

**Transport for the North
Strategic Transport Plan
February 2019**

What does this Plan mean for you?

As someone living in the North... you will have access to a high quality, cleaner, greener, and accessible transport system, which will support job creation and increase wages. The Plan will support and improve the excellent quality of life the North has to offer.

As a young person... this plan has been developed with your future in mind. The transport system needs to meet demand and support people to access new opportunities, both now and in the future.

As a commuter... this Plan will improve the quality of your daily commute across different modes of transport to give you confidence in the reliability and quality of your door-to-door journeys. It will also open up new ways to get around the North.

As a developer... the transport network will unlock high quality housing and business development sites, creating new opportunities for you to build the homes and workplaces of the future.

As an entrepreneur... enhanced connectivity will enable you to embrace new opportunities to grow your business and networks.

As a tourist... you will have better and easier access to the great natural, historic, coastal, and cultural destinations of the North.

As the Government... this Plan sets out the North's unified vision on how we can transform and rebalance the economy, with support from the UK Government.

As a large multi-national corporation... you will have the confidence to invest in the North, knowing you have access to a reliable network to move goods and services, and better access to new supply chains and a bigger labour market.

Chairman's Foreword

I am proud to present our Strategic Transport Plan, the first time the North has come together to outline the transport interventions that will rebalance our economy and leave a legacy for future generations.

This Plan is the culmination of an unprecedented collaborative effort between TfN and its Partners. This momentous occasion sees the North speaking for the first time with a single voice to present our vision for a prosperous pan-Northern future. The Northern Powerhouse Independent Economic Review published by TfN in 2016 set a blueprint for us to build upon to realise our potential, delivering nearly £100 billion more productivity and creating 850,000 jobs. The steps we need to take toward that transformational economic growth are outlined in this document.

This is economic growth using transport to deliver outcomes – not just transport for transport's sake, but better access to jobs, collaboration between businesses, more choices for leisure and tourism – providing a better quality of life for all. Only by connecting people to opportunity can we flourish and realise our ambitions. This Plan allows the North to achieve its full potential and is our opportunity to address decades of under investment and provide a legacy for future generations.

This Plan is underpinned by our Long Term Investment Programme. This list of projects presents our initial priorities for the North, to connect its regions based on economic strengths and addressing current constraints. Our Strategic Development Corridors explore how we can do this, as well as addressing the need for improved East-West-East connections. It reflects the views of our Partners, bringing regions together to consider transport solutions at a macro level. Although much has been done by Local Transport Authorities and Local Enterprise Partnerships across the North in securing landmark deals with Government, what is missing is a more strategic view of transport investment that connects the economic assets across the North, both internally to create an economic mass, but also externally as part of a global marketplace.

We released the first draft of this Plan in January 2018, and since then have embarked on an extensive period of consultation. This final Plan is now a statutory document written by the North, for the North and is our blueprint for our future economic prosperity. Our task now is to instigate change and drive this Plan forward in order to seize the economic prize to which we all aspire.

John Cridland CBE, Chairman, Transport for the North

Executive Summary

Introduction

TfN is the voice of the North of England for transport – a statutory body of elected leaders and a partnership of business leaders from across the whole of the North of England who collectively represent all of the region’s 15 million citizens.

The people of the North are at the heart of this Strategic Transport Plan. An effective, efficient Northern transport network is a fundamental part of everyday life – 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. A transport system that is fit-for-purpose with strong North-South and East-West connections will be the backbone of a strong economy for both the North and the UK.

This Strategic Transport Plan provides an opportunity to drive major improvements in strategic connectivity throughout the North, taking a pan-Northern view for the first time. It will encourage trade and inward investment by improving links to the North’s ports and airports, and faster links between the economic assets that they serve. This will make the North a more attractive place for businesses to invest and to base themselves and will also support the aspirations of the North’s visitor and tourism economy. It signals an opportunity to invest in the people who live in the North to improve living standards, health, productivity and opportunities for all.

Vision and pan-Northern transport objectives

TfN’s vision is 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 have informed the development of the Strategic Transport Plan and 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.

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

Why? The case for change

The North is home to around 1.1 million businesses, more than 7.7 million jobs, and over 15 million people, with population growth of 6.7%. The North's economy is around £343 billion, 19% of UK total. If the North were a country, it would be the 27th largest in the world. 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. Most recent data reveals that gap has widened further, with the economic value (GVA) per person in the North now 18% below the UK average. The widening gap can be attributed to the North generally experiencing slower GVA growth rates over the last decade compared to the UK average.

The success of the UK in the global marketplace and the success of the Government's Northern Powerhouse Strategy and Industrial Strategy depends upon transforming the economy of the North.

Benefits of agglomeration

At the heart of strong regional economies, are strongly performing towns and cities. The benefits of a large economy are only achieved when combined with the concentration of economic activity in specific places, such as towns and cities. Therefore, the fundamental challenge for the North's economy is to improve the economic interaction between the key economic assets and clusters of the North to improve the sharing of knowledge, supply chains, resources, and innovation to drive agglomeration benefits and productivity.

A lack of agglomeration is frequently cited as a reason for the North's performance gap with the rest of England, with Northern cities unable to take full advantage of positive externalities from the spatial concentration of economic activities, such as increased supply chains and labour demand. Creating more dynamic places where people and businesses thrive will be an important factor in boosting productivity and jobs, and realising the economic opportunity of the North's economy.

The Northern Powerhouse's role in the UK economy

The scale of the economic opportunity for the North was set out in the Northern Powerhouse Independent Economic Review, which includes a bold vision of economic transformation for the North that will rebalance the UK economy and increase international competitiveness. It concluded that improving economic performance in the North could bring the following significant benefits to the UK economy by 2050:

- £97 billion (15%) increase in GVA.
- 850,000 additional jobs.
- 4% higher productivity than in a 'business as usual' scenario.

This higher productivity and growth could be driven by promoting and growing four prime capabilities (advanced manufacturing, energy, health innovation and digital) and three enabling capabilities (financial and business services, logistics

and higher education) – which are already strongly performing sectors with committed investment in the North. A significant proportion of this growth is focused on major towns and cities, but there are opportunities to achieve transformational growth across all parts of the North, not just in the large urban conurbations. There are also opportunities to further recognise and make use of the vital role of the North’s visitor economy.

Aims of the Plan

TfN has adapted the cluster theory and used it to develop three key aims for the Strategic Transport Plan:

- Connecting people – improving access to leisure and tourism assets and work opportunities, whilst widening the labour market for businesses.
- Connecting businesses – improving connections to collaborators, client and competitors, including those within the prime and enabling capabilities.
- Moving goods – supporting businesses to move freight and goods efficiently and across modes.

The North’s transport network

To realise the benefits of agglomeration and economic mass, the North requires faster, more efficient, reliable and sustainable journeys on the road and rail networks. Yet these existing networks have a number of challenges.

Over the last two decades, the North’s railway has experienced substantial growth in passenger numbers despite a legacy of underinvestment. Much of that growth has been accommodated within pre-existing capacity, but this is no longer possible on many routes, and most of the North’s key rail hubs are now at capacity. The North’s rail network lacks sufficient capacity for growth and is severely constrained by on-train congestion, low journey speeds and poor punctuality.

East–West road connectivity is a significant barrier for future growth in the North, and a key constraint to agglomeration and transforming the North’s economy. Currently the M62 is the only motorway standard East-West road link across the Pennines between Derby in the Midlands and Edinburgh in Scotland. Other major arteries, including the M1, M6 and M56 corridors, are also already heavily congested and are acting as major barriers to transforming the North’s economy.

Future transport demand for a transformed North

Transformational economic growth in the North would be expected to lead to far-reaching changes in transport demand and travel patterns compared to today.

Analysis of the North’s labour markets indicates that the majority (61%) of the North’s workers lived and worked in the same local authority district in 2015, but in a transformed North, the proportion of workers taking employment outside of their home district is expected to markedly increase by 2050. The greatest

change is expected for those in high-skilled occupations, who are already more likely to travel further for work.

Transport investment in the North, and the UK as a whole, has historically been made on a 'predict and provide' approach, where future demand for travel is forecast based on historic trends and transport interventions are then designed to meet this demand. Increasingly there is movement towards a 'vision and validate' approach, where TfN, Local Transport and Highway Authorities and Government can actively shape and influence how people travel to meet joint economic, transport, environmental, and social objectives.

TfN has produced a Northern Transport Demand Model that estimates how changes in employment, population and the transport network could affect travel patterns across the North. The model uses the transformational growth in population and employment from the Northern Powerhouse Independent Economic Review to forecast transport demand scenarios for the road and rail networks in 2050.

Inclusive and sustainable growth

Income, social and health inequalities are widely seen as one of the defining challenges of the 21st Century. As such inclusive growth should be at the heart of public investment. This Strategic Transport Plan should provide a way for inclusive benefits from investment to be embedded and secured across the North.

Transport is social infrastructure which should provide opportunity for all potential users, and TfN wants to drive forward the inclusive growth agenda. Strategic transport improvements should not just better connect already connected areas or people to other similar areas or people, improvements should ensure that all areas of opportunity are connected, and that communities are not disconnected and further isolated.

The North's strategic transport network needs to be designed and developed to be accessible, ensuring individuals have a choice of services and opportunities to access work and leisure. TfN fully supports the ambitious policy measures in the Government's Inclusive Transport Strategy, which aims to achieve equal access for disabled people using the transport system by 2030.

Working with Public Health England, TfN and Partners will further explore how investment can have a positive impact on people's health. The National Institute for Health and Care Excellence recommends that active travel and use of public transport should be encouraged.

TfN recognises that successfully delivering inclusive, healthy and sustainable growth is dependent upon protecting and renewing the high quality environment in the North, which is already an asset and a reason why many people and businesses chose to live in and visit the North. Working with Partners and other statutory bodies, such as the Environment Agency, Natural England and Historic England, TfN will aim to minimise the impact of transport on the historic and natural environment, and where possible will seek to deliver environmental enhancements and biodiversity net gain.

Being the largest greenhouse gas emitting sector, accounting for 28% of all UK greenhouse gas emissions in 2017, transport has a significant role to play in meeting commitments to reduce greenhouse gas emissions, in particular carbon emissions. The transport network must be decarbonised to support a shift to a low carbon economy, and with increased investment in the whole of the transport network, the North will support the achievement of the targets set out in the Climate Change Act. This means that national road transport emissions will need to be near-zero, almost every vehicle on the road will need to be of an ultra low emission type, and rail will need to be decarbonised by 2050.

TfN supports the series of Government policies and proposals to meet the UK's legislated emission reduction targets as set out in the Road to Zero Strategy and Clean Growth Strategy, with the latter setting out a series of policy measures focussed on accelerating the shift to low carbon transport.

However, TfN cannot achieve a carbon reduction from transport on its own – this is a collaborative effort. As part of TfN's commitment to develop an Inclusive and Sustainable Growth Framework, TfN will lead the scoping, developing and implementing of a 'Pathway to 2050'. This will require continued collaboration with Partners and the Government to deliver the ambitions of the Strategic Transport Plan and local transport plans in tackling carbon impacts and reductions from transport. TfN's preliminary carbon analysis demonstrates that total emissions will need to fall further and quicker as future interventions are delivered, in particular in the next two carbon budget periods.

What? Identifying the required interventions to Transform the economy

In order to achieve transformational and inclusive economic growth, significant investment will be required to the road and rail networks across the North. Five work programmes will achieve the shared ambition for the North over the next 30 years.

Local and sustainable transport

TfN's remit is focused on the identification and recommendation of pan-Northern strategic transport interventions, generally longer distance trips between other economic centres. However, there will undoubtedly need to be complementary and supporting investment at a local as well as a pan-Northern level to ensure that a 'whole journey' and 'total network' approach to improving transport is followed. This means targeting short trips that could be taken on public transport, cycling or walking, thereby reducing localised congestion, improving the environment, and supporting an improved transport system at a local and pan-Northern level.

Taking a 'whole journey' approach will not only support transformational economic growth and a carbon reduction, it will have significant social benefits, by reducing severance and connecting local communities with employment and other services in local areas and across the North.

Of particular importance in encouraging a mode shift towards rail, will be the need to ensure effective connections to new and existing rail stations by all modes, and the provision of adequate access facilities, such as parking and

drop-off/pick up provision, electric charging points, bus facilities and secure cycle parking. How local rail stations are managed can also aid integration and will also be a key part of future rail franchises.

Further development of core bus networks, using new engine technology to ensure that the bus fleet is as green as possible, working towards a zero carbon public transport network across the North, and incorporating the latest techniques in providing bus priority in congested networks, will all be essential for providing effective and efficient access to urban centres.

TfN supports the delivery of a real step-change in the quality of cycling infrastructure and wants to ensure that the Strategic Transport Plan and Investment Programme provide a design opportunity for Delivery Partners, and Local Transport and Planning Authorities, to future-proof enhanced and new rail and road infrastructure for cycling and walking. As set out in the National Planning Policy Framework, sustainable transport can have the added benefit of making developments in communities across the North more feasible and appealing.

TfN fully endorses the National Infrastructure Commission's proposals for a significant uplift in funding from 2025 onwards for devolved cities and non-urban local transport, and also potentially National Parks.

Integrated and Smart Travel

The Integrated and Smart Travel programme is an ambitious four year programme to introduce contactless payment for travel on public transport across the North. This programme will transform the passenger experience in the North by working in partnership with the rail, bus and light rail sectors, and key transport organisations.

Customers can already use a smartcard, contactless bank card or their smartphone to pay for travel on some public transport in the North. Using emerging technologies, the Integrated and Smart Travel programme will deliver modern payment methods and mobile travel information right across the North, in line with what passengers now want and expect from today's public transport system. Paying for journeys will become quicker, easier and more convenient.

The programme is being delivered in three phases:

- Phase 1 – Smartcard on rail - roll out smart ticketing across all rail travel.
- Phase 2 - Customer information, collaboration and innovation - integrated customer information, disruption messaging and fare information to make journey planning quicker and easier.
- Phase 3 - Account-based travel - allows passengers to travel using contactless bank card for payment and enjoy a fair price promise on multimodal, multi-operator journeys across the North.

Strategic Rail

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 both the North, and

the UK. Rail is the fastest and most reliable way to carry significant numbers of people directly into city centres and economic clusters.

Despite the relatively low proportion of people who currently choose to travel by rail compared to road, there is significant potential for rail to take an increased share of the growing demand for transport, particularly for the city-to-city and town-to-town trips required to unlock transformational economic growth.

Long Term Rail Strategy

The Revised Draft Long Term Rail Strategy (January 2018), sets out TfN's guiding principles for rail and is an integral part of the Strategic Transport Plan. It sets out why change is needed, what that change should be and how that change should be delivered, with an ambitious vision for the transformation of the North's rail network based on five themes:

- Connectivity – a step-change in connectivity including frequency and journey time improvements for both passenger services and freight, combined with better integration of services.
- Capacity – providing longer trains and additional services to meet existing and future passenger demand, with improvements to the infrastructure and signalling capability to accommodate these additional services.
- Customer – a passenger network that is easy to navigate, accessible and predictable, with consistent information available before and throughout journeys.
- Community – a railway that supports the social fabric of the communities it serves, providing journey opportunities which enable access to education, training and leisure opportunities as well as employment, and plays a full part in addressing transport poverty, isolation, and deprivation across the North.
- Cost Effectiveness – growing revenue and minimising the unit cost of operating and maintaining the North's railway without compromising the quality of the services offered.

Minimum standards for the rail network have also been developed and more detailed delivery plans will be developed across the network to determine how these standards can be met in the future.

The principal intervention within the next five year period for rail enhancements will be the Transpennine Route Upgrade, with improvements concentrated on the corridor between Manchester and Leeds. The high level strategic outputs for the Transpennine Route Upgrade programme that TfN and Partners want to see are:

- Leeds to Manchester target journey time of 40 minutes.
- York to Manchester target journey time of 62 minutes.
- Capacity for six inter-urban services per hour for trains of eight carriages, and up to two local services per hour, in both directions.
- 92.5% of passenger trains to arrive within 5 minutes of the scheduled time.

- W10/W12 gauge clearance and provision of one freight path per hour (in each direction) for freight services.
- Upgrades to stations along the route.

TfN requires that the strategic outputs above are fully delivered so that the Transpennine Route Upgrade programme can deliver maximum benefits to the North, and also form an important forerunner to the Northern Powerhouse Rail programme, which will deliver longer term benefits across the North.

In addition to major infrastructure and investment programmes, TfN will work in partnership with Network Rail to identify opportunities to reduce the cost of the railway and make better use of existing assets. One way of doing this is to accelerate trains across the network by reducing journey times – not only does this make services more attractive to users, it also makes more efficient use of trains and crews. Together these factors make the railway more effective and more affordable.

High Speed Two (HS2)

TfN firmly believes that HS2 will be transformational for the North of England. It will be a key piece of world class infrastructure integral to the expansion of the existing rail network, regeneration of railway stations and their surrounding areas, and supporting the delivery of Northern Powerhouse Rail, which will free up much-needed capacity in a system that is struggling to perform. The whole HS2 programme is most effective and delivers greatest benefit when fully delivered, and is estimated to generate £17.6 billion of wider economic benefits.

HS2 will carry over 300,000 passengers a day, releasing capacity on the existing rail network for both passenger and freight services by allowing the existing West and East Coast Main Lines, and the Midland Main Line, to be used in different ways, growing the overall capability of the rail network to meet future need. How this released capacity can be used effectively to help the North's rail offer support the economy will be investigated through the Long Term Rail Strategy and the development of Northern Powerhouse Rail as integral components of a modern, dependable and responsive rail network.

Northern Powerhouse Rail

To make the most of HS2, a step-change in the level of rail connectivity between some of the North's largest cities and its largest airport is required to support agglomeration, access to opportunities for all, and choices to the next generation of workers and businesses. Northern Powerhouse Rail is a transformational programme of rail investment that will radically improve journey times and service frequencies between some of the major cities and economic areas in the North, which unlocks capacity and capability to deliver a much more effective rail network overall.

The physical capacity for trains to run on the rail network is also heavily constrained in the North. The North has inherited a largely Victorian railway largely pared back to a mostly two-track network, carrying a competing mix of traffic including fast intercity trains, local stopping services and freight services. This is challenging as rail capacity is maximised when trains of the same speed

can operate on the same stopping patterns. However, services sharing the same two-track railways on the North's network have very different speeds and stopping patterns, which limits the potential number of trains per hour that can be accommodated.

The proposed programme for Northern Powerhouse Rail includes:

- Improving the capacity and frequency of links between Liverpool and Manchester Piccadilly via Warrington and Manchester Airport using the HS2 infrastructure and a new integrated Northern Powerhouse Rail/HS2 station.
- A new hub station at Manchester Piccadilly.
- Faster links between Manchester, Huddersfield, Bradford and Leeds.
- Significant upgrades along the corridor of the existing Hope Valley Line between Sheffield and Manchester (via Stockport).
- Leeds to Sheffield delivered through HS2 Phase 2b and upgrading the route from Sheffield to/from the North.
- Leeds to Newcastle via a junction off HS2 and significant upgrades to the East Coast Mainline corridor (via York, Darlington and Durham).
- Significant upgrades to the existing lines from Leeds to Hull (via Selby) and Sheffield to Hull (via Doncaster).

The Northern Powerhouse Rail proposals represent a network that will improve services across the North, providing world class investment and infrastructure for seamless rail travel as part of the Long Term Rail Strategy, with benefits that will be felt beyond where the infrastructure is actually provided.

TfN analysis shows that the wider benefits of Northern Powerhouse Rail include:

- Bring millions more people, and hundreds and thousands of businesses within reach of each of the key economic centres of the North by public transport. By 2050 in a transformed North, nearly 10 million people in the North will be within 90 minutes reach of multiple economic centres in the North.
- Help treble the number of businesses able to access four or more cities or Manchester Airport within 90 minutes, from 70,000 today to 260,000 with Northern Powerhouse Rail.
- Deliver significant benefits to the North's economy and rebalance the UK by closing the productivity gap between the North and the rest of the country.
- Ensure that growth is delivered sustainably, building the market for rail travel by around four times the level seen today and taking up to 64,000 car trips off the road – equivalent to 800 million km per year.

Major Road Network for the North

Over 80% of commuting trips and 87% of freight movements use the road network in the North, which equates to more than 120.4 billion km travelled across the North's road network every year.

Whilst total traffic volumes are greatest on roads operated and managed by Highways England, known as the Strategic Road Network, this network only

accounts for 2% of the road network in the North. Almost all road journeys start and finish on local roads, including those first and last miles of a journey that can determine whether goods or people make it in time and as efficiently as possible. Hence a focus on the existing Strategic Road Network alone will not support transformational economic growth.

TfN and Partners have identified a Major Road Network for the North – a network consisting of the North’s economically important roads. This network, which includes both strategic and important local roads, represents about 7% of the roads in the North, and links the North’s important centres of economic activity. The ambition is for the Major Road Network in the North to act as a seamless network of roads, enabling safe, reliable and resilient multimodal journeys.

Although managed separately by Highways England and Local Transport and Highway Authorities, TfN will ensure that evidence gathering, network planning, the provision of journey information, traffic and performance management decisions are all developed and delivered collaboratively. This will ensure a fully rounded approach to achieving a better ‘whole journey’ travel experience, and improved safety, economic, environmental and community outcomes.

TfN has agreed pan-Northern conditional outputs against which the performance of the Major Road Network will be monitored as the data becomes available. These include:

- Journey reliability – where 90% of journeys of 15 miles or more on the Major Road Network should be delayed by no more than 15 minutes for a journey of 60 minutes expected travel time.
- Network efficiency – aiming to optimise the efficient flow of passengers and goods on the Major Road Network and through the improved flow of traffic, and support for new technologies to reduce emissions of pollutants and greenhouse gases.
- Network resilience – aiming to reduce the number of incidences of closure of Major Road Network routes leading to severe journey delay.
- Journey quality – improving the customer experience of using the Major Road Network, including the quality and availability of travel information.

TfN will also explore options for reducing the impact of road-based travel on the environment, air quality and carbon emissions, including exploring how Highways England’s Air Quality Strategy could be expanded to cover the Major Road Network through future investment on the network. Inter-urban road schemes will need to be assessed in terms of their impact on the urban areas that they serve.

Through influencing travel behaviour, supporting higher quality design and adapting to innovative technologies, such as electric vehicles, the Major Road Network can be improved, managed and adapted for the future to support a sustainable Northern economy. For example, this includes plans for investment in electric vehicle charging points, options for shifting more freight from road onto rail and support for bringing forward emerging technologies such as connected and autonomous vehicles.

Strategic Development Corridors

If the Strategic Transport Plan is to truly support transformational economic growth, the starting point cannot be strategic rail or major road. It must instead be based around the need to connect the North's economic assets and clusters.

Using an innovative and different approach, while building on the work to date, TfN has identified and is taking forward a series of Strategic Development Corridors. These are currently seven geographic corridors that reflect the economic links across the North, as well as links with its neighbours in Scotland, Wales and the Midlands. They are not traditional transport corridors, but economic eco-systems where the evidence to date suggests most progress towards the transformational growth scenario would be made by bringing forward major, strategic rail and road investment over the lifetime of the Strategic Transport Plan.

Each of the Strategic Development Corridors will have a different scale of contribution towards achieving the outcomes of transformational economic growth and therefore different transport needs. However, investment in all of the corridors is critical to the collective ambitions of TfN and Partners.

The corridors are by no means where all future investment should be concentrated, but represent where the largest gaps between demand and performance currently exist, and also where there is likely to be the greatest economic potential for agglomeration between the economic assets and clusters across the North.

The seven Strategic Development Corridors are:

- Connecting the Energy Coasts – Improving connectivity for people and goods between the nationally significant non-carbon energy and research assets located in Cumbria, Lancashire, North Yorkshire, the North East, and Tees Valley.
- West and Wales – Improving connectivity, for people and goods, to, from and through the important economic centres and assets of Cheshire, Liverpool City Region and Greater Manchester, with strategic connectivity in to North Wales and the Midlands.
- Central Pennines – Improving strategic east-west connectivity for some of the North's important economic centres and assets in North Yorkshire, West Yorkshire, East Riding and Hull and Humber through to Greater Manchester, Lancashire and Liverpool City Region.
- Southern Pennines – Improving the strategic East-West, multimodal connectivity between the important economic centres, assets and ports within Liverpool City Region, Greater Manchester, Cheshire, Sheffield City Region, East Riding and Hull and Humber, as well as cross-border movements to the Midlands.
- West Coast - Sheffield City Region – Strengthening rail connectivity between the economic centres on the West Coast corridor including the advanced manufacturing clusters and assets in Cheshire East, Warrington, Cumbria, Lancashire, Greater Manchester and Sheffield City Region, with improved connectivity from the North in to Scotland and the Midlands.

- East Coast - Scotland – Strengthening rail connectivity and capacity along the East Coast Main Line and other key parallel rail lines, such as the Durham Coast Line, to provide enhanced strategic and local connectivity in the North of Tyne, the North East, Tees Valley, City of York, Sheffield City Region, and North Yorkshire.
- Yorkshire - Scotland – Strengthening road connectivity between the Midlands, the Sheffield City Region, West Yorkshire, North Yorkshire, East Riding, North East Lincolnshire, Tees Valley, the North East, the North of Tyne, and Scotland, building on the existing road investment commitments.

For each Strategic Development Corridor, we have identified a series of transport interventions required to sustain the future economy of the North between now and 2050, and these have informed the Investment Programme that accompanies the Strategic Transport Plan. The proposed interventions are supported by a significant volume of evidence gathered from stakeholders, through innovative modelling and appraisal, considering current and future planning proposals, including housing and nationally significant projects, emerging technologies, potential policy changes, environmental constraints and deliverability challenges.

The next stage of work in each corridor is to take forward the interventions to develop a true pipeline of strategic transport interventions that will support the delivery of the pan-Northern transport objectives, aligned with national policy, such as the Industrial Strategy, and local stakeholders' plans, including spatial plans and housing growth proposals.

How? Delivering the required interventions

Delivering the interventions derived through the Strategic Transport Plan and set out in the Investment Programme will require many facets and numerous organisations, both public and private. It will also require co-ordination with areas that are non-transport related, particularly in the medium to longer term.

Funding

TfN's initial Investment Programme that accompanies this Strategic Transport Plan identifies a funding requirement for strategic transport of around £60-70 billion during the period to 2050. Based on current estimates therefore, an average of £2.0-2.3 billion will need to be spent on strategic road and rail infrastructure in the North per annum to deliver the required interventions to the transport system that will allow it to facilitate transformational economic growth.

Assuming the levels of committed strategic transport funding, primarily through Highways England's Road Investment Strategy and Network Rail's Control Period, in this Parliamentary cycle are continued from 2020 through to 2050, this could equate to around £39-43 billion investment in the North. This means that additional expenditure of £21-27 billion would be required over the period for TfN to achieve improvements set out in the Investment Programme. TfN and its Partners consider this to be an ambitious but realistic scale of programme.

Transformational growth in the North can only be delivered by a step-change in city-to-city and town to-city connectivity. All modes have a role to play here, but it is expected that a key role will be played by rail, which is best suited to moving large numbers of people quickly and reliably between key centres. Thus, a significant focus of TfN's investment over the lifetime of the Strategic Transport Plan will be in putting in place the rail infrastructure needed to bring about these changes.

This scale of the investment is in line with the fiscal remit for the National Infrastructure Commission set by HM Treasury, which is itself benchmarked against other countries' commitment to strategic infrastructure, as set out in the National Infrastructure Assessment. However, increased investment in strategic transport infrastructure needs to be matched with an increase in spend for transport within towns and cities, in line with the Commission's proposals for devolved cities and non-urban local transport to receive a significant uplift in funding from 2025 onwards. This will be in addition to the level of strategic transport investment identified previously, bringing the total requirement in transport to £100-120 billion between 2020 and 2050.

TfN has developed a Funding Framework that sets out the parameters within which the allocation and management of the financial resources required to deliver the objectives of the Strategic Transport Plan 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. There will, however, be opportunities for private sector investment within the Investment Programme, such as market-led rail proposals and a number of combined transport and energy proposals.

In the short term, TfN will need to work with the mechanisms that are currently in place to ensure that the right schemes are funded at the right time. This would very much be business as usual, based on current powers and operating paradigms to influence central decision making, but limited to a largely advisory capacity (albeit in the context of a statutory body).

TfN is seeking to move to the position where it becomes responsible for a combined regulatory settlement for strategic transport investment in the North. Such an approach will require discussion and agreement with Government. In addition, TfN will need to consider what, if any, governance changes would need to be made in order to allow it to fulfil this role.

Analytical Framework

As the Strategic Transport Plan sets out, TfN requires strong evidence and analysis to make the case for transformational investment in the North's strategic transport network. Working with Partners and the Department for Transport, significant progress has been made in developing a new Analytical Framework.

Creating compelling evidence that shows how transport infrastructure investment can transform the North's economy requires existing modelling tools to be strengthened and also augmented with new approaches that help to

present the case for a transformed Northern economy. Modelling within the Analytical Framework focuses on two key tools:

- Northern Economy and Land Use Model (NELUM).
- Northern Transport Modelling System (NorTMS).

In establishing and using the Analytical Framework, TfN will continue to be guided by the HM Treasury Green Book and the Department for Transport's WebTAG for programme and scheme development, to ensure consistency of approach with the Department and other promoters. TfN will also ensure the development of the Rebalancing Toolkit is dynamic and considers interventions more strategically.

TfN wants to embed sustainable return on investment and social value in the procurement and development of any transport intervention. This should be an element of a total value approach as part of a more sustainable way of developing, constructing, and operating infrastructure. This approach will be further scoped and implemented through the development of TfN's Inclusive and Sustainable Growth Framework.

Spatial planning

Transport investment is transformative in the role it plays in determining where people and business choose to locate and grow. Transport is a derived demand, and much of that demand will be influenced by where people choose to live and work.

There are currently around 6.5 million households in the North, but there is a new housing delivery challenge. Analysis by Homes for the North shows that at least 50,000 new homes are required every year for the next decade across the North to keep up with projected demand and in the future, there will need to be a more diverse, affordable market to house the present population and that of the future.

TfN wants to build a collaborative and constructive relationship with the North's Local Planning Authorities, to ensure that the right sustainable developments, spaces and places are unlocked and delivered across the North to support inclusive, sustainable growth. TfN will also provide its evidence base and NELUM model, to support Local Planning Authorities as they develop their local plans and strategies.

Innovation, technology and research

TfN wants to harness innovative measures and encourage smart technology to support the delivery of its pan-Northern objectives. By embracing innovative solutions now, TfN can influence future infrastructure and transport connectivity captured by long term planning.

Innovation also has the potential to increase the capacity and capabilities of the North's transport connectivity now and there is a need to take swift action to support the existing infrastructure. Innovation also encourages the uptake of

new solutions which can deliver efficiency and flexibility across our transport networks.

The transport sector has seen significant innovations over recent decades and our future mobility will likely be further influenced by a number of global trends and behaviours including demographic challenges, social change, the protection of the environment, and economic and political landscapes. As mobility evolves into a more on-demand and flexible service to meet the needs of the user, these trends pose both risks and opportunities which will require strategic planning.

Future mobility will likely be achieved through the combination of technology trends such as shared mobility, automated and connected systems and electrification (or other low carbon energy options) with a focus on integration of energy systems, public transport and infrastructure.

To ensure TfN's plans are informed, challenged, and proactive but flexible to the latest innovation changes and uncertainties, there needs to be collaboration with a variety of organisations.

Northern transport skills

Improving education and skills to support economic prosperity is a priority at a national and local level. Analysis shows that demand for highly skilled workers in the transport sector has increased which has led to the creation of specialist colleges and training facilities within and connected to transport. There will be high demand across some key skills sets and high competition across sectors. Currently the skills provision is fragmented and not targeted, there is little emphasis on transport as a sector outside of rail.

TfN will work closely with delivery agencies as well as the broader transport industry to ensure a joined-up approach to skills. In delivering the Investment Programme, the focus will be on maximising social value for local areas, a sustainable pipeline of skills, and diversity within the workforce.

Conclusion

The Strategic Transport Plan and its supporting Investment Programme marks the first time TfN has undertaken its statutory requirement to submit advice to Government. However, TfN recognises that these are changing economic times. Some of TfN's Partners are also in the process of updating their transport strategies, and developing local industrial strategies. Building the evolving and maturing analysis and evidence base, and any potential governance changes, TfN will look to refresh the Strategic Transport Plan by 2022. The refresh will also be timed to fit within industry planning processes. This will ensure that TfN is positioned to influence policy and investment decisions with a robust, evidence based and up-to-date plan that makes the case for continued investment. TfN will monitor progress with delivery of the Investment Programme. A review of the initial programme will take place in late 2019 as part of the Government's Spending Review and then periodically after that, no more than annually.

TfN is committed to continued engagement with stakeholders across the North. With any revision of the Strategic Transport Plan we will undertake

comprehensive consultation to ensure the Plan continues to reflect and promote the case for strategic transport investment in the North.

Introduction

About Transport for the North

Transport for the North (TfN) is the voice of the North of England for transport; a statutory body of elected leaders, and a partnership of business leaders, from across the whole of the North of England who collectively represent all of the region's 15 million citizens.

The North has a wealth of high profile and growing national and international businesses, and a rich and diverse set of assets and talent. The quality of life in the North underpins its attractiveness as a place to live, visit and invest in, with a varied sport and cultural offer, and access to spectacular coastlines and countryside, including some of the most iconic places in the UK.

TfN's vision is of a thriving North of England where world class transport supports sustainable economic growth and improved health and opportunities for all. As England's first sub-national transport body, TfN was established to transform the transport system across the North of England, and has a clear remit to identify, make decisions on, and plan the transport infrastructure required to support transformational economic growth in the North.

Complementing the work of existing local transport authorities and with powers devolved down from central Government rather than up from local Government, our role is to add value, ensuring that funding and strategic decisions about transport in the North are informed by local knowledge, expertise and requirements.

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

The success of the UK in the global marketplace depends upon transforming the economy of the North of England. Whilst London remains the UK's main contributor to economic performance, the North of England has areas of substantial performance above the UK average, but also areas of weaker performance that need to be addressed.

A vision for a transformed North was set out in the Northern Powerhouse Independent Economic Review. It concluded that transformational growth will require investment and improved performance in a number of critical areas, especially education, skills, health, innovation and inward investment, alongside improved transport infrastructure and services for passengers and freight, which needed to be in place to support the delivery of major growth proposals.

The statutory powers that have been granted allow and require TfN to:

- Develop and implement a Strategic Transport Plan for the North of England.
- Act as 'one voice' for the North, clearly communicating pan-Northern priorities to the Secretary of State for Transport.
- Coordinate and deliver smart ticketing systems across the North.

- Become a statutory partner in road and rail investment decisions, through the Rail North Partnership and Highways North Board.
- Oversee (jointly with the Department for Transport) franchised rail services covering Northern and TransPennine Express franchises.
- Promote highways improvements of Northern significance, with the agreement of Government and relevant local transport and highway authorities.
- Prioritise investment on the transport network.

The Northern Powerhouse Independent Economic Review also established that a transformed North could see an additional 850,000 jobs and almost £100 billion additional Gross Value Added (GVA), over and above 'business as usual' trends, by 2050.

It is crucial that the productivity gap, which is holding back growth in the North, is reduced to ensure that all of the North performs as well as the rest of the UK. A step-change in strategic transport infrastructure investment is a vital enabler to achieve the North's economic aspirations – establishing a value-for-money investment programme, within an ambitious but realistic funding envelope, is TfN's primary responsibility and the key outcome of the Strategic Transport Plan.

MAP - Local Transport Authorities of Transport for the North (TfN)

Scope of the Strategic Transport Plan

The people of the North are at the heart of this Strategic Transport Plan. An effective, efficient Northern transport network is a fundamental part of everyday life – 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. A transport 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 for the UK.

Better connections at a pan-Northern level, particularly between the North's existing and future economic assets, will create jobs and generate growth. To realise the benefits of agglomeration, the North requires its networks of railways and major roads to provide effective, resilient and reliable connections. These connections should meet a series of conditional outputs or standards of journey time and frequency set by the North. Sufficient capacity will also be required to accommodate the increased passenger and freight travel demand that growth will bring.

This Strategic Transport Plan provides an opportunity to drive major improvements in strategic connectivity throughout the North, taking a pan-Northern view for the first time. It will encourage trade and inward investment by improving links to the North's ports and airports, and faster links between the economic assets that they serve. This will make the North a more attractive place for businesses to invest and to base themselves, and will encourage shipping companies, airlines and the freight and logistics industry to better serve our ports and airports. It will also support the aspirations of the North's visitor and tourism economy. It signals an opportunity to invest in the people who live in the North to improve living standards, health, productivity and opportunities for all.

TfN recognises that it is the whole 'door-to-door' journey that matters. For our transport systems to work efficiently and effectively, it is crucial that pan-Northern road and rail networks are well integrated with local roads and public transport, as well as walking and cycling networks.

Whilst interventions to support local roads, local public transport, walking and cycling will mostly be made at a local level, these can reduce congestion and are essential in creating a more integrated, healthy, and resilient overall transport system, and so are vital to achieving transformational growth across the North. The management and delivery of such improvements are vital to the North's transport system and to achieving our economic, health, social and environmental targets, but they are not solely within our remit.

It is therefore crucial that all of our Partners work together to deliver a transport system that promotes social inclusion and improves the health outcomes and quality of life for communities across the North. It is also important to meet our objectives for an improved environment and contribute to national and international targets on carbon reduction, clean air and protection of natural species and habitats.

By producing an integrated, aligned pan-northern Strategic Transport Plan, TfN has the opportunity to support local aspirations for more sustainable, innovative, efficient local transport networks. However, the focus of this Strategic Transport Plan is on identifying and securing the investment needed to provide the North of England with a transport network which links both with local transport infrastructure and with strategic national schemes like HS2. This is illustrated on the opposite page.

The role of Transport for the North

- Local Transport Authorities - Managing and investing in local transport networks within economic clusters, such as investment in local roads, cycling, walking, and buses, and in some cases light rail.
- Transport for the North - Setting out the case and priorities for connecting different economic clusters, ports, and airports across the whole of the North. TfN's 'blue print' for road and rail investment will enhance strategic pan-Northern connectivity, complementing local transport investment to improve the 'whole journey'.
- National connectivity - Working with the Department for Transport and the North's cross-border authorities, the pan-Northern investments will support enhanced connectivity across the UK.

The Plan will advocate investment to remove transport constraints at stations and will support the role of major transport hubs by acting as a catalyst for economic growth.

Evidence shows that a step-change in economic growth in the North can only be achieved through significant improvements in transport connectivity between labour markets and our economic assets, combined with increases in the skills level and productivity of the North's workforce. It will take a joint effort across public and private sector Partners to achieve our ambition of a transformed economy, but TfN is building a better understanding of current and future labour market and supply chain trends and how these will impact on transport demand. Understanding and supporting the needs of the North's freight and logistics sector and our international gateways will be vital.

TfN recognises that the influence of this Strategic Transport Plan should not be constrained by borders. TfN has sought to create and maintain strong relationships with the North's neighbours, principally Transport Scotland, the Welsh Government and Midlands Connect. This will ensure cross-border connections and issues are properly considered, including in matters relating to sustainability, and TfN is looking forward to working with neighbours to secure the investment that is critical to nurturing a stronger and more sustainable UK economy.

TfN will continue to work closely and collaboratively with other successful existing partnerships and networks. These include the NP11, N8 Research Partnership, TechNorth, the Institute for Transport Studies, Campaign for Better Transport, the Northern Powerhouse Partnership, IPPR North, and others to ensure TfN's vision and objectives are delivered. The North should be at the

forefront of the application of innovation and new technology to achieve our vision.

The Strategic Transport Plan has a horizon year of 2050 to align with the Northern Powerhouse Independent Economic Review and to enable the development of a long-term transport investment programme for the North. This will mean that TfN and its Partners can work with Government to secure funding and delivery of the right schemes, in the right place, at the right time, providing certainty for local transport authorities to plan complementary investments and also for the private sector to plan commercial investments. The pipeline of investment will give businesses across the North confidence to invest and grow, and give the supply chain, including SMEs, the confidence to plan interventions, build up their skills base and collaborate across industries.

TfN is grateful for the efforts and contributions of all our Partners to help make this Plan a reality, and all those who responded to the consultation on the Draft Plan. TfN has built upon the research and experience of Partners and engaged with them throughout the process to ensure there is agreement on the way forward, and the Plan has benefited from significant input from key stakeholders in the private sector. Together, with one voice, TfN and this Strategic Transport Plan can help deliver the transport network that the people of the North need and deserve.

Our vision and pan-Northern transport objectives

Vision

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

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

This 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 as a result of 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. TfN will also promote measures that help support modal shift and make the best of our existing networks, exploring new technologies and demand management tools that help to maximise network efficiency.

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.

Improving inclusivity, health, and access to opportunities for all

The Strategic Transport Plan 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 an individual's age, income level, location and mobility. Promoting active and sustainable travel will improve people's health, reduce air pollution and improve the environment. A carefully co-ordinated approach is required to ensure strategic and local transport investment programmes and policies are aligned and complementary.

Promoting and enhancing the built, historic, and natural environment

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 pollutant 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 net environmental gains where possible. Promoting access to the natural and green environment will also promote physical and mental health.

Why? The case for change

The North is home to around 1.1 million businesses¹, more than 7.7 million jobs², and over 15 million people, with population growth of 6.7%³.

Quality of life in the North underpins its economic strengths. In particular, it provides more housing that is affordable, with 18 out of 20 affordable places for housing⁴ in England. The average house price in the North is £158,000 compared to £482,000 in London and £328,000 in the South East⁵. In addition to the affordable cost of living in the North, quality of life is enhanced by the vast range of cultural, historic and natural assets.

The North has a wealth of high-profile, growing UK-wide and international businesses, and a long history of innovation, utilising the rich and diverse set of assets and talent to support national growth. Over the last decade the North's economy has grown by over £66 billion and the North continues to contribute strongly to the UK economy. In 2017 the North contributed over £340 billion, equivalent to 20%, to the UK economy⁶.

To put this in to context, if the North were a country, its economy would be the 27th largest in the World (on par with the likes of Austria and Norway) and the 10th largest European economy.

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. Most recent data reveals that gap has widened further, with the economic value (GVA) per person in the North now 18% below the UK average. The widening gap can be attributed to the North generally experiencing slower GVA growth rates over the last decade compared to the UK average⁷.

Productivity matters because it is the main determinant of living standards – lower productivity results in lower wages and living standards for those living in the North, therefore increasing productivity is considered the only sustainable way of improving living standards in the long term.

The success of the UK in the global marketplace and the success of the Government's Northern Powerhouse Strategy and Industrial Strategy depends upon transforming the economy of the North.

Infographics - The North today

£343bn GVA (19% of UK total)⁹

265 towns¹⁰

Six of the most populous urban areas in the UK¹¹

£158,365 average house price¹²

73% employment¹³

7 international airports¹⁴
43.7m annual air passengers from Northern airports¹⁵
28 universities in the North, with 523,000 students¹⁶
3 county councils¹⁷
4.6% unemployment rate¹⁸
9 major ports¹⁹
5 National Parks²⁰
77% activity rate²¹
6 UNESCO World Heritage Sites²²
7.78 million job²³
10 unitary authorities
37 district councils²⁴
15.4 million people²⁵
11 Local Enterprise Partnerships²⁶
7 Combined Authorities²⁷

The productivity puzzle

The success of the UK in the global marketplace and the success of the Government's Northern Powerhouse Strategy and Industrial Strategy depends upon transforming the economy of the North.

At the heart of this is a significant disparity between the economic performance of the North compared to London and the South East. For those living in the North, this equates to £4,750 lower disposable household income compared to the rest of England²⁸. This means that the UK is the most unequal Northern European country in terms of income inequalities, with income disparities between different regions one of the starkest²⁹.

In all regions of the UK except London, Government expenditure exceeds tax receipts, leading to an annual budget deficit. In the North, the current budget deficit is around £65 billion³⁰. As a result of the fiscal deficit, currently 15p in every £1 spent by the Government in England is borrowed³¹. Therefore, a more productive North has the potential to contribute more to the Exchequer, thus reducing the North's deficit.

The effects of the North's persistent underperformance relative to the rest of England manifests in real terms in the form of lower-than-average wages for workers, which has multiple and adverse knock-on impacts on health and social welfare issues, such as benefit dependency, increased health and social care costs, and lower aspirational motivations. Typically, areas with low attainment

levels have higher economic inactivity and unemployment counts, as is the case in the North. By contrast, investment in health-promoting built environments and education provide a return on investment through a healthy, skilled and motivated workforce, leading to improved productivity.

Index of Multiple Deprivation (IMD) data shows that 14 of the 20 English towns and cities with the highest levels of deprivation are in the North³². Furthermore, 14 of the 20 English local authorities with the lowest healthy life expectancy³³ (both male and female) are also found in the North. Boosting the economy of the North would reduce the deficit highlighted above, by reducing work-related welfare benefits and by increasing real wages and spending power.

Inequalities in health are also clearly visible between regions, as health in the North is significantly poorer than the rest of the country. For example, a baby born today in Richmond upon Thames can expect to have 15-16 more years of good health than a baby born in Manchester³⁴. Those living in poverty in the North, even if compared to similar areas of deprivation in the South, generally experience worse health. In addition, the difference in health outcomes between the most and least affluent within the North is much greater than elsewhere in the country³⁵. Mental and physical health is dependent on socio-economic, cultural and environmental factors, which in turn can be improved to benefit the health of the population.

Average annual earnings³⁶

North – £27,104

London - £35,716

England average - £29,869

Educational attainment³⁷

Low skill (NVQ1)

North – 84%

London – 84%

England average – 86%

High skill (NVQ4+)

North – 33%

London – 52%

England average – 38%

Economic inactivity³⁸

North - 23%

London - 22%

England average - 21%

The North's environmental assets

The North has strong diversity in its spaces and places, both built and natural. These vary greatly, and range from upland moorlands, valleys, low lying plains, to the numerous estuaries and coastal areas. Across the North there are a full range of settlements from isolated farmsteads and the smallest hamlets, to some of the largest urban conurbations in the UK. This provides opportunities, but also some challenges for the North's economy and the transport network.

Across the North there are areas that are recognised as nationally and internationally significant for the heritage that they provide, including World Heritage Sites. These sites are also joined in the North by a wide range of other cultural heritage features and large areas designated for the highest nature conservation value, such as:

- 5 National Parks.
- 74,000 listed buildings.
- 16 registered battlefields.
- 354 registered parks and gardens.
- Around 5,800 scheduled monuments.
- Around 7,800 Ancient Woodlands.
- Around 80 Special Protection Areas.
- Around 250 Special Areas of Conservation.
- 60 Ramsar sites.

Additionally, there are numerous Sites of Special Scientific Interest (SSSI), National Nature Reserves and Local Nature Reserves which were established to protect some of the UK's most important habitats, species and geology. All of these features receive and require protection due to their continuous link with the North's past, and the sense of place which they help to engender.

For the built environment, there are a mix of land use types across the North, including heavily urbanised, suburban, urban fringe and rural locations. This also reflects the labour markets and segmentation of people who live in these areas. This pattern of land use has resulted in large parts being very quiet and peaceful, noted for their dark skies at night, but there are also significant large built-up areas, particularly those close to urban areas.

The North's environmental assets If not planned and designed properly, there can be profound implications for the built and natural environment from transport interventions, threatening the high quality environment and strong sense of place that have defined the North. A strong sense of place is becoming increasingly recognised as being key to attracting and retaining the best businesses and skilled workers.

The transport network can impact on the environment in numerous ways. Key threats from a transport network to biodiversity have been identified from air pollution and climate change, which can change distribution of species and habitats.

New transport interventions have the potential to impact on sites of ecological or geological value, and more generally on the network of linked multi-functional

green spaces, such as green local infrastructure, through direct land take. This may contribute to fragmentation, and construction and operational disturbance and emissions/contamination. There can also be impacts to the cultural heritage of an area, with direct loss of features, or detrimental impacts on their setting. Impacts should be fully mitigated to provide opportunities for protection and/or enhancements to the environment in which they are located.

Physical modifications to watercourses, along with pollution from transport networks, are recognised as being particular threats to water bodies, including groundwater, in the North. Pollution incidents can occur directly, or through rainwater draining from roads and pavements carrying pollutants.

Transport investment can, and should, provide opportunities for increased biodiversity, or to aid certain species, as noted in the range of policies developed by Defra and Highways England relating to Pollinators. It is a challenge for TfN and Partners to ensure that improvements to transport networks do not produce unacceptable environmental impacts.

The North's social context

The North's population is as rich and diverse as the landscapes in which they live. For the most part, the ethnicity of the North is white, though there are significant numbers of Black and Minority Ethnic, Asian and Asian British citizens in communities across the North.

The North is also diverse with a mix of affluent and deprived communities, in both urban and rural areas.

Data from the Department for Work and Pensions (DWP) showed that across the North, 3.5% of the population claim Disability Living Allowance (2.4% nationally) and 1% claim Job Seekers Allowance (0.8% nationally). The proportion of claimants varies across different parts of the North³⁹.

The health of the North's population is also mixed and, as with other areas across the UK, the poorest health is often aligned with those areas of greatest deprivation. People reporting as being in 'bad' or 'very bad' health are highest in Liverpool and the North East (8% of the population), whilst Cheshire and Warrington, York, North Yorkshire, and East Riding have fewer people (5% of the population) in these categories. Physical activity figures (including those for walking and cycling) also reflect the above indices, with areas such as Liverpool and Tees Valley being less active, whilst Warrington, York, and Cheshire tend to be more active⁴⁰.

ONS data shows that average life expectancy in England for someone born between 2009 and 2013 is 83 years old for females, and 79 for males. In the North, life expectancy is one year less for both genders. Male life expectancy is on average another year lower for males in Greater Manchester and Liverpool City Region⁴¹.

Local air pollution can cause significant harm to health and the environment. The most dangerous pollutants are NO₂ and particulates, small particles which are harmful even in low concentrations. These pollutants contribute to respiratory

illness, as well as cardio-vascular issues and cancer, and can lead to early death. Poor air quality due to transport issues (mainly emissions from cars) is reflected in the designation of a number of Air Quality Management Areas across the North – these are for the most part within urban areas and along major roads.

In addition to health problems caused by air pollution, the transport network can also cause health issues through the direct risk of accidents, as well as more indirect effects on people's health and wellbeing, such as stress caused by noise, vibration and light pollution. For example, consistently high levels of noise have been shown to cause hearing impairment, hypertension, ischemic heart disease, stress and sleep disturbance.

People's wellbeing can also be adversely impacted by a reduction in a sense of place. This can be caused by vehicle emissions leading to dirty deposits on buildings and the corrosion of some building materials. The transport network and the associated high levels of traffic can also cause severance that can make it difficult or prevent people from easily accessing the services that they require in their local area.

High levels of traffic may also reduce opportunities for physical activity, for example by making it unpleasant or dangerous to walk or cycle along a route, or even by causing the perception of danger. As well as this reduction in physical activity having a direct effect in terms of health through measures such as obesity, it also helps to prevent people enjoying their locale and can also lead to reduced social cohesion.

It is a challenge for TfN and Partners to ensure that improvements to transport networks do not produce unacceptable social impacts, and that inclusive transformational growth improves people's lives across the North.

A changing economic landscape

Businesses play a crucial role in addressing the North's economic challenges. A successful economy provides confidence that generates capital investment, business start-ups and stronger supply chains, which in turn leads to job creation and increased opportunities.

In 2018, the North attracted 315 new foreign-owned businesses, bringing with them significant investment into the North, creating almost 10,700 new jobs. However, this represents just 15% of all inward investment projects secured throughout the UK⁴².

Business start-ups are a good measure of confidence, and in 2016 79,000 new businesses started in the North, which represented 23% of all new businesses in England⁴³, and a strong year-on-year growth of 14%. As businesses operate within competitive markets there will always be those that close, and the North has the second highest business closure rate nationally, at around 21%⁴⁴.

In terms of employment, the map opposite shows the spatial distribution of employment across the North in 2016. There is a concentration of employment in the counties of West Yorkshire, South Yorkshire, Lancashire, Greater Manchester and Merseyside, which between them contain 65% of all employment in the North, yet comprise only 23% of the total spatial area⁴⁵.

It should be recognised that strong regional economies require strongly performing towns and cities at their heart. The benefits of a large economy are only achieved when combined with the concentration of economic activity in specific places, such as towns and cities. Concentrations, especially in financial and professional services and knowledge-based businesses, not only tend to employ more highly skilled and higher paid workers, but also provide benefits to supporting employment in retail and leisure sectors. Towns and cities are also developing to increase the densification of office and residential properties.

Many small and medium-sized towns and cities are growing at the same pace, or even faster than their core city neighbours in the North⁴⁶, particularly where local economic clusters exist that can complement the larger urban areas. However, other small and medium sized towns and cities have struggled to deal with de-industrialisation and have fewer opportunities for collaboration and interaction. Poor connectivity is frequently a major factor in such areas becoming peripheral.

Some parts of the counties of Cumbria, North Yorkshire and Northumberland have lower levels of employment density, reflecting their predominantly rural nature⁴⁷, but the rural economy is still an important part of the North's economic make up. More than 2.1 million people in the North live in communities officially classified as rural, accounting for around 14% of the total population, and more than 121,000 businesses operate from the rural North⁴⁸.

Many of these businesses are demonstrating vision, ambitions and the ability to grow. These aspirations can also be supported by enhanced strategic pan-Northern connectivity.

Agglomeration benefits

The greatest change is expected for highly skilled workers, which could see cross boundary commuting increase to over 70% of workers.

The fundamental challenge for the North's economy is to improve the economic interaction between the key economic assets and clusters of the North to improve the sharing of knowledge, supply chains, resources, and innovation to drive agglomeration benefits and productivity. Investment in digital technology and other complementary infrastructure, such as superfast broadband, will support the North's businesses to connect more widely and become more productive, as will improved physical connectivity of the North's towns, cities, and international gateways. This will support and create agglomeration economies centred on areas of commercial and industrial specialisation.

Different areas of the North have distinct strengths, so the challenge is to understand and identify how transport investment can be used to support the strengths, or overcome the weaknesses, of a particular area.

Over 70% of the UK's population live in urban areas, one of the highest across Organisation for Economic Co-operation and Development (OECD) countries⁵⁰. Towns and cities are hubs of activity, where highly skilled and knowledge intensive employment is predominantly concentrated, with 73% of the UK's knowledge intensive business jobs (KIBS), such as finance, law and accounting located in cities⁵¹.

The North's towns and cities are almost unique in terms of their size and spatial proximity with four large cities within less than 80 miles of each other. The North has been identified as potentially one of the most polycentric regions in Europe, where the geography means it has numerous large towns and cities in close proximity to each other.

A lack of agglomeration is frequently cited as a reason for the North's performance gap with the rest of England, with Northern cities unable to take full advantage of positive externalities from the spatial concentration of economic activities, such as increased supply chains and labour demand.

At present connectivity between the North's towns and cities, and beyond, restricts growth and opportunities. Commuting between Manchester and Leeds is 40% lower than expected when compared to city pairs that are similar distances apart in the UK, with cost identified as the biggest driver⁵². The market for rail travel between other cities in the North is even less developed. For example, the number of journeys between Manchester and Sheffield, and Leeds and Sheffield, is relatively small given the size of these cities at just 500 and 2,000 rail commuters per day, respectively.

Better transport connectivity increases the physical proximity of firms, workers and consumers and concentrates economic activity in clusters. Improving

transport connections between the North's cities, towns, economic centres, infrastructure and assets allows for greater opportunities for employment, collaboration and knowledge sharing.

The benefits of agglomeration⁵³

Collectively these are the benefits of agglomeration:

- Matching - Ability to recruit from a deep pool of workers with relevant skills
- Sharing - Ability to share inputs, supply chains and infrastructure
- Learning - Ability to exchange ideas and information

The majority of the North's workers live and work in the same local authority district. Without transformational investment in the North, these commuting patterns are not expected to significantly change in the future. However, in a transformed North, the proportion of workers taking employment outside of their home district is expected to markedly increase, from around 35% of workers in 2015 to almost 60% by 2050. The greatest change is expected for highly skilled workers, which could see cross boundary commuting increase to over 70% of workers⁵⁴. These forecasts are a result of transformational investment in the transport system, but also growth in the North's prime and enabling capabilities, which support the benefits of agglomeration.

Whilst each city is already in relative proximity to each other (around 40-50 miles apart, with the exception of Newcastle), at present there is limited interaction between cities in the North. Increasing the effective density of each individual city, through improved transport links for example, could help foster greater agglomeration and boost productivity in those cities. Doubling the size of a city alone can increase productivity by 3-8%⁵⁵. Creating more dynamic places where people and businesses thrive will be an important factor in boosting productivity and jobs, and realising the economic opportunity of the North's economy.

Delivering agglomeration benefits in a polycentric system that also has significant rural areas is a challenge, as each area would ordinarily compete for growth and investment, driven in part by existing governance and competitive funding regimes. It is also a challenge to ensure that transport networks do not produce unacceptable environmental and social impacts.

The Northern Powerhouse's role in the UK economy

Inclusive and more balanced growth is a key priority for the Government and Local Authorities in the North, and this is particularly important for places that may not have performed as well over the last few decades.

The Government's Industrial Strategy is committed to creating prosperous communities throughout the UK by strengthening local leadership and developing local Industrial Strategies, fostering better collaboration across the North's economic geographies, and providing high quality infrastructure at the local, regional and national level.

Future investment in the North's transport network must be considered in the wider context of the UK's productivity challenge, and the long-term opportunities for a more balanced UK and Northern economy.

The Northern Powerhouse Independent Economic Review identified the North's current economic position and the factors constraining its performance, specifically:

- Employment gap: higher levels of unemployment in the North.
- Productivity gap: less productive workforce.
- Insufficient high skill opportunities.
- Not enough exploitation of innovation and technology.
- Lower levels of investment.
- Lower levels of enterprise.
- Lack of agglomeration between economic centres across the North.
- Sub-optimal transport links and underinvestment in transport.

The Review set out a bold vision of economic transformation for the North that will rebalance the UK economy and increase international competitiveness. It articulated the vision of a transformed North and concluded that improving economic performance in the North could bring significant benefits for the UK economy by 2050 of:

- £97 billion (15%) increase in GVA.
- 850,000 additional jobs.
- 4% higher productivity than in a business as usual scenario⁵⁶.

The business as usual scenario assumes the future will be like the past, reflecting both historical experience and substantial levels of previous policy intervention and investment, as well as expected UK trends. This is distinct from a 'do nothing' scenario.

GRAPH – Annual GVA Growth rate gap (to rest of England)⁵⁷

The transformational scenario⁵⁸ assumes the North's future performance is transformed, relative to the past, and that progress is made in tackling the range of factors responsible for the performance gap.

Employment

2015 - 7.6 million

2050 Business as usual scenario - 8.3 million

2050 Transformational scenario (baseline for TfN) - 9.2 million

GVA (2011 prices)

2015 - 302 billion

2050 Business as usual scenario - 603 billion

2050 Transformational scenario (baseline for TfN) - 695 billion

The North's prime and enabling capabilities

The Northern Powerhouse Independent Economic Review identified that promoting and growing the North's four prime and three enabling capabilities could result in higher productivity and growth. These capabilities are already strongly performing sectors with committed investment in the North. They are highly skilled and productive sectors that are already competitive and will continue to compete nationally and internationally. As the map opposite shows, these capabilities are spread across the North.

The North stands on the cusp of the fourth industrial revolution and is ready to lead the world in modern industries, such as the prime and enabling capabilities; innovative, frontier industries. These are spread and clustered across the North, with businesses ranging from large multi-nationals to small and medium-sized enterprises (SMEs) that have been formed and grown in the North. The Government's Industrial Strategy also acknowledges the importance of these sectors and the value of the North's regional strengths.

Prime capabilities

Advanced manufacturing

The North has strengths in advanced manufacturing, including through highly productive, automated and digital manufacturing techniques and processes. There is also a strong presence of automotive manufacturing in the North. These include expertise in textiles, research and design, and metallic and non-metallic production processes. The GVA growth in advanced manufacturing is expected to increase from £33.4 billion to £58 billion between 2015 and 2050 (2011 prices). Productivity as measured by GVA per job is also expected to rise from £58,000 in 2015 to over £178,000 in 2050⁵⁹.

Health innovation

The North has a strong health innovation presence, with pioneering clinical research particularly in life sciences, cancer and ageing. The North exported £7.3 billion worth of pharmaceutical products in 2015, accounting for 45% of all

medicinal exports from the UK. The GVA growth predicted under the transformational scenario up to 2050 is a rise from £17.5 billion to £43 billion (2011 prices). This capability includes productivity GVA per job rising from £30,000 in 2015, to £67,000 in 2050⁶⁰.

Digital

The North has strengths in cognitive computation, simulation/modelling, financial technology, cyber security, high performance computing, data analytics (big data), and media. Seven of the UK's 27 key tech clusters are in the North. The GVA growth predicted to 2050 is a rise from £9.2 billion (2011 prices) to £41.1 billion, with productivity, as measured by GVA per job, rising from £49,000 in 2015 to £190,000 in 2050⁶².

Energy

More than 40% of England's energy is generated in the North, and in 2015 the North generated 31% of the UK's total renewable energy. The North's energy strengths include offshore wind, nuclear research and processing, new technologies including biomass and hydrogen, and electricity distribution. Developing new technologies for energy security, production, distribution, and storage is also crucial. The GVA growth in energy capability is predicted to grow from £8.9 billion in 2015, to £15.3 billion in 2050 (2011 prices). Productivity as measured by GVA per job is also expected to rise from £77,000 in 2015 to £170,000 in 2050⁶¹.

Enabling capabilities

Financial and professional services

Providing key business, legal, insurance and financial services that support the North's prime capabilities and perform important day-to-day functions which keep the wider economy functioning.

Logistics

Through significant private sector investment and innovation, airports, ports and wider logistics are delivering a more efficient Northern infrastructure. The North has existing capacity to relieve demand, drive economic growth and enhance Britain's international connections and trade links.

Education (primarily higher education)

Research capability and technical expertise that underpins the prime capabilities, provides access to global networks, and also provides a supply of skilled labour and export strengths.

*MAP - Distribution of the Prime and Enabling Capabilities around the North⁶³
(The map presents a sample of the largest employment areas for each of the prime and enabling capabilities using the Northern Powerhouse Independent Economic Review Standard Industrial Classification (SIC) codes and the UK Business Register and Employment Survey (BRES) employment data)*

MAP - Economic growth forecast for a transformed North by 2050⁶⁴

The prime and enabling capabilities combined create distinctive and coherent outcomes, and currently account for:

- 2.1m jobs or 30% of all employment in the North
- Almost £100bn 35% of the North's economy by value

The high level economic growth forecasts identified in the Review have been examined to understand where this growth is most likely to happen. The map opposite shows the spatial distribution under the transformational scenario in terms of the total absolute GVA by each area by 2050.

A significant proportion of this growth is focussed on major towns and cities, but there are opportunities to achieve transformational growth across all parts of the North, not just in the large urban conurbations.

The Review defined the North's ambition to close the productivity gap by building on clear economic strengths. To ensure sustained economic growth over the coming decades, businesses will need to draw on pan-Northern resources including access to labour markets, research centres and supply chains.

The Review suggests that the transformational scenario could be achieved if the necessary steps are taken to enable the following to occur in the North:

- Substantial growth in four prime and three enabling capabilities.
- Consequent positive effects on suppliers based in the North.
- Better, faster, more frequent transport links between key settlements, and increasing the pool of workers available to work in higher productivity urban locations, thus increasing the effective scale of cities and the associated benefits of agglomeration.
- Improvements in productivity across the wider economy and a higher employment rate.
- Positive effects on private and public services that serve the population which has a higher income.
- A growing population as more people respond to new opportunities, and a retention of skills and labour.

Recent analysis of the North's current and future labour markets, undertaken by TfN, provides projections that disaggregate the transformational scenario by high level occupation and by local authority area⁶⁵.

Under the transformational scenario, growth is expected in high and medium-skilled occupations (an increase of 35,300 and 1,600 jobs per annum by 2050, respectively), while jobs in low-skilled occupations are expected to stabilise from 2030 after a decline since 2015⁶⁶.

Conversely, under the business as usual scenario, the number of medium and low-skilled occupation jobs is projected to decline consistently throughout the whole period (by 3,500 and 6,400 jobs each year, respectively).

By 2050, the annual demand for high-skilled occupations is expected to rise significantly, with an additional 45,000 high-skilled workers required each year compared to 2015 levels to meet the aspirations of the transformational scenario⁶⁷.

The map opposite shows the share of high-skilled occupations as a proportion of all jobs in the North by local authority in 2050 under the transformational scenario. Again, these are spread across all parts of the North, not just in the large urban conurbations.

Low-skill jobs

2015 – 2.1 million

2050 Business As Usual scenario – 1.8 million

2050 Transformational scenario (baseline for TfN) – 2.1 million

Medium-skill jobs

2015 – 2.5 million

2050 Business As Usual scenario – 2.4 million

2050 Transformational scenario (baseline for TfN) – 2.5 million

High-skill jobs

2015 – 3.0 million

2050 Business As Usual scenario – 4.1 million

2050 Transformational scenario (baseline for TfN) – 4.6 million

Total jobs

2015 – 7.6 million

2050 Business As Usual scenario – 8.3 million

2050 Transformational scenario (baseline for TfN) – 9.2 million

By 2050, the annual demand for high-skilled occupations is expected to rise significantly, with an additional 45,000 high-skilled workers required each year to meet the aspirations of the transformational scenario.

MAP - Share of high level occupations in 2050⁶⁸

The visitor economy

In addition to the prime and enabling capabilities, it is crucial that the wider economy is also supported. This is all underpinned by the North's excellent quality of life, and the opportunities that this affords for the visitor economy.

The visitor economy is an important sector of the North's economy, with the area boasting an array of historic and vibrant towns and cities together with seaside resorts and National Parks. The North's visitor economy currently consists of over 369 million visitors per year, contributing more than £17 billion to the economy, including over £2 billion from overseas visitors⁶⁹. The total visitor spend is currently distributed across the North as shown by the map below.

MAP - Total annual visitor spend⁷⁰

For each additional visitor spend of £54,000 in the UK, an extra job in the sector is created, with analysis suggesting that UK tourism could grow by up to 94% over the next 20 years⁷¹.

GRAPH - The North's share of visits

North Total – 26%

Rest of England – 74%

GRAPH – The North's share of expenditure

North Total – 21%

Rest of England – 79%

The importance of the visitor economy to the North includes:

- Impact on the local economy – the direct and indirect impact of tourism expenditure on suppliers and employment in the area.
- Supporting domestic and international linkages – levels of visitors enable additional transport linkages (such as flights to new destinations and additional rail services), thus also providing a facility for local business and residents.
- Public realm – the works to make a destination attractive and offer services for visitors also has a positive impact for the communities where they are located.
- Inward investment – the visitor economy raises the profile and marketing of a location for inward investment, especially international, with the improved public realm and linkages making the area a more attractive location for inward investment.

The North has a varied visitor type:

- Overseas staying (towns and cities in the North make up 5 of the 20 most visited destinations in the UK by overseas visitors)⁷⁴.
- Domestic staying (the North has 9 of the 20 most visited destinations in England by domestic visitors)⁷⁵.
- Day trips (9 of the 20 most visited areas in England by day visitors are in the North)⁷⁶. The North has also seen growth in overseas and domestic visitor trends, and in some cases is outperforming London and other parts of England, as the graphs below show:

GRAPH - Domestic staying visitor trends⁷⁷ and Overseas visitor trends⁷⁸

The visitor economy and related employment is crucial to the North. It is complex to quantify the importance of the visitor economy, as it includes not just direct employment, but areas where employment is supported by visitor and business spend. The visitor economy is a significant employer in some parts of the North, with over 25% of employment⁷⁹. These areas tend to be, but not exclusive to, the more rural areas of the North.

Transport forms a core part of the overall visitor proposition, as transport enables efficient dispersal of visitors to, from and within the North. Enabling dispersal is important so that overseas visitors are encouraged to visit and stay in Northern towns and cities during their trip. This is particularly important, given that London has the largest draw, particularly for first time visitors and those in emerging markets, and stimulating travel to beyond the capital is important to increase the North's gain.

It is vital that the transport network supports the North's visitor economy strengths, and this Strategic Transport Plan recognises the growth potential. Without transformed transport linkages to these areas, a sizable proportion of the North's potential growth will not be realised, and the communities will not have the employment and opportunities they require.

An objective of the Lake District National Park is to enable 50 per cent more visitors to reach the National Park by rail and integrated onward travel⁸⁰, which enhanced pan-Northern connectivity can help deliver. TfN also wants to support the North's five National Parks' objectives to protect and care for the landscape, and promote the understanding and enjoyment of the Parks, as well as supporting the North's wider rural economy.

The North's economic assets and clusters

Each part of the UK's economic geography is different, as highlighted by the different strengths described previously, and the North has a polycentric system of economic assets and clusters.

Clusters are a feature of all modern economies, including in the UK. They are geographic concentrations and form the functional economic geography of an area. They tend to comprise of specialisations of firms, supply chains, support services, and specialised institutions, and typically comprise the main population centres, nationally significant assets and infrastructure, university and education institutions, and enterprise zones. As the Northern Powerhouse Independent Economic Review highlighted, clusters also have some of the North's greatest growth potential, on a national and global scale.

By nature, clusters often overlap with other clusters. For example, biopharmaceutical, chemical and medical device clusters tend to locate in the same areas due to the externalities in technology, sourcing, and skilled labour.

Over the past few decades new clusters have emerged and grown, creating areas diverse in their economic contribution and population characteristics. TfN has adapted the cluster theory and developed four broad groups that form the make-up of a series of economic clusters in the North:

- The large urban conurbations.
- Grouping of Northern Powerhouse Independent Economic Review prime and enabling capabilities and/or other sectors.
- The National Parks and Areas of Outstanding Natural Beauty, recognising the important role of the rural and visitor economy, and residential areas.
- The commuter and market towns that have a presence of small and medium-sized business, as well as rural residents, that are located in the periphery of the large urban conurbations and have populations that may commute to other clusters.

This gives rise to the series of the North's economic assets and clusters as shown opposite. Working with Partners, through the development of their Local Industrial Strategies, TfN will be undertaking further agglomeration and cluster analysis as part of the Strategic Transport Plan evidence base.

MAP – The North's assets and clusters

Aims of the Plan

Transport investment is key to supporting the North's economy to grow. Providing better connections at a pan-Northern level, particularly connections between the North's existing and future economic assets and clusters, will create jobs and generate growth.

Improved transport connectivity can ensure that existing and future assets and clusters benefit from the effects of agglomeration, which can support transformational economic growth. This transformation of pan-Northern connectivity can in turn result in improved local connectivity, which will support the whole journey and deliver economic and social benefits.

Investment in transport can:

- Increase employment and real wages, which has a social benefit via taxation.
- Increase competition, leading to increases in net business productivity and output.
- Improve health and wellbeing, increasing life expectancy.
- Increase social mobility and inclusion.
- Increase land values, supporting investment and regeneration.
- Stimulate agglomeration economies, by effectively increasing proximity, raising productivity and wages, and retaining a skilled workforce.
- Reduce journey times, increasing productivity and output.
- Reduce transport costs, lowering prices and thereby allowing for an expansion of output.
- Strengthen our global reach, by making it easier, faster and more reliable for people and goods to access the North's airports and ports.

This will help to:

- Transform East-West inter-urban connectivity, which has not previously received sufficient attention and investment.
- Helping develop the North's existing and future functional economic clusters and assets, and support city regions as drivers of economic growth.
- Provide easier access to high quality jobs for more communities.
- Tackle overcrowding and congestion.
- Improve connectivity across the North's transport network.
- Make areas of the North accessible for new housing, commercial and industrial developments.
- Strengthen businesses' access to supply chains and the markets they serve.
- Access the world's most important current and future markets to support trade and inward investment.
- Support growth of tourism and the visitor economy.
- Deliver a sustainable transport network that improves health, quality of life, and protects the environment.
- Establish a firm commitment to create a stronger, more diverse and resilient place to do business.

- Ensure that the North is an excellent place to live, work, visit, study and do business.

In short, transport has three main roles that can help support these economic assets and clusters:

- Connecting people - Improving access to leisure and tourism assets and work opportunities, whilst widening the labour market for businesses.
- Connecting businesses - Improving connections to collaborators, clients and competitors, including those within the prime and enabling capabilities.
- Moving goods - Supporting businesses to move freight and goods efficiently and across modes.

Collectively, these three roles provide the key aims of our Strategic Transport Plan.

Connecting people

Connectivity between the North's economic assets and clusters

The North's transport system needs to be accessible, resilient, safe, well-maintained and accommodating for the free-flowing movement of people for work, business and leisure. Better transport links make jobs more accessible, provide greater choice, and can deliver a better quality of life.

Better connectivity will also help the North's deprived areas reach their full economic potential. For an employee seeking work, better links increase the number and range of jobs and career opportunities available. For an employer, better connectivity increases the ability to access and compete across a larger labour market catchment area.

As shown previously, not all of the North's economic assets and clusters are in the largest towns and cities, so a nuanced approach is required to ensure the skills and jobs can reach the labour markets they require. In addition to pan-Northern connectivity enhancements, improved inter-urban connections will increase labour pools and assist with agglomeration in the North, strengthening the case for inner city living with connected places across the North.

Employers in the North draw more workers from smaller areas than those in the South. In 2011, almost 500,000 commuters travelled over 30km to work in London – double the number who commute that distance across six largest city regions in the North, although the longer distance commuting in the South East is due in part to the cost of living and affordability of housing in and around the capital⁸¹. This limited reach of labour markets means that Northern workers have reduced job opportunities, and Northern employers have much smaller labour markets. This is holding back wages and productivity.

A relatively small proportion of the North's population commutes by rail. This is due to factors such as the cost, convenience and perception of the rail network, as well as capacity constraints on both intra and inter-urban rail services. Many of the current journeys between Northern economic assets and clusters are slow and infrequent, both in absolute terms and compared with journeys to and from London.

It currently takes longer to travel by rail between Liverpool and Hull than it does to travel twice the distance between London and Paris, and trains between Manchester and Sheffield travel at less than half the average speed of services between Milton Keynes and London⁸².

There is recognition that car travel will also play a major role in satisfying future demand, particularly where rail services are limited.

The Government has made a commitment to using electric and hydrogen fuels by 2050⁸³, so charging and fuelling networks will need to be developed and adapted within the time frame of the Strategic Transport Plan in order to deliver the future connectivity required across the North.

People and businesses want faster, frequent and more reliable services to access the North's ports and airports. These surface access improvements, alongside additional direct air connections, will support an increase in passenger capacity and demand. In turn, the surface access improvements to airports can also stimulate growth around the airport, supporting them as economic centres in their own right, and making them more attractive places in which to invest and do business.

People move around the North for a wide variety of reasons. In addition to travel for work and leisure, faster, frequent and reliable services are crucial for providing access to services such as hospitals and health services, study, religious and cultural purposes and experiences. Transport plays a key role in supporting the skills agenda and travel for study is vital to helping realise the North's transformational growth ambitions.

Multimodal connectivity improvements

It is important that the North's transport network delivers a future mobility which is right for the customer. People should be able to have a seamless travel experience, including improved ticketing and better journey information. Currently, integration is poor and information and ticketing systems are fragmented and complex. This improved travel experience must be made not just on pan-Northern routes, but also at a local level, including on light rail, rapid transit and buses.

To ensure a seamless travel experience, the 'first and last mile' of the journey will be taken into consideration as part of the impact assessments on the North's transport network, seeking a suitable standard for the passenger throughout their whole journey. For many people, choice and the ease of the 'first and last mile' connection is the main determinant of which mode to use, which is why complementary improvements in local transport infrastructure and services are needed to underpin the more strategic interventions. This includes making sure active travel is a viable option for a complete journey or as part of a journey made by public transport. This could be assisted by ensuring there are safe and accessible cycle and walking routes to transport links and central hubs, together with regular joining points, as well as having safe and secure lockers for bicycles or allowing bicycles on public transport where possible.

For rail users, multimodal travel must become easier. Rail can deliver large numbers of passengers to, from, and within the North, especially in peak periods. The overall journey experience is an important factor in each passenger's decision to use rail. It is important to provide a journey experience and a pricing strategy that encourages passengers to choose rail over their car for both shorter and longer journeys. To improve journeys, enhance onward connectivity and offer greater choice, opportunities for interchanges between modes of travel need to be improved. Stations should also be transformed where applicable to cope with increased passenger numbers with the introduction of wider platforms and gateline provisions, while additional lifts and escalators should be added to ensure accessibility for all. Facilities and customer experience need to be improved so that journeys involving more than one train or multiple

modes of transport are safe, reliable and pleasurable. This is also important and reinforced by the Government's Inclusive Transport Strategy, to ensure the transport network is inclusive and accessible for all.

The North needs more enhanced interchanges at railway stations and strategic park and ride facilities for multimodal journeys to better connect the road and rail networks. Improved interchanges and onward travel options for the HS2 and Northern Powerhouse Rail networks, as well as the existing rail network, will also be required to ensure people benefit from proximity to high-quality links across the UK. At a local level, improvements can also be made to connect bus and cycling provision with the wider transport network. The North has also seen progress in bus investment through alliances such as in the Liverpool City Region.

Delivering nationally significant infrastructure projects and major local development approvals

Transport investment stimulates other investment – this can be residential, commercial or industrial. Road and rail will continue to play a significant role in the movement of materials and workers to support the construction industry in delivering housing growth, such as planned garden villages and large residential sites, as well as the transport infrastructure itself. For those seeking employment, transport projects require more skilled labour across the North to construct them. This will support inclusive growth and regeneration, whereby new homes can be built for people to live, work and learn, and businesses can expand and create more jobs.

HS2 will be, and is, unleashing development. Growth strategies are under development, centred on the North's future HS2 hubs, including Crewe, Manchester Piccadilly, Manchester Airport, Leeds and Sheffield. The strategic transport network needs investment across all modes to create access to labour markets. TfN will help to promote and stimulate this investment at a regional and local level.

Cross-border connectivity with the North's economic neighbours

Access to opportunities should not be limited by administrative boundaries – the North's functional economic geographies and clusters go beyond its borders. The transport network needs to support the movement of people within and beyond the North. The Major Road Network and the rail network play a critical role in realising the economic potential of our border areas and of our neighbours, by moving goods and labour across the borders every day.

The North also facilitates the through-movement of people. There are existing strong economic relationships with the North's adjacent regions, with the most notable movements being:

- Between North Wales and Cheshire and Warrington/ Liverpool City Region.
- Between Scotland and Cumbria/North East and North of Tyne.
- Between East Midlands and Hull and Humber/Sheffield City Region.
- Between West Midlands and Cheshire and Warrington/ Greater Manchester/Liverpool City Region.

- Between Northern Ireland and Liverpool City Region/ Lancashire.

TfN is working collaboratively with Midlands Connect, Transport Scotland and the Welsh Government to ensure that the necessary interventions are brought forward. Improved connectivity to the North's ports and airports is also important to strengthen links to Northern Ireland.

The Strategic Transport Plan aligns with the Borderlands Inclusive Growth Deal being developed in partnership with the Scottish Government. Examples of key cross border national, pan-Northern and local transport corridors include the East Coast Main Line and the A1, where improvements are needed to strengthen capacity and connectivity.

TfN is also working with the Welsh Government to ensure that modern, connected infrastructure supports cross border movements. This will happen through schemes such as the North Wales Metro/Growth Track 360, as set out in the Welsh Government's Prosperity for All National strategy.

Supporting the international connectivity of the North

As an estimate of the economic impact of tourism, the Northern Powerhouse Independent Economic Review identified that there are around 600,000 jobs (8% of the North's total) in the accommodation and recreation, and food and beverages sectors. The GVA of these sectors currently stands at nearly £12 billion, which is about 5% of the North's total GVA⁸⁴.

Harnessing this strength will require investment in developing easy, integrated and accessible transport connections to enable visitors and residents to move between Northern gateways and destinations efficiently and effectively. The North's airports have an available capacity to support an additional 60 million passengers per year, if supported in the right way⁸⁵. By 2050, there is potential for the North to have 75 million air passengers per year⁸⁶.

Ultimately, if more passengers can access the North's airports by road and rail within a one to two hour catchment, then airlines are more likely to open new European and Intercontinental services from the North's airports. This drives an increasingly competitive market whilst providing more choice and opportunity for passengers.

Manchester Airport has identified that surface access is currently the largest constraint on the airport's development, which is why bringing HS2 and Northern Powerhouse Rail services directly to the Airport will be so important.

This surface access can also make new air routes appealing. For example, since a direct Manchester to Beijing flight was introduced there has been:

- A 38% increase in the number of Chinese visitors to the North - a growth rate higher than both London and the UK average⁸⁷.
- A 94% increase in the average spend per visit in the North West to £2,167, which is now 5% higher than the national average⁸⁸.

- A 114% increase in the number of Northern students gaining Chinese internships, with more than 70% now coming from low income backgrounds⁸⁹.
- An increase in export values from Manchester Airport to China of 41% to £1.29 billion in the two years after route launch⁹⁰.

With enhanced sustainable surface access to the North's airports, there are opportunities to increase the benefits of new air and trade links from the North, and the positive economic benefits for people and businesses. Understanding the connectivity requirements of the North's other airports and ports will be crucial.

These international gateways are crucial for how people will travel around the North, with investment for cruise terminals resulting in increased passenger traffic, such as in Liverpool and the Port of Tyne.

Connecting businesses

Connectivity between the North's economic assets and clusters

Sustainable economic growth can occur when businesses, employees and customers are better connected through transport. The industries identified as the four prime and three enabling capabilities within the Northern Powerhouse Independent Economic Review, as well as businesses in the wider economy, are spread across the North.

Improving connectivity has the potential to increase trade and investment, collaboration, the sharing of ideas, and reduce costs for businesses and their operations. The Northern Powerhouse Independent Economic Review provided a picture of the existing economic links. Enhancing these links will strengthen agglomeration and support the growth of the clusters and capabilities.

The business links that need improving include those between:

- The professional service sectors located in all the North's towns and cities, with concentrations in Leeds and Greater Manchester City Regions and in Cheshire West and Chester.
- Digital clusters in Newcastle and the Liverpool, Manchester and Leeds City Regions.
- The aerospace and defence industry in Central and East Lancashire and Barrow, Cumbria, as well as in North Wales at Airbus in Broughton (near Chester), and materials and process research and development in Greater Manchester and Sheffield.
- Advanced manufacturing, vehicle manufacturing, energy and health innovation capabilities in Lancashire, the Atlantic Gateway, Tees Valley, Liverpool City Region, Cheshire Science Corridor, the North East, Cheshire West and Chester, Hull and Humber, Alderley Park, and West and South Cumbria (the highest proportion of manufacturing workers in the UK), and universities, consultancies and international airports.
- New advanced manufacturing capabilities at both the International Advanced Manufacturing Park in the North East and the Advanced Manufacturing Innovation District in the Sheffield City Region, and firms in their hinterland, including McLaren and a growth in vehicle light weighting technology.
- The agricultural food production and food industry in York, North Yorkshire and the East Riding of Yorkshire, West Lancashire, Hull and Humber, Cumbria and Leeds City Region.
- The freight and logistics sector, serving businesses via the North's ports, airports and inland distribution facilities, such as iPort in Doncaster and the new Liverpool2 deepwater container terminal.
- The energy industry, including the nuclear and offshore power generation situated across Cumbria (including the World's largest offshore wind farm), Tees Valley, Hull and Humber, and Lancashire – this means links with processing facilities in Cheshire, Warrington and Cumbria and with the research and development organisations in Lancashire, Greater Manchester and the Sheffield City Region.

Poor road and rail connectivity between economic assets and clusters is affecting the capability of these clusters to expand and is preventing growth in supply chains. This is also true for a number of economic assets and clusters outside the urban cores.

Improved connectivity will also facilitate more face-to-face interaction and support stronger service and product markets. Existing road links are not always efficient, resilient or reliable enough to support these connections. Similarly, rail connectivity needs to support businesses, as well as being better connected globally.

The map opposite shows how current employment is distributed around the North

MAP - Employment distribution across the North⁹¹

Multimodal connectivity improvements

Different types of businesses use and rely on different modes of travel. Some physically move goods, others require the movement of minds and ideas. Businesses need a seamless journey experience across the North, so that their operations can grow and their daily business requirements are met.

For businesses and collaborators, transport investment will open up and support major development sites. Clusters can grow in the same vicinity, and an improved transport network can aid collaboration and the supply chain to connect localities across the North and beyond.

Delivering nationally significant infrastructure projects and major local development approvals

For businesses, the transport network plays a critical role in delivering major development sites and nationally significant infrastructure projects, particularly in areas that are isolated, or where the topography makes moving materials by road difficult. A lack of suitable provision on the road and rail network, which impacts on reliability and resilience, could hold back nationally significant infrastructure projects, particularly in more remote areas, or areas not served by rail.

Examples include the range of major developments in west and south Cumbria, the International Advanced Manufacturing Park in Sunderland and Liverpool².

In the Tees Valley, the South Tees Development Corporation is promoting the economic development and business growth of an area covering 4,500 acres. It is the first Mayoral Development Corporation to be set up outside of Greater London.

Cross-border connectivity with the North's economic neighbours

Links with the North's neighbouring economies play a critical role in realising the economic potential of both the North and the UK. Without interventions, the current links will not fully support growth in either of these economies.

Businesses within the North have supply chains, competitors and collaborators that are beyond the geographical boundaries of the North. Connectivity should not be hindering the potential for growth but supporting it. This includes physical links to the Midlands, North Wales, and Scotland, as well as through ports to Northern Ireland, the Republic of Ireland, Europe and beyond. The food technology industries in North and North East Lincolnshire are an example of this, with supply chains across the wider Lincolnshire area, Hull and East Riding.

Supporting the international connectivity of the North There were around 2 million return business-related air trips to and from the North in 2016, with business productivity brought about through direct international air connections accounting for £5 billion GVA⁹².

A key challenge is to attract more businesses to take advantage of the North's prime and enabling capabilities. To achieve this, it needs to be easier, cheaper, faster and more reliable to travel to and from the North's gateways.

The Independent International Connectivity Commission found that, of the additional 12 million passengers generated under the transformational growth scenario, there would be 1.5 million more business trips than the business as usual scenario, adding over £4 billion to the economy⁹³.

If the existing capacity available at Northern airports is supported, business-related air passengers would make up a higher share of the North's travel market than today, but improved surface access and connectivity for inward and onward journeys is also required. Enabling this growth would more than double the economic contribution of Northern airports, reaching £13 billion⁹⁴ (from £5.5 billion in October 2016).

Increasing the range of global destinations and the frequency of direct international services to and from the North will boost efficiency, encourage entrepreneurship, enhance employment opportunities and increase foreign direct investment, inward investment and trade opportunities. Securing international routes to new destinations relies on demonstrating sufficient passenger and goods demand. This means that good surface access to increase airport and port catchment areas is crucial.

Easier access to the North's airports can also support additional economic growth by enabling increased development of sites near or adjacent to the North's airports.

Moving goods

Connectivity between the North's economic assets and clusters

The strength of the North's logistics sector is its true multimodality. The Enhanced Freight and Logistics Analysis shows a 33% increase in tonnes lifted within the North by 2050⁹⁵, which will play a significant role in providing goods and materials to achieve the GVA growth outlined in the Northern Powerhouse Independent Economic Review.

A third of the UK's freight currently moves through the North's ports against a population that only represents 23% of the UK total⁹⁶. Significant growth is taking place, reflecting the investment and aspiration of port operators. Investments at Liverpool, Immingham and Teesport have opened the Northern market places to global trade with container and other movements.

Currently, the commodities that arrive at Northern ports stay primarily within the North, with the biggest flows to and from the ports using East-West routes. This is driven by high volume flows of biomass and construction aggregates from ports and quarries. Significant rail flows from the south centre on Daventry and the East Midlands for consumer goods. The use of these rail freight interchanges for Northern flows indicates that the North needs to develop rail freight interchanges, and have more gauge cleared rail corridors, which would increase the options for handling freight flows across the North.

Investment in Liverpool² and the continuing growth of the Humber Ports has given strength to the concept of a rail freight "superhighway" connecting Liverpool and the Humber, as well as wider benefits for freight movement across the North to other ports. This concept is endorsed by IPPR North and supported by the Northern Ports Association, enhancing engagement with freight businesses that are not as strongly aligned to the ports in other ways. This increases the attractiveness of the North for business, strengthening the economy and encouraging job creation.

For infrastructure programmes such as HS2 and Northern Powerhouse Rail, huge bulk movements of aggregates and steel will be required to deliver the enhancements. Quarries within the North can provide the volume of materials needed, and rail would be the most efficient means of transportation. Northern steel plants produce over 1 million miles of rail, which is another example of the North as a centre for excellence.

Until now, where modal shift from road to rail has occurred, it has often been driven by unreliable journey times on key congested road routes, with a shift to a reliable timetabled rail freight service from origin to destination that more closely meets customer needs. Actively supporting modal shift to rail will reduce road congestion, free up capacity, enable businesses to make sustainable choices and reduce emissions, but the constraining factors affecting rail as the mode of choice for freight must be addressed.

It is often less expensive to handle goods by road compared with rail as it is free at the point of access, not restricted to a timetable, and there are lower handling charges. However, a more congested, less reliant road network could hinder

these benefits. The Major Road Network for the North includes those routes linked to key freight distribution and processing sites, and TfN is developing metrics to ensure journey times and reliability on these roads can be maintained and improved. The road haulage industry is flexible and has already changed the way it operates logistically to ensure the increase in next day deliveries meets demand.

The Enhanced Freight and Logistics Analysis considers the future of road freight operations, where new technologies including Connected Autonomous Vehicles stand to revolutionise the movement of goods and have the potential to deliver improvements in emissions levels across the North. It could be the answer to the growth in commodity movements being predicted. The North also needs to collectively consider how the 2050 workforce required for the logistics industry is found and trained, and the impact of greater automation in warehousing. Skills in driving and operating autonomous vessels and vehicles remotely in future need to be encouraged from within the education system.

However, road freight will not be able to meet the needs of heavy bulk markets, even with the emerging technological change, hence the need to consider how best to support moving more freight onto the rail network. Rail movements can offer an alternative way to move aggregates and bulk products for infrastructure projects, which are necessary to support population increase. Although there is a cost differential between road and rail freight, when whole costs are considered, including environmental costs, rail freight can still be competitive; this is particularly the case over long hauls but can also be the case over shorter distances where volumes carried are both high and frequent.

Where modal shift from road to rail may not currently be seen as economically viable, there is the opportunity to create the right conditions for a paradigm shift in the way that freight is viewed in the North. To achieve this, freight routes must be direct and not circuitous, which is a significant constraint at present. Freight routes and paths must be planned alongside passenger rail, rather than as an afterthought. TfN will support a meaningful dialogue between stakeholders on future planning.

Multimodal connectivity improvements

The connectivity of goods moved in the North can also be improved, particularly with the interchange between road and rail. There is a clear benefit in developing sites with multimodal access that can accommodate the efficient transfer of goods between modes for storage and onward distribution.

The North needs to high gauge inter-modal containers on normal height wagons. There are currently too few gauge cleared rail routes capable of accommodating container trains, and no suitable routes across the Pennines that can accommodate the largest intermodal deep-sea shipping containers on standard wagons. The availability of suitable freight paths on rail routes across the Pennines is also limited, and there is currently no East-West rail route anywhere in the North that is cleared for W10 and W12 gauge and therefore capable of taking containers. The map opposite highlights the lack of W10/W12 clearance East-West in the North. To carry a modern container on a standard rail wagon

across the Pennines, only the Leicester–Nuneaton and Edinburgh–Carstairs routes can currently be used. In contrast, approximately 18,000 Heavy Goods Vehicles (HGVs) and an additional 20,000+ light goods vehicles per day cross the Pennines on the M62, adding to worsening congestion and air quality concerns⁹⁷. These issues increase the cost of rail journeys and prevent the growth of a market-based on East-West import and export using Northern ports.

At present the North Transpennine rail corridor is W8 gauge cleared, which allows the original 2.6m (8ft. 6in) high shipping containers to be carried on standard wagons. However, shipping container standards have changed and a significant and increasing proportion of flows use either modern 'high cube' containers, which are 2.9m (9ft. 6in) high, or Euro containers, which are slightly wider.

W10 gauge clearance allows 2.9m (9ft. 6in) high shipping containers to be carried on standard wagons. It also allows 2.5m (8ft. 2in) wide Euro shipping containers. W12 gauge is slightly wider than W10 at 2.6m (8ft. 6in) to accommodate refrigerated containers and lorry swap bodies and is now the recommended clearance for new structures such as bridges and tunnels.

There are currently no East-West freight cleared paths in the North to move the largest containers arriving at the North's ports.

MAPS - Rail freight gauge⁹⁸ and Rail container services⁹⁹

Delivering nationally significant infrastructure projects, major employment and major local development approvals

The North's ports have invested and are able to cater for a greater share of the intermodal freight market, but they are limited by the capacity of the rail network and road access to and from ports. Attractive market conditions must be created to enable the private sector to expand airports and ports, and for shipping lines and airlines to improve international connectivity.

Freight is also crucial for the energy sector as it supports the delivery of major projects, including the movement of fuel and waste, and supporting the delivery of major construction projects, such as the Moorside Power Station.

Reducing carbon emissions and improving air quality is now imperative for the freight and logistics sector. The Government's Clean Growth Strategy includes the desire to work with the industry to reduce the impact of freight emissions and improve air quality across all modes including road, rail and shipping. There is a need to understand the different options for the North to move towards delivery of alternative fuelling and associated operations.

In the face of changing energy policy and a move towards greener fuels by 2050, the future of the power stations and storage facilities currently used for refining and energy production in the North will potentially need to be repurposed. TfN needs to be aware of this progress and ensure the infrastructure is ready to receive new opportunities.

Cross-border connectivity with the North's economic neighbours

TfN will make improvements to the North's transport network that will support economic movement for people and goods from outside the North. The sections of the Major Road Network that cross boundaries provide long distance links on the trans-European road network. This includes North of the M6 from Carlisle on the M74 and A75 to the Ports of Glasgow and Cairnryan, as well as the A55/A494/M56 and the A55/ A550 to Wales and through to the Port of Holyhead. There are also crucial rail freight movements that need to be supported. Improved connectivity to the North's ports on the Irish Sea, including Heysham and Liverpool, is also important to support the movement of goods to Northern Ireland, the Republic of Ireland and beyond.

Support for cross-border connectivity will also be considered where this supports increased opportunities for economic growth, for example working with Midlands Connect on transport improvements with crossborder benefits along the A15 and A46 corridors.

Supporting the international connectivity of the North

Air freight has a significant economic value and industries that rely on transporting high-value goods quickly around the globe (for example just-in-time services) depend on it. Whilst 11% of air freight is customs cleared in the North, only 4% is flown from the North¹⁰⁰. This reflects the dominance of the direct, long-haul passenger flights that provide most of the air freight capacity.

There is the capability to have the majority of the air freight with an origin or destination in the North flying from the North's airports, compared with just 4% in 2016¹⁰¹. Increasing the North's direct long-haul air connections will increase its air freight capacity, meaning that fewer goods need to be transported across the UK. In turn, this could reduce congestion and road-based carbon emissions on North-South corridors.

The North's airports and ports could increase their capacity to handle freight by both air and sea, respectively. The Independent International Connectivity Commission was of the view that securing more direct long haul passenger services would increase capacity for high-value, time sensitive air freight. This would enable businesses in the North to make full use of our international gateways, trading more directly and effectively with Partners around the world. Greater use of coastal shipping and inland waterways would also improve the North's ability to move freight more efficiently than at present.

For the end-to-end freight journey to be as efficient as possible, the North needs better surface access to ports, airports and intermodal terminals – enhancing the 'first and last mile' of these journeys, and in turn creating better road connections and additional rail freight paths.

The North's transport network

To realise the benefits of agglomeration and economic mass, the North requires faster, more efficient, reliable, and sustainable journeys on the rail and road networks, and potentially the major inland waterways. It also needs capacity for the increased passenger, business and freight demand that growth will bring. The starting point is an understanding of the existing network's challenges and opportunities.

26 minutes average commute time¹⁰²

Mode shares for travel to work¹⁰⁸

75% car / 14% other / 7% bus / 4% rail

222.9 million rail trips within the North pa¹⁰⁷

85,580 total kms of road¹⁰⁹

1.54 vehicle occupancy¹⁰³

207% rail demand increase since 1995/96¹¹⁰

13km average commute

+8% increase in road trips¹⁰⁶ between 2012-2016

3,800km total kms of rail¹⁰⁴

INFOGRAPHICS - All-Northern trip making by mode¹¹¹

Trips

Car 68% / Walking 22% / Bus 7% / Train 1% / Cycling 1%

Distance

Car 81% / Walking 2% / Bus 7% / Train 7% / Cycling 1%

As detailed in the User Insight and Labour Market Analysis, individuals with a higher occupational status typically travel significantly further and make significantly more longer distance trips than those in other occupations, especially by rail¹¹². People within the top 20% income band within the North travel 250% greater distance annually (210% more by car and 330% more by rail) than those within the bottom 20% income band¹¹³. Most of this is accounted for by longer trip distances, rather than making additional trips.

Graduate-level skills, full-time employment and higher incomes are all closely correlated, and individuals within these groups make more trips and travel further than those in other socio-economic groups¹¹⁴. These differences become even more stark when looking at the current travel patterns of different socio-economic groups across the North.

The majority of labour markets in the North are local in nature, with 60% of workers living and working in the same local authority district, compared to a UK average of 54%. This goes up to around 80% for rural areas, and down to just under 50% for urban areas¹¹⁵.

Analysis of total in-commuting across the North reveals a familiar pattern, with over 100,000 people a day commuting in to both Manchester and Leeds¹¹⁶. The highest levels of out-commuting are seen in local authority districts surrounding high employment density urban centres. Several areas, for example Cheshire East and Cheshire West and Chester, see high levels of both in-commuting and out-commuting, suggesting an active and integrated labour market already exists.

MAPS – In and out commuting

The network's role in supporting intra-city region and local transport authority trips will also be vitally important, with the interface between the key strategic roads and other local roads, as well as bus and light rail, critical to the success of local economies, and the overall pan-Northern economy.

The UK is very car-dependent; the same is true of dependency on road-based freight. The North has broadly followed trends that have been observed nationally.

Rail demand

- Rail accounts for a very small share of trips in the North, with only 1.1% share of total trips, but around 7.4% by distance travelled¹¹⁸.
- The number of people using the railway network in the North is nearly three times the number 20 years ago, which is a greater increase than other regions over the same period¹¹⁹.
- Also, over the past 20 years, the number of rail passengers travelling entirely within the North has grown at a rate of 6.3% per annum, which is greater than the national growth rate of 4.2%¹²⁰.
- More recent trends show that five Northern cities have seen rail passenger growth of more than 20% over the last 5 years – Leeds (31%), York (25%), Manchester (24%), Sheffield (21%) and Newcastle (21%)¹²¹.
- 8.8% of all trains in to Leeds, Manchester and Sheffield are overcrowded during the morning peak period¹²².
- 12% of all rail passengers arriving into Leeds station during rush hour (8-9am) have to stand¹²³.
- Average speeds of rail travel across the Pennines and between the major northern cities are below 50mph¹²⁴.
- Since 2010, capacity on trains, measured as morning peak seats, has decreased while morning peak demand has also increased. This has led to significant overcrowding on most routes in the North¹²⁵.

For the rail network, existing East–West services and routes are slow and lack capacity. It also takes half an hour longer to get from Hull to Sheffield than to travel the same distance from Brighton to London. These historic issues impact on freight as well as passenger services, limiting connectivity to many of the North’s ports and airports, and their markets.

Road demand

- Car is by far the dominant mode of travel in the North. It accounts for 66% of all trips and 80% of distance, which is broadly similar to the rest of England (outside of London)¹²⁶.
- The average speed on A roads in the North is 26mph (42kph)¹²⁷.

Source: DfT Average A road delay statistics, 2017¹²⁸

North East

Average A road delay (seconds per vehicle per mile) - 32.8

Average A road delay on a 50 mile journey in minutes - 27

North West

Average A road delay (seconds per vehicle per mile) – 53.9

Average A road delay on a 50 mile journey in minutes - 45

Yorkshire & Humber

Average A road delay (seconds per vehicle per mile) – 41.1

Average A road delay on a 50 mile journey in minutes - 34

North Average

Average A road delay (seconds per vehicle per mile) – 42.6

Average A road delay on a 50 mile journey in minutes - 36

The North’s road network has played a key part in shaping the North’s economic geography and will continue to have a very important role in enabling the North’s economy to grow.

East–West connectivity is a significant barrier for future growth in the North, and a key constraint to agglomeration and transforming the North’s economy. Currently the M62 is the only motorway standard East-West road link across the

Pennines between Derby in the Midlands and Edinburgh in the North. Other major arteries, including the M1, M6 and M56 corridors, are also already heavily congested and are acting as major barriers to transforming the North's economy. Therefore, there needs to be resilient alternative road routes, for example other important East-West routes, such as the A66, A69, A628, and A59.

Future transport demand in a transformed North

The transport system in the North already has significant challenges to overcome and opportunities to exploit to achieve agglomeration benefits. When the transformational growth scenario is factored in, synergies between road and rail will be critical to addressing these challenges and opportunities, as will an understanding of how transport demands will change in the future.

Transformational economic growth in the North would also be expected to lead to far-reaching changes in transport demand and travel patterns compared to today. There is also potential for significant changes in transport accessibility to transform the economic geography of the North. Improved transport infrastructure will stimulate new travel patterns, with individuals adapting their behaviour to take advantage of enhanced connectivity and accessing new employment opportunities.

Analysis of the North's labour markets indicates that the majority (61%) of the North's workers lived and worked in the same local authority district in 2015¹²⁹. Under the business as usual scenario, this proportion is not expected to change in the future. However, in the transformational scenario, the proportion of workers taking employment outside of their home district is expected to markedly increase by 2050. The greatest change is expected in high-skilled occupants, who already have a higher propensity to travel further for work.

However, different groups of people will react differently to these opportunities, dependent on their skills, employment and life stage. People's trip making patterns and motivations are diverse and vary throughout their lives, they also depend on a range of socio-economic factors, as well as their location and the transport choices available to them.

Whilst at an individual level such patterns are rational, aggregated and complex patterns can emerge, making them more difficult to identify and understand. Different markets for travel, such as local commuting into a town centre or longer distance rail commuting, are likely to experience very different growth trends over the coming years, in line with both the behaviours of the groups of people who make those trips and the extent to which the population of these groups is changing within the North. A better understanding of these factors is therefore key to identifying potential future travel patterns within the North.

Transport investment in the North, and the UK as a whole, has historically been made on a 'predict and provide' approach where future demand for travel is forecast based on historic trends and transport interventions are then designed to meet this demand. Increasingly, there is a movement towards a 'vision and validate' approach through which TfN, local transport authorities and Government can actively shape and influence how people travel to meet joint economic, transport, environmental, and social objectives. The approach involves setting out a future vision for the place, as set out in the Strategic Transport Plan, and then identifying the major transport investments required to deliver that vision.

Major investments should then be tested against different future scenarios to determine under what conditions the investment would be valid - which in turn could influence which investments are taken forward.

A number of investments in the UK have followed this approach where the conventional case for investment on the basis of future demand was weak. Therefore a 'vision and validate' approach is central to unlocking the economic potential of the North and is at the heart of TfN's Strategic Transport Plan and Investment Programme. It requires all bodies to think beyond conventional trends and consider the impacts of improved connectivity as widely as possible in the long term, including climate change considerations associated with transport.

Northern Transport Demand Model To help understand future transport demand and develop the Strategic Transport Plan, TfN has produced a Northern Transport Demand Model that estimates how changes in employment, population and the transport network could affect travel patterns across the North. The model uses the transformational growth in population and employment from the Northern Powerhouse Independent Economic Review to forecast transport demand on the road and rail networks in 2050.

To reflect uncertainty regarding key factors affecting travel demand, TfN has developed four future scenarios representing the potential variation in travel markets in the North by 2050. The assumptions have been grouped so that each scenario represents a coherent and plausible future. No single scenario is more likely than any other, but taken together they represent the likely range of outcomes in travel demand in the North.

Enabling policy and plans represents the uncertainty in how local planning processes and policies (local Government priorities, land use and development planning, local transport planning) will affect two key drivers of future transport demand:

- Level of future housing development and employment growth that occurs in urban centres (centralised) as opposed to the suburbs (dispersed).
- Level of improvement achieved in travel conditions (journey times, reliability and travel experience) within and between local transport authority areas.

Technological and socio-cultural change represents the uncertainty in how technologies such as autonomous vehicles, alternative fuels and digital connectivity will evolve and affect three key drivers of future transport demand:

- Cost of energy and the consequent effect on travel costs.
- Capacity and usage of the road network.
- Decision to undertake activities face-to face (travel friendly) or digitally (digital).

When combined, the two dimensions create four different future scenarios for how the transformational growth set out in the Northern Powerhouse Independent Economic Review could create demand on the transport network. All scenarios are possible, and indeed may manifest themselves differently

across the North depending on spatial planning policies, but this initial forecasting provides a base understanding of the potential future transport demand in a transformed North as shown below:

INFOGRAPHICS – The four scenarios of the Northern Transport Demand Model

By 2050, total demand for rail travel in the North is expected to be up to four times higher than today, which would mean an increase in the current total to around 760 million trips¹³¹.

The strongest growth in rail demand is between the largest urban centres in Greater Manchester, Liverpool, Sheffield, Leeds, Hull and Humber, the North East, and the North of Tyne. In 2015 approximately 43 million trips were made between these centres. By 2050 this is forecast to increase to between 105 and 281 million trips, which is between two and six times the level today¹³². In a more connected and integrated North, the level of rail commuting could increase by up to eight times.

In a transformed North, total demand for road travel is forecast to increase by up to 54% by 2050. This would mean an increase from the current level to 193 billion vehicle kms¹³³.

In a more connected North (Scenarios 2 and 4), the growth in road travel demand between the main urban areas is greater than within those areas. In 2015, approximately 34 billion vehicle kms were travelled between these areas in the North, and by 2050 this is forecast to increase to between 37 and 68 billion vehicle kms¹³⁴.

Using the forecasts from the recent research into the North's labour market, further analysis has been undertaken to understand how improved transport connectivity could change commuting patterns and labour markets across the North. The analysis considers alternative patterns of spatial clustering of jobs, either clustered around town and city centres or more dispersed across urban areas, and how jobs are undertaken, using either face-to-face interaction or digitally, in the four scenarios described above.

Across the four demand scenarios, analysis suggests an increased propensity for people who live in the North to commute to work outside of their home local authority¹³⁵. This is driven by the strong growth projected for high skilled workers in the transformational scenario through to 2015 and the assumption that high-skilled and high-paid workers are much more likely to commute and travel longer distances than lower-paid workers.

Knowledge-intensive jobs have a high propensity to locate in urban centres, with a secondary tendency emerging for clusters of specialised activity based around specially designated urban fringe sites¹³⁶, such as science innovation and research parks. Further growth in such town and city centre jobs will also support growth in other sectors (such as leisure, retail and culture). Commuting

to urban centres is typified by longer journeys and a greater propensity to use public transport, particularly rail.

In addition, the four scenarios suggest that compact urban centres and travel-friendly transport infrastructure could result in a greater shift towards commuting between the local authority districts of the North, as opposed to job dispersion or digital working¹³⁷. Therefore, commuting patterns in the Compact & Travel Friendly transformational scenario appear the most different from those in the business as usual scenario.

The chart shows the commuting patterns in terms of flows of workers under the four different scenarios. It shows that in all scenarios workers are more likely to commute across local authority district boundaries, especially among those that are high-skilled and the two Travel Friendly scenarios.

GRAPHS - Commuting flows in the North in 2015 and 2050 under five scenarios¹³⁹

Even in the two Digital scenarios, the number of workers commuting across local authority district boundaries in the North is 70% higher than in 2015, whilst the number of actual workers is only 20% higher. In the two Travel Friendly scenarios it is more than double the number in 2015¹⁴⁰.

The analysis therefore shows that the impact of occupational shifts as set out in the Northern Powerhouse Independent Economic Review and skills forecasts are expected to increase the propensity for more workers to commute over longer distances. It also shows that the impact on the overall scale of commuting on alternative types of shift in the location of work (Compact versus Dispersed) is not large, although it does affect the relative attractiveness of public versus private transport.

TfN will use this analysis to ensure that current and future work programmes identify the most appropriate and relevant interventions required to support long term sustainable growth in the North.

Inclusive and sustainable growth

Income, social, and health inequalities are widely seen as one of the defining challenges of the 21st Century, as such inclusive growth should be at the heart of public investment. Local Industrial Strategies and this Strategic Transport Plan must provide a way for inclusive benefits from investment to be embedded and secured across the North.

There are clear disparities between the socio-economic conditions in the North and the South of England. The North has lower educational attainment levels and higher economic inactivity and unemployment compared to the UK average, and the majority of England's most deprived towns and cities are found in the North¹⁴¹.

Deprivation has a major impact on the physical and mental health of those living in the North, as whilst biological and individual lifestyle factors play a role, the over-arching determinants of people's health are socio-economic, cultural and environmental factors as demonstrated by the health determinants model. As stated in the Marmot Review, action is required across all the socio-economic determinants of health to improve people's health and reduce health inequalities. By supporting sustainable and inclusive economic growth, transport has a major role to play in this.

In the North, two million people of working age live below the poverty line, while the average healthy life expectancy is below the State Pension Age¹⁴³. The remnants of heavy industry and energy production is contributing towards the North being a major contributor of carbon emissions, and levels of air pollution in cities are now above the safe legal limit, which has associated consequences for public health and economic productivity.

Transport is social infrastructure and should provide opportunities for all potential users, and TfN wants to drive forward the inclusive growth agenda. This aligns with the challenges set out in the Northern Powerhouse Independent Economic Review. Inclusive growth includes:

- Ensuring all people and communities can contribute towards, and benefit from, a transformed Northern economy.
- Tackling inequality, through better pay, in-work progression, and improving skills and opportunities.
- Supporting all sections of society into better jobs.
- Supporting people to live healthy and active lives, through good housing, social values, green and transport infrastructure, regenerating neighbourhoods, low carbon initiatives and involvement in sport.
- Raising skills levels and increasing productivity.
- Improving the health of the poorest most quickly.

Strategic transport improvements should not just better connect already connected areas and people to other similar areas and people. It should ensure that all areas of opportunity are connected, and that communities are not disconnected and further isolated.

Social isolation and loneliness are not uncommon in today's society, particularly amongst older people. In addition, those on lower incomes are more likely to experience loneliness. Feelings of loneliness, isolation and lack of social contact are associated with a reduced quality of life. Good and accessible transport, particularly for older people and those with impairment or disability, is of the utmost importance to people in danger of social isolation as it can help build and maintain social connections. Major transport developments must also be cautious not to divide neighbourhoods and promote community severance. People across England have found access to healthcare an issue, with a large number saying they have been unable to get medical help because of transport issues, potentially more so in the North because of longer travel times and fewer transport links.

Access to green space has been shown to decrease mortality from all causes and improve mental health. Therefore, it is important that the development of transport links does not reduce the availability of green space, either through removing the space itself or limiting safe access routes.

This Strategic Transport Plan can play a fundamental and important role in bridging the societal, health and environmental inequality gaps that exist across the North

The North's strategic transport network needs to be designed and developed to be accessible, ensuring individuals have a choice of services and opportunities to access work and leisure. This includes:

- Embedding inclusive design at stations, ensuring they are accessible to all, with design in accordance with the Equality Act 2011.
- Providing step-free access at major rail stations and on all new infrastructure and rolling stock.
- Providing more secure and accessible cycle parking at the North's public transport interchanges and railway stations.

In 2018, the Government published an Inclusive Transport Strategy, which aims to achieve equal access for disabled people using the transport system by 2030¹⁴⁴. TfN fully supports the ambitious policy measures in the Strategy, and the Strategic Transport Plan and Investment Programme will support the delivery of both inclusive transformational economic growth and a world class transport network for the North. TfN will work with the Government, transport operators in the North, and wider stakeholder organisations representing disabled people to deliver this ambition.

People and the transport network

It is important that all members of society feel able to use the transport network with confidence. Issues such as affordability, security and physical accessibility, as well as ease of navigation and ease of use, are crucial. Improving the journey experience, for example through smart ticketing and more accessible rail rolling stock, will help this.

TfN also wants to work with Delivery Partners, the industry, the third sector, professional institutions, and the Government to ensure that equality barriers

are overcome and the right talent and skills are available to deliver the Investment Programme. A transformation of the economy requires a transformation in the productivity of the workforce. This will also support the recommendations set out in the Government's Transport Infrastructure Skills Strategy.

TfN wants to support diversity in transport by promoting the study of Science, Technology, Engineering and Maths (STEM) subjects by students and encouraging more women, BAME, LGBT+ professionals and individuals with disabilities into the transport sector.

Safety on the transport network A safe and inclusive transport network is a fundamental requirement. This determines how people use and perceive the transport network, especially when encouraging more people to use public transport and active travel modes. Safety must also be a fundamental consideration in the design and delivery of all new transport interventions, for public transport, active travel, and private trips. For example, in order to achieve the Long Term Rail Strategy's ambition to support the night time economy, personal security must be an important consideration for public transport investment to avoid people feeling vulnerable, and to support the growth of jobs and the economy. Similarly, good natural surveillance and/or CCTV is essential for encouraging people to use the transport network, and TfN supports Partners leading on initiatives to promote this.

TfN calls on Delivery Bodies, and transport operators and providers to consider safety throughout the development, delivery and operation of the North's transport network.

Transport and health

These greater choices can also support work being undertaken by other organisations, such as Public Health England, to explore how investment in transport can have positive impacts on people's health.

Ill health can reduce productivity through increased absence from work or education, while affecting the ability to perform tasks efficiently and effectively whilst unwell (presenteeism). Around 131 million working days are lost due to sickness absence every year and employers spend £9 billion each year on sick pay and associated costs¹⁴⁵. Improving health and wellbeing can improve employment rates, raise educational attainment and increase productivity. Conversely, unemployment is associated with poor mental and physical health.

Improved transport networks will have a beneficial effect on people's health by creating jobs and improving access to employment. In addition to the health benefits, when an out-of-work claimant moves into a job at the Living Wage, the local economy benefits by an average of £14,436 per year¹⁴⁶.

Physical activity improves health and wellbeing through aiding the prevention and management of conditions such as heart disease, diabetes, stroke, mental health problems, musculoskeletal problems and certain types of cancer.

There are associations between public transport use and increased physical activity. The National Institute for Health and Care Excellence (NICE) recommends that active travel and use of public transport should be encouraged. They recommend doing this by making sure there are high quality walking and cycling routes that are convenient, safe, appealing and well maintained. Consideration should be given to the option of travelling by bicycle to public transport stops and stations, whilst we should ensure that reliable public transportation services are accessible to all, including those with long-term health conditions, impairments, or disabilities.

Working with Public Health England, TfN and Partners will work towards providing a healthier environment for all.

Transport and the environment

TfN recognises that successfully delivering inclusive, healthy, and sustainable growth is dependent upon protecting and renewing the high quality environment in the North, which is a significant asset and a reason why many people and businesses chose to live in and visit the North. Making the best use of existing transport infrastructure and encouraging sustainable modes, including walking and cycling (for example, by providing secure cycle storage at public transport interchanges and ensuring routes are safe), will help to reduce the environmental impacts of travel and can provide public health benefits. In addition, building new developments where there is good access to public transport and services will reduce the need to drive, and therefore reduce emissions. Road and rail networks must also be used as efficiently as possible.

Biodiversity, and the natural and historic environment

This Strategic Transport Plan provides a unique opportunity to invest in strategic transport at a pan-Northern level, as well as sustainable infrastructure at a local level. A fundamental aim of TfN and Partners will be to protect and enhance, where possible, the natural and historical assets of the North. This includes National Parks and their landscapes, historic towns and their assets, rivers and their rich biodiversity and habitats. Green and blue infrastructure should be designed and incorporated into the grey transport infrastructure, which in turn should also deliver a net biodiversity gain, with positive impacts on people's lives and communities.

Working with TfN's Partners, other statutory bodies, such as the Environment Agency and Natural England, and the National Parks where applicable, TfN wants to ensure the strategic transport network is future-proofed, adaptive and resilient by:

- Realising the opportunities for natural capital and green infrastructure to enhance transport infrastructure resilience and performance through both the integration of green, blue and grey infrastructure, and the delivery of green infrastructure-based natural solutions to aid mitigation requirements. The latter includes carbon reduction, clean air and flood risk management, as well as other placemaking and visitor economy objectives.

- Maximising the opportunities for transport interventions to contribute towards major new initiatives, including Nature Recovery Networks and large-scale woodland creation ambitions such as the Northern Forest, which will comprise over 50 million trees over 25 years between the Mersey and Humber estuaries.
- Working with natural processes to promote greater flood resilience to the network ensuring support for Sustainable Drainage Systems (SuDS) such as green roofs, rain gardens and swales is incorporated into the Investment Programme to reduce flood risk. SuDS also have the additional benefit of helping to improve water quality and can help to reduce polluting effects from road runoff. In addition, well designed SuDS can act to increase biodiversity and enhance habitat.
- Supporting Natural England's work on the Green Transport Corridors and Green Infrastructure Agreements, as well as their recommendations of the Linear Infrastructure Network, ensuring that within or adjacent to the rail network and Major Road Network for the North, green infrastructure can deliver biodiversity gains, ecological connectivity and ecosystem services.

Working with Partners and other statutory bodies, such as the Environment Agency, Natural England and Historic England, TfN will aim to minimise the impact of transport on the historic and natural environment and will seek to deliver environmental enhancements and biodiversity net gain where possible. TfN also expects Delivery Partners to deliver transport investments that protect sites designated for important nature conservation, ensure that due regard is given to the need to undertake archaeological investigations, and protect and enhance the quality and distinctiveness of historic assets.

The North contains both statutory and non-statutory designated sites that are protected for their importance for nature conservation. Prime among these sites are Special Areas of Conservation and Special Protection Areas, which form the Natura 2000 European network of core breeding and resting sites for rare and threatened species, along with some rare natural habitat types. It is the aim of this network to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under the European Commission's Habitats and Birds Directives. In addition to the Natura 2000 sites, there are also internationally important wetlands designated as Ramsar Sites.

Across the North, there are a large number of nationally important Sites of Special Scientific Interest, National Nature Reserves, Ancient Woodlands, and many important Local Nature Reserves and green spaces that support wildlife and enhance the wellbeing of the local population.

Any potential direct or indirect impacts on these sites that may arise from new or upgraded transport interventions will be appropriately assessed, mitigated, and/or compensated for, in line with existing best practice and relevant legislation over the lifetime of the Plan. This would include the Natura 2000 sites and Ramsar sites for which Habitats Regulation Assessment will be carried out, as necessary, prior to final decisions being made on transport interventions.

The Strategic Transport Plan and the Investment Programme recognise the importance of all these sites in the North and beyond and TfN is committed to working with Partners to avoid or minimise any adverse impacts on such sites as far as possible.

Adaptation to climate change

Global climate change could mean warmer and drier summers, which could impact on water supply, soil quality and important supply chains, as well as warmer and wetter winters, which could increase flood risk from rivers and surface runoff. As well as a general warming of the climate, severe weather events such as heatwaves, droughts and heavy rainfall are predicted to increase in frequency and intensity.

Adaptation to climate change is the process (or outcome of a process) that leads to a reduction in harm or risk of harm, or realisation of benefits associated with unavoidable climate variability and climate change. Resilience is the ability of a system to recover from the effect of an extreme load that may have caused harm. Adaptation policies can lead to greater resilience of communities and ecosystems to climate change.

The key challenges to transport posed by climate change include protecting rail assets and the road network from flooding, managing heat on public transport, and maintaining service reliability in periods of extreme weather. A resilient transport network in the North is one of the objectives of this Strategic Transport Plan, as without action the North's road and rail networks could be affected.

TfN and Partners, working with stakeholders, will seek to ensure that the North's transport system is resilient to the impacts of severe weather and climate change, so that services can respond effectively to extreme weather events while continuing to operate safely and reliably.

The Investment Programme should therefore not just identify enhancements, but interventions that ensure the North's productivity is not held back due to a lack of resilience on the strategic transport network. Working in collaboration with the Environment Agency, Highways England and Network Rail, proactive risk mitigation through enhanced transport infrastructure design and improved management of grey, blue and green infrastructure can ensure a sustainable legacy.

The Climate Change Act 2008 sets a target to reduce carbon emissions by 80% by 2050 and investment in the North's transport network can support the achievement of this target.

Use of resources

TfN is supportive of new approaches that encourage new or upgraded infrastructure to undertake sustainable procurement and be resource efficient, including through the promotion of the circular economy or exploring opportunities that can reduce the consumption of natural resources, such as soil, materials, energy and water in construction, operation and maintenance.

Protection of soils

Soil is an essential finite resource that provides for the growing of foods, timber and other crops, acts as a store for carbon and water, a reservoir for biodiversity and a buffer against pollution. The soils in the North are valued as a finite multi-functional resource, which underpins wellbeing and prosperity. Decisions made about transport interventions will take full account of the impact on soils, their intrinsic character and the sustainability of the many ecosystems they deliver. A soil survey and agricultural land classification must be carried out as part of the preparation of transport intervention proposals by Delivery Bodies. Measures must be taken to protect, conserve and manage soil resources during construction and operation of transport interventions to prevent soil from being adversely affected by pollution and contamination. TfN and Partners will work to protect and enhance valued soils and prevent the adverse effects of unacceptable levels of pollution.

Reducing air pollution from transport

Air pollution is the UK's largest environmental risk to health, with 5% of deaths in England being attributable to exposure to air pollution. Road transport causes air pollution diesel and petrol vehicles, including through carcinogenic diesel emissions, high levels of nitrogen dioxide (NO₂) and particulate matter (PM). Children and older people are more susceptible to the effects of air pollution and both long and short-term exposure to air pollution is known to adversely affect health. It is estimated that if no action is taken, the effects of air pollution could cost the NHS and social care system up to £18.6 billion by 2035¹⁴⁷. Asthma, chronic bronchitis, heart disease and strokes can all be caused or made worse by air pollution, along with a variety of other conditions. A wide geographical approach, for example across the North, is required to tackle air pollution because air pollutants and their sources are mobile, and actions in one area may directly impact on another.

TfN is, however, conscious that as emissions from exhausts decrease, 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, Delivery Bodies, the Government and the private sector must work collaboratively to address this important issue as the Investment Programme is developed and delivered, in part by encouraging, where possible, more trips by public and active transport modes.

The Investment Programme will give consideration of measures to reduce both sources of air pollution and people's exposure. As well as targeting defined areas where exceedances of the air quality standard objective for Nitrogen Oxide (NO_x) have been observed, TfN supports measures that improve air quality as a whole. Attention must be paid to improving air quality over the wider North.

Interventions that improve air quality could also result from promoting a modal shift from private motor vehicle use to sustainable travel modes. This includes public transport, walking and cycling, and can help improve physical activity

levels, providing additional public health benefits and contributing to reduced CO2 and air pollution simultaneously.

Decarbonisation of transport

Being the largest greenhouse gas emitting sector, accounting for 28% of all UK greenhouse gas emissions in 2017, transport has a significant role to play in meeting commitments to reduce greenhouse gas emissions¹⁴⁸, in particular carbon emissions. The transport network must be decarbonised to support a shift to a low carbon economy.

At present, there is a direct proportionality between the relative energy consumed by different modes of transport and their carbon intensity, as shown in the chart below. The higher the energy consumed the higher the carbon emissions.

INFOGRAPHIC - CO2 emissions from passenger transport¹⁴⁹

The Climate Change Act 2008 set a target to reduce total national carbon emissions, from all sectors, by 80% by 2050. With increased investment in the whole of the transport network, the North will support the achievement of this target. This target means that national road transport emissions will need to be near-zero, almost every vehicle on the road will need be of an ultra low emission type, and a decarbonisation of rail by 2050.

TfN does not currently have the powers to enforce targets and policies on carbon reduction; however, carbon reduction is a key consideration for TfN and Partners.

TfN supports the series of Government policies and proposals to meet the UK's legislated emission reduction targets as set out in the Road to Zero Strategy and Clean Growth Strategy, with the latter setting out a series of policy measures focussed on accelerating the shift to low carbon transport. These include actions on introducing new vehicle technologies, accelerate the uptake of Ultra Low Emissions Vehicles (ULEV), on encouraging the shift of freight from road to rail and on working with the private sector to support research and development of connected and autonomous vehicles. The Road to Zero Strategy sets out further measures towards cleaner road transport, including reducing emissions from vehicles already on the road, encouraging ULEVs, accelerating charging infrastructure deployment and further reducing freight emissions. This will require a resilience and capability of the energy sector to provide green and clean energy to a strategic charging point network.

In order to meet the ultimate 80% reduction target, the Clean Growth Strategy sets out a reduction in transport emissions of 30% from 2017 to 2032. However, the Committee on Climate Change has recommended this reduction should be stretched to 46% from 2017 to 2030. The Committee on Climate Change has also recently called for the interim target of an end to the sale of all new

conventional petrol and diesel cars and vans by 2035, as opposed to the date of 2040 set out in the Clean Growth Strategy.

Achieving these reductions will require very significant action and funding to achieve improved efficiency of conventional vehicles, a major increase in the uptake of ULEV, measures to move goods more efficiently and encouragement of the switching of travel to more sustainable modes, such as zero emissions public transport.

Pathway to 2050

TfN recognises that action across many sectors (including transport), and at different levels, will be needed if the North is to keep on track to achieve 80% emissions reduction by 2050, and most importantly meet the 51% and 57% emissions reductions for the fourth (2023-2027) and fifth (2028-2032) national carbon budgets, respectively¹⁵⁰. TfN also acknowledges that total national carbon reduction levels may need to be even deeper, according to recent advice from the Committee on Climate Change.

TfN commits to identifying the most appropriate targets for the North's transport network as part of the subsequent TfN Investment Programme, as sufficient lead time will be necessary for current approaches to be modified and tested. Future versions of TfN's Investment Programme, supported by complementary local investment and interventions led by TfN's Partners, and strategic investment by Delivery Partners, will set out a clear programme of phased introduction and implementation of carbon policies and measures. These must all contribute towards meeting the Government's carbon reduction targets and carbon budgets, through to 2050.

TfN cannot achieve carbon reduction from transport on its own; this is a collaborative effort. As part of TfN's commitment to developing an Inclusive and Sustainable Growth Framework, and recognising the urgency of addressing carbon reduction, TfN will lead the scoping and development of a 'Pathway to 2050' by 2020. This will require continued collaboration with Partners, Delivery Bodies and the Government, to deliver the ambitions of the Strategic Transport Plan and local transport plans, in tackling carbon impacts and reductions from transport. A carbon performance approach similar to that used in London and set out in the Mayor's Transport Strategy will be explored to inform the establishment of the 'Pathway to 2050' and plot the trajectory through to 2050.

TfN's preliminary carbon analysis, as set out in the evidence base, demonstrates that total emissions will need to fall further and quicker as future interventions are delivered, in particular in the next two carbon budget periods. In order to address this challenge, further carbon analysis work to define the 'Pathway to 2050' will consider:

- Development of an estimate of 1990 baseline emissions for the North to enable comparison with appropriate national carbon budget reductions.
- Definition of scenarios to explore linkages between potential policies and interventions, scenario parameters and strategic outcomes. Direct consideration of modal split will form a strong focus of this approach, in

particular active and public transport versus other road transport and consideration of rail and other non-road modes.

- Further detailed modelling of travel demand over time and across different parts of the North.
- Development of an enhanced approach to modelling scenarios/options, which is strategic outcomes-led and focused on definition, evaluation and programming of policy/intervention/package options designed to deliver strategic outcomes over the STP programme to 2050.
- Refinement of the model to include consideration of the range of low and zero emission road vehicles other than electric vehicles, covering all vehicle types.
- Refinement of the model to consider a wider range of technologies and emission reduction measures, such as plug-in hybrid electric vehicles, biofuels and technologies that promote smoother driving.
- Modelling of emissions of local air pollutants.
- The impact of a number of policy assumptions, such as more efficient use of the network, displacement of emissions from elsewhere in the UK and low carbon energy production, directly enabled by the Strategic Transport Plan.

Given that transport is the only UK sector that saw an increase in total emissions over the second carbon budget period (2012–2017), and given the importance of the period covered by the third (current), fourth and fifth carbon budgets in terms of being able to limit global warming to 1.5 degrees, estimates of total carbon impacts and reductions from transport (from 1990 baseline) projected for the periods 2023–2027 and 2028–2032 will form a key focus of the carbon analysis work.

The 'Pathway to 2050' will set out a clear programme of phased introduction and implementation of key policies and measures through the interventions promoted, and their projected contribution to meeting carbon budget targets, through to 2050. TfN commits that the scale and type of programmes and interventions, and underpinning scenarios, will if necessary be adjusted in order to be consistent with the 'Pathway to 2050' over the lifetime of the Strategic Transport Plan.

Public transport operators and providers

Public transport providers, deliverers and operators should work towards a zero carbon public transport network by 2050 through:

- Retrofitting vehicles, including ensuring all buses meet the Euro VI diesel standards for NOx.
- Implementing different options for alternative fuelling and operation, including encouraging new bus fleets and rail rolling stock to be hybrid, electric or hydrogen, and liquefied natural gas for freight transport.
- Supporting the circular economy by encouraging responsible procurement and maximising the reuse and recycling of materials.

- Working with Delivery Partners in undertaking measures to ensure that CO2 and other air pollutant emissions from the construction and operation of transport infrastructure are minimised.
- Investing in heavy and light rail networks, which have zero emission at the point of use and increase efficiency in operation.
- Encouraging space-efficient modes of transport, including the promotion of bus priority, increased car occupancy and use of public transport.
- Increasing the use of sustainable transport modes, including cycling measures such as cycle routes, parking and promotional activity.
- Ensuring the availability of cleaner and green private and public transportation such as hybrid buses, as well as provision of electric vehicle charging points.
- Introducing measures to reduce energy consumption or increase the use of low carbon energy sources, including LED lighting and solar panels.

Uptake of Ultra Low Emissions Vehicles

TfN fully supports the Birmingham Declaration on zero emission vehicles in meeting the goals of the Paris Agreement. The development and deployment of zero emission vehicles will contribute towards economic, health, social and environmental benefits for the North. TfN calls on the Government to work closely and collaboratively with the North to address these issues in the short, medium and long term, ensuring there is an acceleration in the transition to ULEV, and that the North will have world class innovations and technological advances implemented.

Electric vehicle charging infrastructure

To succeed in making the transition to zero emission, the electric vehicle charging infrastructure will need to change significantly. The Automated and Electric Vehicles Bill will provide an opportunity for the North to improve and invest in the charging experience for current and future electric vehicle drivers by ensuring improved accessibility and interoperability at charging points. The Bill will enable a common minimum method of accessing public charge points across the North, enabling interoperability between different types of electric vehicles and charge points.

TfN wants to ensure that current and future electric vehicle drivers can easily locate and access electric vehicle charging infrastructure that is affordable, efficient and reliable. This should be from their home, work or leisure location. A typical electric vehicle uses 19kWh of energy to travel 100km, while the average petrol vehicle uses 67kWh¹⁵¹.

Working with the Government and TfN's Partners, the North must ensure there is a joined-up plan for strategic electric vehicle charging infrastructure to enable the mass adoption of electric vehicles. This must be on the Strategic, Major and Local Road Networks, with user experience and availability also being crucial for transport users. Range anxiety, which is the perceived mistrust that electric vehicles will not reach the destination, is one concern of current motorists.

Currently, there are only 2,971 public charging point connectors across the whole of the North¹⁵² (17% of the UK total).

To meet long distance en route rapid charging requirements, the number of rapid chargers located near the Major Road Network needs to expand by about 2.5 times relative to 2016¹⁵³. This relatively modest increase is explained by an increase in the range of future electric vehicles, which means that many fewer trips will require a charge en route. In 2016 around 27% of trips needed to charge en route; with increased battery range, this falls to less than 1% by 2030¹⁵⁴.

The number of public chargers required to meet demand for 'top-up' charging during parking-based charging is estimated to rise by around a factor of 10 by 2030. This is a much larger increase than for longer distance en route charging, reflecting a continued demand for 'top-up' charging, despite the increase in battery size and range, and reduction in range anxiety.

TABLES –

Number of Rapid chargers (near the North's Major Roads Network)

50kW – 589 / 150kW – 203 / Total – 798

Number of topping up chargers around the North

Slow – 2,433 / Fast – 5,587 / Rapid – 5,211 / Total – 13,231

Building on the Committee on Climate Change analysis, the table below shows the estimated number of different types of charge points required across the North by 2030:

In order to support a move to electric vehicles, promoting a greener and cleaner road network, TfN calls for a rapid increase in the number of public charging points across all parts of the North, as part of improvements planned to the North's road network, and through close engagement and collaboration with energy providers.

The North's transport hubs, such as its 575 rail stations, are places where large numbers of vehicles are left for several hours, and working with Network Rail, train operators and local authorities, TfN will support the establishment of rapid hubs or charging point filling stations at these and other key strategic locations in all parts of the North.

Autonomous vehicles

Connected and autonomous vehicles may change or replace the need for capacity upgrades on some parts of the North's road network, with the vehicles instead being integrated into a wider sustainable transport network. This could include support for journeys on the strategic network, or for rural and last mile connectivity where other options are not available. This is currently still technology that is being tested. However, given the significant number of current and future road-based trips, TfN and Delivery Partners need to work with

the private sector to ensure that vehicles are cleaner and greener, and the road network is adaptive to change.

Zero emissions zones

As well as providing incentives and supporting infrastructure to encourage a move to ULEV, including Clean Air Zones, it will also be necessary to use disincentives to phase out fossil fuel vehicles altogether. In addition to the introduction and expansion of ULEV, tightening emission standards by implementing a network of zero emission zones in the North could help reduce total CO₂ (and also NO_x and PM) emissions. As many of these will predominantly be in town and city centres, Local Transport and Highway Authorities will assess where, and if, they are required and lead on developing and implementing these with the support of TfN.

Emissions from current road vehicles

The use of alternative (to standard fossil fuels) low carbon fuels can also contribute to an emissions reduction. Low carbon fuels be made from wastes or crops and can replace fossil petrol, diesel and natural gas (methane). There are a range of different types, including biodiesel, bioethanol, biomethane and bio-LPG. On average, low carbon fuels supplied in the UK provide greenhouse gas savings of around 70% compared to standard fossil fuels. For hydrogen vehicles, water is the only by-product at point of use as no greenhouse gases or air pollutant emissions are produced. The Road to Zero Strategy aims to increase the supply of low carbon fuels to reach 7% of road transport fuel by 2032¹⁵⁵. TfN and Partners will work together to encourage vehicle retrofit, the roll out of hydrogen vehicles and the implementation of a network of low carbon fuelling stations across the North, as part of a long-term sustainable solution.

The Road to Zero Strategy also calls for heavy goods vehicles greenhouse emissions to be reduced by 15% (from 2015 levels) by 2025¹⁵⁶. This is a voluntary, industry supported target. The Committee on Climate Change has welcomed a 15% reduction in emissions by 2025 from fleet operators, but there will be a need to move beyond the current voluntary approach should real emissions reductions not be delivered. TfN and Partners will work with the Government and the freight industry to improve journey times and reliability for deliveries, and to reduce the environmental impact of logistics through the promotion of electric and alternative-fuelled vehicles in the North, and support mode shift from road freight to rail and inland waterways.

Emissions from rail

The Carbon Plan 2011 identified the need to decarbonise rail travel through electrification, more efficient trains and low carbon emissions.

TfN supports the Government's recent pledge to remove diesel trains from Britain's railways by 2040. TfN also calls for the trial of new rail traction technology in the North when commercially available to reduce the dependency on diesel-powered rail units and, potentially, reduce the overall running costs of the railway.

Introducing bi-mode and electric trains on the TransPennine Express network will cut carbon emissions by 30%¹⁵⁷. Increasing the ability of the railway network to spread the benefits of electric powered trains onto more lightly used sections of line, whilst retaining the benefits of electrically powered services, should be further explored. Battery and fuel cell-powered trains could make electrification an outdated technology. The role of innovation is explored further later in this Strategic Transport Plan.

Small, yet significant investments, such as solar panels and LED lighting at rail stations, on streets, on strategic road networks, and on dedicated cycle and walking routes, will reduce the carbon impacts on the communities where they are located. Through the co-management of the Northern and TransPennine Express rail franchises, TfN will ensure that current and future rail franchises undertake sustainability improvements on rolling stock and station infrastructure.

Emissions from aviation

The UK's 2050 target and carbon budgets current exclude emissions from international aviation. Aviation is probably the most difficult transport area to decarbonise. TfN wants to see more direct international links from the North's airports to support the economy of the North and to provide local options for residents in the North who currently have to travel outside the area to take flights. TfN recognises that aviation is a significant contributor to carbon emissions, however TfN strongly expects the aviation sector to become greener and cleaner and will support future Government initiatives to reduce emissions from aircraft. TfN will ensure that any increased surface transport demand, as a result of increased passenger and goods movements, is sustainable. In the national picture, more goods being customs cleared and distributed from the North's airports could also reduce emissions and congestion on the wider transport network attributed from moving from airports in the South or the Midlands.

Principles for developing the Investment Programme

TfN aims to assume a leadership role in developing a transport network that is sustainable. Working together with Delivery Partners, TfN will ensure that strategic transport infrastructure is designed and constructed in a sustainable way. The principles set out below, build on the pan-Northern transport objectives, and will be developed over time to ensure the Investment Programme becomes an exemplar in how it:

- Defines a broad set of infrastructure requirements that will seek to deliver high quality travel with associated high quality environmental mitigation, to create an attractive, inclusive, and accessible environment to live, work and invest, for a healthier, safer, more inclusive strategic transport network across the North.
- Acts as a catalyst for future transport technologies, enabling environmentally-friendly and efficient travel and contributing to the Government's target to reduce carbon emissions.

- Ensure that improvements to the strategic transport networks 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, as well as supporting wider opportunities.
- Explores opportunities for green and blue infrastructure to enhance landscapes, ecosystems, and habitats, and support a net gain in biodiversity.

These principles, together with the sustainability ambition, will align and support the delivery of the Government's 25 Year Environment Plan. For transport, this will specifically mean reducing emissions from vehicles, supporting a net gain in biodiversity, reducing the health impacts of the transport network and mitigating the impacts of climate change, while also undertaking more sustainable and efficient procurement and delivery of interventions.

In time, as the Strategic Transport Plan and Investment Programme develops, TfN will work towards delivering infrastructure that supports these agreed principles. This can be achieved in part through joint infrastructure planning, consultation and engagement with Delivery Partners, other statutory bodies and wider stakeholders.

TfN endorses the work being undertaken by Highways England and HS2 Ltd through its Design Panels, as well as similar approaches by other Delivery Partners, to work towards delivering the best sustainable design through infrastructure development.

What? Identifying the required interventions to transform the economy

In order to deliver transformational, inclusive economic growth, significant investment will be required to the road and rail networks across the North. Five work programmes will achieve the shared ambition for the North over the next 30 years.

Local and sustainable transport

TfN's remit is focused on the identification and recommendation of pan-Northern strategic transport interventions, but the regulations governing TfN state that it must have regard to all transport users. By producing an integrated and aligned pan-Northern Strategic Transport Plan, there is the opportunity to support the Local Transport and Highway Authorities who are best placed to explore the opportunities to deliver more sustainable and efficient local transport networks. This means targeting short trips that could be undertaken by public transport, cycling or walking, thereby reducing localised congestion, improving the environment, and supporting an improved transport system at a local and pan-Northern level.

Delivering transformational, inclusive economic growth will require complementary and supporting investment at a local as well as a pan-Northern level to ensure that a 'whole journey' and 'total network' approach to improving transport is followed. The start and finish of almost all journeys lie beyond the strategic transport networks and require integration with local systems and other modes such as local public transport (including light rail, bus rapid transit, underground metro and local bus services), walking and cycling, as well as the use of the local road network.

Very often it is the access to, as well as the affordability and quality of, these local journeys that will be the determinant of the overall choice of mode for the whole journey. If the walk or cycle to the bus stop or rail station is of poor quality and perceived to be insecure, a potential public transport trip will be replaced by one using the private car. If the local public transport network does not support effective connections to and from the main public transport hubs, then once again the opportunity to move longer-distance trips away from the private car could be lost. Notwithstanding this, there are parts of the North, especially in more rural parts, that car travel will remain a necessity.

Taking a 'whole journey' approach will not only support transformational economic growth and carbon reduction objectives, it will have significant social benefits, by reducing severance and connecting local communities with employment and other services in local areas and across the North. In many cases, local transport is key to allowing people to access work, health, leisure and education opportunities. This also supports the pan-Northern transport objective to improve opportunities to people across the North, working towards a healthier and more inclusive North, as well as having a positive impact on air quality.

Light rail systems, including Manchester Metrolink, Sheffield Supertram and Tyne and Wear Metro and Merseyrail's local heavy rail network all provide vital high frequency intraurban connectivity to support their economic geographies and feed into long distance journeys. There are examples where local investment priorities will interact with strategic priorities, such as new rail links, rolling stock and new stations.

New rolling stock on the Merseyrail Electrics network will be introduced by 2020 with the following key features:

- The new trains will be safer – most notably in the ease in which everyone can get on and off, and will make Merseyrail the most accessible rail network in the UK.
- The trains will be able to carry more than 50 per cent more passengers while retaining the same number of seats. This will help them better cater for rising passenger numbers, both now and in the future.
- The trains will be faster, cutting journey times by 10% – up to eight minutes on some end-to-end routes.
- The trains will have the capabilities to eventually run beyond the current Merseyrail boundaries to places like Skelmersdale, Wrexham, Warrington, and Hooton to Helsby connecting to Halton Curve services, meeting the ambitions of the Liverpool City Region's Long-Term Rail Strategy.
- Potential for dual operation with the new units AC/DC or vbattery/DC.

TfN and Partners will work together to achieve the most optimal solution for local and strategic movements. Local investment plans, as set out in strategies such as the Tyne and Wear Local Rail Strategy, have been recognised in the development of this Plan, as well as future options for the management of future rail franchises.

Of particular importance in encouraging a mode shift towards rail, will be the need to ensure effective connections to new and existing rail stations by all modes, and the provision of adequate access facilities, such as parking and drop-off/pick up provision, electric charging points, bus facilities and secure cycle parking. How local rail stations are managed can also aid integration and will also be a key part of future rail franchises in the North.

It is important to recognise that there are many journeys across the North that are not possible by rail, but where improved light rail, bus rapid transit, underground metro demand responsive services and local bus services may be the best solution to improve such connectivity.

Further development of core bus networks, using new engine technology to ensure that the bus fleet is as green as possible, working towards a zero carbon public transport network across the North, and incorporating the latest techniques in providing bus priority in congested networks, will all be essential for providing effective, efficient and clean access to urban centres. Delivery of these improvements can be underpinned by new partnership arrangements such as the Liverpool Bus Alliance and by new arrangements provided for through the Bus Services Act.

As TfN, its Partners, and the Delivery Partners – Network Rail, Highways England and HS2 Ltd – develop major interventions for improving the national and inter-urban road and rail network, consideration should be given to how to maximise the integration with local transport networks.

Park and ride can play an important role in improving access to public transport and to reduce urban congestion and improve air quality. Whilst many urban areas have introduced a successful park and ride offer using buses – and there are numerous examples in Cheshire West and Chester, Liverpool City Region, Greater Manchester, Sheffield City Region and the North East of park and ride using the local and light rail networks. Strategic rail-based park and ride remains a relatively untapped market across the North. As major rail interventions such as Northern Powerhouse Rail are developed, understanding the opportunities for strategic park and ride to reduce overall levels of car mileage and volumes of traffic entering urban areas will be important.

TfN and Partners will look to assess the options, including through the powers of the Bus Services Act, to improve intermodal travel and modal shift, by simplifying access to travel information to make journey planning easier. TfN's work to develop the Integrated and Smart Travel programme will make intermodal travel more attractive. The benefits of this initiative will be constrained if measures to improve the offer of local public transport networks are not explored, particularly for serving new housing and employment locations.

The Government's Walking and Cycling Investment Strategy sets out the ambition that cycling and walking are the natural choices for shorter journeys, or as part of a longer journey. The Strategy includes an aim to double cycling activity by 2025 and each year reduce the rate of cyclists killed or seriously injured in England, and also to increase walking activity to 300 stages per person per year in 2025.

TfN supports the delivery of a real step-change in the quality of cycling infrastructure, with the Investment Programme acting as a catalyst for the development and delivery of improved sustainable transport routes across the North. TfN wants to ensure that the Strategic Transport Plan and Investment Programme provide a design opportunity for Delivery Partners and Local Transport and Planning Authorities to future-proof enhanced and new rail and road infrastructure for cycling and walking. As set out in the National Planning Policy Framework, sustainable transport can have the added benefit of making developments in communities across the North more feasible and appealing.

Importantly, enhanced sustainable transport infrastructure aligned with the TfN Investment Programme could boost the visitor economy, as set out in the 'Why' section of the Strategic Transport Plan, by better connecting local communities both rural and urban. TfN welcomes the potential of a national cycleway associated with HS2. An improved Northern and national cycleway could provide the potential for increased tourism trips, bringing the economic benefit to the many communities and businesses. TfN will support Local Transport and Highway Authorities, National Parks and other organisations in the promotion of

these schemes, and in securing funding towards interventions, ensuring they support local strategies to design and deliver more attractive, continuous and safer cycle routes.

The Delivery Partners have all developed mechanisms to incorporate cycling and walking facilities within their major schemes, and TfN will ensure that all future strategic transport interventions follow suit so that design principles for interventions factor in enhanced opportunities in their spheres of influence.

Alongside the Cycling and Walking Investment Strategy, the Government published guidance on the preparation of Local Cycling and Walking Infrastructure Plans, enabling local transport and highway authorities to take a more strategic approach to improving conditions for cycling and walking, and support increases in travel on foot and by cycling.

Whilst TfN, and this Strategic Transport Plan, is focused on pan-Northern transport interventions, there is an equally important job to be done at local level to enhance mobility within local functional economic geographies, particularly within the city regions, and ensure that the value of pan-Northern investments is maximised through carefully coordinated and integrated local transport investment. This has been explicitly recognised by the National Infrastructure Commission in the National Infrastructure Assessment.

The Commission's proposals for a significant uplift in funding from 2025 onwards for Devolved Cities and Non-Urban local transport, and potentially also National Parks, is strongly endorsed by TfN¹⁵⁸, and will go some way to closing the current gap between the need for local transport investment and the money that is made available to pay for it. This increased investment could also support TfN's Partners, where appropriate, to develop the rapid transit networks in the North's largest towns and cities that will encourage a shift away from the private car, and support air quality measures.

Local Enterprise Partnerships across the North have secured over £2 billion in Local Growth Fund allocations for local transport projects through City Deals, Growth Deals and Devolution Deals. This has been supplemented by locally funded investment programmes in a number of areas. Over time, future iterations of such deals should look to respond positively to the National Infrastructure Assessment and identify the complementary local interventions to improve the 'whole journey'.

In 2018, the Government introduced the Transforming Cities Fund with the aim of driving up productivity and spreading prosperity through investment in public and sustainable transport in some of the largest English city regions. The Fund is focused on intra-city connectivity, making it quicker and easier for people to get around and access jobs. In line with the National Infrastructure Assessment, it is hoped that other funding will become available, in addition to the Transforming Cities Fund, to support the delivery of transformational local schemes and priorities.

The spatial nature of these locally-led improvements has been recognised in the development of the Strategic Development Corridors set out within this Plan as

well as the long-term Investment Programme. Working in conjunction with its Constituent Authorities in these city regions, TfN is looking to deliver a successful 'whole journey' experience through the promotion of sustainable and efficient travel to jobs, services and other opportunities on both the local and strategic transport networks.

The role of the local road network cannot be forgotten, particularly the issue of the ongoing maintenance of the network, which also serves buses, rapid transit, cycling and walking. Whilst some of TfN's work is focussed on new strategic interventions, specifically on the Major Road Network, one of the objectives of the Strategic Transport Plan is to increase the reliability and resilience of the transport system as a whole. It is critical to ensure that ongoing funding for local road maintenance and asset management, as well as maintaining and renewing local public transport system, reflects the real needs of such networks.

Many of TfN's Partners are in the process of updating their statutory Local Transport Plans. Section 120I of the Cities and Local Government Devolution Act 2016 states that the constituent authorities of a Sub-National Transport Body must exercise transport functions with a view to securing the implementation of the proposals contained in the statutory Sub-National Transport Body's transport strategy¹⁵⁹.

These plans and strategies are important documents which should include TfN's local transport aspirations. It is envisaged that the Strategic Transport Plan, the analysis underpinning it and TfN's policy positions, will help to provide some of the strategic context within which Local Transport Plans evolve in the future. The collaborative approach through which this Strategic Transport Plan has emerged and will be reviewed, ensures a continuing two-way alignment between the Strategic Transport Plan and Local Transport Plans, thereby providing a comprehensive framework for how transport investment priorities are identified and delivered by both TfN and Local Transport and Highway Authorities, as part of the 'whole journey' approach.

An overview of some of the recent transport investment, as well as crucial future transport investment in each of the North's Local Transport and Highway Authorities, is detailed on the next page. These investments all complement the envisaged pan-Northern transport interventions derived through this Strategic Transport Plan.

Planned future local transport investments

East Riding of Yorkshire

- A164/Riplingham Road roundabout scheme (£4.2 million) to start in April 2019.
- Major scheme planned for B1232/A164 junction to support new housing and employment development, and further improvements planned at Swanland and Humber Bridge roundabouts.

- A1079/Shiptonthorpe roundabout improvement scheme (£4.3 million) to commence spring 2019 with further capacity improvements planned for this key corridor.

Cumbria

- £7 million of NPIF funding is being used to deliver junction and capacity improvements in Kendal, Barrow, Whitehaven and Carlisle.
- £4 million road over rail access bridge at the Port of Workington.
- £120 million Infrastructure Recovery Programme with over 1,200 individual schemes.
- £7.9 million in the Keswick to Threlkeld multi-user trail.

City of York

- £155 million of infrastructure for York Central development, including new access road, two foot and cycle bridges and a new station entrance to the west side of York Station.
- £38 million West Yorkshire Transport Fund, including A1237 Roundabout Upgrades.

Cheshire East

- £90 million Congleton Link Road scheme to ease congestion and improve air quality in Congleton, enabling significant Local Plan Housing Growth.
- £51 million Poynton Relief Road scheme to connect the A523 south of Poynton to the new A6 Manchester Airport Relief Road.
- £58 million Middlewich Eastern Bypass scheme enabling jobs and homes growth as well as relieving traffic congestion in Middlewich town centre.

Cheshire West and Chester

- Chester City Gateway major investment, building on the £8 million secured in the Wales and Borders franchise for Chester station enhancements.
- Chester to Broughton Growth Corridor road access improvements.
- Chester Transport Strategy schemes, including a potential fifth park and ride on the Hoole corridor.

Blackburn with Darwen

- Lancashire Cycling and Walking Strategy investment programme to be delivered through the Local Transport Plan - which includes further linkages to the Weavers Wheel and the wider East Lancashire Strategic Cycle Network.
- New public rights of way links in and around Darwen to improve walking and cycling accessibility, connecting future housing developments with the Town Centre and public transport nodes.

Blackpool

- Ongoing SMART UTMC highways management programme.
- Improved town centre access arrangements.

- Enhanced network maintenance programme, including the vital Yeadon Way.

North Lincolnshire

- Growth Deal investment in infrastructure to support the regeneration of Scunthorpe town centre.
- Upgrade of the highway infrastructure in the South Humber Gateway.
- A1077 improvements/Barton relief road.
- Lincolnshire Lakes Road Infrastructure.

Sheffield City Region

- Widening of the A630 Sheffield Parkway near Junction 33 of M1 to address congestion (£45m).
- £27 million Supertram track renewal Phase 2.
- New £180 million rail link and station at Doncaster Sheffield Airport.

Tees Valley

- £162 million for the Darlington Station Growth Hub.
- Further capacity enhancements and improvements at Middlesbrough Station through £20 million investment.
- £18 million for the Hartlepool Western Growth Corridor.

North Yorkshire

- £3.6m upgrade to the A1(M)/A59 junction 47 at Allerton Park to address significant congestion and potential safety issues at the main junction from the SRN into Harrogate.
- £30m realignment of the landslip prone main A59 at Kex Gill to remove the future risk of landslips closing the road.

Warrington

- A new railway station at Warrington West.
- Centre Park Link - £19 million investment in a new bridge over the River Mersey.
- Omega Local Highways - £21 million investment in improvements to five major junctions.
- Warrington East – improvements to Birchwood Way.

West Yorkshire

- £173.5 million investment in public transport improvements in Leeds.
- £120 million package of road and sustainable transport improvements on the A629 corridor Halifax to Huddersfield to relieve traffic congestion and unlock growth in South East Calderdale.
- £70 million East Leeds Orbital Route - a new 7.5km dual carriageway supporting housing development in the East Leeds extension and unlocking employment opportunities.

- Developing 4 new rail stations at Elland, White Rose, Thorpe Park and Leeds Bradford Airport Parkway, and improvements to station gateways across West Yorkshire.

Lancashire

- M55 to St Annes Link Road.
- Preston City Region transport package including Cottam Parkway railway station, South Fylde Line capacity improvements and enhanced north-south and east-west cross-city bus and active travel corridors.
- Lancaster City Centre and Lancaster South transport package including reconfiguration of the city centre gyratory and an enhanced north-south sustainable transport corridor.

North East Lincolnshire

- Construction of Grimsby West Relief Road to support delivery of a major strategic housing site and enhance network capacity.
- Capacity improvements at key junctions within the A180, A46 and A16 corridors as identified in the Local Transport Plan Highway Strategy.

Liverpool City Region

- £460 million to enable 52 new trains to run on the Merseyrail network with level boarding from all platforms.
- £41.4 million to fund 64 sustainable transport enhancement schemes.
- New Mersey ferries.
- Investment in the Key Route Network and corridor based improvements to the bus network.

Hull

- £1.8 million scheme to improve access to Priory Park Business Park.
- £8 million capacity improvements to the Stoneferry Corridor (A1033/A1165).
- North Hull park and ride site development.

North East and North of Tyne

- £270 million Local Growth Fund investment across economic infrastructure.
- £362 million replacement of the Tyne and Wear Metro Fleet.
- Metro Asset Renewal, New skills centre and Interchange developments.
- Housing Infrastructure Fund projects in Sunderland and North Tyneside to unlock new homes by delivering infrastructure, including bus links.
- Expanded and refreshed network of electric vehicle charging points, including a new filling station.

Greater Manchester

- Town and city centre regeneration and connectivity schemes.
- £160 million investment in walking and cycling schemes across Greater Manchester.

- Metrolink Airport Terminal 2 Extension.
- Additional Metrolink carriages and associated infrastructure.
- Tram-train pathfinder.

Integrated and Smart Travel

The Integrated and Smart Travel programme is an ambitious four year programme to make it easier to find out about and pay for public transport across the North, including the introduction of contactless.

This programme will transform the passenger experience in the North by working in partnership with the rail, bus and light rail sectors, and key transport organisations.

Improving the appeal and ease of use of multi-operator and multimodal public transport is essential to increasing the use of public transport, and thereby improving connectivity and the attractiveness of the North as a place to live and work.

This programme to improve integrated transport is essential to helping to keep the North's towns and cities moving as they become increasingly busy and connected, as well as making our rural areas more accessible.

The programme's current Partners include:

- Department for Transport.
- 20 Local Transport Authorities.
- 3 Train Operating Companies (TransPennine Express, Northern Rail and Merseyrail Electrics).
- Over 400 bus operators.
- Suppliers.
- Open Data Institute Leeds.
- Traveline.

TfN is working to introduce new initiatives that will improve the experience for passenger across the North by making travelling on public transport easier to find out about and quicker and easier to pay for. This will enhance choice and ensure passengers pay prices that are fair for the collection of journeys they have made. By doing this, it will support an increase in the number of people travelling by public transport, broadening people's access to jobs.

At the moment, four out of every five travellers use paper tickets, while only one in ten use tickets on their mobile phone. Meanwhile, 78% of all debit cards are now contactless, and nine out of ten passengers use rail travel primarily to commute to work on a regular basis¹⁶⁰. These facts highlight the opportunity for this ambitious programme.

Customers can already use a smartcard, contactless bank card or their smartphone to pay for travel on some public transport in the North. Using emerging technologies, the Integrated and Smart Travel programme will deliver modern payment methods and mobile travel information right across the North, in line with what passengers now want and expect from today's public transport system. Paying for journeys will become quicker, easier and more convenient.

For customers, travelling by public transport will be:

- Easier to use.

- Easier to pay for.
- Easier to access through personalised travel information.

Operators and Local Transport Authorities will benefit from:

- Smarter use of data and customer information.
- Confidence in revenue reimbursement.
- Being at the forefront of innovation.

The programme can help to build a more efficient transport network with a consistent and familiar travel experience throughout the North. The programme will be delivered in three phases over the next four years.

ITSO, the technology that will enable contactless travel on rail, is being rolled out across the North, enabling more stations for contactless travel.

Phase 1 - Smartcard on rail (2018-19)

This phase is part of a national programme to roll out smart ticketing across all rail travel. The success of this phase in delivering smartcards for rail passengers demonstrates that TfN has the partnerships and skills needed to create a new era of seamless and convenient travel across all public transport modes throughout the North.

Key features:

- Smart rail season tickets.
- Smart multiple, single and return tickets.
- Top up and tap with platform validators.

Phase 2 - Customer information, collaboration and innovation (2019)

This phase will include the provision of integrated customer information, disruption messaging and fare information to make journey planning quicker and easier. It will extend the same open source data and disruption information that rail passengers currently enjoy to bus passengers across single and multimode journeys. It is the information enhancement the industry has been waiting for, bringing together best practice and innovation from across the sector to deliver joined up travel solutions.

Key features:

- Enhanced information on bus fares.
- Planned disruption messaging, via a variety of sources.
- Open data hub for sharing of fare and disruption messaging.
- A knowledge network, with templates and tools to help operators introduce smart ticketing.
- Support for the best in innovation and technology to enhance later phases.

Phase 3 - Account-based travel (2020 onwards)

This will deliver an account-based back office travel solution that allows passengers to travel using contactless bank card for payment and enjoy a fair

price promise on multimodal, multi-operator journeys across the North. People will be able to travel with confidence in the price they are being charged and operators will have confidence in accurate reimbursement.

Key features:

- Contactless payments.
- Fair Price Promise.
- Enhanced customer information.
- Account-based back office.

The overall goal for the programme is a simpler and easier end-to-end customer journey, as illustrated below:

- Journey planning - First the customer decides which journey to make.
- Ticket selection - Then they decide whether to buy a ticket in advance, a ticket for multiple journeys, or simply pay as they go.
- Planned disruption - If there's any disruption they'll know about it, and be able to plan around it by using an alternative transport mode with the same payment method.
- Tap on - They then hop on their chosen public transport with a tap.
- Tap off - When they arrive, they simply tap again and carry on with their day.
- Fair Price Promise - They can trust they'll be charged the best price for all their journeys when it's calculated at the end of the day or week

The Fair Price Promise is at the cornerstone of the programme and means passengers have confidence that they are being charged the fairest price across multimode, multi-operator journeys through fare capping. This means they will never pay more for a pay-as-you-go collection of daily or weekly journeys than they would if they had bought the best value day saver ticket, whilst operators can participate with confidence that they will receive accurate reimbursement.

The Integrated and Smart Travel programme is well into delivery as set out in the TfN Investment Programme.

Strategic Rail

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 for the UK as a whole. An effective, efficient rail network in the North is fundamental 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 way to carry significant numbers of people directly into city centres and economic clusters. It is the mode of choice for high-skilled individuals and younger people, who are showing a greater propensity to use public transport and deferring learning how to drive to later in life.

Rail is one of the most effective ways to improve access opportunities for people in the North. The ability of rail to enable people to travel longer distances relatively quickly also provides the significant potential to increase the catchment of economic clusters. Rail-based modes and investment generally provide the most passenger capacity per hour compared to road-based and tram modes as set out below, but this is dependent on the context in which the intervention is located, and will be more applicable for direct, long distance connectivity between city centres:

Passenger capacity per hour¹⁶¹

- Double deck bus - 1200
- Tram (single) - 2700
- London Underground (Victoria Line) - 29376
- Docklands Light Railway (3 car) - 21300
- 10 car train - 19260
- HS2 - 19800
- 3-lane motorway - 7616 - 23800 (1.6 passenger occupancy to 5 passenger occupancy)
- Single carriageway - 1224 - 3825 (1.6 passenger occupancy to 5 passenger occupancy)

Such a rail network will also help improve opportunities and quality of life for all, whilst playing a critical role in reducing greenhouse gas emissions and moving towards a sustainable transport system. This includes providing fast, frequent, reliable and high-quality passenger services, along with the capacity and capability to adapt to modern freight requirements.

Over the last two decades, the North's railway has experienced substantial growth in passenger numbers despite a legacy of underinvestment. Much of that growth has been accommodated within pre-existing capacity, but this is no longer possible on many routes, and most of the North's key rail hubs are now at capacity. The North's rail network lacks sufficient capacity for growth and is severely constrained by on-train congestion, low journey speeds and poor punctuality.

Committed investment is a real start, with TfN, through its predecessor organisation Rail North, making the case for such investment in the current

Northern and TransPennine Express franchises. These franchises commenced in April 2016 and are jointly managed by the Department for Transport and TfN through the Rail North Partnership.

Both the franchises include significant enhancements in terms of investment in new and refurbished trains, additional capacity and services, enhanced station facilities and faster and more frequent services.

Northern is adding 2,000 extra services a week to destinations across the North of England, including 400 additional Sunday services. These will provide more frequent services, faster journeys, better connections and more seats. A new high quality Northern Connect service will be introduced between the major towns and cities of the North. Northern is also introducing a £500 million fleet of 281 new, air-conditioned carriages as electric and diesel trains. All of Northern's Pacer trains will be replaced and Northern's remaining fleet of trains will be refurbished.

TransPennine Express is delivering an investment of £500 million to provide 220 new intercity carriages running at up to 125 mph and £31 million to fully refurbish retained trains, with 72% of services to be operated by new trains by 2019. This will provide 13 million more seats across the timetable each year. TransPennine Express's existing, modern trains are being refurbished, plus 25 brand new five-carriage trains will be in service.

Aside from these two franchises, the North is served by other rail franchises, open access passenger operators as well as freight operators, many of which also have committed investment plans.

On the East Coast Main Line, the introduction of 65 new Azuma trains will provide 12,200 additional seats, faster journeys and more services to more destinations. The Wales and Borders franchise, which now has devolved responsibility to the Welsh Government through Transport for Wales, provides crucial cross-border services. Improvements will be implemented through to 2033. There will be £800 million spent on trains that will serve the North, boosting capacity by 65%, and the current fleet will be replaced entirely by 2023, with additional services serving more destinations across the North and North Wales. The franchise will also provide improvements at Chester Station.

The West Coast Partnership rail franchise is one of the fundamental parts for delivery of the Long Term Rail Strategy, directly serving nearly a quarter of the Strategy's identified economic centres. The Partnership offers a chance for a transformation of connectivity nationally, within the North, and locally.

The West Coast Partnership is planned to commence in 2020 and will initially operate InterCity West Coast services until becoming the integrated operator for InterCity West Coast and HS2. TfN and Partners will ensure that there is strong, strategic collaboration regarding the North's expected outcomes for both the operation, and the development of integrated high speed rail services, especially ensuring that there is the right balance between local, pan-Northern and long distance services.

TfN will then expect a similar, ambitious and integrated operator to address the needs for the full Phase 2B network, including on the East Coast Main Line.

Despite the relatively low proportion of travellers that use rail on average across the North compared to the road network at this time, there is significant potential in the North for rail to increase its share of the growing demand for transport needed to unlock transformational economic growth.

Rail already holds good market share between town and city centres, and in to the largest urban areas, but performs poorly where its offer has not kept up with roads investment or where strategic network gaps exist. However, the North's existing rail network lacks the resilience needed and sufficient capacity to accommodate all the journey types and lengths demanded of it, which is affecting the quality of its offer. The need for a step-change in the role and expectations of the rail network across the North is clear, and this Plan, and the associated Long Term Rail Strategy, provide a basis for that change.

Tram-Train

Tram-train has the potential to expand the rapid transit network across the North, adding additional capacity to the rail network. This also supports TfN's inclusive sustainable growth agenda, by better connecting communities with more reliable, frequent and sustainable public transport. Delivering tram-train in Greater Manchester can help build on the success of the Metrolink network, with adapted Metrolink vehicles running on the same lines as trains. This technology is common in other European countries, but has only recently been tried in the UK. By bringing tram-train to Greater Manchester and potentially other parts of the North, and building on investment in tram-train in the Sheffield City Region, TfN can help support a more integrated transport network. It also has the potential to encourage a modal shift from road to rail. TfN will support Transport for Greater Manchester, Sheffield City Region and other local partners when working with Network Rail, to deliver these benefits for passengers and communities as quickly as possible.

MAP – The North's passenger railway network and stations

Long Term Rail Strategy

The Long Term Rail Strategy, as of January 2018, sets out TfN's guiding principles for rail and is an integral part of the Strategic Transport Plan. It sets out why change is needed, what that change should be and how that change should be delivered, with an ambitious vision for the transformation of the North's rail network. This includes new railways (such as HS2 and Northern Powerhouse Rail) and services, complemented by major upgrades of the existing network and the harnessing of new technology to create a world class railway for the North.

The Long Term Rail Strategy sets out to deliver high quality rail services right across the North, with more frequent and better integrated services, faster journeys and improved reliability on modern trains, with high quality facilities alongside an efficient and attractive rail freight offer.

The starting point is the identification of a number of strategic gaps within existing rail network. These include:

- Poor journey times and low service frequency.
- Poor service reliability and punctuality, which undermine passenger confidence.
- Lack of on-train capacity.
- Inadequate integration with other modes of travel.
- Poor attractiveness of rail to passengers, businesses and freight.
- Evening, weekend and public holiday services that fall short of customer expectations.
- Limited access to international gateways and major tourist destinations.
- Services for rural and economically deprived areas that do not always meet local needs.
- Capacity and capability constraints that limit the potential for rail freight services.
- Insufficient train paths limiting the provision of passenger and freight services.
- Inconsistent quality of train services, stations, security and information provision.
- Trains that contribute to poor air quality and climate change.
- Complex fares and ticketing.
- Operating and infrastructure inefficiencies, and lack of revenue collection.

The Long Term Rail Strategy defines a series of key themes based on evidence of economic and social impact of rail. Each key theme addresses one or more of the gaps that prevent the current rail network from delivering the pan-Northern transport objectives. Each demonstrates a clear and strong alignment to the pan-Northern transport objectives to deliver a single, cohesive and integrated rail network.

Within each theme, a series of conditional outputs are identified, setting out what the North's rail network should provide to achieve the themes, recognising the different characteristics of:

- Community railways.
- Rural railways.
- Urban commuter services.
- Inter-urban services.
- High-speed and long-distance services.

These outputs are defined as conditional as they are dependent upon an affordable and deliverable solution being identified

Connectivity

A step-change in connectivity, including frequency and journey time improvements for both passenger services and freight, combined with better integration of services. This will bring the North's economic assets and clusters and neighbouring regions closer together and better align service provision to the seven day economy, supporting sustainable transformation of the North's economic performance.

- Reduce journey times between the North's economic and freight centres, and between these centres and both international gateways and key centres across the UK.
- Increase the population within 60 minutes rail journey time of two or more major Northern cities.
- Increase the population within 30 minutes rail journey time of at least one economic centre.
- Increase the population within 60 minutes rail journey of one or more of the North's airports.
- Increase the population within 90 minutes rail journey time of one or more of the North's major rail connected tourist destinations.
- Increase the number of services operating on Sundays and Public Holidays to achieve parity with the weekday inter-peak.
- First services to arrive in economic centres prior to 0700 (0900 on Sundays), with last services departing no earlier than 2300.

Capacity

Providing longer trains and additional services to meet existing and future passenger demand, with improvements to the infrastructure and signalling capability to accommodate these additional services. It will also enable the railway to be maintained and renewed in such a way that passengers and freight users are not unnecessarily disrupted by engineering possessions. This will ultimately improve access for all to opportunities across the North and facilitate the modal shift of passenger and freight flows.

- Increase the percentage of passengers satisfied with the level of crowding on franchises within the North.
- Enable all passengers to expect a seat on off-peak services, and within 20 minutes of boarding peak services.
- Provide the infrastructure capacity and capability to increase the permissible speed, weight, gauge and length of freight trains to cater for proven existing demand and for evidenced future demand.

Customer

A passenger network that is easy to navigate, accessible and predictable, with consistent information available before and throughout journeys. For passengers, there will be a less complex and more rationalised fares structure and better co-ordination of services with one another and with other modes of public and active transport. Stations and rolling stock will be of high quality with secure and comfortable passenger environments and facilities tailored to the needs of the journeys being made. For freight, there will be improved reliability and punctuality, and the flexibility to meet the changing needs of the industries of the present and the future. Collectively, this will improve the performance and integration of the North's strategic transport network by delivering high quality services across the North.

- Increase the percentage of passengers satisfied with the facilities and condition of the train franchises within the North.
- Increase the right time punctuality of passenger and freight services in the North.
- Decrease the percentage of cancelled passenger and freight services in the North.
- Increase the percentage of passengers satisfied with personal safety at station and on board.
- Increase the percentage of passengers satisfied with the provision of information during the journey.

Community

A railway that supports the social fabric of the communities it serves, providing journey opportunities which enable access to education, training and leisure opportunities as well as employment, and plays a full part in addressing transport poverty, isolation, and deprivation across the North. Equally important is enhancing rail's wider role in society and reflecting our global responsibilities, including the reduction of greenhouse gas emissions, the transition to sustainable energy sources and reducing the pollution caused by transport activities. Rail will meet these responsibilities by supporting modal shift for both passenger and freight and by increasing environmental standards of rail's own operations.

- All stations to meet TfN's minimum standards, recognising their role as gateways to the North's towns, cities and communities, and their potential greater role in the economic and social fabric of the areas they serve.
- Increase the percentage of passengers satisfied with the station.
- Improve air quality and reduce CO2 and other harmful emissions both on and about the railway estate and in wider society through modal shift to rail.

Cost effectiveness

Growing revenue and minimising the unit cost of operating and maintaining the North's railway without compromising the quality of the services offered, helping

maximise network efficiency and enhance the case for additional faster and direct services.

- Reduce the cost per passenger mile and per freight tonne km of services in the North.
- Grow the net revenue generated by the North's passenger and freight railway whilst delivering high-quality services and inclusivity.

For the conditional outputs to be achieved, a set of desirable minimum standards has been identified, which specify minimum frequencies, connectivity and journey speeds that should apply across the North. The current minimum standards are:

- All passenger routes to be served by a minimum two trains per hour.
- Long distance services to achieve average journey speeds of at least 80mph.
- Inter-urban services to achieve average journey speeds of at least 60mph.
- Local and suburban services to achieve average journey speeds of at least 40mph.
- The North's rail network to accommodate the evolving needs of the freight market, supporting longer and heavier trains, increased path availability and enhanced infrastructure, and ensuring additional room between freight trains and clearance of structures on the network (also known as gauge clearance). This should also include support for the operation and delivery of major employment sites.
- Direct connectivity between economic assets and clusters and Manchester Airport.
- Rail to directly serve each of the North's international airports, with direct services to economic centres within the airport's catchments.
- Direct connectivity between tourist destinations and economic centres in their catchments.
- Infrastructure to be available to enable a weekday interpeak level service on Sundays and public holidays.
- Capacity provision aligned to demand patterns during holidays and for events.
- Major ports in the North to be served by a network that will support movement and future growth of rail freight.
- A 50% improvement in the average speed of freight services by 2028.

These set out the targets that form the starting point for developing the interventions that feed into the Investment Programme.

The Long Term Rail Strategy is a strategic opportunity to join up track and train, meaning train service solutions can be developed and implemented alongside infrastructure schemes. It seeks to ensure that all of that investment work is delivered coherently as a single programme, underpinned by a consistent set of principles that maximise the benefits to the North's economy, passengers and the industry.

Rail network enhancements pipeline

From March 2018, the Department for Transport announced that it was taking a different approach to the way in which it brings forward enhancements to the rail network. The new approach is based around creating a rolling programme of investment that continues to focus on outcomes that deliver real benefits for passengers, freight users and the economy, known as the Rail Network Enhancements Pipeline. This is in line with the approach to the Long Term Investment Programme that supports the Strategic Transport Plan.

In developing the Investment Programme, TfN has therefore prioritised the rail interventions needed in the shorter term in the context of the Rail Network Enhancement Plan process, and TfN's Long Term Rail Strategy and Strategic Development Corridor programmes.

This means completing the remaining elements of the Great North Rail project – Network Rail's current programme of improvements to transform train travel in the North. This includes connectivity benefits, journey time improvements, capacity enhancements, and reliability improvements. This includes developing solutions for cross-Manchester capacity and reliability to deliver the outcomes of the original Northern Hub programme, in addition to exploring enhancements to the Castlefield Corridor. These improvements together with electrification between Lostock and Wigan will benefit rail users across the North.

Other rail enhancements either committed or already in the Rail Network Enhancements Pipeline across the North include new rail stations at Horden Peterlee and Leeds Bradford Airport Parkway, enhancements between Oxenholme and Windermere and in the Sheffield area in lieu of postponed electrification schemes, and improvements to the Hope Valley Line, which is an important early element of the Northern Powerhouse Rail programme. Also, there is the re-instatement of passenger services on the Northumberland Line, between Ashington and Blyth, and improvements to the power supply on the East Coast Main Line to support the delivery of the new Intercity Express Programme rolling stock. Additionally, there are also enhancements predominantly funded by local growth deals to increase the gauge clearance for freight services between Doncaster and Immingham and to improve capacity for passenger services between Harrogate and York.

The principal intervention within the next five year period for rail enhancements will be the Transpennine Route Upgrade, with improvements concentrated on the corridor between Manchester and Leeds. It is also increasingly clear that projects will need to be developed to further unlock capacity at key network hubs, which are constraining the capacity of the network as a whole.

The Transpennine Route Upgrade programme is planned to deliver significant performance improvements and journey time savings, increased capacity and capability to meet current and future demand and the potential provision of one freight path per hour (in each direction) for large container traffic.

The high level strategic outputs for the Transpennine Route Upgrade programme that TfN and Partners want to see are:

- Leeds to Manchester target journey time of 40 minutes.
- York to Manchester target journey time of 62 minutes.
- Capacity for six inter-urban services per hour for trains of eight carriages, and up to two local services per hour, in both directions.
- 92.5% of passenger trains to arrive within 5 minutes of the scheduled time.
- W10/W12 gauge clearance and provision of one freight path per hour (in each direction) for freight services between Manchester Victoria/Guide Bridge and Thornhill (Dewsbury).
- Upgrades to stations along the route.

TfN requires that the strategic outputs above are fully delivered so that the Transpennine Route Upgrade programme can deliver maximum benefits to the North, and also form an important forerunner to the Northern Powerhouse Rail programme, which will deliver longer term benefits for many parts of the North.

It is expected that the Transpennine Route Upgrade programme will also include the use of Digital Railway technology as a prelude to the wider roll-out across the North's rail network. The introduction of digital signalling has the real potential to make better use of the existing railway through increasing the capacity of the network and allowing more effective management at times of disruption, again benefitting passengers and freight users. However, Digital Railway solutions should not remove the need for key network capacity enhancements as and when required.

Beyond the Transpennine Route Upgrade programme, initial interventions are based around ensuring that the western part of the North's rail network is ready for the arrival of HS2 at Crewe in 2027, including enhancements that will spread the benefit of this major scheme and improvements to the West Coast Main Line and the main stations along it.

On the eastern part of the North's rail network, with the delivery and upgrade of the East Coast Mainline, and its parallel routes, it is important to unlock capacity for high speed services in advance of Northern Powerhouse Rail, facilitating franchise commitments, and supporting port related activity.

There remains the opportunity to re-open additional connections across the Pennines, which may provide further freight capacity, as well as new connections to areas of significant housing growth and economic activity. TfN will actively promote interventions aimed at increasing economic participation in the North, creating vibrant communities founded on strong and inclusive economies, which deliver benefits that are equitably distributed and do not compromise the ability of future generations to sustain standards of living and quality of life.

In addition to major infrastructure and investment programmes, TfN will work in partnership with Network Rail to identify opportunities to reduce the cost of the railway and make better use of existing assets. One way of doing this is to accelerate trains across the network by reducing journey times, not only does this make services more attractive to users, it also makes more efficient use of trains and crews. Together these factors make the railway more effective and more affordable.

The needs of the North's logistics sector will continue to be dynamic, with changing demand for freight flows. A rail network able to respond quickly to such dynamics is key to ensuring the continuation and growth of freight on rail, including capturing commodities currently carried by less sustainable modes such as road or air freight. This will require the provision of reserve network capacity, as well as a flexible solution for network maintenance and renewals to permit maximum network access. It is also important that the rail network can support the delivery of major investment proposals. For example, the upgrade to the Cumbria Coast Line is critical to the delivery and operation of major programmes in the energy, nuclear and mining sectors; supporting exports worth £10.9 billion, the creation of 18,450 jobs in West Cumbria and a £10.1 billion contribution of GVA to the Northern economy.

There are also significant gains to be made from making the railway work more efficiently, and from using the on-going maintenance and renewal programme to deliver benefits. More radical solutions will be required to resolve long-standing network weaknesses which limit the choice of rolling stock, constrain capacity, preclude service integration and prevent freight train operators introducing new services. TfN will work with the wider manufacturing and logistics industry to identify where these challenges are likely to arise and ensure plans are in place to accommodate additional demand. TfN will also identify where the infrastructure needs enhancing to give improved reliability and resilience.

TfN's long-term aim is transformational connectivity, maximising the opportunities of HS2 and Northern Powerhouse Rail, both of which will lead to a step-change in rail's offering, benefitting many areas of the North.

HS2 will enhance the North's connectivity with the rest of the UK, whilst Northern Powerhouse Rail will transform connectivity between major Northern cities, helping to redefine the economic relationships within and beyond the North, whilst securing modal shift from road transport for major interurban flows.

Planning for future improvements is already taking place and continued investment in the rail network is essential if the current gaps that will still exist once these committed schemes have been delivered are to be addressed. For freight, these gaps include limitations in network capacity, train lengths, loading gauges and axle weights, which makes some journeys uncompetitive. For passengers, these gaps include slow journey times, infrequent and poorly integrated services, overcrowding, poor quality passenger facilities, and outdated rolling stock.

HS2

TfN firmly believes HS2 will be transformational for the North. It will be a key piece of world class infrastructure integral to the expansion of the existing rail network, regenerate railway stations and their surrounding areas, and support the delivery of Northern Powerhouse Rail, which will free up much-needed North-South and East-West capacity in a system that is struggling to perform.

HS2 will enhance connectivity by public transport between the North, the Midlands and the South. Current plans are that HS2 will reach Crewe in 2027 with trains using existing infrastructure to reach their destination. Full completion of HS2 Phase 2 in 2033 will lead to more and faster journeys between the North, the Midlands, and London.

HS2 infrastructure can provide up to 18 trains per hour running in each direction to and from London by 2033, and has the potential for up to a further 12 trains per hour to and from Birmingham. HS2 services will be up to 400m in length, with almost double the number of seats as the longest Pendolino (11 carriages) in operation today on the West Coast Main Line. HS2 will carry over 300,000 passengers a day, releasing capacity on the existing rail network for new and improved services better serving local and regional markets¹⁶² including commuting as well as allowing more freight trains. This will help to reduce road congestion and take lorries off the road, helping to improve air quality.

INFOGRAPHICS – HS2 Journey Times

The Strategic Case for Phase 2 considered how both HS2 and strategic alternatives would address challenges on the West and East Coast Mainlines, as well as the Midland Mainline. Addressing these challenges will also have wider impacts on the wider rail network. Analysis shows that without HS2:

- Sufficient additional capacity to meet the long-term needs for the railway would not be provided.
- Significant additional capacity for commuter and freight traffic on the West Coast Main Line would not be released.
- The problem of resilience and performance on the East and West Coast Mainlines, and the Midland Mainline, would not be solved. As the Northern Powerhouse Independent Economic Review highlighted, enhanced connectivity, such as that which HS2 will bring, will increase the competitiveness and change the future pattern of economic growth in the UK as a whole.

When assessing transport user benefits and wider economic impacts, Phase 2a will generate approximately £700 million of wider economic impacts, with some £10 billion generated by Phase 2b. The whole HS2 programme is most effective and delivers greatest benefit when fully delivered, and is estimated to generate £17.6 billion of wider economic benefits¹⁶³.

The graphs below highlight how the peak seating capacity for passengers could be transformed. For example, there could more than double the number of seats from Manchester on the Crewe and Stoke corridors and from Leeds on the Doncaster corridor through the improvement to services. Although the graphs show evening peak enhancements, there will also be similar improvements in the morning peak.

GRAPHS – Leeds via Doncaster corridor and Manchester Piccadilly PM high peak hour seats

When construction peaks, it is estimated that HS2 will need 30,000 people to design and build the full HS2 rail network and 3,000 to operate it once finished. A large portion of these will be in the North, with more than 70 per cent of the jobs outside London¹⁶⁴. HS2 is already creating a significant supply chain in the North, and this will become larger as construction of Phase 2 commences.

The table below shows that over 850 business in the North are already providing services to HS2 Phase 1 between London and the West Midlands that is now under construction:

TABLE – Number of businesses in the North working on Phase 1

North Total – 858 - (Micro 142 / Small 222 / Medium 249 / Large 245)

The Government also requires HS2 Ltd and contractors deliver at least 2,000 new apprenticeships as part of the project. From September 2017 the National College for High Speed Rail in Doncaster has been offering a range of training opportunities, with the expected number of learners starting at approximately 100 in the 2017/18 academic year, and this increasing to more than 1,000 new learners starting in the 2021/22 academic year¹⁶⁶.

Alongside faster journeys, HS2 delivers substantial benefits for capacity release for both passenger and freight services by allowing the existing West and East Coast Mainlines, and the Midland Mainline, to be used in different ways, growing the overall capability of the rail network to meet our needs. How this released capacity can be used effectively to help the North's rail offer support the economy will be investigated through the Long Term Rail Strategy and the development of Northern Powerhouse Rail as integral components of a modern, dependable and responsive rail network.

HS2 will also transform places in the North through improved connectivity. The proposed HS2 Crewe station offers potential for transformational connectivity which will lead to substantial economic opportunity.

TfN has been working with Cheshire East and Cheshire West and Chester councils, as well as Network Rail and HS2 Ltd, on the proposals for an integrated

hub at Crewe. The hub would not just connect the areas around the station, it would also improve connections to other parts of Cheshire, including HS2 northbound, and strengthen cross-border movements to and from North Wales.

Crewe is a major rail gateway for Cheshire and the North, as well as an interchange for six different rail routes and a major centre for freight. Cheshire and Warrington is the strongest performing economy measured in terms of GVA in the North of England and one of the strongest performing nationally. Cheshire and Warrington generates about £20 billion GVA annually and has 430,000 people in work, which is similar to Leeds and Birmingham.

The Crewe Hub seeks to build on this connectivity by developing a fully integrated hub station in the town, spreading the benefits of HS2 across the North West, West Midlands and North Wales, bringing almost five million people within a one hour journey.

Crewe could be served by five HS2 trains per hour, with two able to split/join at Crewe to give seven trains per hour north of Crewe, enabling HS2 to also serve Stoke-on-Trent and Macclesfield167. Its connectivity will be further enhanced by the proposed Northern connection, allowing trains to re-join HS2 having called at Crewe, and also offering faster Liverpool–London journeys and for Northern Powerhouse Rail services to serve Crewe.

Cheshire East Council has developed a comprehensive HS2 Framework and Masterplan Vision for Crewe which demonstrates its vision for the town to capitalise on the opportunity that HS2 and a Crewe Hub station provides. The Masterplan Vision covers some 120 hectares of land around the proposed hub station and provides a framework to reinvigorate the town centre, create a new commercial hub around the station housing over 350,000 square metres of new commercial floorspace and delivering an additional 7,000 new homes by 2043168. This is a cornerstone of the Constellation Partnership, involving seven local authorities and the two Local Enterprise Partnerships in Cheshire and Staffordshire seeking to deliver 100,000 new homes and 120,000 new jobs by 2040.

TfN believes that to maximise the opportunity of the Crewe Hub, the 5-7 HS2 services per hour scenario is needed to provide the level of connectivity needed for this Northern gateway. In addition, a Northern junction is needed to provide a link from Crewe to Manchester, the North West, and Scotland, as well as to facilitate Liverpool– Birmingham/London trains via HS2. This could also facilitate Crewe, and possibly Chester, to be connected to the Northern Powerhouse Rail network. It is therefore critically important that the Crewe Hub is planned at the outset as part of the wider rail network and not in isolation to it. This is set out in Growth Track 360's proposition. An enhanced interchange with enhanced rail services is important, and the opportunity to develop local and regional services should be maximised. This provision at Crewe Hub would also enable classic compatible services via Macclesfield to call at Stafford and Stoke-on-Trent.

Crewe is a significant freight node, and the ability to accommodate growth is currently constrained, especially on the West Coast Mainline. Introduction of

additional capacity associated with HS2 offers opportunities to address these constraints.

Leeds City Council, in partnership with West Yorkshire Combined Authority and the wider rail industry, has developed an integrated Masterplan for Leeds Station¹⁶⁹. The Masterplan sets a compelling vision for the major transformation of Leeds Station, currently the busiest transport hub in the North.

The Masterplan establishes a blueprint spatial plan for a holistic and phased development strategy for the new integrated station and surrounding roads, places and spaces. Delivery of the Masterplan will:

- Create a world class gateway for the City Region that is at the heart of the UK's rail network.
- Accommodate the planned doubling of growth in passenger numbers using the station over the next 30 years.
- Enable a step-change in rail connectivity and capacity in the North of England, which better connects people and businesses to jobs and markets.
- Deliver a new internationally significant district in Leeds city centre, with the potential for 300,000 square metres of commercial development.
- Be a catalyst for accelerating the regeneration of South Bank Leeds, which is one of Europe's largest city centre regeneration initiatives and will double the size of the city centre economy.

The vision set out within the Masterplan for Leeds Station focuses on the transformation of passenger-facing elements of the transport hub. In conjunction with this there remains, as a priority, significant need to unlock a further round of network capacity around Leeds Station. The function and growth of the whole local and pan-Northern rail network relies on this, which is also vital to the realisation of the benefits of HS2, Transpennine Route Upgrade and Northern Powerhouse Rail. This investment is of local, pan-Northern, and national importance, given the effective operation of the network around Leeds has wider operational impacts. TfN and the West Yorkshire Combined Authority will continue to work closely to make the case for these crucial interventions, and the opportunities they will unlock.

The arrival of HS2 in 2033 at Manchester Piccadilly is a great opportunity for new development, not only for the transformation of the station itself into a fully integrated transport hub, but also the surrounding areas. The once in a century opportunity to regenerate the area around the station will create a new mixed-use neighbourhood and include new offices, new homes and significant new public spaces. Greater Manchester's strategy has focused on four key areas, designed to support the economic growth potential of both HS2 and Northern Powerhouse Rail:

- Station design and infrastructure.
- Improved transport connectivity.
- Regeneration of land around the stations.

Investment in people, skills and employability. Investment in HS2 will not only make Manchester Piccadilly one of the best connected and productive locations in the North, it is also estimated to create 40,000 new jobs, 13,000 new homes and close to a million square metres of commercial development in the area¹⁷⁰. This could be further increased with the arrival of Northern Powerhouse Rail. Greater Manchester has developed the 'stops are just the start' Growth Strategy. This emphasises the importance for Manchester Piccadilly as a 'build it once and build it right' transport hub for the future; maximising the benefits at the same time as minimising the disruption.

The arrival of HS2 and Northern Powerhouse Rail at Manchester Airport also offers the opportunity to create a brand new station that both respects the natural setting and creates a new diverse neighbourhood with homes, offices and hotels, as well as the potential for 20,000 new jobs over the next ten years. This will also connect in with the ongoing £1 billion investment at the Airport's terminal.

New integrated stations at Manchester Airport and Piccadilly linking HS2 and Northern Powerhouse Rail will mean Greater Manchester becoming a truly integrated transport hub linking international, national, regional and local passengers with fast interconnected public transport networks including planes, trains, trams and buses.

The North East's Combined Authorities and the North East Local Enterprise Partnership (NELEP) are working to ensure high speed rail supports the region's future. HS2 to the region will be delivered utilising the East Coast Mainline serving Durham and Newcastle stations. To achieve this, there is a need to explore reopening/upgrading parallel lines. By delivering HS2, this will open up the possibility of not just regenerating the immediate areas around the two stations it serves, but of wider economic benefits in delivering the increased jobs across the North East.

The Sheffield City Region are currently developing the HS2 Growth Strategy, which will identify the interventions, whether sectoral, infrastructure and/or public realm, and will need to be implemented before, during and after construction of HS2 to ensure that the maximum economic benefits are secured. The Growth Strategy will include the development of extensive masterplans around both Sheffield and Chesterfield Stations to identify how both stations and their surrounding areas can be improved and developed to achieve safe, efficient and pleasant public transport interchanges, as well as identifying opportunities for commercial and residential development to maximise economic and land value uplift. The Growth Strategy also looks at the interface with future Northern Powerhouse Rail services in the Sheffield City Region, ensuring that a coordinated approach is taken and the opportunities from both HS2 and Northern Powerhouse Rail are maximised.

TfN will work with Partners to ensure the benefits of HS2 continue to be realised where services continue North along the West Coast Main Line and East Coast Main Lines, including spurs of the mainline to destinations such as Chester, North Wales, and Stockport. This includes the delivery of comprehensive

masterplans for stations at Carlisle, Preston, Durham, Newcastle, and Darlington, and the potential split and joining of Scottish services in Carlisle, as well as train service specifications that can deliver real benefit and better services across the North. TfN will also seek to ensure that north of Wigan and York, where release capacity has not been identified to date, steps are taken to ensure there is sufficient capacity to serve HS2 and Northern Powerhouse Rail, but also improvements to other services and freight which will need to share train paths with HS2 services.

The full benefits of HS2 to the economy will only be realised if stations are well integrated into local transport networks. Work between Local and Combined Authorities, Local Enterprise Partnerships and other local stakeholders, Network Rail and the Ministry for Housing, Communities and Local Government are key to developing these plans in the coming years, and TfN will provide supporting evidence as required.

As part of the construction of HS2, a green corridor of connected wildlife habitats is being created alongside the railway. This includes around seven million new trees and shrubs on Phase One alone. TfN will be strongly advocating that this level of commitment is delivered as part of Phase 2a and 2b, along with other high-quality mitigation measures.

Northern Powerhouse Rail

Northern Powerhouse Rail 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 areas in the North, which unlocks capacity and capability to deliver a much more effective rail network overall.

The vision for Northern Powerhouse Rail was first established through the 2014 One North report and the 2015 Northern Transport Strategy which defined the journey times and frequencies for rail journeys between key cities in the North of England that would deliver the transformation in connectivity needed to attract businesses, investors and workers.

This included non-stop journey times between key cities in the North of between 20 and 60 minutes and a service frequency of 4 to 6 trains per hour to provide a seamless “turn up and go” style of service. One North drew on the experience of other polycentric urban regions, particularly the Randstad and Rhine-Ruhr regions of central Europe.

The conditional outputs for Northern Powerhouse Rail provide a powerful vision of the North's future rail network and have framed the ambition of the Northern Powerhouse Rail development programme. In 2016, the Government provided £60m of funding to develop Northern Powerhouse Rail to assess the economic benefits and engineering feasibility of delivering these conditional outputs. A further £37m of funding was announced at Budget 2018, as well as £300m for future proofing HS2 announced in 2017.

Through further infrastructure development work conducted by Network Rail and HS2 Ltd as well as economic appraisal from TfN, Northern Powerhouse Rail has evolved in the light of the emerging evidence, changes to HS2 Phase 2b (which is essential to the delivery of Northern Powerhouse Rail) route and the priorities of the North. In particular the development of the Strategic Transport Plan, supported by the Northern Powerhouse Independent Economic Review has placed a stronger emphasis on connecting a much wider range of economic areas across the North to unlock economic potential and to ensure that the benefits of Northern Powerhouse Rail are felt as widely as possible.

Through development of Northern Powerhouse Rail the opportunity to service significant intermediate markets falling in between major cities was realised. This includes Warrington, Huddersfield, York, Darlington and Durham. Other markets such as Bradford offer an unprecedented opportunity for regeneration given their young and dynamic population. Serving these markets is consistent with the overall economic vision for Northern Powerhouse Rail to further expand labour markets and agglomeration.

The development of Northern Powerhouse Rail has now reached the stage where a Strategic Outline Business Case has been produced.

[Why is Northern Powerhouse Rail needed?](#)

As the 'Why' section of this Plan demonstrates, a step change in the level of rail connectivity between some of the North's largest cities is required to support agglomeration, access to opportunities for all, and provide choices to the next generation of workers and businesses. Access to multiple economic areas is central to achieving the collaborative, unified economy needed to grow the North and rebalance the UK economy. Analysis by Network Rail of city to city commuting patterns in the UK shows that the level of commuting between the Northern cities demonstrate lower than expected proportion of commuting. The analysis also demonstrates the disparity between access to jobs in London compared with other cities. The average number of jobs accessible within 60 minutes by rail available to someone living in the North West is 187,000 compared to 1.7 million available to someone living in London.

That connectivity between places is central to bringing people and businesses within economic centres closer together to deepen labour markets and improve opportunities for trade. Conventional rail is the best way to get significant numbers of people directly from the centre of one urban area as quickly and as reliably as possible.

Analysis has also shown that most of the growth in the key capabilities of the Northern economy identified by Northern Powerhouse Independent Economic Review will be concentrated in key economic centres. The figure below shows that across the prime and enabling capabilities, there is a higher tendency to travel by rail when compared to the national average. Moreover the people employed in those industries are more likely to travel further and are more likely to use rail.

Northern Powerhouse Rail can help deliver the integrated Northern labour markets that is central to achieving economic transformation, unlocking investment potential and creating opportunity and new economic choices for millions of people across the North as set out in this Strategic Transport Plan.

Through the outcomes of expanded labour markets, improved business to business connectivity, and greater access to ports and airports, Northern Powerhouse Rail can help drive inclusive, transformational economic growth. More people will have access to opportunities, opening up a wider range of jobs that better match their skills. Businesses will be able to grow their supply chains and labour markets, making it easier to be able to seek out opportunities across a wider range of markets in the North and beyond. Whilst future transport technologies, such as hyperloop and maglev, provide the potential for significantly faster speeds than today, they fail to deliver the overall capacity that can be achieved with mainline rail. Rail is the only proven and deliverable technology with a global supply chain that can provide competitive costs for expertise, infrastructure and trains.

Challenges to achieving the required change One of the key causes of limited connectivity in the North is the poor journey times currently experienced across the rail network, especially between some of the North's largest towns and cities. Faster journey times are one of the most important and direct benefits

that improved rail connectivity can provide, by saving people and businesses time and money, bringing places closer together to foster agglomeration.

Journey times can be relatively slow when travelling by road-based travel, particularly centre to centre journeys. The journey time when travelling between Liverpool and Manchester for example is still around 51 minutes over a distance of around 34 miles, with an average speed of only around 40 mph. Given congestion and the lack of reliability on the M62, however, it often takes significantly longer, and a predictable journey time cannot be depended on.

Economic centres in the North also have slower rail journey times compared to comparable pairs in the UK. For example, despite similar distances between the respective pairs, Reading-London services average speeds of around 74 mph, whilst Manchester-Leeds and services only average around 48 mph. Only Leeds-Newcastle and other services using the East Coast Main Line significantly exceed these speeds, although this is below the design speed and at 90 minutes the journey time is still too high to achieve agglomeration impacts, and subsequent productivity benefits.

Existing performance issues with the North's rail network demonstrate the challenges of adding additional or more frequent services to the constrained rail infrastructure in the North. The physical capacity for trains to run on the rail network is also heavily constrained in the North. The North has inherited a largely Victorian railway largely pared back to a mostly two-track network, carrying a competing mix of traffic including fast intercity trains, local stopping services and freight services. This is challenging as rail capacity is maximised when trains of the same speed can operate on the same stopping patterns. However, the services on the North's rail network sharing the same two-track railways have very different speeds and stopping patterns which limits the potential trains per hour that can be accommodated. This also has implications for freight with East-West and North-South journey times taking several hours. Segregation of different services offers substantial gains for both the capacity and reliability of the rail network as a whole.

Rail service provision is generally maximised when timetables provide a regular service that is evenly spaced. Achieving 'turn up and go' style service frequencies usually requires a minimum of four trains per hour that are 'clockface' (evenly spaced by around 15 minutes). With this level of service provision, the average wait time is around 7.5 minutes for each train and users no longer need to plan journeys around timetables. The consequence of a mixed use and constrained network in the North, however, is that service frequencies between key inter-urban routes are poor with many town and city pairs having two or less services per hour. Even destinations with more frequent services such as Liverpool-Manchester have a fragmented service as they tend to have irregular service patterns which are not clock-face in nature.

Why is further investment needed?

Even with the improvements to capacity from the existing rail programme, forecast growth on the rail network in the North will lead to significant crowding by 2033 on some parts of the network. After this point, if there is no further

investment, unsustainable levels of crowding and congestion could persist under the different economic scenarios considered for the Strategic Transport Plan up to 2050. Even under "business as usual" scenarios for economic growth the impact on crowding and congestion on key routes is likely to be significant.

These improvements, while important, are not enough to significantly improve connectivity and help deepen labour pools and foster agglomeration, which as outlined earlier are important mechanisms through which transport can help improve economic performance to address the Northern productivity gap. They do less to address many of the other challenges and constraints identified earlier, including improving connectivity, releasing capacity for freight, journey times, reliability and resilience of the Northern transport network.

The Northern Powerhouse Rail Programme

The Northern Powerhouse Rail development programme is considering a number of options including:

- Improving the capacity and frequency of links between Liverpool and Manchester Piccadilly via Warrington and Manchester Airport using the HS2 infrastructure and a new integrated Northern Powerhouse Rail/HS2 station. This link will also facilitate faster Liverpool to London services, maximising the benefits of the Crewe North Connection.
- A new hub station at Manchester Piccadilly, including NPR.
- Faster links between Manchester and Leeds, via a new line serving Bradford
- Significant upgrades along the corridor of the existing Hope Valley Line between Sheffield and Manchester** (via Stockport).
- Leeds-Sheffield delivered through HS2 Phase 2b and upgrading the route from Sheffield to/from the North.
- Leeds-Newcastle via a junction off HS2 and significant upgrades to the East Coast Mainline corridor (via York, Darlington and Durham).
- Significant upgrades to the existing lines from Leeds to Hull (via Selby) and Sheffield to Hull (via Doncaster).

Combined together, the Northern Powerhouse Rail proposals represent a coherent network that will transform rail services across the North, providing a world class investment and infrastructure for seamless rail travel across the North as part of the Long Term Rail Strategy.

Journey times and user benefits

One of the overall benefits of Northern Powerhouse Rail is to improve journey times between major economic centres in the North, bringing more people within the catchment area of one or more Northern cities. The current forecast frequencies and journey times across the network are shown below.

TABLE – Northern Powerhouse Rail Journey Times

Northern Powerhouse Rail is the only solution that can deliver the step-change in access to jobs, businesses, key international gateways, freight distribution centres and leisure destinations. That change in accessibility will drive increased employment, improved productivity and increased business investment through the expansion of markets, allowing businesses to access a larger labour force, more customers and other businesses. It unlocks opportunity and shared prosperity for people and places across the North.

MAP – Northern Powerhouse Rail network

Strategic Outline Business Case demonstrates the scale of that potential in more detail. Fully realised, Northern Powerhouse Rail represents a transformation of the North's rail connectivity, resulting in reduced journey times, improved frequency and reliability for millions of people across the North. Unique accessibility analysis undertaken by TfN demonstrates the step-change in access to economic opportunities, investments and jobs. It demonstrates that:

- Access to city centres is radically improved, increasing the population catchments of the largest cities by between 30% and 40% for most cities, over and above the planned and committed improvements. Compared to today, around 3 million more people will have access to Sheffield within 90 minutes, 4 million will have access to Leeds and 3 million to Manchester.
- By 2050 1.6 million able to access multiple places within an hour by 2050 compared with just 52,000 today. At 90 minutes, 10 million people (over half of the North) will have that access, against just 2 million today.

Northern Powerhouse Rail will also bring:

Improved connectivity to labour markets.

More people able to commute between and within different areas but with a stronger propensity to travel outside traditional commuting areas in the North. People can get a job that better suits their skills, which leads to improved productivity. 1.6 million people with level 4 qualifications will be able to access multiple economic areas within 90 minutes, 4 times the number today. With Northern Powerhouse Rail, half of the North's population will be able to access job opportunities in different cities compared with a quarter today.

Improved business to business connectivity.

Northern Powerhouse Rail will bring businesses effectively closer together, facilitating business interactions as a result of reduced travel times and costs (static agglomeration). In the long-term, businesses may also decide to relocate to places that are better connected leading to physical clustering of businesses (dynamic agglomeration). Northern Powerhouse Rail will increase the number of higher skilled workers within 60 minutes from home of three or more Northern

cities more than five-fold, and means 55% of the Northern Powerhouse Independent Economic Review based jobs will be within 90 minutes of 4 or more of the largest Northern cities.

Access to universities, research and education.

Northern Powerhouse Rail will support innovation and research collaboration between businesses and academic institutions across the North, driving increased collaboration in innovation, providing more choice for students and opportunities for graduates and post graduates, as well as access for business to key centres of innovation and research, building on the existing centres of excellence in the North such as energy and advanced manufacturing.

International connectivity benefits.

Businesses within the North's prime and enabling capabilities rely heavily on international connectivity to compete effectively for investment. Much advanced manufacturing, for example, is reliant on-air freight for just in time supply chains and the export of low-volume, high-value products. Moreover, continued success in higher education will depend in part on the ability for students and researchers from across the world to easily access the North's world class universities.

Manchester Airport sits at the heart of the integrated Northern Powerhouse Rail and HS2 network. A new airport station will provide faster, more frequent journeys between the airport and a wide range of destinations across the North. The combined impact of HS2 and Northern Powerhouse Rail will mean that the population of the North are able to access the new Manchester Airport Station within an hour increases from 2 million today to 4.7 million with HS2 and Northern Powerhouse Rail, and within 90 minutes by 4 million to 8.7 million - over half of the North's population. Northern Powerhouse Rail will improve access to the world via dramatically improved links to its primary international gateway. Northern Powerhouse Rail will not only encourage the further development of long-haul and business routes from Manchester, both in terms of new destinations and greater choice and frequencies to existing destinations, but also mitigate pressure on the constrained London system and transport networks by reducing leakage of air passengers from the North.

Improved freight connectivity.

Northern Powerhouse Rail is likely to release rail capacity that can be utilised for freight transportation purposes. Through released capacity, increased volumes of freight will be able to be transported in a more efficient way. This will lead to environmental benefits, increased inward investment, and housing and land release, which will each have a positive overall impact on the economy.

If you increase the opportunity for putting more freight on the railway across the entire network, including Northern Powerhouse Rail, shipping lines could make greater use of Northern ports. Having more containers being moved by rail will reduce congestion on the existing crowded road and rail infrastructure, especially on the East-West routes.

More detailed work to understand the individual business cases for these freight re-routings is required, but initial analysis suggests that there is potential to provide greater opportunities for rail freight growth as part of a package of Northern Powerhouse Rail interventions in the next phase of development.

Improved connectivity for tourism and culture.

By improving connectivity to key leisure destinations across the North, Northern Powerhouse Rail will have a positive impact on the tourism and leisure sector. The growth in rail travel has come from increases in off-peak travel during the last two decades. This shows that rail is likely to have become an increasingly attractive mode for leisure trips. The dynamic and growing visitor economy means that Northern Powerhouse Rail will further support and facilitate growth in the off-peak and weekend leisure markets. Existing tourist destinations outside of the Northern cities also benefit from Northern Powerhouse Rail. Journey times to Scarborough, Blackpool and other critical tourist economy destinations (such as key gateways to the national parks) will be significantly improved by Northern Powerhouse Rail, not only providing Gross Value Added (GVA) and jobs growth, but can also maintain and enhance the Northern population's quality of life, whilst helping retain and attract a skilled and experienced workforce.

Unlocking local growth and place making.

In bringing people, places, business and public institutions closer together, NPR represents a clear opportunity to transform the way economic centres are used, facilitate regeneration and development opportunities and create dynamic and attractive places.

Northern Powerhouse Rail has the potential to bring forward new commercial and residential development by making places more attractive for private sector investment through improved accessibility.

Innovative new research by the Institute for Transport Studies has demonstrated the improvements in rail accessibility to employment. This could strengthen the value of place, creating uplifts in residential property in the region of up to 5.4% for local areas that are very well connected by rail to employment across the North. The total expected uplift or increase in value in the residential property market is estimated at £2.9 billion in a single year (based on 2017 property values).

Northern Powerhouse Rail aligns closely with the development plans of the towns and cities being served by the network. Some of these locations already have significant commercial and residential development already in place or planned where existing stations are already located or build off the development of planned new HS2 stations. Northern Powerhouse Rail is now being embedded into local economic plans, HS2 Growth Strategies and Local Industrial Strategies. Further investment in local and pan-Northern connectivity set out in TfN's Investment Programme is needed to fully connect Northern Powerhouse Rail to the North's economic assets and clusters to support the delivery of the Strategic Transport Plan.

A number of Northern authorities have commissioned studies to understand the potential economic impact of Northern Powerhouse Rail in their economic region, building on the work already undertaken for HS2 Growth Strategies.

Through the outcomes of expanded labour markets, improved business to business connectivity, and greater access to ports and airports, Northern Powerhouse Rail can help drive inclusive, transformational economic growth. More people will have access to opportunities, opening up a wider range of jobs that better match their skills. Businesses will be able to grow their supply chains and labour markets, making it easier to be able to seek out opportunities across a wider range of markets in the North and beyond.

Some of the locational benefits that Northern Powerhouse Rail will deliver include:

- Hull - Rail investment will mean an extra over 30,000 businesses and over one million more people will be within 90 minutes' reach of the city. Hull's connections to the rest of the North's economic centres will be dramatically improved, boosting the labour pool and also offering more frequent and faster services to Manchester Airport.
- Leeds - More than 4 million people and 135,000 extra businesses will be within 90 minutes' reach of Leeds and the programme will see greater capacity and significantly higher speeds on the network than today. The plan will see upgraded and new routes between Manchester and Leeds including Huddersfield and Bradford. Segregating East-West inter-city traffic across the Pennines will release capacity on existing lines via Halifax and Huddersfield to serve local and regional markets more effectively and dependably.
- Liverpool - A dramatically improved network operating with greater capacity and significantly higher speeds with a link to HS2, providing a faster journey time to London and enhanced access to Manchester Airport. Over 90,000 extra businesses will be within an hour's reach of Liverpool and nearly three million more people will be within 90 minutes of the city centre.
- Manchester - The programme will see new and faster connections to Leeds via Bradford as well as vastly improved connections to Sheffield, Liverpool and Manchester Airport. Nearly 100,000 extra businesses and over one million more people will be within 90 minutes' travel time of the city centre.
- Newcastle - 15,000 extra businesses and 300,000 more people will be within 90 minutes of Newcastle. The network will operate with greater capacity and speed utilising the HS2 ECML connection south of York to Leeds. This will enhance long distance connectivity to the rest of the North, the Midlands and London. These enhancements, including interchange to the Tyne and Wear Metro, will also provide enhanced connectivity within the sub-region to Sunderland, Durham, Newcastle Airport, and the wider North East.
- Sheffield - Over 100,000 more businesses and three million more people will be within 90 minutes' reach of the city. Options for Sheffield include

upgraded routes to Manchester (via Stockport) and Hull (via Doncaster) and a 30 minute journey time to Leeds.

Bradford is a £10.5 billion economy, the fifth largest in the Northern Powerhouse, and home to half a million people. The transport connectivity is currently poor, with journeys taking over an hour between Bradford and Manchester. A total of 45,000 commuters already commute between Bradford and Leeds, the largest flow of commuters between any two UK cities, but 74% choose to travel by car.

NPR is central to unlocking opportunity and transformational growth in Bradford. The impact of NPR is demonstrated by the step-change in access to jobs and opportunities for people and businesses across the North. NPR can double the number of people and businesses within reach of Bradford providing access to ¾ million more job opportunities in the key economic sectors of the North for Bradford residents, including places most in need of investment and access to opportunities, particularly for young people. By enabling Bradford residents and firms to create and access the wider range of quality jobs created and brought within reach by NPR by connecting people to opportunities it will raise skill levels and help build Bradford's business base.

These benefits can only be realised if Bradford is served directly, which is why the North's clear preference is a new line between Leeds and Manchester via Bradford rather than further upgrading the existing line via Huddersfield. Northern Powerhouse Rail would transform Bradford's connectivity, more than halving journey times to Leeds, Manchester, Manchester Airport, Liverpool and York, putting Bradford at the heart of an integrated economic area across the North.

A number of options for serving Bradford are under consideration, but the key options under consideration are a parkway south of the city centre at Low Moor, and a city centre station. Further work will be undertaken in the next sequence of work to fully understand both the engineering solutions required, and to assess the relative economic impacts of the two options for serving Bradford. Both options bring clear benefits for travellers, businesses and investors, but the city centre station offers a real strategic opportunity to bring new transformational opportunities to Bradford and its residents, and as such a city centre station remains the most transformative option available with strong local support.

Interfaces with HS2, Transpennine Route Upgrade and the East Coast Main Line Both Northern Powerhouse Rail and HS2 are integral future parts of the North's rail network and it is essential that they are planned as part of the network and not in isolation to it. There is now a clear opportunity to ensure that, alongside Transpennine Route Upgrade and improvements to the East Coast Main Line, HS2 and Northern Powerhouse Rail deliver a transformation in rail that can be spread across the whole of the North by integrated planning through the Long Term Rail Strategy and the Strategic Transport Plan.

Through utilising available capacity for trains on HS2 infrastructure, this will help deliver the following Northern Powerhouse Rail outputs with the addition of junctions:

- Improved capacity and connectivity for Liverpool, Warrington and Manchester Piccadilly by connecting onto the HS2 Manchester spur. This will also significantly reduce journey times between Liverpool and Manchester Airport and provide a faster route between Liverpool, Warrington and London services.
- Improved journey times and service frequencies between Sheffield and Leeds using the HS2 eastern leg. A junction at Clayton has already been included in the scope of HS2 Phase 2b to enable future Northern Powerhouse Rail and HS2 services from Sheffield Midland station to connect onto HS2 to travel towards Leeds.
- A junction at Garforth to enable services from the West to connect onto HS2 to the east of Leeds, connecting Manchester and the North West to the North East.
- A new integrated hub station at Manchester Piccadilly.

This will be achieved in several ways:

- Regional and local rail services extend the reach of HS2 and Northern Powerhouse Rail by offering connections via hub stations to places not directly served.
- Taken together, HS2 and Northern Powerhouse Rail will make significant direct contributions to the connectivity and capacity and will provide new high-speed services across and from the North that better meet customer expectations. It is also likely that significantly enhanced rail services will lead to a growth in use.

Northern Powerhouse Rail will provide faster East-West connectivity across the North with more capacity, while HS2 will provide fast long-distance connections from the North to London, the Midlands and Scotland. Together, the Transpennine Route Upgrade, HS2 and Northern Powerhouse Rail will significantly transform journey times right across the North for a range of key economic centres. For example:

- Journey times from Middlesbrough will be faster by 40 minutes to Manchester and 50 minutes to Liverpool. Sunderland services to Manchester, which are currently around 3 hours, will be nearly an hour faster.
- With the Transpennine Route Upgrade and HS2 in place, journey times from Darlington and Durham will be around 20 minutes quicker to Manchester, and around 45 minutes faster to Crewe. With Northern Powerhouse Rail that improves further to 50 minutes and 70 minutes, respectively.
- York to Crewe currently takes around 2 hours 30 minutes. With the Transpennine Route Upgrade and HS2 that reduces by 30 minutes, and with Northern Powerhouse Rail it will be one hour faster.

Northern Powerhouse Rail will provide the principal centre to centre networks using new or upgraded infrastructure, which will free capacity on the existing rail network to accommodate new or additional regional and local services and for freight.

Northern Powerhouse Rail will have potential for innovation and investment, for example in stations, ticketing and in the rail supply chain.

TfN will work with its Partners to ensure integration of the wider transport network through the implementation of the Strategic Transport Plan and the full TfN Investment Programme. TfN's Strategic Development Corridors are assessing what further pan-Northern interventions might be required to fully maximise the investment in Northern Powerhouse Rail. At local level, TfN and Partners will assess how best to ensure local connectivity to station hubs by local rail services, light rail, bus and promoting active travel.

Programme development Working collaboratively with local transport authorities and the Department for Transport, TfN has been developing the Strategic Outline Business Case for the Northern Powerhouse Rail network, making progress in improving the economic case for the investment, whilst retaining the scale of ambition required to transform the North.

Throughout that process, TfN's Partners have contributed to the development of the scheme and have been engaged throughout the process. This includes participation in the infrastructure sifting and economic appraisal processes. Specific information has also been sought from local authorities on development plans for their areas to understand the interactions between Northern Powerhouse Rail and local development plans.

Having a robust process for developing solutions and a consistent set of criteria upon which to evaluate these options will be key to ensuring value for money and that the programme delivers on its objectives. Northern Powerhouse Rail presents a particular challenge because the number of concepts being considered across a number of corridors potentially allows for a very wide range of potential solutions.

Once the Strategic Outline Business Case has been submitted, TfN will continue to assess the available options. The key stages of the network development and assessment for Northern Powerhouse Rail are shown on the next page.

DIAGRAM - Northern Powerhouse Rail network development

Stage One

Corridor and concepts development - long list Developing corridor and concepts according to Programme Objectives and technical inputs

Infrastructure assessment criteria Development of infrastructure criteria and scoring scale to assess the feasible concepts for the corridors

List of technically feasible concepts and options List of preferred concepts per corridor based on outcome of infrastructure assessment

Stage Two

Development of Network assessment criteria Development of Network criteria and scoring scale aligned to the NPR strategic objectives

Concepts assessment of concepts using the network assessment criteria to shortlist 2 concepts per corridor

Development of Network "constructs" to be presented in the Strategic Outline Business Case Shortlist of network possibilities based on shortlisted concepts to be modelled for the purposes of the Economic Case

Stage Three

Cost-Benefit Analysis of Network "Constructs" Undertake detailed cost-benefit analysis of the shortlisted network options

Further stages of programme development

Further business case development and option refinement

Further scheme development, including line of route and station design, route refinement and consultation

Hybrid Bill and other delivery powers

Phased construction

Operation

Major Road Network for the North and Strategic Road Studies

Over 80% of commuting trips and 87% of freight movements use the road network in the North, which equates to more than 120.4 billion km travelled across the North's road network every year¹⁷¹.

Whilst total traffic volumes are greatest on roads operated and managed by Highways England, which is known as the Strategic Road Network, this network only accounts for 2% of the road network in the North¹⁷². A significant number of road journeys will start and finish on local roads. Therefore, an efficient first and last mile of a journey can make all the difference as to whether goods or people make it in time and as efficiently as possible.

Improvements to the Strategic Road Network within the North are a key priority for businesses, individuals and local authorities, especially for interventions to strengthen the performance and resilience of the M62, M1 and A1(M). The M62 currently carries half of all trans-Pennine traffic, and will continue to have a central role in supporting future East-West movements and the realisation of transformational and local growth opportunities. TfN expects to see continued investment in the Strategic Road Network in the short, medium and long term.

Improvements to the Strategic Road Network are planned across the North as part of Road Investment Strategy 1 (the period between 2015 and 2020), and a number of key interventions have been delivered recently, including the last remaining section of motorway standard connection to the North East and the A556 Improvements, for which the design sets an exemplar for future projects, receiving numerous environmental and considerate constructor awards.

Ensuring the timely completion of the remaining 16 schemes or packages of work within the Road Investment Strategy 1 programme in the North will undoubtedly provide much needed road capacity and efficiency. We will expect to see this investment in capacity, efficiency and resilience continue into the next Road Investment Strategy period and into subsequent funding periods.

However, a focus on the existing Strategic Road Network alone in defining pan-Northern strategic improvements will not support transformational economic growth. Investment will also be required in interventions off the Strategic Road Network, in those important roads that link to, or provide congestion relief for, the Strategic Road Network, including alternative East-West trans-Pennine alternatives to the M62, as well as interventions facilitating access to our most important economic places and gateways.

Major Road Network for the North In response to this issue, TfN and its Constituent Authority Partners have identified and mapped a Major Road Network for the North - a network consisting of the North's economically important roads. This network, which includes both strategic and important local roads, represents about 7% of the roads in the North, and links the North's important centres of economic activity¹⁷³, including the first and last miles to and from the Strategic Road Network.

Strategic Road Network (SRN)174 - 2,444 km

Major Road Network (MRN) (excluding SRN)175 - 5,454 km

Major Road Network (MRN) (including SRN)176 - 7,899 km

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. There is a direct link between better connectivity to these assets and allowing the North's economy to realise its potential.

The current Major Road Network for the North is shown on the following page, although TfN expects this network to evolve as the North's economy progresses and develops over the coming years and decades.

As shown, the Major Road Network for the North is larger in scale than the Major Road Network published by the Department for Transport. This is primarily because it is based on improving connectivity to deliver economic growth and improved opportunities for all, whereas the Department for Transport has chosen to define the England-wide Major Road Network on a more quantitative basis, primarily based on a measure of traffic flow and proportions of heavy goods vehicles.

The ambition is for the Major Road Network in the North to act as a seamless network of roads, enabling safe, reliable and resilient multimodal journeys. For the North's major roads to fulfil this role they must in combination:

- Enable international connectivity by improving access to ports and airports
- Supporting 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

Although managed separately by Highways England and Local Transport and Highway Authorities, TfN will ensure that evidence gathering, network planning, the provision of journey information, traffic and performance management decisions are all developed and delivered collaboratively.

This will ensure a fully-rounded approach to achieving a better 'whole journey' travel experience, and improved safety, economic, environmental and community outcomes.

MAP – The Major Road Network for the North

In collaboration with its Constituent Authorities, TfN has agreed pan-Northern conditional outputs against which the performance of the Major Road Network will be monitored as the data becomes available. These include:

Journey reliability

where 90% of journeys of 15 miles or more on the Major Road Network should not be delayed by more than 15 minutes for a journey of 60 minutes expected travel time.

Network efficiency

aiming to optimise the efficient flow of passengers and goods on the Major Road Network and through the improved flow of traffic, and support for new technologies to reduce emissions of pollutants and greenhouse gases.

Network resilience

aiming to reduce the number of incidences of closure of Major Road Network routes leading to severe journey delay.

Journey quality

improving the customer experience of using the Major Road Network, including the quality and availability of travel information.

TfN will periodically review and adapt the Major Road Network for the North, to best meet the needs of the North in the future.

TfN will also explore options for reducing the impact of road-based travel on the environment, air quality and carbon emissions, including exploring how Highways England's Air Quality Strategy could be expanded to cover the Major Road Network through future investment on the network.

Through influencing travel behaviour, supporting higher quality design and adapting to innovative technologies, such as electric vehicles, the Major Road Network can be improved, managed and adapted for the future to support a sustainable Northern economy. For example, this includes plans for investment in electric vehicle charging points, options for shifting more freight from road onto rail and support for bringing forward emerging technologies such as connected and autonomous vehicles.

National Roads Fund

The Government's Transport Investment Strategy set out proposals to create a Major Road Network across England, and also to allocate a proportion of the National Roads Fund to be invested in the Major Road Network (£3.5 billion). This is a welcome development, recognising that the current funding mechanism

for road investment means that the bulk is allocated to the Strategic Road Network (£25.3 billion).

The National Roads Fund will operate from 2020 onwards as a ring-fenced source of funding for major roads drawn from Vehicle Excise Duty. It will be the principal source of Highways England's Road Investment Strategy 2 programme (to run from 2020 to 2025) as well as for interventions on the Major Road Network (as defined by the Department for Transport).

In developing its Investment Programme, TfN has therefore prioritised the road interventions needed over this period for the Major Road Network for the North.

This includes interventions on the M62 and the M53 that were originally programmed for Road Investment Strategy 1 but are being re-scoped. It also includes interventions previously announced for consideration in Road Investment Strategy 2 on the M1 in South Yorkshire, the A64 in North Yorkshire and the A1(M) around Doncaster. This is together with significant improvements to the M60/M62/ M66 Simister Island and the M1/M62 Lofthouse Interchange, which are two of the North's busiest motorway junctions.

Interventions off the Strategic Road Network that are already committed include Large Local Major schemes in Middlewich, Congleton and East Riding, initial Major Road Network improvements on the A595 at Grizebeck, and the A1237 York Outer Ring Road. This is alongside improved road access to Leeds Bradford Airport and the A582 Preston Western Distributor, which are both predominantly funded through local growth deals.

Beyond these interventions, evidence presented in the Major Roads Report identified the following five strategic connectivity gaps for the North:

- North-South and East-West connectivity: The Major Road Network for the North is like a ladder that only provides the requisite strength for transformational growth where both axes perform. The M62 is the only continuous East-West dual carriageway road across the North and carries half of all trans-Pennine traffic, meaning the North has the ability to work together as one to generate benefits for the whole of the UK as it is currently heavily dependent on the successful operation of just one road. Even where North-South links have helped establish a recognisable economic spine (such as the M6, the M1 and the A1/A19), pressures in terms of efficiency, reliability and resilience are evident, and constraining potential growth.
- International connectivity to and from the North's ports and airports: Helping to get business and leisure passengers and freight to time sensitive locations as efficiently as possible, enabling inward investment and trade.
- Connectivity of the North's economic neighbours: Scotland, Wales and the Midlands all play a critical role in realising the economic potential of the North's border areas and its neighbours.
- Future access to deliver Nationally Significant Infrastructure Projects and locations of significant private sector investment: These include more reliable and resilient access to and from Sellafield and the Moorside

Nuclear Power station development, to Liverpool 2 and the North East ports and the Green Port Hull project, many of which are key to the achievement of the UK's energy policy.

- Improved touchpoints with rail stations: Providing greater multimodal travel opportunities, including enhanced integration with key HS2 stations, for example at Crewe.

These strategic connectivity gaps have driven the identification of the required interventions for the first wave of schemes to be funded through the National Roads Fund, working with Highways England and TfN's Partners. TfN is also conscious that delivery needs to be a key factor in the sequencing process, hence its support for the road schemes being promoted by its Constituent Authorities through the Large Local Major Transport Schemes Fund, and any other future funding streams that may become available. This also includes the Housing Infrastructure Fund which can unlock developments for new housing across the North.

All of the initial interventions have had significant work undertaken to date to confirm value for money and deliverability, but more needs to be done in advance of their confirmation within the forward programme for the National Roads Fund. They do, however, represent an important step, and added value, in TfN and Partners providing clear advice to Government on its major road priorities.

Through the work on a series of Strategic Development Corridors, TfN will work with its Partners and Highways England to develop a pipeline of Major Road Network interventions, focusing on identifying and prioritising the interventions needed to deliver a better integrated, higher quality and safer, transport system in the North, that is more efficient, reliable and resilient. Inter-urban road schemes will need to be assessed in terms of their impact on the urban areas that they serve.

This process will draw on the identified connectivity priorities and also the suggested conditional outputs for the Major Road Network for the North. Future interventions should also include improved links to and integration with public transport hubs (rail stations, Metro and rail and bus based park and ride sites), as well as investment in traffic management and real time customer information systems.

Strategic Road Studies

TfN is working closely with the Department for Transport and Highways England on three Strategic Road Studies:

- Northern Trans-Pennine Routes
- Manchester North West Quadrant
- Trans-Pennine Tunnel

The Northern Trans-Pennine Routes Study assessed the strategic and economic case for improving the A66 between the A1(M) at Scotch Corner and the M6 at

Penrith. This included making targeted interventions to improve safety, environmental, and connectivity issues on the A69 between Newcastle and Carlisle.

Highways England is now taking forward development work on options for dualling the remaining sections of single carriageway on the full length of the A66 from the A1(M) to the M6. The options identification and assessment work will be complete in 2019, and it is anticipated that delivery will start in the Road Investment Strategy 2 period. In the meantime, major improvements at two junctions on the A69 should be delivered by 2020.

The Manchester North West Quadrant Strategic Study, covering the transport networks in the area including sections of the M60, M62, M602, M61 and M66, has demonstrated there is a strong strategic case for the substantial upgrade to the M60 to improve journey times, East–West connectivity, safety, and user experience. It has also supported the case for investment in the Local Road Network and public transport to support the Strategic Road Network and provide travellers with more choice for their journeys. This programme of work is now continuing with a focus on identifying options for the Strategic Road Network,

Major Road Network, and the wider Local Road Network and public transport networks, which deliver best value for money, whilst improving and mitigating any adverse sustainability impacts.

The Trans-Pennine Tunnel Strategic Study examined options for providing significantly improved road connectivity between Greater Manchester and Sheffield City Region, and the wider southern Pennines corridor. This programme of work has shown that although a long tunnel under the Peak District National Park would be technically feasible, the cost would be prohibitive and offer poor value for money.

TfN is now leading on developing alternative options, working closely with Highways England and the Department for Transport, that will provide a more cost effective solution while addressing sustainability requirements. This includes ensuring that the road connectivity improvements would be an exemplar scheme involving environmental enhancements to benefit the Peak District National Park.

To date, this work has found that the most promising alternative option is a partially tunnelled route on the line of the existing A628, with a supporting package of wider road connectivity enhancements, including on the M60, M67, M1 and M18/A1, which would have road user and economic benefits for the Sheffield City Region, Greater Manchester, and the wider Northern economy. This alternative option would also have the benefit of possibly being sequenced in its delivery, building on the committed works within Highways England's Trans-Pennine Upgrade Programme.

Strategic Development Corridors

MAP – Strategic Development Corridors

Developing the interventions for the Rail Network Enhancements Pipeline and those in the initial part of the National Roads Fund programme has followed more traditional transport planning techniques. However, if this Strategic Transport Plan, and the interventions within the Investment Programme that flow from it, are to truly support transformational economic growth, the starting point cannot be strategic rail or major road. It must instead be based around the need to connect the economic assets and clusters identified previously.

To follow this different approach, while building on the work to date, TfN has identified and is taking forward a series of Strategic Development Corridors. These are currently seven geographic corridors that reflect the economic links across the North, as well as links with its neighbours in Scotland, Wales and the Midlands. They are not traditional transport corridors, but economic eco-systems where the evidence to date suggests most progress towards the transformational growth scenario would be made by bringing forward major, strategic rail and road investment over the lifetime of the Strategic Transport Plan.

Each of the Strategic Development Corridors will have a different scale of contribution towards achieving the outcomes of transformational economic growth and therefore different transport needs. This is set out for each of the current seven corridors in the following part of this Plan, but investment in all of the corridors is critical to the collective ambitions of TfN and Partners.

The corridors are by no means where all future investment should be concentrated, but represent where the largest gaps between demand and performance currently exist, and also where there is likely to be the greatest economic potential for agglomeration between the economic assets and clusters across the North. Investment in these Strategic Development Corridors will benefit the whole of the North as movements to, from and within the corridors will benefit from interventions brought forward within it.

Each Strategic Development Corridor has identified a series of transport interventions required to sustain the future economy of the North between now and 2050, and these have informed the Investment Programme. The proposed interventions are supported by a significant volume of evidence gathered from stakeholders through modelling and appraisal, considering current and future planning proposals, including housing and nationally significant projects, emerging technologies, potential policy changes, environmental constraints and deliverability challenges.

The approach taken within each corridor has been unique in planning for future investment in that it has:

- Looked across the rail and road networks in a holistic way, understanding how these networks connect.

- Assessed the current and future movements of people and goods throughout the region, as well as links nationally and internationally, including understanding the future labour markets of the North, where they are located and how they might make use of the transport network.
- Understood the benefits that an enhanced transport network can bring to the North as a whole.
- Considered the necessary improvement to the 'whole journey' for passengers and freight. The work draws on the existing spatial planning proposals across the North, noting that not all of TfN's Partners are also Local Planning Authorities.

Evidence has been collated from private sector organisations to understand the transport issues that businesses face, and to understand how their growth aspirations could be fulfilled through improved transport infrastructure.

There has also been a look towards the future, through consideration of advances in innovation and technology that apply to transport modes and methods.

For the four multimodal Strategic Development Corridors, a Strategic Programme Outline Case document has been prepared that summarises the business case, established through the evidence gathered, to support the programme of interventions identified within each corridor. Each Strategic Programme Outline Case includes more detail of the interventions proposed, and the benefits they will bring for the economy of the North, thereby providing a package-level confirmation of value for money.

For the three single-mode Strategic Development Corridors, a programme of interventions has been identified, drawing on work that has been undertaken by the Delivery Agencies, which will allow TfN to move forward to develop an equivalent Strategic Programme Outline Case for each.

The next stage of work in each corridor is to take forward the interventions to develop a true pipeline of strategic transport interventions that will support the delivery of the pan-Northern transport objectives.

Evidence from the Strategic Programme Outline Case gives TfN and Partners the opportunity to maximise the benefits of any significant new strategic infrastructure investment, ensuring that the pipeline of transport interventions aligns with national policy, such as the Industrial Strategy, and local stakeholders' plans, including spatial plans and housing growth proposals.

In line with the Strategic Transport Plan, the identified Strategic Development Corridors will be reviewed on a regular basis to ensure they reflect changes in spatial planning, advancing technologies and user needs.

Connecting the Energy Coasts

Improving connectivity for people and goods between the nationally significant non-carbon energy and research assets located in Cumbria, Lancashire, North Yorkshire, the North East, and Tees Valley.

Strategic and economic context

This corridor seeks to enhance the strategic connectivity, for people and goods, between the advanced manufacturing and energy generation research centres and assets. This is crucial to support the transformational growth potential within this economic area. There is a strong presence of the North's prime capabilities within this corridor.

These economic centres and assets need to be better connected within the corridor, as well as to the North-South transport corridors. Strategic transport investment in this corridor will support nationally significant infrastructure investment, unlock opportunities for employment, support the supply chain, and housing construction, such as the proposed garden villages. Enhanced connectivity will also support tourism and leisure connectivity to some of the North's natural assets, such as the National Parks.

To the west of the corridor, strategic connectivity improvements can support the delivery and operation of a range of major projects including investment West and South Cumbria; this will also support wider growth in the centre of international excellence for the energy and nuclear sector found in Cumbria, including the national nuclear laboratory and the University of Manchester's Dalton Institute. There are also growth aspirations for the Port of Workington and Barrow, and strengths in advanced manufacturing and renewable energy schemes in the south of Cumbria, such as BAE Systems and Siemens. This corridor also benefits from a major visitor economy boasting four national parks and four world heritage sites alongside a diversity of cultural, rural and urban attractions

Transport context

Despite the range of strategically important activity on this corridor, it faces a number of transport constraints. Most significant is poor East-West connections. This impacts on the ability of residents, business and visitors to access opportunities, and also the ability of this corridor to realise major investment opportunities and wider agglomeration. It also prevents exploiting the full potential of the ports, airports and development proposals within this corridor; all of which are important to the North. The challenges affecting this area acts as a barrier within the corridor itself, but also in terms of movements across the North as a whole.

In this context, key issues include a lack of capacity and resilience issues, with limited route options meaning the impact of congestion or disruption on the road network are pronounced. The rail network is similarly affected by a lack of capacity, slow speeds and poor journey times, with issues pronounced on the Tyne Valley Line, Durham Coast Line, Cumbrian Coast Line, Furness Line and Lakes Line.

While the focus of this corridor is East-West, there are also important challenges surrounding the interface of East-West routes with the strategic North-South corridors, including the A1, M6, East Coast Main Line and West Coast Main Line.

West and Wales

Improving connectivity, for people and goods, to, from and through the important economic centres and assets of Cheshire, Liverpool City Region and Greater Manchester, with strategic connectivity in to North Wales and the Midlands.

Strategic and economic context

This corridor can strengthen the connectivity between important and densely populated economic centres and assets, including some of the North's largest cities, such as Liverpool and Manchester. This corridor will also strengthen strategic cross-border connectivity in to North Wales and the Midlands.

There is significant economic and population growth forecast within this corridor, with associated transport demand. Economically, there is a strong representation of all the prime and enabling capabilities, along with nationally important economic assets that will support economic growth across the North as a whole. Strategic connectivity improvements can support growth at Manchester Airport, Liverpool John Lennon Airport, the Cheshire Science Corridor Enterprise Zones, the Atlantic Gateway, the North Wales Arc, the Port of Liverpool, and the Crewe HS2 Hub. Work by Growth Track 360, including connectivity with the Constellation Partnership, has highlighted how connectivity improvements would transform the North Wales and Cheshire regional economies.

Transport context

This corridor has a complex, dense transport network but future interventions need to be focussed on the key economic assets and adjacent markets for goods and labour. For example, there is currently poor southern and western access to Manchester Airport, the largest airport in the North. Current investment plans provide capacity in the short term. The Halton Curve re-instatement will unlock direct journey opportunities beyond Chester to North Wales in the medium term. Significant congestion, efficiency, capacity, and reliability impacts on the road and rail networks are constraining economic growth, such as on parts of the West Coast Main Line and M6 Motorway. The freight and logistics industry require enhanced connectivity on both the road and rail networks, as well as exploring opportunities for greater use of waterborne and intermodal freight.

Major strategic interventions can allow the important economic centres within the corridor to capitalise on inward investment and ensure that centres and assets continue to stimulate investment. Significant investment in rail, benefiting both passengers and freight, including the enhancement of Liverpool Lime Street Station and the redevelopment of Liverpool Central, will further enhance its capabilities.

Central Pennines

Improving strategic East-West connectivity for some of the North's important economic centres and assets in North Yorkshire, West Yorkshire, East Riding and Hull and Humber through to Greater Manchester, Lancashire and Liverpool City Region.

Strategic and economic context

This corridor has some of the North's key economic and population centres, with a diverse mix of strategic movements. With enhanced strategic connectivity, there is the potential to uncap the significant economic growth potential.

Addressing East-West connectivity is a priority for TfN, and a failure to address current connectivity constraints would critically restrict the transformational growth potential of this corridor and the wider Northern economy.

This corridor is a major economic area of the North, and is home to globally significant businesses, supply chains and economic assets across all the North's prime and enabling capabilities. The corridor has the largest aerospace cluster in the UK, including BAE Systems and Rolls Royce, with major sector representation and internationally competitive advantages in sectors such as automotive and other advanced manufacturing.

Enhanced connectivity can support complementary high-growth, high-value economic sectors and clusters and could attract new high-value business activity and inward investment to the corridor and the North. Freight and logistics is a key element of this corridor, connecting the Port of Liverpool with the Ports on the Humber. Leeds Bradford and Liverpool John Lennon Airports are situated within this corridor, providing important air connectivity that is enhanced by the catchment areas of other airports such as Manchester Airport. The visitor economy is also a key element of this corridor. Blackpool remains the UK's largest seaside resort, with economic renewal a key priority locally.

Transport context

There is a need to provide enhanced, additional road and rail capacity across the Pennines to provide alternatives to existing routes and to open up new opportunities. Across the corridor there is a diverse mix of strategic movements to cater for. Freight and logistics support the ports, airports and inland ports as well as servicing the businesses located across the corridor. Improving connectivity would accelerate increased employment, new housing developments, and increase the scale of the overall growth opportunity.

There is currently strong road and rail demand between Liverpool, Manchester and Leeds, with demand exceeding the current capacity on the rail network and the M62, with alternative connections along this corridor not providing a strong alternative movement option. For the rail network, growing the capacity of key hubs, including Manchester, Leeds and York is crucial to releasing the potential of individual rail routes within the corridor.

Southern Pennines

Improving the strategic East-West, multimodal connectivity between the important economic centres, assets and ports within Liverpool City Region, Greater Manchester, Cheshire, Sheffield City Region, East Riding and Hull and Humber, as well as cross-border movements to the Midlands.

Strategic and economic context

This corridor provides connectivity between some of the major economic and population centres of the North, including Liverpool, Manchester, Sheffield and Hull, along with four major ports, and three international airports. East-West connectivity will need to be transformed in order to support the forecasted economic and population growth.

The North's prime and enabling capabilities are highly represented in this economic area. The corridor is home to globally significant businesses, supply chains and economic assets with major sector representation and international competitive advantages in advanced manufacturing, low-carbon/energy and logistics, including the Energy Estuary in Hull and the Humber. Advanced manufacturing is a particular strength with a strong cluster in the Sheffield City Region, which is home to the Advanced Manufacturing Research Centre managed by the University of Sheffield and the top Enterprise Zone for Modern Manufacturing and Technology in the UK. Greater Manchester also offers significant opportunities for growth in the advanced materials sector and advanced manufacturing is one of four specific areas of 'smart specialisation' identified by the Liverpool City Region. This corridor has the opportunity for freight and logistics to continue to strengthen the operations and investment at the corridor's ports, airports and inland ports. Enhancing strategic connectivity to the growth plans of Doncaster Sheffield Airport, Manchester Airport, and the Ports of Liverpool and the Humber, can have associated economic growth benefits along the corridor and the wider Northern economy. Grimsby and Immingham ports are the busiest in the UK by combined freight tonnage.

Investment in the corridor will also need to be sensitive to sustainability considerations, particularly the Peak District National Park, as well as identifying the visitor economy benefits from the enhanced strategic connectivity.

Transport context

Providing transport routes to complement the M62 corridor and linking the Sheffield City Region west and east more effectively, thereby improving overall trans-Pennine connectivity are key aims, with an additional need to improve connections to the growing Humber ports. The important economic centres can be supported to grow and invest through significant agglomeration benefits gained through improved, efficient, resilient strategic road and rail connectivity. Improved multimodal connectivity would address the economic challenges and ambitions of the corridor. Improving resilience will enhance conditions for freight movements particularly, and therefore continuity of supply for businesses.

West Coast - Sheffield City Region

Strengthening rail connectivity along the West Corridor, through the West Coast Partnership and infrastructure upgrades, connecting the advanced manufacturing clusters and assets in Cumbria, Lancashire, Greater Manchester, Cheshire, and Sheffield City Region, with improved connectivity from the North in to Scotland and the Midlands.

Strategic and economic context

This rail corridor looks to strengthen the strong and growing connectivity and collaboration between the advanced manufacturing, health technology, digital businesses, and research centres in the Sheffield City Region and those in Lancashire and Cumbria.

The corridor is home to globally significant businesses, supply chains and economic assets. Important centres including Samlesbury Enterprise Zone, Blackpool Airport Enterprise Zone, which is home to the National Energy College, Manchester Airport, and the Sheffield City Region Advanced Manufacturing Park, which is home to the Nuclear Catapult Research Centre, the Furness Peninsula and its major role in advanced manufacturing including subsea technologies, nuclear power transmission and marine engineering and the Kingmoor Park Enterprise Zone and St Cuthbert's Garden Village in Carlisle. The Fylde Coast is an established base for polymer science, nuclear and renewable energy.

The corridor is also home to a major visitor economy, with Cumbria and Blackpool acting as assets for the UK economy. Rail travel is considered central to the success and sustainable growth of this sector with UK and international links provided by the West Coast Mainline and in to Manchester Airport seen as critical to the future sustainable growth of this sector.

Greater Manchester sits between these two clusters and, in addition to forming part of the expertise in these sectors, it provides access to professional and financial services which support the prime capabilities. Bringing all these centres of research closer together by improving connectivity will increase productivity and support collaboration and innovation.

The logistics industry is also important for servicing the businesses located across the corridor, and within the corridor. There is also a strong visitor and tourism offer from two of the UK's national parks, which enhanced strategic connectivity and access to international gateways across the North can support.

Transport context

The potential economic links between the two areas are not served well by the existing rail network, and so this corridor needs to complement other investments being pursued in road improvements in the North West and across the Pennines. There is also strong demand for growth on this corridor through to Scotland, for passengers and freight. On the line between Blackpool North, Preston and Manchester, journey times and frequencies are being improved.

Locations north-west of Manchester are poorly connected to Sheffield City Region and the West Coast Main Line has capacity constraints north of Preston. Frequency of through services across Manchester are insufficient, and journey times are also poor. This issue extends to Cumbria, with speed and capacity constraints. There are also significant freight flows, such as on the Hope Valley Line, where freight flows are driven by the cement and aggregates industries.

Current challenges on the Hope Valley line include the mix of fast and stopping passenger services and freight services. Journey time and frequency improvements are also an issue on the South Fylde line.

Integration with the current proposals of Northern Powerhouse Rail and HS2 is critical with investment is required at rail stations including Preston, Lancaster, Oxenholme, Penrith and Carlisle to increase capacity, promote economic growth, and make the most of the opportunities provided by HS2.

East Coast - Scotland

Strengthening rail connectivity and capacity along the City of York Main Line and other key parallel rail lines, such as the Durham Coast Line, to provide enhanced strategic and local connectivity in the North East, Tees Valley, East Riding and North Yorkshire.

Strategic and economic context

This rail corridor looks to strengthen the significant economic development in this corridor. These developments include the major ports, airports including Newcastle and Leeds Bradford, major rail hubs, strategic rail freight interchanges and intermodal terminals.

The corridor also contains several nationally significant assets, such as the International Advanced Manufacturing Park (IAMP), in Sunderland and South Tyneside, Tees CCPP NSIP, York Potash Harbour Facilities and Walney Extension offshore wind farm. There is potential for future longer term investment at Hartlepool nuclear power station and major renewable energy assets at Dogger Bank and Blyth, with links to those within Hull and the Humber. Advanced manufacturing is a particular strength with a strong automotive sector in the North East and the Tees Valley and advanced manufacturing in the Sheffield City Region.

There is also a growing renewable energy sector along the east coast, requiring collaboration and connectivity across the corridor. The North East also has particular strengths in the health sector, which are complemented by emerging growth areas within the Tees Valley, and Sheffield City Region, and a strong and growing health and life science sector in the Leeds City Region. These prime capabilities are supported by strengths in the enabling capabilities including professional services (particularly in the North East and Leeds City Region) and logistics associated with the corridor's ports, airports and freight hubs.

There are significant freight and logistics centres along the corridor with key national links within the North East, as well as to the Midlands and Scotland. Both air and freight hubs provide a focus for growth in the movements of goods, supported by a growing inland port and distribution capability. There is also a strong visitor and tourism offer, including Hadrian's Wall World Heritage Site, Northumberland Dark Skies Park, Northumberland and North Yorkshire Moors National Parks.

Transport context

Although the East Coast Main Line provides a key spine for North-South freight and passenger movements, this rail corridor is wider than just that route, encompassing parallel rail lines, including the Durham Coast Line where journey time and peak capacity are key issues that constrain opportunities. The wider connectivity requirements along the Eastern Corridor link several key economic centres and also include links to the Northern Powerhouse Rail and HS2 programmes.

Investment is required at rail stations including Darlington, Middlesbrough, Newcastle, York, Hartlepool, Morpeth and Sunderland to increase capacity, promote economic growth, and make the most of the opportunities provided by HS2. There are existing capacity, operability, timetabling, and reliability constraints along the corridor, which is limiting economic growth and the movement of people. Effectively resolving these competing demands, particularly in the context of HS2 and NPR is crucial to realising the potential of the rail network in this corridor.

Yorkshire - Scotland

Strengthening road connectivity between the Midlands, South Yorkshire, West Yorkshire, North Yorkshire, East Riding, Tees Valley, the North East, and Scotland, building on the existing road investment commitments.

Strategic and economic context

This road corridor looks to strengthen and complement the East Coast Corridor to Scotland road corridor and will examine the transformational requirements to better connect the economic centres in this corridor beyond the current Road Investment Strategy commitments.

The significant economic developments in this corridor include ports (Tyne, Tees, Sunderland), airports (Newcastle, Durham Tees Valley and Doncaster Sheffield), major rail hubs (Newcastle and Doncaster), and intermodal freight terminals.

The corridor also contains several nationally significant assets, such as the International Advanced Manufacturing Park (IAMP), in Sunderland and South Tyneside, Tees CCPP NSIP and York Potash Harbour Facilities. There is potential for future longer term investment at Hartlepool nuclear power station and major renewable energy assets at Dogger Bank and Blyth, with links to those within Hull and the Humber. Advanced manufacturing is a particular strength with a strong automotive sector in the North East and the Tees Valley and advanced manufacturing in the Sheffield City Region. There is also a growing renewable energy sector along the east coast, requiring collaboration and connectivity across the corridor. The North East also has particular strengths in the health sector, which are complemented by emerging growth areas within the Tees Valley, and Sheffield City Region, and a strong and growing health and life science sector in the Leeds City Region. These prime capabilities are supported by strengths in the enabling capabilities including professional services (particularly in the North East and Leeds City Region) and logistics associated with the corridor's ports, airports and freight hubs.

There are significant freight and logistics centres along the corridor with key national links within the North East, as well as to the Midlands and Scotland. Both air and freight hubs provide a focus for growth in the movements of goods, supported by a growing inland port and distribution capability. There is also a strong visitor and tourism offer, including Hadrian's Wall World Heritage Site, Northumberland Dark Skies Park, Northumberland and North Yorkshire Moors National Parks.

Transport context

The major North-South routes of the A1 and A19 must provide a consistent level of service and resilience to meet the needs of the important economic centres they link and the strategic journeys they facilitate. Improved transport connectivity between the cities and surrounding economic centres, such as along the A19, will increase productivity and support the growth of complementary industrial capabilities.

This corridor can transform the movement of people and goods within this corridor, as well as strategic movements between Scotland and the Midlands. This will complement Midlands Connect and Transport Scotland's aspirations for additional North-South connectivity and resilience.

How? - Delivering the required interventions

Delivering the interventions derived through this Strategic Transport Plan and set out in the Investment Programme will require many facets and numerous organisations, both public and private. It will also require co-ordination with areas that are non-transport related, particularly in the medium to longer term.

Funding

The initial Long Term Investment Programme that accompanies this Strategic Transport Plan identifies a funding requirement for strategic transport of around £60-70 billion during the period to 2050¹⁷⁸. Based on current estimates therefore, an average of £2-2.3 billion will need to be spent on strategic road and rail infrastructure in the North per annum to deliver the required interventions to the transport system that will allow it to facilitate transformational economic growth.

The 2017 Budget made clear that the ratio of gross economic infrastructure spend to GDP in the UK is expected to rise to 1% of GDP by the end of this Parliament – compared to a long-term fiscal remit of 1% to 1.2% provided to the National Infrastructure Commission¹⁷⁹.

Assuming the levels of committed strategic transport funding, primarily through Highways England's Road Investment Strategy and Network Rail's Control Period, in this Parliamentary cycle are continued from 2020 through to 2050, this could equate to around £39-43 billion investment in the North. This means that additional expenditure of £21-27 billion would be required over the period for TfN to achieve improvements set out in the Investment Programme. Even at the upper end of the range of the required investment, the increase of £900 million per annum in transport infrastructure expenditure in the North is achievable within these constraints.

Alongside the preparation of the Strategic Transport Plan and the initial Investment Programme, TfN has developed a Funding Framework that sets out the parameters within which the allocation and management of the financial resources required to deliver the objectives of the Strategic Transport Plan will be undertaken.

TfN's funding arrangements will be shaped by the complex and diverse landscape within the North for the delivery of its projects. In addition, it can be anticipated that specific funding sources, industry processes and priorities will change over time. This indicates a need for TfN's Funding Framework to be underpinned by a set of fundamental principles which can be used by TfN, its Partners and central Government to deal with changing circumstances over time, as well as how funding will be allocated and managed.

The Funding Framework consists of four building blocks:

- The principles that underpin a deliverable and appropriate funding arrangement.

- The potential funding sources from which revenues could ultimately flow.
- The governance arrangements that will enable funding allocated for strategic transport infrastructure in the North to be directed to TfN programmes.
- How financial risk is managed.

Principles

At the core of TfN's remit is the need to facilitate transformational, yet inclusive, economic growth. TfN has therefore identified a series of principles that will guide its approach over time to funding the delivery of the Investment Programme in response to current and future circumstances.

- Evidence-based decision making – The Strategic Transport Plan and Investment Programme will prioritise interventions that demonstrably contribute to the overarching goal of facilitating growth in a sustainable way across the North. The criteria upon which investment decisions are made will therefore need to be reflective of a broad range of measures that include the economic and social benefits that any interventions will deliver.
- Strategic consistency – The means by which identified interventions are funded should be consistent with the overarching goal of facilitating economic growth. For example, mechanisms that directly or indirectly increase the general tax burden for individuals or businesses in some or all of the North in relation to other regions will dampen activity and impact negatively on inward investment decisions.
- Locally-raised funding should be spent locally – Delivering transformational economic growth will require investment at a local as well as a regional level to ensure that a 'whole journey' approach to improving transport is followed. In some cases, TfN-led investments will result in financial benefit to developers, businesses or individuals that can be captured locally. At the same time, TfN's proposals will have implications for local expenditure, principally through the need for new or enhanced local infrastructure. Localities will seek to maximise the extent to which such benefits can be captured, but the funding raised by localities, for example through commercial revenue, user charges or local taxation mechanisms, will be spent in those localities on local schemes, rather than being used to subsidise strategic (national) infrastructure.
- Mode-agnostic solutions – Planning is currently done separately at a national level on a road and rail basis. TfN is engaged in genuinely multimodal planning in relation to work on the Strategic Development Corridors and such an approach offers clear potential for cost and efficiency benefits where the targeted outcome is to enable economic activity rather than deliver improvements to specific modes. The Funding Framework should allow investment to be focused where the evidence indicates that it will have the greatest impact.

Funding sources

Whilst TfN and Partners are committed to exploring project-level value capture opportunities to deliver consequentially required local enhancements, the evidence indicates that the Investment Programme will need to be underpinned by public funding commitments that meet a very high proportion of the overall expenditure requirement.

This view is supported by the National Infrastructure Commission's National Infrastructure Assessment. This suggested that based on any reasonable allocation methodology across regions, in particular when the separate funding line for Northern Powerhouse Rail is taken into account, the strategic transport requirements as set out in the Investment Programme are fully deliverable within its fiscal remit for infrastructure investment through to 2050.

TfN is therefore not making undue financial demands on Government. The interventions in the Investment Programme are ambitious yet realistic. The decision to fund TfN is a choice that can be made by Government within existing paradigms, based on the overall objective of rebalancing the economy through transformational and inclusive growth, and robust business cases that will be presented through TfN's future work programmes.

To provide further, more detailed support for this position, TfN has considered the sources of transport-related funding that might support the Investment Programme. This work has included:

- The current funding regime for strategic transport infrastructure.
- The range of the overall funding requirement that would be needed to deliver the required strategic infrastructure.
- The opportunity for capturing incremental value created by the strategic interventions identified. The Investment Programme consists primarily of major road and rail enhancement projects, with an estimated cost of £60-70 billion (in current prices) over 30 years.

This needs to be supplemented by an increased investment in local transport as recommended by the National Infrastructure Commission, bringing the total investment requirement to £100-120 billion between 2020 and 2050.

Local transport infrastructure investment will continue to be the responsibility of the relevant combined authorities and local authorities and TfN cannot be funded at the expense of these programmes, as per the overarching objectives of the Strategic Transport Plan.

Assuming the levels of committed strategic transport funding in this Parliamentary cycle are continued from 2020 through to 2050, this could equate to 55-70% of the funding requirement identified in the Investment Programme. Whilst this is insufficient to fund the investment that is currently estimated to be required to facilitate transformational economic growth, it does provide a baseline that demonstrates the extent to which TfN proposals represent an incremental increase on current arrangements rather than requiring a step-change in the funding allocated to the North.

Transformational growth in the North can only be delivered by a significant change in city-to-city and town-to-city connectivity. All modes have a role to

play here, but it is expected that a key role will be played by rail, which is best suited to moving large numbers of people quickly and reliably between key centres. The major investments of HS2 and Northern Powerhouse Rail will deliver a step change in the quality of links between the North's major cities, however, even with these in place, the majority of rail journeys will still be on the 'classic' network, where there are substantial opportunities to significantly improve journey times, frequency, capacity and reliability. Thus, a significant focus of TfN's investment over the lifetime of the Strategic Transport Plan will be in putting in place the rail infrastructure needed to bring about these changes.

The UK's centralised funding regime means that the funding for the Investment Programme will need to come from central sources. This is consistent with the approach to transport funding outside of London where allocations that pay for national infrastructure are made to delivery bodies (Network Rail, Highways England) and strategic programmes, such as HS2, from centrally collected taxation, supplemented on the railways by user revenues.

On this basis, the exact source of each pound expended on strategic transport infrastructure in the North is less relevant, as the Government is responsible for managing the UK's finances. What is relevant is that the quantum of expenditure identified by TfN is manageable within a reasonably assumed future funding environment.

TfN has not sought to identify specific Government revenue streams that can be hypothecated to it and used to fund its proposals, but there are four particular elements that might fund TfN's proposals based on current revenue raising mechanisms. These are:

- Vehicle Excise Duty hypothecation.
- Rail enhancement capital.
- Major project grant (in this case, most likely for Northern Powerhouse Rail).
- Rail franchise hypothecation.

Whilst it is likely that the balance of the funds that can be raised from these mechanisms over time will vary (for instance due to technological changes) the assumption would be that central Government would over time take steps to address any revenue erosion that might result from this to maintain its financial position.

High level modelling has been undertaken to derive an indicative range of funding that these elements might contribute over time. The results of this analysis are set out in the graph below.

GRAPH – Enhancement funding between 2020 – 2050

This suggests that even at the low end of the range of potential outcomes, with the necessary reform to funding flows and allocation arrangements, central

funding for the required interventions can support the investment levels identified in the Investment Programme. This is consistent with the fiscal remit analysis in the National Infrastructure Assessment, and to confirm this the levels of strategic transport investment required in the North are around 0.8% of the North's (current) GDP.

TfN recognises that the estimated level of funding identified in the Investment Programme, whilst reasonable, indicates a higher level of funding than would be provided under a business as usual approach. However, this simply reflects the scale of the challenge that TfN has been established to address.

It is important to remember that the ability to be able to address an overall funding requirement is only the first step towards being able to deliver the Investment Programme. This analysis does not address the timing of funds flows, modal allocations or the risks associated with funding a programme of this size. These will be explored further as the Investment Programme is developed.

In terms of other sources of funding, it is important to recognise that the revenue raising mechanisms for capturing local/project level revenue do not sit with TfN. TfN does not have revenue raising powers of its own. Neither, in many cases, do they sit with TfN's Partners, but rather with the individual local authorities which serve the North. Those local powers were not granted in order to fund strategic/ national infrastructure. The current funding environment is extremely challenging for local authorities in general and local transport funding in particular, meaning that these mechanisms cannot be used to raise direct contributions for the interventions within the Investment Programme.

In addition, whilst TfN is focused on pan-Northern transport interventions, there is an equally important job to be done at local level to enhance mobility within local functional economic geographies, particularly within the city regions, and ensure that the value of major regional schemes is not diluted through failure to invest locally. This has been explicitly recognised in the National Infrastructure Assessment.

Whilst the National Infrastructure Commission's proposals for devolved cities and non-urban local transport would go some way to closing the current gap between the need for local transport investment and the money that is available to pay for it, local schemes will need to have the 'first call' on any local funds that can be incrementally raised from investment in transport infrastructure, as recognised by the principles of the Funding Framework.

Governance

As important to the delivery of TfN programmes as the availability of funds within the system is the ability to direct the funding that is available for strategic transport infrastructure to support the delivery of the Strategic Transport Plan, and by extension the economic objectives of TfN. If TfN is not able to exert more control over strategic transport investment in the North, and the system that currently delivers infrastructure continues in its current form, it is highly unlikely that the Strategic Transport Plan, or the benefits that will flow from it, will be delivered.

In the short term, TfN will need to work with the mechanisms that are currently in place. This will include working closely with central Government, Highways England and Network Rail to achieve the following:

- Delivery of 'quick wins' where possible on an opportunistic basis.
- Inclusion of interventions in the Investment Programme for pre-2027 in industry processes.
- Ensuring that these interventions are then delivered at the necessary time by the national agencies. This would very much be business as usual, based on current powers and operating paradigms to influence central decision making, but limited to a largely advisory capacity, albeit in the context of a statutory body. There is, however, some opportunity to take a different approach to the delivery of the pre-2027 schemes across the North on the Major Road Network, as part of a transition to any new arrangements.

In the longer term, how TfN develops and the role that it plays in the planning, promotion and delivery of strategic transport infrastructure needs to be addressed. This would need to cover TfN's role in strategic and business planning and budgetary processes as well as decision making and accountability.

TfN has considered a range of options as to how this could be achieved, ranging from a purely strategic role for TfN (with no funding resource or remit) but with a sponsorship and 'score keeping' role to a much more autonomous role as a budget holder, able to shape future investment and incentivised to deliver greater reforms.

It is clear that in order for TfN to be able to ensure the delivery of its programme it needs to have control over budgets and decision making. Otherwise, the North will remain vulnerable to schemes being cancelled or delayed based through remote decision making. This is not a theoretical risk, as many of the current issues on the northern road and rail systems are a consequence of just such decisions.

TfN is of the view that it needs to target a position where it agrees and controls a long-term funding settlement for strategic transport infrastructure in the North. On the basis that TfN and its Partners are best placed to identify the balance of need between road and rail it makes sense for this to be done on a pan-modal basis, rather than on the basis of a modal allocation that would fix road and rail expenditure envelopes potentially without reference to regional need.

TfN is seeking to move to the position where it becomes responsible for a combined regulatory settlement for strategic transport investment in the North. Such an approach will require discussion and agreement with central Government, and in particular the Department for Transport and HM Treasury. In addition, TfN will need to consider what, if any, governance changes would need to be made in order to allow it to fulfil this role.

Management of risk

The final element of the Funding Framework is the management of financial risk. As with any programme or project, particularly one of this scope and scale, there needs to be clarity with regard to who is ultimately responsible for what risks. This depends not only on the willingness of an organisation to accept certain risks – its ‘risk appetite’ – but also how it will manage those risks and crucially how it will absorb the financial consequences of risks materialising as issues.

In considering how financial risk can be managed in relation to the Investment Programme, the following fixed parameters need to be considered:

- TfN has no revenue raising powers of its own and no ability to borrow. Its ability to take risk is therefore limited to the extent of the funding that it receives from the Department for Transport. Under current arrangements TfN has no independent ability to take risk on the proposed programme.
- TfN’s Partners have limited ability, either individually or collectively, to take risk in relation to the programme. As noted previously, their revenue raising powers are limited and where they exist were not granted for the delivery of national strategic infrastructure projects. By a process of elimination, the only body that has the revenue raising powers and consequent financial resources to take financial risk in relation to a programme at the proposed scale under current fiscal arrangements is central Government, specifically HM Treasury.

However, were TfN’s desire for a combined regulatory settlement to be adopted, there are approaches to managing programme risk that would usefully act as a proxy for TfN sharing the financial risks of the programme. These might include:

- TfN managing modal or pan-modal budgets within a fixed envelope over a spending cycle or other time period to be agreed.
- Cost overruns at a programme or project level would need to be managed within the fixed budget.
- Delivery savings at a programme or project level would likewise accrue to TfN, allowing the offset of overruns or pipeline projects to be brought forward. This approach would incentivise TfN and Partners to focus on the most efficient way of delivering the objectives of the Strategic Transport Plan, allowing to the North benefit from difficult decisions that might need to be taken, whilst at the same time encouraging the close management of project delivery by both TfN and Partners. This is similar to the approach used in Scotland, where Transport Scotland manages programme delivery within a devolved budget settlement.

As noted previously, such an approach would need to be considered in the light of TfN’s governance arrangements and would need to be worked up in detail if this approach were deemed to be suitable. However, it would not only constitute a significant step forward in terms of the devolution of decision making for the North, but would also be a mechanism for managing expenditure in a way that allowed value for money to be achieved.

Analysis and appraisal

Analytical Framework TfN requires strong evidence and analysis to make the case for transformational investment in the North's strategic transport network. Working with Partners and the Department for Transport, significant progress has been made in developing a new Analytical Framework to provide this evidence. The Analytical Framework provides an overarching framework which can be applied across the North with the overall goal of providing:

- One voice for data.
- One voice for forecasting.
- One voice for investment decisions.

The objectives of the Analytical Framework are to:

- Develop a consistent approach to the analysis of strategic transport proposals across all TfN activities in the North, ensuring that all elements of the Analytical Framework are reliable and robust.
- Work with stakeholders, academics and consultants to develop innovative pan-Northern transport models that help to address modelling challenges and make these models available to TfN and its Partners, helping to improve consistency and create efficiency savings.
- Establish and maintain appropriate governance structures to build and maintain confidence in the Analytical Framework, especially of TfN's Constituent Authority Partners and the Delivery Partners (Network Rail, Highways England and HS2 Ltd).
- Provide input to overarching investment prioritisation programmes that identifies the need for future transport investment, including the evidence of the impacts of economic growth and wider policies.
- Improve the external visibility and accessibility of analytical outputs to wider stakeholders.
- Develop an approach consistent with that of other subnational organisations and derive substantial efficiencies and quality improvements in creating the Analytical Framework. Creating compelling evidence that shows how transport infrastructure investment can transform the North's economy requires existing modelling tools to be strengthened, but also augmented with new approaches that help to present the case for a transformed Northern economy.

Modelling the transformational impacts of transport infrastructure can be complex. Traditional approaches favour schemes in places where there is already growth and significant levels of congestion, often resulting in frictions or 'market failures'. However, where growth or travel demand is currently limited these traditional approaches fail to demonstrate the potential for growth into the future. To create compelling evidence that shows how transport investment can transform and reshape markets a much broader and integrated modelling process is required. TfN recognises that to be able to provide one voice for data, forecasting and investment decisions, which is fair, transformational and maximises the impact on the pan-Northern transport objectives, there is a need to challenge and change traditional approaches.

TfN has identified how aggregation and tools anchored in the past, based on more marginal incremental change typically associated with single schemes, can reduce the impacts of transformation. The limitations of a narrower 'predict and provide' approach means that within the Analytical Framework there is a shift towards a 'vision and validate' approach, which tests TfN's ambition for a transformational transport network against a range of futures set out in the Northern Transport Demand Model scenarios.

TfN is tackling these issues through disruptive and data driven improvements to develop new datasets and tools. To provide a united voice, TfN must consider a programme of many interventions that will individually or collectively transform areas of the North. Key challenges that the Analytical Framework is therefore focused on are:

- Improving robustness – strengthening the core analysis by improving the robustness of assessments and business cases.
- Wider economic impacts, particularly expanding the range of analysis including how TfN can enhance current practices to enable the full range of economic impacts in business cases.
- Exploring future year uncertainty, incorporating the range of future year scenarios identified in the Northern Transport Demand Model and accounting for the impacts of local spatial plans, thereby enabling assessment of innovative future developments that take into account technology take-up, such as autonomous vehicles, policy changes, collaboration and Mobility as a Service.

Modelling within the Analytical Framework focuses on two key tools:

- Northern Economy and Land Use Model (NELUM).
- Northern Transport Modelling System (NorTMS).

The diagram below shows how transformational travel markets are generated in NELUM and then downloaded into NorTMS for optioneering and design, and how more detailed representation in NorTMS is used to generate network and service capacity restraints to upload to NELUM.

The components of the Analytical Framework are shown in the diagram below.

MODEL INPUTS Ensure consistency, reliability and robustness of data inputs

Analytical Framework Toolkit - Models and tools developed and maintained by TfN and available for Northern partners to use

Northern Economy Land Use Model (NELUM) - Land use interaction model tailor made for TfN portfolio analysis which allows for more granular time sequencing enabling portfolio assessment

Northern Transport Models (NorTMs)

Great Britain Freight Model (GBFM) - Models movement of goods across mainland GB. Multimodal across rail, shipping and road.

Northern Highways Assignment Models (noHAMs) - Derived from regional transport models, tailored for TfN needs and maintained to link Highways England.

Northern Rail Modelling System (NoRMs) - Provides the granularity required for both transformational and multimodal analysis.

Quality Management System - Verifies model development is correct

MODEL OUTPUTS Provide consistent, reliable and credit model outputs

Technical Assurance - validates model outputs

Investment Programme

Appraisal

In establishing and using the Analytical Framework, TfN will continue to be guided by the HM Treasury Green Book and the Department for Transport's WebTAG for programme and scheme development, which will ensure consistency of approach with the Department for Transport and other promoters.

However, TfN will also apply the following principles to make sure the appraisal properly reflects the key factors impacting on economic growth in the North and continue to influence Government and others to work in the same way.

- Taking a programme level approach. The use of Strategic Outline Programmes means TfN and Partners can make an overall case for packages of multimodal interventions to deliver a coherent set of outcomes. This will also enable decisions to be taken on projects knowing what further improvements will be needed in the future so to avoid incremental changes being of low value for money in the longer term.
- Using a coherent strategic economic narrative from the Northern Powerhouse Independent Economic Review, which flows through to the economic objectives in the Strategic Transport Plan and the Strategic Development Corridors. TfN will continue this approach through to intervention level, ensuring a strong link to the strategic and economic cases through all five business cases in scheme development. TfN will build in evaluation from the outset, ensuring success is measured against the pan-Northern transport objectives.
- Considering a wide range of potential futures and economic forecasts. Building on the Northern Powerhouse Independent Economic Review and the work on future travel demand for the Strategic Transport Plan, TfN will use the business as usual and transformational scenarios against a range of potential futures outcomes.
- Measuring the widest possible range of impacts to fully capture all of the impacts of transport investment.
- Measuring national as well as pan-Northern impacts. In appraising the impact of programmes, TfN will aim to demonstrate the net national benefits to the UK economy and the North as a whole, as well as the

distributional impacts across the North wherever possible. These principles represent best practice in appraisal and evaluation of public policy and reflect how TfN has been working to ensure that it balances the need to make a transformational case for investment while delivering traditional transport appraisal to a high level of technical assurance.

TfN is supportive of the proposed changes to the WebTAG guidance to better capture the wider economic impacts of transport interventions and of the wider changes outlined in the Transport Investment Strategy. TfN will continue to work closely with the Department for Transport to improve the evidence base and appraisal guidance, whilst continuing to press for further and more rapid changes to the system.

TfN will also ensure the development of the Rebalancing Toolkit is dynamic and considers interventions more strategically. This will be critical to support TfN in monitoring and updating the Investment Programme to ensure that the interventions needed to drive transformational economic growth in the North have the right level of 'rebalancing' evidence in strategic business cases.

Sustainable return on investment

Alongside all the technical and financial considerations to be taken in relation to any proposed interventions in the Investment Programme, it will be a key aim to minimise the impact of transport on the built and natural environment and the health and wellbeing of residents, workers and visitors in the North, and where possible to deliver enhancements. It is important to recognise that in the development of any intervention the environmental, health and social aspects will be assessed at an appropriate level for that stage of the design or planning. However, the Strategic Transport Plan has a key role in defining those elements that require consideration early on in the selection of interventions.

Any early assessments made as part of the development of the Strategic Transport Plan are important steps in protecting and, where possible, enhancing the environment, health and wellbeing of the North. Environmental and social sustainability considerations will then continue through to the construction and operation of the individual interventions, through the implementation of effective Environmental Management Plans.

The development of the Integrated Sustainability Appraisal has ensured that these elements have been factored in throughout the development of the Strategic Transport Plan. The Integrated Sustainability Appraisal is an iterative assessment process which has informed the Strategic Transport Plan as it developed, intended to ensure that potential significant negative effects arising from the Plan are identified, assessed, and mitigated as necessary, and that positive effects are enhanced. It also ensured that the Strategic Transport Plan incorporates the regulatory and guidance requirements for Strategic Environmental Assessment, Equality Impact Assessment, Health Impact Assessment, Community Safety Assessment and Habitats Regulation Assessment.

Building on all the sustainability challenges and opportunities highlighted elsewhere in the Strategic Transport Plan, TfN wants to embed sustainable return on investment in the procurement and development of any transport intervention. This supports HM Treasury Green Book guidance to capture social value of investment and should form part of a total value approach as part of a more sustainable way of developing, constructing and operating infrastructure. For TfN and Partners, this will require the co-creation of infrastructure that is fit for purpose, with business cases identifying scheme features that maximise sustainable return on investment.

The diagram below gives an indicative view of areas where business cases currently monetise benefits, and areas where further work should be undertaken by intervention promoters to capture wider benefits.

Any interventions set out in the Investment Programme should carry out an environmental and sustainability assessment to the highest regard, including what carbon benefits the interventions will bring. This should build on the sustainability principles set out in the Strategic Transport Plan, as well as the Independent Integrated Sustainability Appraisal on the Strategic Transport Plan, the Environmental Assessment Reports for each of the Strategic Development Corridors, and further sustainability analysis TfN will be undertaking, working with stakeholders.

Any interventions set out in the Investment Programme will be the subject of environmental and social sustainability assessments to the highest regard, including what carbon and air quality benefits the interventions will bring.

In developing and delivering TfN's Investment Programme, a two-stage sustainability appraisal approach will be carried out. For the Strategic Development Corridors, an Environmental Assessment Report is being undertaken as part of the Strategic Programme Outline Case, and the Strategic Outline Business Case for Northern Powerhouse Rail includes a sustainability assessment. These form Stage 1 assessments, helping to shape interventions for inclusion in the Investment Programme. Stage 2 will ensure that in the development and design of the interventions, further detailed sustainability assessments are undertaken to inform final funding decisions and approvals.

Stage 1 will involve checking the degree of alignment of the interventions with the sustainability principles and ambition for developing the Investment Programme, as set out in the Strategic Transport Plan.

Stage 2 will require a more detailed WebTAG compliant appraisal, and an enhanced TfN appraisal, undertaken prior to seeking final approval for funding. Interventions will be specifically assessed for their impact on environmental and social sustainability. Environmental Assessment Reports will be first prepared, and further sustainability analysis of each proposed intervention will be undertaken as part of the development of the business cases, with TfN working with Partners and stakeholders.

Advice and data will be sought from statutory bodies, local authorities and stakeholders relating to environmental and social threats and priorities, with a

view to ensuring that these are considered in the development of any new transport interventions and the design of any required mitigation is considered and opportunities for securing wider benefits are taken.

The environmental and social impact of selected interventions will be minimised through the selection and design process and assured through the WebTAG appraisal and the planning application process, which involves statutory Environmental Assessment and may also involve Habitats Regulations Assessment for certain interventions.

This approach will be further scoped and implemented through the development of TfN's Inclusive and Sustainable Growth Framework.

Spatial planning

Transport investment is transformative in the role it plays in determining where people and business choose to locate and grow. Transport is a derived demand, and much of that demand will be influenced by where people choose to live and work. The spatial analysis of the Northern Powerhouse Independent Economic Review set out in this Strategic Transport Plan considers how transformational economic growth may impact on employment locations. However, inclusive, sustainable spatial planning, in terms of the location of housing and businesses, is an equally important determinant of transport demand.

Currently, the planning system has only limited influence on travel demand. Analysis shows that only 10% of the locational choices made by businesses and households are met by new development¹⁸⁰. The other 90% is represented by turnover within the existing stock of buildings. Transport provision remains the main driver of choices in location and associated travel demand.

There are currently around 6.5 million households in the North, but there is a new housing delivery challenge¹⁸¹. Analysis by Homes for the North shows that at least 50,000 new homes are required every year for the next decade across the North to keep up with projected demand, however in 2016-17, only 32,650 new homes were completed in the North. Currently the shortfall in the North makes up nearly a third (29%) of England's entire projected housing need. The bulk of the North's housing need, around 70% in total, is concentrated in the seven largest city regions¹⁸², highlighting the projected demand in and around urban centres.

To meet the expected demand for new housing across the North, there will need to be a more diverse and affordable market to house the present population and that of the future. TfN welcomes moves in the Government's recent White Paper to set out plans to improve the relationship between housing supply and supporting infrastructure.

The principle of joined-up planning for new homes and infrastructure has long been acknowledged at a national level and is mentioned as a key element of the Government's Industrial Strategy. This challenge is underlined when considering that projections for the North, which underpin the Government's housing need methodology, are significantly short of the transformational growth scenario set out in the Northern Powerhouse Independent Economic Review, which is underpinning the transport demand analysis and the interventions within the Investment Programme.

The National Planning Policy Framework sets out the Government's planning policies for England, and how these should be applied. It provides a framework within which locally prepared plans for housing and other developments can be produced. Local transport and planning authorities will continue to lead the development and implementation of spatial plans and local infrastructure strategies aligned to the National Planning Policy Framework.

TfN wants to build a collaborative and constructive relationship with the North's 72 Local Planning Authorities, to ensure that the right sustainable developments,

spaces and places are unlocked and delivered across the North to support inclusive and sustainable growth. The success of delivering the pan-Northern transport objectives, which have non-transport elements and outcomes, requires collaborative working. TfN will also provide its evidence base and NELUM model, as set out in the Analysis and Appraisal section, to support Local Planning Authorities as they develop their local plans and strategies. TfN also hopes there will be alignment with the implementation of the Strategic Transport Plan and the delivery of the Investment Programme. TfN currently has a remit to influence and promote strategic transport interventions, with the spatial development locations requiring joint working with combined authorities and groups of co-operating authorities as they develop Statements of Common Ground.

TfN also wants to continue to work collaboratively through existing partnerships and networks, such as in developing a Great North Plan, to ensure that there is long-term and co-ordinated strategic infrastructure investment in the North linked to these spatial planning priorities and associated infrastructure needs. TfN will also work with its Partners to use the Strategic Transport Plan to support the case for strategic and local investment and how it supports priorities set out in spatial plans.

Part of the success of the Strategic Transport Plan and the Investment Programme will be how it supports sustainable settlement patterns and urban forms, and contributes to the creation of inclusive, healthy and productive spaces and places.

The joint aim should be to encourage developers to ensure that all future developments, both residential and commercial, are of inclusive and accessible design to enable people to access sustainable means of transport, such as public transport, walking and cycling. This should avoid residual cumulative impacts on the existing network. Electric charging points should be provided at new developments to encourage a shift to electric and ultralow emission vehicles, as set out in the National Planning Policy Framework.

As the Investment Programme is refreshed, factoring in new developments will be crucial for sustainable and inclusive growth. This will ensure the right investment, in the right place and at the right time, and also that the interventions in the Investment Programme are linked to demand and future travel markets.

In the first stage, TfN is undertaking qualitative assessments through the work on the Strategic Development Corridors, with further work using the modelling tools within the Analytical Framework described previously having the capability to quantify spatial planning and required transport investment as business cases develop. These tools will be available for all local transport and planning authorities across the North to use in the revision of their local plans and strategies over time.

Co-ordinating the planning of strategic transport investment can help support schemes seeking funding. Working with Homes England, local authorities, and other housing organisations, transport investment should, where possible, be

aligned with such initiatives as the Housing Infrastructure Fund, which seeks to provide infrastructure to unlock house building where the need is greatest. TfN will add value to submissions through the strategic narrative and evidence base for the Strategic Transport Plan.

At a smaller scale, improvements to station buildings with more commercial and non-commercial facilities, such as health and community facilities, could transform and revitalise the communities in which they are situated.

At a larger scale, increasing densities and mixed-use developments around public transport hubs, such as the North's 576 railway stations, will improve access to public transport alternatives across all parts of the North. Emerging spatial plans around planned HS2 and Northern Powerhouse Rail stations are demonstrating how transport is a catalyst for growth. The developments around the proposed Manchester Airport HS2 Station could support 20,000 new jobs in the next 10 years; a transformed Piccadilly Station and surrounding area could create 40,000 new jobs, 13,000 new homes, and nearly a million square metres of commercial development¹⁸³; and in Leeds the arrival of HS2 is a facilitator of the regeneration of the South Bank, a 250 hectare regeneration project creating at least 8,000 new homes and generating 35,000 jobs, doubling the size and economic impact of Leeds city centre¹⁸⁴.

Innovation, technology and research

The importance of innovation TfN wants to harness innovative measures and encourage smart technology to support the delivery of its pan-Northern objectives. By embracing innovative solutions now, TfN can influence future infrastructure and transport connectivity captured by long-term planning.

Innovation also has the potential to increase the capacity and capabilities of the North's transport connectivity now and there is a need to take swift action to support the existing infrastructure. Innovation also encourages a move away from business as usual approaches and the uptake of new solutions that can deliver efficiency and flexibility across our transport networks.

Both of these uses can result in better transport user outcomes and experiences, with increased mobility options that are people and business focussed. This will allow the North to live within its environmental, demographic and financial limits, while supporting economic growth in the North and the UK.

Regions which support innovation and create new technological solutions grow faster than those that do not. Furthermore, investing in research and development can provide a reliable pipeline of skills in the North, which could attract and retain employers. With the North's digital, energy and innovative capabilities growing, there is an opportunity to harness this research and innovation and use the North as early adopters or a test bed to strengthen the UK's competitive advantage globally.

Finally, innovation extends beyond new technology. New approaches for the design and delivery of projects, as well as the management, operation and maintenance of existing infrastructure and funding and financing models, can all support the transformation of the economy and improved quality of life for those living and working in the North.

A changing technological landscape Transport is an enabler, connecting people and businesses to places of activity, raw materials to manufacturers, and goods to market. But it is also impacted by changes to how people engage with and access their mobility needs, and by relationships of new innovative entrants and interactions between sectors, which in turn impacts on wider society and the economy.

The transport sector has seen significant innovations over recent decades and our future mobility will likely be further influenced by a number of global trends and behaviours including demographic challenges, social change, the protection of the environment, and economic and political landscapes. As mobility evolves into a more on-demand and flexible service to meet the needs of the user, these trends pose both risks and opportunities, which will require strategic planning.

Future mobility will likely be achieved through the combination of technology trends such as shared mobility, automated and connected systems, and electrification (or other low carbon energy options), with a focus on integration of energy systems, public transport and infrastructure.

Mobile and connected devices are increasingly at the centre of digital lifestyles and access to data will increasingly influence passengers' relationship to transportation and their decision-making processes. The development of a strong mobile infrastructure will pave the way for truly integrated and intermodal transport that maximises efficiency gains. This will include providing transport users with real time information, which could have an impact in the patterns of movements on the transport network, the promotion of agile and flexible working. Alternatively, improved digital connectivity may impact on the need to physically travel. Big data, smart infrastructure (such as superfast fibre broadband) and the Internet of Things are other examples of innovation that will allow transport modes and users to communicate with each other and with the surrounding environment.

These uses can be combined with the trend towards a more shared economy of service provision rather than traditional product ownership. This is already seen within Mobility as a Service, which provides personalised transportation options and has seen a global uptake in recent years. It means that some consumers are increasingly likely to purchase access to a car or another shared service, rather than purchasing their own vehicle, especially among younger people and in urban areas. Automotive companies are rethinking their positioning and reframing themselves as providers of mobility, not just manufacturers of vehicles.

Connected and Autonomous Vehicles could improve the throughput of the road network and make driving easier and accessible, enabling people to be more productive and offering greater mobility to a wider range of people. Robotics and automation will also play an increasing role in operating and delivering transport services.

The Automated and Electric Vehicles Bill aims to put the UK at the forefront of the driverless car market. There is a balance to be struck as Connected and Autonomous Vehicles could have a variety of impacts on the North's future transport system. For example, public transport could be undermined by people choosing to instead use these vehicle services. Understanding the changes in technology will also be crucial when addressing interventions to support TfN's road-based travel projections and maximising the efficiency and resilience of the Major Road Network for the North, delivering improved travel benefits, environmental impacts and economic outcomes.

The North will also need to take due account of more stringent environmental regulations, including the likely implementation of Clean Air Zones in major towns and cities. There will need to be an understanding of the take up of electric and alternative fuels (such as LNG, LPG, hydrogen fuel cell) in road and rail vehicle technology in the North. New fuel technologies are likely to accelerate the transition away from fossil fuels, potentially driving changes in travel behaviour and requiring changes to infrastructure. This may present varying challenges across the North or in certain settings – for example, in more dispersed and less densely populated areas – over the lifetime of the Strategic Transport Plan. This will contribute towards reducing greenhouse gas emissions

from transport in improving air quality and supporting the UK to meet targets under the Climate Change Act 2008.

Harnessing innovation and influencing future strategies

TfN is expected to champion not just what the North needs now in terms of transport investment, but also what it will need in 2050. To ensure TfN's plans are informed, challenged, pro-active and also flexible to the latest innovation changes and uncertainties, there needs to be collaboration with a variety of strategic partners.

This will involve taking a strategic role to support partners across the public and private sector when defining best practice and new approaches to tackling future challenges. Through collaborative working across innovating institutions, we can grasp a real opportunity to put the North at the forefront of transport innovation. We can build an innovation ecosystem that combines expertise to influence transport planning and support the economic growth objectives.

Public and Private Bodies at a local and national level

The Industrial Strategy identified the Future of Mobility as one of its Grand Challenges¹⁸⁵. TfN and Partners will support the development of this Future of Mobility strategy and work with Highways England, Network Rail and HS2 Ltd to ensure the Strategic Transport Plan delivers transport connectivity that meets changing trends over the coming decades.

TfN will also support the Clean Growth Strategy, which looks to build on the UK's strengths in low carbon growth and deliver the economic benefits of being a world leader in sectors of particular strength in the North. This includes working with the Government to deliver the Roads to Zero strategy through the planning of infrastructure that supports ultra-low emission vehicles.

Further national and local collaboration, including with the National Infrastructure Commission and Government Office for Science's Foresight Future of Mobility project, as well as engagement across TfN's Partners and Local Enterprise Partnership networks, will ensure that plans are informed by the latest public and private sector information from across the North and further afield.

Innovator bodies and industry

TfN has built collaborative relationships with the innovator networks to share and stimulate new ideas. Key partners include the Catapult Centres (including transport systems and digital), Innovate UK, Transport Focus, the Centre for Connected and Autonomous Vehicles, and the Office of Low Emission Vehicles.

With the move towards a more integrated transport world and as these as these relationships across industry sectors develop further, it will become increasingly important to align with digital and energy infrastructure to ensure cleaner and more efficient ways of transportation. For example, the link between transport infrastructure and energy generation, storage and reclamation innovations will be key, with developments in new cleaner power expected during the lifetime of

the Strategic Transport Plan. Both digital and energy infrastructure are identified as prime capabilities in the Northern Powerhouse Independent Economic Review. TfN's work programmes will seek to encourage opportunities which innovate in the delivery of grey, green and blue infrastructure for improved cross-sector sustainability.

Academia

TfN can be a leader of the innovation agenda across the North and is already disrupting the norm in terms of traditional transport planning methods. To support the development of this work and inform the Strategic Transport Plan as it evolves, TfN can enhance its evidence base by working with academics across a broad scope of disciplines.

TfN has already established strong links with key institutions such as the Institute for Transport Studies in Leeds, the N8 Research Partnership, Newcastle Helix, Liverpool John Moores and Manchester Universities. To increase this valuable input, TfN has initiated an Academic Forum, which provides a consolidated forum to engage academics and thought leaders. This will maximise the range of research undertaken, provide a balanced and evidence-based approach and ensure the very latest best practice is accounted for in transport planning across the North.

TfN programmes and interventions Reviewing and understanding future trends, behaviours and technologies is integral to ensuring the transport system in the North is future-proof. These factors will be considered during the review process of the Strategic Transport Plan. TfN is committed to strengthening analysis and understanding of these trends so they can be better reflected in the evidence base and influence the Investment Programme. This is why TfN is building on the Northern Powerhouse Independent Economic Review by developing its Northern Transport Demand Model to assess what enabling policy and planning, as well as technological and socio-cultural changes, mean for future mobility within different scenarios of future transport demand in a transformed North.

TfN has undertaken further work to analyse and assess existing and future travel patterns across the North as it believes it is important to view the transport system as a whole – meaning a greater focus on multimodal solutions, with seamless transfer between different modes. The Strategic Development Corridor programmes of work have developed our understanding of how individuals use the transport network to ensure the right priorities and investments are delivered.

Innovation and technology will also have an impact on rail travel. The increased use of digital and data tools will allow for stronger traffic management. TfN is keen to see delivery of the Digital Railway programme in the North, which would transform the rail network for passengers, business and freight operators by deploying modern signalling and train control technology to increase capacity, reduce delays, enhance safety and drive down costs. The Northern Powerhouse Rail network will be a Digital Railway throughout.

Furthermore, through the co-management of the Northern and TransPennine Express rail franchises, TfN will continue to secure investment in new and refurbished trains, enhanced station facilities and faster and more frequent services. This includes working with the franchises regarding the contractual requirement to invest a proportion of turnover in innovation schemes.

The Integrated and Smart Travel programme will provide customers with a seamless and personalised transport service, where customers can plan journeys, buy tickets, work and monitor progress electronically. It will use superfast broadband and 5G mobile phone capability.

The programme is working with transport operators, local authorities and other stakeholders across the North to deliver a range of improvements to the way we find out about, and pay for, public transport journeys. Through embracing emerging technologies to enhance the customer experience, we will reduce barriers to entry, encourage sustainable modal shift, and improve accessibility and connectivity for all the North's residents and businesses, which will positively impact the economy.

Consideration of future innovations, trends and behaviours will be integral to the continued development of TfN's long term strategic planning and Investment Programme. TfN will be undertaking further activities and research as the Strategic Transport Plan evolves over time.

Transport skills

Improving education and skills to support economic prosperity is a priority at a national and local level. The Industrial Strategy and Transport Infrastructure Skills Strategy set out that more needs to be done to address sector-specific skills gaps, including urgent skills shortages in transport infrastructure. Local devolution deals have presented new opportunities for better skills delivery matched to economic priorities.

Analysis shows that demand for highly-skilled workers in the transport sector has increased, which has led to the creation of specialist colleges and training facilities within and connected to transport¹⁸⁶, such as the National College for High Speed Rail in Doncaster, the Newcastle College Rail Academy, Modal Training (who specialise in maritime, ports, wind energy, offshore, road and logistics sectors) and the Advanced Manufacturing College in Carlisle. Across transport there are many skills required that are in high demand across competing sectors, driving up demand for scarce skills and in turn the pay and benefits that can be commanded across both public and private sectors. There is also an impact on the cost and deliverability of transport projects.

The UK Commission for Employment and Skills Working Futures Data and the Northern Powerhouse Independent Economic Review together demonstrate a trend in employment in the North up to 2050. The data from Working Futures shows that from 2014 to 2024 across the North, there is a projected increase in employment of 3.6% from 7.1 million to 7.4 million¹⁸⁷.

Looking at job categories most closely aligned to transport, the average growth rate over this time period is expected to be 6.6%, which is more than double the Northern average. Analysis by Engineering UK indicates that between 2012 and 2024 over 200,000 people with Level 3+ engineering skills are required per year to meet expected demand¹⁸⁸. Based on the current educational pipeline they estimate an annual shortfall in engineering skills to be between 83,000 and 110,000 per year. It is estimated that an additional 7,200 engineering and technical workers will be needed in high speed rail by 2020. There will be high demand across some key skills sets and high competition across sectors. Currently, the skills provision is fragmented and not targeted, and there is little emphasis on transport as a sector outside of rail.

Longer term, there are wider changes that compound the education and skills issues. Education, both technical and academic, from primary through to higher and further education, workplace learning and apprenticeships, and specialist centres, are key enablers to building a skills pipeline that will support delivery of investment programmes. Specific skills gaps have been identified in relation to project leadership, engineering and technical, logistics, and IT and digital. These skill gaps become far more significant in the medium to long term, with action to meet the skills challenge needed in the short term.

The transport sector also has an issue with image and attracting young people to opportunities. Research commissioned by TfN suggests a prevailing negative perception of transport's role is exacerbated by a disconnect between employment opportunities in transport and education providers, parents and

business. This is further compounded with an ageing workforce and difficulties in attracting certain social groups, including women and ethnic minorities, to the sector. There is an opportunity to build a virtuous circle between better connected Northern businesses, higher levels of skilled employees being recruited, retained and developed within the North, and transformational Northern growth.

National policy on skills, as set out in the Industrial Strategy, presents opportunities for transport and progress is underway, particularly in rail. Further opportunities will be available through the introduction of technical institutions. Going forward, the North faces a complex set of challenges in addressing its transport skills gap.

Delivery of the Investment Programme will require a skilled workforce behind both the operational roles and the infrastructure development, which will support the successful delivery of the Strategic Transport Plan. Working collaboratively across education, skills and transport will be the only way to achieve this. There is the need to determine the flexibility of funding across the skills system, understand the impact of Brexit and have a clear line of sight to an evolving project pipeline that will inform the skills need, avoid lack of capacity and capability, and support longer-term planning. The Investment Programme will enable this, as well as looking to directly improve access to education assets through the Strategic Development Corridors and other programmes.

TfN will work closely with delivery agencies as well as the broader transport industry to ensure a joined-up approach to skills. In delivering the Investment Programme, the focus will be on maximising social value for local areas, a sustainable pipeline of skills, and diversity within the workforce, as discussed in the previous section on inclusive growth.

Policy positions

Improvements to the North's transport network will be delivered by numerous organisations, both in the public and private sector.

This Strategic Transport Plan has set out the case for the role of investment in transport, and how it can act as a positive, sustainable catalyst for growth in the North. TfN will use the Strategic Transport Plan and accompanying Investment Programme to drive improvements to pan-Northern connectivity, while the Plan will also be used to support local transport authorities when they are developing their plans and strategies.

In order to help with this, TfN has set out below its position on how it will work with Partners and stakeholders across the North and beyond to deliver the Strategic Transport Plan:

TfN Will...

Enhanced connectivity

- Work with Partners to make the case for transport interventions that enhance connectivity between the North's key economic clusters and global gateways, as well as other UK economic centres, to rebalance the UK's economy and support the delivery of the National Industrial Strategy.
- Support the development and delivery of improved multimodal transport hubs at key national and international gateways in the North.

Inclusive economic growth

- Give greater confidence to public and private investors by developing a long-term Investment Programme which supports the delivery of the Strategic Transport Plan.
- Support the growth of businesses across the North by prioritising investment in transport interventions that increase agglomeration benefits and widen supply chains, with a particular focus on the North's prime and enabling capabilities.
- Support growth of the visitor economy by making the case for transport investments, which improve access to and between the North's key visitor attractions.
- Work with partners to identify transport interventions that deliver inclusive economic growth by improving access to employment and skills opportunities for all.

Local transport networks

- Continue to work with Partners to develop and implement their local plans and strategies, ensuring they complement the policies and proposals set out in the Strategic Transport Plan, to deliver packages of improvements that support a more seamless, integrated end-to-end experience. Where possible, this should encourage modal shift and promote active transport, and further develop public transport networks as important sustainable modes of travel.

- Support Partners to improve bus journey times and reliability, by making the best use of any powers included in the Bus Services Act 2017, as well as existing powers and alliances. In some areas of the North this will include factoring in the demand and accessibility of coach parking.
- Ensure that the Investment Programme aligns with and complements the development and delivery of local transport, development, and economic plans and policies.

Spatial planning and development

- Support emerging policy thinking on Freeport Zones and Special Economic Zones, as well as connectivity to existing trade and business enterprise zones, to ensure connectivity maximises the role of logistics hubs in appropriate locations.
- Work with Partners to ensure that future strategic housing, commercial and industrial developments are well connected, and have high expectations on developers to provide access to public transport facilities, high levels of cycle parking and storage, and provide electric charging facilities to support a greener and cleaner road network.
- Ensure that improvements to the strategic transport network align with local spatial plans and other key strategies, and are in accordance with the National Planning Policy Framework.
- Ensure that necessary strategic transport interventions are delivered in the right place and at the right time to support the delivery of major development proposals, including Nationally Significant Infrastructure Project developments, Enterprise Zones and Garden Towns/Villages.
- Ensure that stations proposed to be served by HS2 and Northern Powerhouse Rail, as well as stations on the wider network, are ready for increased demand, interchange, and onward regional and local connectivity, and are planned as fitting gateways to the places they serve.

Funding and powers

- Ensure that the Investment Programme is adequately funded to deliver the objectives of the Strategic Transport Plan. This may include making the case for additional devolution of powers and funding to TfN and/or Partners.
- Develop a monitoring and evaluation plan for the Investment Programme which ensures adequate review of delivery against the policies, proposals and expected outcomes of the Strategic Transport Plan.

Customer experience

- Implement an intuitive and accessible fares structure that is fit for purpose, primarily on the rail network through the Long Term Fares Strategy.
- Work with Partners and stakeholders to make the North's public transport system easier and more pleasant to use, with a focus on improving passenger comfort, confidence, reliability, safety and security.

- Enhance the customer experience, through delivery of the Integrated and Smart Travel programme to make it easier and affordable for customers to plan, make and pay for their journeys.

Rail network

- Work with train operators and Network Rail to deliver the minimum standards in the Strategic Transport Plan and Long Term Rail Strategy. The focus will be on increasing investment in the rail network (track, train, and stations) to improve journey speed, frequency, capacity and reliability for passengers and goods, whilst maintaining safety. This should include developing a streamlined and more cost-effective method of increasing the line speeds, identifying the infrastructure necessary to allow reliable operation of the network, and providing longer trains and additional services/paths to meet existing and future passenger and freight demand.
- Work with Network Rail, rail franchise operators, and Partners to deliver a programme of rail station improvements, through a Long Term Stations Strategy, to complement line enhancements.
- Maintain and enhance the role in decision making with regard to rail infrastructure and operational investment, focusing on championing the needs of rail customers across the North.

Sustainability

- Support the UK in meeting commitments under the Climate Change Act 2008 by collaborating with Partners and stakeholders to deliver a low carbon Northern transport network, including a zero carbon public transport network, by 2050.
- Ensure that transport interventions that TfN is promoting or supporting enhance the North's natural, historic and built environment in order to deliver a net gain in biodiversity where possible.
- Support Partners to identify and deliver interventions which improve sustainable transport access to the North's key public transport hubs, including better walking and cycling provision and improved local bus access.
- Support Partners to develop and promote measures that improve local sustainable travel options, such as strategic cycle networks, and encourage their use to make best use of the North's existing and future strategic transport networks.
- Promote transport interventions that improve the resilience of the North's existing strategic transport networks to the effects of climate change, including extreme weather events.
- Ensure that any intervention requiring business case development and implementation that features in the Investment Programme must undertake a sustainable return on investment process, in order to fully capture and monetise the wider benefits of the transport investment.

Road network

- Work with Highways England, local authorities and the Department for Transport to develop a consistent approach for managing the Major Road

Network and to co-ordinate improvements, investment and operation, drawing on best practice and balancing the needs of all road users.

- Prioritise measures that tackle journey reliability and congestion, and support less polluting and more energy efficient movement of people and goods on the Major Road Network.

Innovation and data

- Ensure the North is a leader in transport innovation where there are clear benefits for the customer, and where these support the pan-Northern transport objectives, by making sure TfN's plans take a proactive but flexible approach to emerging and potential future transport innovations.
- Facilitate cross-business and cross-sector collaboration to ensure an integrated approach to new transport mobility opportunities.
- Develop an open data initiative, to ensure Partners, Delivery Agencies and innovators have access to TfN's research, modelling and data to support evidence-based policy making, as well as consistency and robustness in business cases for local and strategic infrastructure schemes. Access to open data will encourage the private sector to develop innovations which improve the transport user experience.
- Ensure transport investment decision making is evidence based and the case for transport investment is robust through enhanced and innovative transport modelling.

Goods and freight

- Improve the efficiency of the movement of goods by working with local authorities and the private sector to improve journey times and reliability for deliveries. • Work with Partners and the private sector to explore the benefits of regional freight consolidation and distribution networks, and network of construction consolidation centres. • Work with the rail industry to identify opportunities for moving freight on to the rail network and increase the number of rail corridors capable of accommodating container trains, to ensure they can accommodate the largest intermodal deep-sea shipping containers.

International connectivity

- Promote the development and implementation of sustainable surface access to the North's international airports and major ports, including promoting direct rail access. This can increase demand of air services and increase air freight to fly to/from the North. This includes improving access to Manchester Airport, which is currently the third busiest airport in the UK, ensuring it continues to act as the largest global gateway for the North, as well as supporting the growth and development of all international airports across the North.

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Reviewing and updating the Strategic Transport Plan

The Strategic Transport Plan marks the first time TfN has undertaken its statutory requirement to submit advice to Government. However, TfN recognises that these are changing economic times. Some of TfN's Partners are also in the process of updating their transport strategies, and developing local industrial strategies. Building on the evolving and maturing analysis and evidence base, and any potential governance changes, TfN will look to refresh the Strategic Transport Plan by 2022.

The refresh will also be timed to fit within industry planning processes. This will ensure that TfN is positioned to influence policy and investment decisions with a robust, evidence-based and up-to-date plan that makes the case for continued investment.

The refresh will continue to ensure that TfN is delivering the pan-Northern transport objectives, and complements spatial planning, local transport plans, and economic strategies at a local level.

TfN is committed to continued engagement with stakeholders across the North. With any revision of the Strategic Transport Plan we will undertake comprehensive consultation to ensure the Plan continues to reflect and promote the case for strategic transport investment in the North.

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