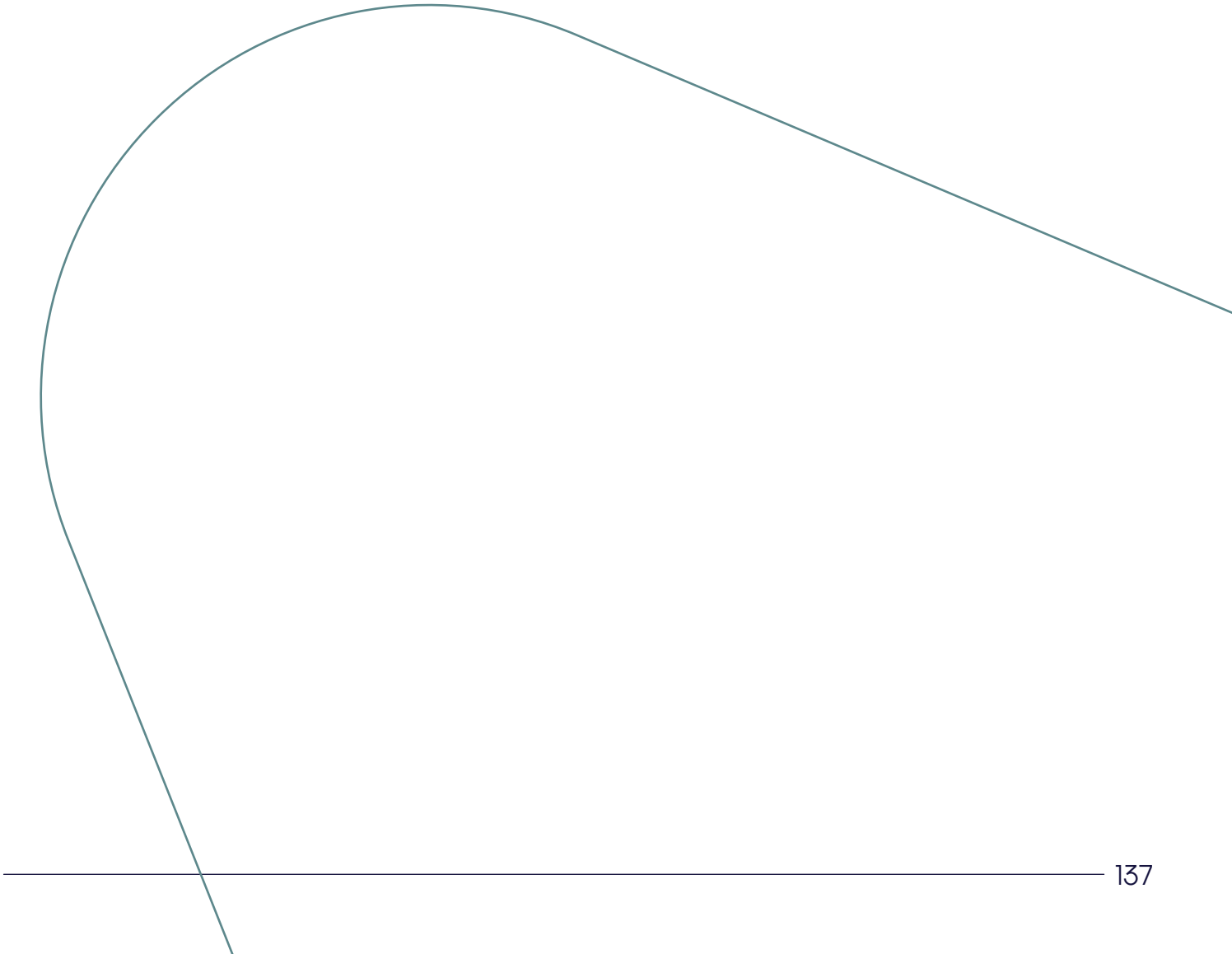
8.4   Planned investment in the Strategic Road Network

Improvements to the SRN within the North are a key priority for businesses, individuals, and local authorities; particularly including interventions to strengthen the performance and resilience of the M62, M60, M6, M1 and A1(M).

The M62 currently carries half of all trans-Pennine traffic, demonstrating its central role in supporting future East-West movements by connecting Hull to Liverpool, via Manchester and Leeds. With freight flows between Liverpool, Greater Manchester and West Yorkshire of more than 5 million equivalent HGVs per annum[118], TfN expects to see continued investment in the SRN in the short, medium and long term, led by National Highways, to support the realisation of transformational growth.

The RIS1 (2015-2020) has delivered several vital interventions in the North, such as the final remaining section of motorway standard connection to the North East and the A556 improvements.[119]

Completion of the RIS1 programme and the delivery of further interventions in RIS2 (2020-2025) are inherent to providing greater network efficiency, reliability and resilience improvements on the SRN and wider MRN.

The Road Investment Strategy 2[120] (2020-2025) was published in March 2020 and sets out that £27.4bn will be invested on the SRN over the five-year period (Road Period 2). The RIS2 outlines that following RIS1, 11 schemes are open for traffic and five are under construction in the North.

The document outlines the following enhancement schemes are committed for Road Period 2 in the North:

→ A1 Morpeth to Ellingham

→ A19 Down Hill Lane

→ A1 Birtley to Coal House

→ A66 Northern Trans-Pennine

→ M6 South Lancaster Growth Catalyst Junction 33a (funded under Housing Infrastructure Fund)

→ A585 Windy Harbour to Skippool

→ M60/M62/M66 Simister Island

→ A61 Westwood Roundabout

→ A5036 Princess Way

→ Mottram Moor Link Road and A57 Link Road

→ M6 Junction 19

In addition, RIS2 sets out that the sequencing of smart motorway projects will be revisited in light of the smart motorway stocktake when it is concluded. In the North, RIS2 identifies three potential smart motorway schemes subject to stocktake, these are:

→ M62 Junctions 20-25

→ M6 Junctions 21A-26

→ M56 Junctions 6-8

RIS2 also outlines proposals in the pipeline for RIS3. In the North, these include:

- → A19 North of Newcastle Junctions

- → A64 Hopgrove

- → M1 Leeds Eastern Gateway

- → M1/M62 Lofthouse Interchange

- → M6 Junctions 19-21A Knutsford to Croft extra capacity

- → M1 Junctions 35A-39 Sheffield to Wakefield extra capacity

- → A1 Doncaster to Darrington

- → M6 Junction 22

- → Manchester South East Junction improvements[121]

Furthermore, RIS2 outlines that there are several existing strategic studies focusing on making major improvements to the capacity and connectivity of the SRN. In the North relevant studies for the SRN comprise the Trans-Pennine Tunnel and M60 Manchester North-West Quadrant.
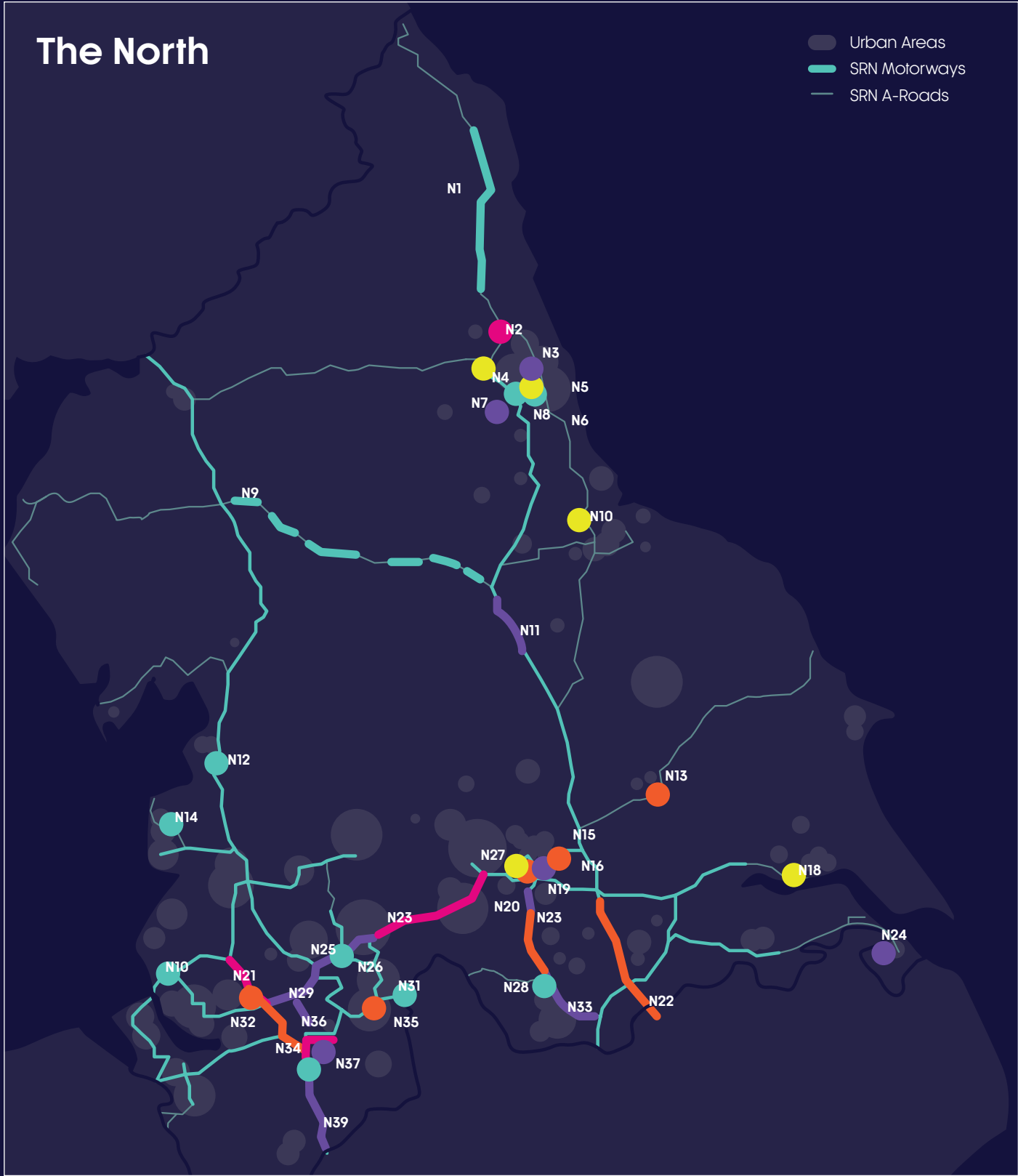
The RIS2 programme includes a series of designated funds, unlike the enhancements fund these are not specified in advance and are available to enable National Highways to work with stakeholders on invest in local improvements. The RIS2 Designated Funds Programme comprises:

- → Environment and Wellbeing Fund

- → User and Communities Fund

- → Innovation and Modernisation Fund

- → Safety and Congestion Fund

Transport for the North believes that it is critical that National Highways takes a holistic view of the role of the SRN in supporting an effective and integrated transport system encompassing strategic and local networks and all modes of transport, and recognises the importance of working with the DfT, National Highways, Network Rail, local partners and other key agencies to shape a seamless MRN and SRN which provides a better end to end customer experience, and responds to societal, environmental and technological opportunities and challenges. For example, the need for decarbonisation of the economy and the impact of smart infrastructure has potential to be further utilised moving into the future.

Figure 8.2 outlines the RIS programme of schemes in the North.

The North

Urban Areas
SRN Motorways
SRN A-Roads

RS1 Open for Traffic
N32   A19/A1058 Coast Road
N7   A1 Coal House to Metro Centre
N11   A1 Leeming to Barton
N16   M1 Junction 45 Improvement
N20   M1 Junctions 39-42
N24   A160/A180 Immingham
N25   M60 Junction 8 to M62 Junction 20
N29   M62 Junctions 10-12
N33   M1 Junctions 32-35A
N39   M6 Junctions 16-19

Committed for RP2
N1   A1 Morpeth to Ellingham
N6   A19 Down Hill Lane
N8   A1 Birtley to Coal House
N9   A66 Northern Trans-Pennine
N12   M6 South Lancaster Growth Catalyst J33a (HIF)
N14   A585 Windy Harbour to Skippool
N26   M60/M62/N56 Simister Island
N28   A61 Westwood Roundabout
N30   A5036 Princess Way
N31   Mottram Moor Link Road & A57 Link Road
N38   M6 Junction 19

Under Construction
N4   A1 Scotswood to North Brunton
N5   A19 Testos
N10   A19 Norton to Wynyard
N17   M621 Junction 1-7
N18   A63 Castle Street

Smart Motorways Subject to Stocktake
N21   M62 Junctions 20-25
N27   M6 Junctions 21A-26
N36   M56 Junctions 6-8

RIS3 Pipeline
N2   A19 North of Newcastle Junctions
N13   A64 Hopgrove
N15   M1 Leeds Eastern Gateway
N19   M1/M62 Lofthouse Junction
N22   A1 Doncaster-Darrington
N23   M1 Junctions 35A-39 Sheffield to Wakefield extra capacity
N32   M6 Junction 22
N34   M6 Junctions 19-21A
N35   Manchester South East Junction Improvements
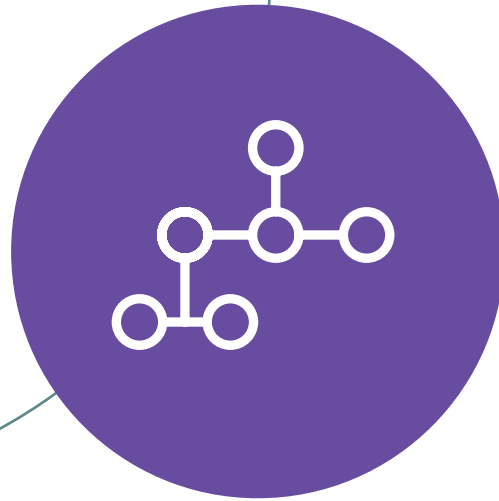
Scheme Line Representations do not denote route choices
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9. Next Steps

To be fit for the future, how we manage, operate and invest in our transport networks, including the 85,000km of roads in the North (7,953KM of MRN) should reflect the needs and priorities of our communities in the 21st century.

The Strategic Transport Plan and Investment Programme sets out TfN's early priorities for transport investment, including improved connectivity on the strategic and major road network.

As we move into the second quarter of the century, road transport will continue to have a vital role in underpinning economic activity, social interaction, and movement of goods.

Moving forward, TfN's ambition is to achieve a long-term funding settlement and realise a long-term Northern pipeline of transport investment.

In 2019 TfN submitted a regional evidence base setting out the case for £700m of new investment on the MRN over the next five years, which were carefully considered in respect of viability to take forward into construction during the period 2020-2025. This is investment in addition to the RIS2 programme and a number of locally sponsored schemes, at the time already within an existing development pipeline.

Future sustained and targeted investment in the North's transport network, including the MRN, is essential to improving strategic transport connectivity in the North, to support 'levelling up' and achieve the pan-Northern transport objectives as set out in the STP.

The governance of, operation of and planning for our roads also needs to adapt to better meet the challenges ahead, and it is important to recognise the many classifications, functions, and ownership across the road network in the UK, including in the North, and the challenges this creates in achieving a cohesive outcome-focused programme of investment. Strong collaboration across key delivery bodies and stakeholders is critical to maximising the benefits of investment on all parts of the transport network.

As the Sub-national Transport Body for the North of England, TfN has a vital role in bringing together public and private sector partners from across the North, working collectively to agree and act as a single voice in recommending a Northern Investment Pipeline.

Through application of TfN's Analytical Framework, assessing the transport benefits and wider social, economic and environmental outcomes of our proposed programmes of transport investment, we will provide a strong evidence base, and make recommendations for future policy decisions and transport investment, including investment on the MRN.

10 Action Plan - Major Roads

Major roads are part of the 'life blood' of our economy with more than 90% of the distance travelled in the North by road, and 75% of commuters travelling to work by car.

→ **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 action	Description	Timing
Investment Programme Benefits Analysis (IPBA)	This will provide a quantified understanding of the Investment Programme benefits and support TfN Board in recommending policy and investment priorities for the North's transport networks (including the MRN), as statutory advice to the Secretary of State for Transport.	Spring 2021 – Summer 2022
TfN input to SRN Route Strategies	With our comprehensive evidence base we will input to influencing the National Highways-led SRN Route Strategies.	Autumn 2020 – Summer 2023
TfN inputs to Road Investment Strategy pipeline (RIS3)	Using evidence from our Strategic Development Corridor studies, the IPBA and our wider portfolio of research, TfN will represent the North's position with regard to the development of the National Highways RIS3 pipeline.	Autumn 2020 – Summer 2023
Major Road Network Performance Monitoring Evidence Base	Utilising data from tracking mobile phones we will provide TfN partners with access to MRN data reporting on journey times, journey time reliability, origin and destination of motorised trips using the MRN. This will support TfN and our partners in identifying issues on the MRN, in appraising options, developing business cases and in evaluating the impact of policies and of investment.	Annual reporting 2019-2022
Electric Vehicle Charging Strategy	Using TfN's suite of analytical tools to underpin work on assessing the future trajectory and geographical location of EV demand, combined with input from our partners and Distribution Network Operators, we will develop an EV charging infrastructure evidence base for the North.	Summer 2021 – Summer 2022

10 Action Plan – Major Roads (continued)

TfN action	Description	Timing
Zero Emissions Vehicle charging & re-fuelling Strategy	Working with partners across the North with regards to hydrogen fuelling, we will combine work on identifying requirements for hydrogen re-fuelling with the Electric Vehicle Strategy to formulate a ZEV Infrastructure Strategy and support Local Authority partner delivery of charging and re-fuelling solutions.	Summer 2021 – Spring 2023
Multimodal hubs policy position and evidence base	We will develop a TfN policy position and evidence base on the provision of multimodal transport hubs in the North.	Spring 2022
TfN research into Transport-Related Social Exclusion	This project will provide new data tools and primary empirical evidence on the link between transport and social exclusion. This includes accessibility analysis, socioeconomic analysis, and demographic analysis. Evidence from this work will support transport related investment and policy decisions, including on the role of the MRN in supporting an inclusive and sustainable North.	Winter 2020 – Summer 2021
TfN research into health and wellbeing	This project will expand evidence on the link between transport, health, and wellbeing in the North – focusing on severance, physical inactivity, poor user experience, and access to health services. It will provide new data tools and indicators to measure these relationships. Evidence from this work will support decisions on the role of the MRN in supporting an inclusive and sustainable North.	Autumn 2021 – Spring 2022

TfN action	Description	Timing
TfN Clean Mobility Visions project	This project will develop a set of strong and attractive mobility visions based on practicable evidenced based policy options for reducing private car usage, applicable to specific place and population contexts in the North. It will consider the decarbonisation, health, inclusion, and accessibility-related impacts of these policies.	Summer 2021 – Spring 2023
Impact of Future Mobility on the MRN	Building on the Future Travel Scenarios, this workstream will support TfN and partners in planning for the impact of new and emerging technologies, for example connected autonomous vehicles, freight platooning and data platforms supporting greater use of shared mobility solutions.	2023/2024
Future MRN investment	Building on the outputs of the IPBA, EV Strategy and performance monitoring, we will set out the priorities for MRN investment 2035-2030.	2022/2023

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Footnotes

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[42] The free-flow hour for each path is defined as: the hour during which road users traverse the path at the fastest speed on average.

[43] Weighted travel times for each path and hour are calculated as shown: $T_h = \frac{\Sigma(T_h * W)}{\Sigma W}$, where WT_h is Weighted Average Travel Time and W is User Weighting. Further detail on methodology is available to on request.

[44] Data received by TfN is pre-processed and fully anonymised.

[45] Average congestion index 17:00-18:00, all days 01Feb19-31May19 and 01Jul19-31Dec19.

[46] Example shows origin of traffic on A628_1 (path 1) on Wednesday 15th May 2019 7:00AM-10:00AM

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[48] Cyclists, pedestrians and equestrians: measuring satisfaction with journeys on National Highways's network in the North West and East Midlands, Transport Focus 2018

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