Peninsula Transport Shadow Sub-National Transport Body

WP06 Report: Carbon Transition Strategy

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Quality information

Prepared by	Checked by	Verified by	Approved by
Richard Adams (AECOM) Alex Bertram (AECOM) Ben MacLeod (AECOM) Adrian Regueira-Lopez (WSP)	Richard Adams (AECOM)	Peter Wright (AECOM) Nick Woollett (AECOM)	Nick Woollett (AECOM)

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Peninsula Transport

Prepared for:

Peninsula Transport Shadow Sub-National Transport Body

Prepared by:

Lead Consultant
Richard Adams
Associate Director

Winslade House,
Winslade Park,
Manor Drive,
Clyst St Mary,
EXETER
EX5 1FY
United Kingdom

T: +44 1392 663200
aecom.com

Supporting Consultant
Adrian Regueira-Lopez
Principal Consultant

WSP
Kings Orchard
1 Queen Street
Bristol
BS2 0HQ

T: +44 117930 6200
wsp.com

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Glossary of terms

| Abbreviation	Description
Adaptation	The process of adjusting to the current and future effects of climate change (e.g. building flood defences to protect against sea-level rise).
BEV	Battery Electric Vehicle
Carbon Neutral	Defined by an internationally-recognised standard – PAS 2060. Under this definition, a carbon neutral footprint is a 'condition in which during a specified period there has been no net increase in the global emission of greenhouse gases to the atmosphere as a result of the greenhouse gas emissions associated with the subject during the same period'.
CAV	Connected and autonomous vehicles
CNG	Compressed Natural Gas
E-bikes / e-scooters	Electric bikes / scooters
EV	Electric Vehicle (generic)
FCEV	Fuel Cell Electric Vehicle
GHG	Green House Gas
ICE	Internal Combustion Engine
$KtCO_2e$	Kilotonnes of carbon dioxide equivalent. Relates to the combined emissions of carbon dioxide, methane, nitrous oxide, and the four F-gases (hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride)
LPG	Liquefied Petroleum Gas
LNG	Liquid Natural Gas
LA	Local Authority
MaaS	Mobility as a Service
Mitigation	Mitigation means making the impacts of climate change less severe by reducing the sources of greenhouse gases emissions and/or enhancing the sinks (e.g. increasing the size of forests).
Net Zero	Where total greenhouse gas emissions are equal to or less than the emissions removed from the environment. Net zero can be achieved by a combination of reducing emissions and removal by offsetting and/or carbon trading. Emissions can also be removed or absorbed by natural processes such as tree planting or by using technologies like carbon capture and storage
PHEV	Plug-in Hybrid Electric Vehicle
TDM	Travel Demand Management
ULEZ	Ultra-Low Emission Zone
ZEV	Zero Emission Vehicle

Executive Summary

Overview

In the face of the climate emergency, action must be taken at all levels to transition away from carbon intensive activities to meet Net Zero commitments. Transport remains the largest-emitting sector in the UK and Peninsula Transport is committed to driving change and coordinating actions between our local authorities, LEPs, delivery partners and other stakeholders. This Carbon Transition Strategy sets out the needs of our region, prioritising the actions where we can add most value and identifying those areas where we need others to lead.

The strategy identifies five themes for action (Figure ES-1): two are driven by changes in behaviours – reducing demand and shifting how people and goods move; two will support the decarbonisation of our fleets – through changes in vehicles and supporting infrastructure; and finally, those that will be facilitated through actions that improve choice and efficiency.

Figure ES-1: Carbon Transition Strategy Action Themes
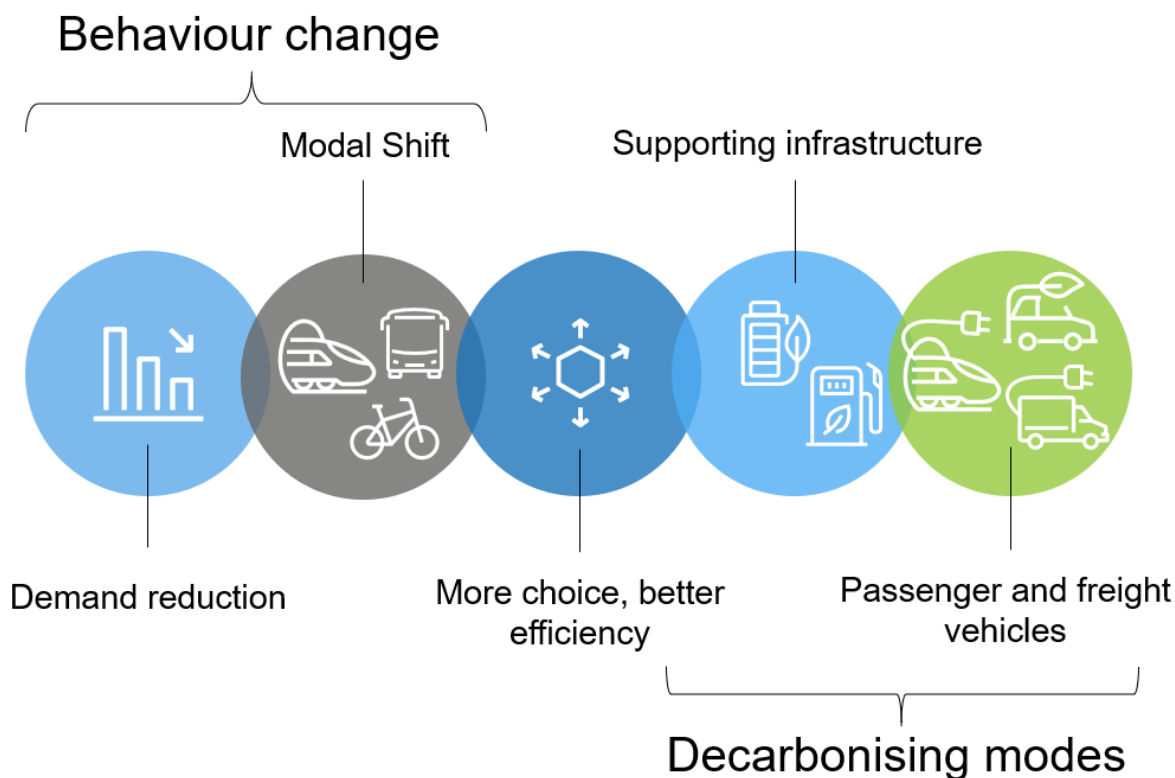
The Carbon Transition Challenge

In the peninsula, 2020 baseline transport emissions of over 4,400 $ktCO_2e$ per annum frame the challenge of achieving net zero. Modelling indicates that with current policy alone driving decarbonisation, transport emissions in the Peninsula could still be around 3,300 $ktCO_2e$ per annum in 2050 (c. 25% reduction). Although future technologies may be able to mitigate or offset some of the transport shortfall, the peninsula will still need to support national transport emissions reductions of approximately 65-76% relative to 2019 levels.

These rapid reductions in emissions also need to be considered within Peninsula Transport's wider vision of "transforming transport across the Peninsula to enable our society and economy to thrive and our unique and outstanding environment to flourish". The peninsula shares many challenges with the rest of the country but also has critical geographical and

socio-economic differences. The population of the peninsula has grown above national levels in the past 20 years, with a significant rural and increasingly elderly population. Events such as the 2014 storms and subsequent damage to critical networks have also demonstrated the severe impact of climate change on those living, working and visiting the peninsula. Access to the transport network represents a critical determinant of an individual's level of social and economic inclusion, affecting their quality of life, access to key services, and level of deprivation. This strategy has therefore considered how the compelling need for urgent carbon transition can provide wider co-benefits.

2.35 million residents   58% urban   42% rural

Rural populations typically facing higher transport costs as a percentage of disposable income than urban areas

Creation of 170k new jobs &   >200k new homes by 2040

Car ownership is the second highest of any region in England (1.39 cars per household)

Over 6,300 miles travelled per person, per year on average – the highest private transport distance nationally

Ultra-low emission vehicle growth of over 3,000% since 2011 (0.7% of vehicles, compared to 1.4% nationally)

Less than 50 electric vehicle charging devices per 100,000 population in all authorities

Priority Actions for Peninsula Transport

An initial longlist of nearly 100 potential carbon transition interventions was developed alongside stakeholders at workshops and meetings over an 18-month period. These interventions were then assessed with stakeholders, with reference to policy commitments and local challenges, to develop a shortlist of the 36 most desired interventions. A total of twelve actions have subsequently been developed by the technical team to bridge the gap between Peninsula Transport's current role, activities and desired future interventions.

Priority	Demand Reduction	Modal Shift	Demand Reduction, more choice, better efficiency	Passenger freight and vehicles	Supporting infrastructure
Highest (STB role to lead)		Public Transport Prioritisation		Zero Emission Bus Implementation	Electric Network of the Future
Medium (potential co-ordination or intervention pilot opportunities)		Multi-Modal Coordination Plan	Future Funding Focus		
	Promotional Activities linking to existing STB Communications Plan				
Lowest (integrated into other activities / business as usual)	Identification of Spatial Planning Opportunities	Identification of Strategic Active Travel Opportunities	Partnership and Engagement Activities	Rail Action Plan	
		Digital Connectivity Action Plan		Freight Decarbonisation Plan	

Three actions have been deemed 'priority actions' for Peninsula Transport to lead in the short-to-medium term, including the assessment of future electric vehicle demands requested by the Department for Transport for the end of 2022.

Priority Actions: Peninsula Transport Lead

Public Transport Prioritisation
Use strategic review of BSIPs and Rail Strategy to maximise carbon reduction from measures

Electric Network of the Future
Defining demands for electric vehicle infrastructure

ZEB Coordination
Bring together best practice and develop efficiencies from local authority bus decarbonisation strategies
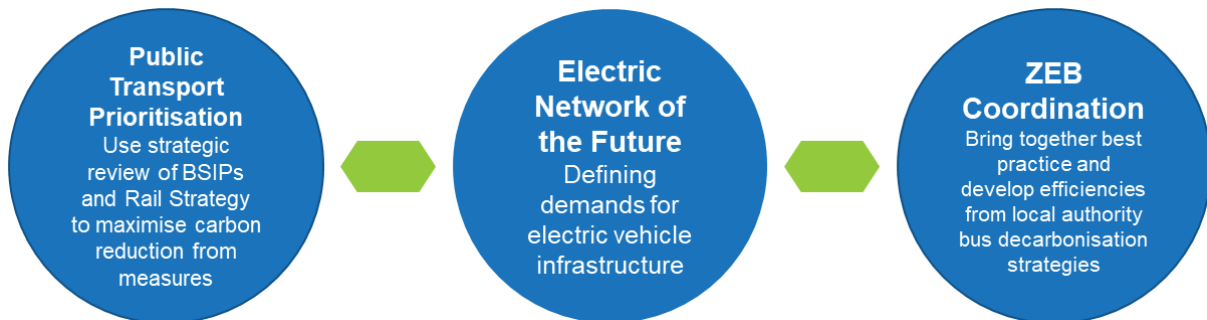
An additional three medium-term actions involve Peninsula Transport placing greater emphasis on co-ordinating efforts and potentially bringing forward pilot projects. The remaining actions can be discussed and developed as part of the Full Transport Strategy but will require future decisions in order to commit the funding and resources necessary to maintain Peninsula Transport's commitment to transitioning to zero carbon transport.

The carbon modelling work undertaken indicates that if a range of technological and behavioural interventions are implemented as part of a 'Maximum Ambition' scenario, a substantial (c. 90%) reduction in transport emissions could be delivered in the region by 2050. However, a gap of approximately 500 ktCO$_2$e per annum would still exist and therefore need to be addressed. This is a stark reminder of the scale of the challenge for decarbonising transport and the importance of continuing to invest Peninsula Transport's resources in this area in the medium-long term.

1. Introduction

1.1 Overview

This document presents Peninsula Transport's Carbon Transition Strategy. Peninsula Transport is the shadow sub-national transport body (STB) for the South West peninsula. We represent five local authorities and two local enterprise partnership areas and work closely with co-opted members and key stakeholders from the private and public sector (Figure 1-1). Along with our neighbouring STB, Western Gateway, we are responsible for defining and delivering the strategic transport priorities for most of South West England (Figure 1-2).

Figure 1-1: Peninsula STB local authorities and key stakeholders

Figure 1-2: Peninsula and Western Gateway STB

1.2 Peninsula Transport Strategy

The vision for Peninsula Transport was published for consultation in Autumn 2021 and adopted in Spring 2022. Building on the unique aspects of the peninsula identified in previous analysis – including the Regional Evidence Base (REB)[1] and Economic Connectivity Study (ECS)[2], the following vision was agreed:

> *"Transforming transport across the Peninsula to enable our society and economy to thrive and our unique and outstanding environment to flourish."*

The full Peninsula Transport Strategy is now being developed to deliver that vision. It will address the challenges, opportunities, and priorities for Peninsula Transport and the region over the next 30 years – to 2050 and beyond.

This 'Carbon Transition Strategy' is one of the seven work packages contributing to the Full Transport Strategy (as shown within Figure 1-3) which will be published later in 2022. Over the following pages a summary of the final technical analysis and evidence are presented, with additional details included in the Appendices.

Figure 1-3: Peninsula Transport Strategy work packages[3]

The Peninsula Transport Vision is supported by five goals which cut across the sustainability pillars (Figure 1-4)[4]. Although this paper primarily focuses upon the zero-carbon emission and network resilience goals, emphasis has also been placed upon the achievement of potential 'co-benefits' associated with carbon transition; "the positive effects that a policy or measure aimed at one objective might have on other objectives"[5]. From a transport perspective, co-benefits of appropriate carbon reduction interventions can include improved air quality and health outcomes, reduced congestion, and opportunities for new jobs through innovation[6].

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[1] Peninsula Transport (2019) Regional Evidence Base
[2] Peninsula Transport (2020) Economic Connectivity Study
[3] Peninsula Transport (2021) Vision for Public Consultation
[4] Peninsula Transport (2021) Vision for Public Consultation
[5] Intergovernmental Panel on Climate Change (2014) Fifth Assessment Report, Annex I Glossary
[6] DfT (2021) Decarbonising Transport: A Better, Greener Britain

Figure 1-4: Peninsula Transport Strategy Goals[7]

We will improve connections between people, businesses, and places

We will enhance the resilience of the transport network

We will deliver affordable, zero-emissions transport for everyone

We will help to improve the health and wellbeing of communities in the Peninsula

We will help the Peninsula to be a great place to live and work

1.3 Decarbonising Transport

As acknowledged by numerous policy documents (see Section Policy Context 2.2) and the UK's recent presidency of the UN climate summit, tackling climate change is a key Government priority. In 2019, the UK government announced a target of net zero for UK greenhouse gas (GHG) emissions by 2050. The legislation for this target subsequently amended the goal of the Climate Change Act 2008, which had previously set a target of an 80% reduction in GHG emissions compared with the 1990 levels.

> **Box 1: What do 'Net Zero' and 'Carbon Neutral' mean?[8,9]**
>
> 'Net zero' means that total greenhouse gas emissions are equal to or less than the emissions removed from the environment. Net zero can be achieved by a combination of reducing emissions and removal by offsetting and/or carbon trading. Emissions can also be removed or absorbed by natural processes such as tree planting or by using technologies like carbon capture and storage.
>
> 'Carbon neutrality' is defined by an internationally-recognised standard – PAS 2060. Under this definition, a carbon neutral footprint is a 'condition in which during a specified period there has been no net increase in the global emission of greenhouse gases to the atmosphere as a result of the greenhouse gas emissions associated with the subject during the same period'.

The UK has witnessed progressive reductions in GHG emissions since 1990, although changes vary greatly by sector. Much of the change has been driven by the power sector, with energy generation switching from coal towards gas and renewable energy. Achieving net zero requires that emissions continue to reduce not only through energy generation but across all parts of society.

The transport sector[10] is the largest GHG-emitting sector in the UK, accounting for approximately 27% of UK emissions in 2019 (almost entirely through carbon dioxide emissions; Figure 1-5). Between 1990 and 2019, there has been relatively little overall change in the level of greenhouse gas emissions from the transport sector, with 2019 emissions believed to be around 5% lower in 2019 than 1990. Road transport is the most significant source of emissions in this sector, in particular passenger cars and taxis (55.4%[11]). Although fuel efficiency in passenger cars has generally improved over the period, vehicular traffic increases have largely offset any efficiency improvements[12]. Urgently

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[7] Peninsula Transport (2021) Vision for Public Consultation
[8] House of Commons Library (2019) Net zero in the UK
[9] Carbon Trust (2022) Briefing: Net Zero for Corporates
[10] consisting of emissions from road transport, railways, domestic aviation, shipping, fishing and aircraft support vehicles
[11] DfT, Transport Decarbonisation Plan (2021), 2019 UK Domestic Transport Emissions
[12] Department for Business, Energy and Industrial Strategy (2021) 2019 UK Greenhouse Gas Emissions, Final Figures

tackling emissions from surface transport is therefore critical if UK-wide emissions reductions are to be sustained or accelerated.

Figure 1-5: UK Territorial Greenhouse Gas Emissions, 2019, by Sector[13]

Others include Public, Industrial Processes and the Land Use, Land Use Change and Forestry (LULUCF) sectors. The percentages may not sum to 100% due to rounding.

Impact of COVID-19 on Decarbonisation

The global impacts of the COVID-19 pandemic resulted in large changes in travel patterns and behaviours in 2020 and 2021 compared to previous years. At a national level, territorial carbon dioxide emissions from the transport sector were nearly 20% lower in 2020 than 2019[14]. However, the sizeable reductions in travel demand seen during the lockdown were reversed in many places, including across the peninsula region, as restrictions lifted, providing an indication of demand changes associated with restrictions on movement. The extent to which travel behaviour impacts arising from COVID-19 restrictions will remain in the medium to long-term is uncertain, with any behaviour changes both reflecting and altering the relationship between peninsula's socio-economic characteristics and transport demand (see Sections 2.3 and 2.4).

Box 2: The 'new normal'? Post-pandemic behaviour change

The potential to 'lock-in' pandemic-related behaviour change is not universal amongst the population and may have complex consequences. For example, the increases in remote working during the pandemic attracted much media attention and demonstrated the potential for significant travel reductions for some businesses. However, it is important to note that many sectors cannot operate remotely, with only 47% of people in employment conducting at least some of their work from home during the period of greatest restrictions[15]. For those with the ability to work remotely, there is also the potential for longer distance commutes facilitated by more attractive housing options or greater leisure travel. It is possible that the changes in modes of transport may have a longer-term behavioural impact on travel than the reduction in the amount of travel.

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[13] Department for Business, Energy and Industrial Strategy (2021) 2019 UK Greenhouse Gas Emissions
[14] Department for Business, Strategy and Industrial Strategy (2021) 2020 UK greenhouse gas emissions, provisional figures
[15] DfT (2020) Union Connectivity Review Analytical Report

1.4 About this report

This report provides an indication of the state of transport decarbonisation throughout the peninsula, as well as the need for future change and intervention. Surface transport forms the primary focus of the report as the dominant component of transport emissions, although air and water-based interventions are considered as part of a holistic approach to decarbonisation. The report covers the following key areas:

- **Section 2- Contextual evidence:** Background including policy, socio-demographic data and trends.

- **Section 3- Current and Future transport emissions:** Establishing the emissions baseline for the Peninsula. Understanding possible scenarios and future emissions.

- **Section 4- Exploring decarbonisation for the Peninsula:** Setting regionally relevant themes for achieving decarbonisation. Outlines how carbon transition interventions have been developed and short-listed.

- **Section 5- Summary Recommendations:** Presents priority actions for Peninsula Transport to support the implementation of short-listed interventions, alongside potential funding sources and approaches.

1.4 About this report

2. Contextual Evidence

2.1 Overview

This section provides a summary of information and analysis to help frame the policy, socio-economic and transport context for mobility and emissions in the Peninsula region. The contextual evidence demonstrates that whilst the unique characteristics of the Peninsula create challenges, the decarbonisation of the transport system has the potential to leverage many opportunities and support policy aspirations across the region. Appendix A includes the detailed analysis of the relevant policies and context informing these summaries.

Figure 2-1 outlines the five key challenges and opportunities for the Peninsula, which formed the central focus of Peninsula Transport's Economic Connectivity Study (2020). Whilst Decarbonisation represents the central strand of this report, it is important to recognise the interconnected nature of the five themes, with potential measures and solutions likely to involve several at once. This interconnected nature of solutions to decarbonisation is a running theme, reflected throughout the policy context examined below, across a range of scales of governance.

Figure 2-1: Economic Connectivity Study Key Challenges and Opportunities[16]
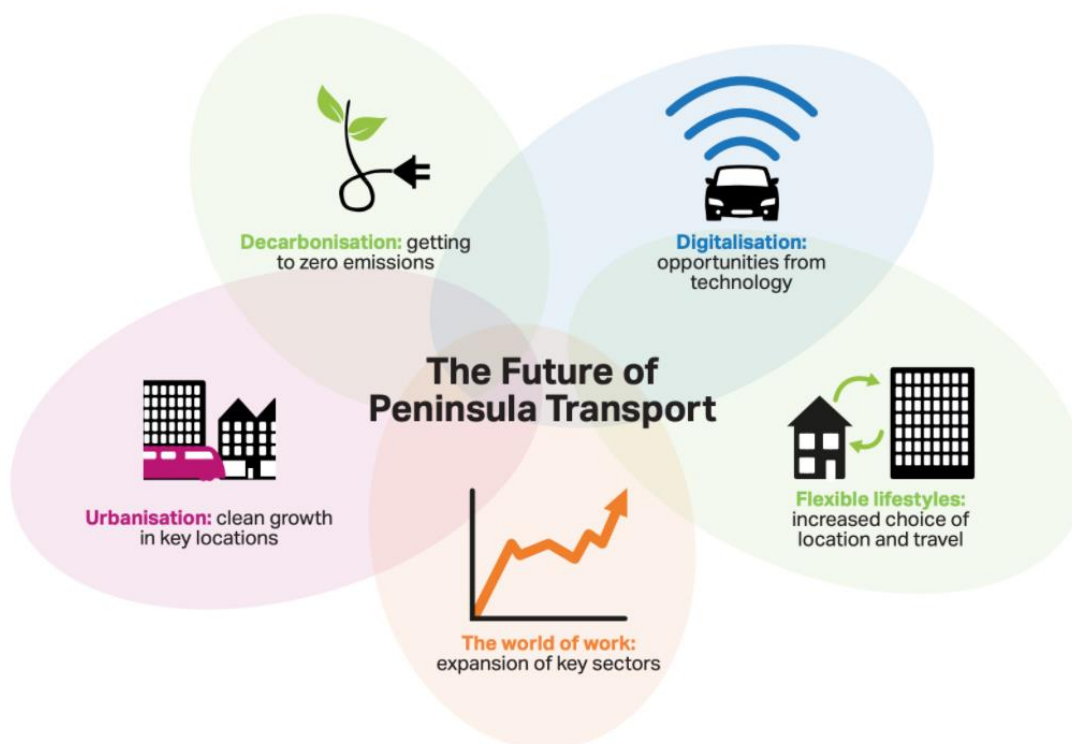
2.2 Policy Context

This section presents key policies relevant to carbon and transport for the UK and the peninsula, helping to identify strategic and local issues and drawing on the latest guidance. This emphasises that an innovative approach is needed to solve current greenhouse gas (GHG) emission issues for the specific challenges of the region (see Sections 2.3 and 2.4), as well as sharing latest technological and best-practice measures within and beyond the

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[16] Peninsula Transport (2020) Economic Connectivity Study

region. A more detailed summary of the national, regional, and local policies and strategies is provided in Appendix A.

Figure 2-2: Recent National Policy Context Summary (see Appendix A for more details)
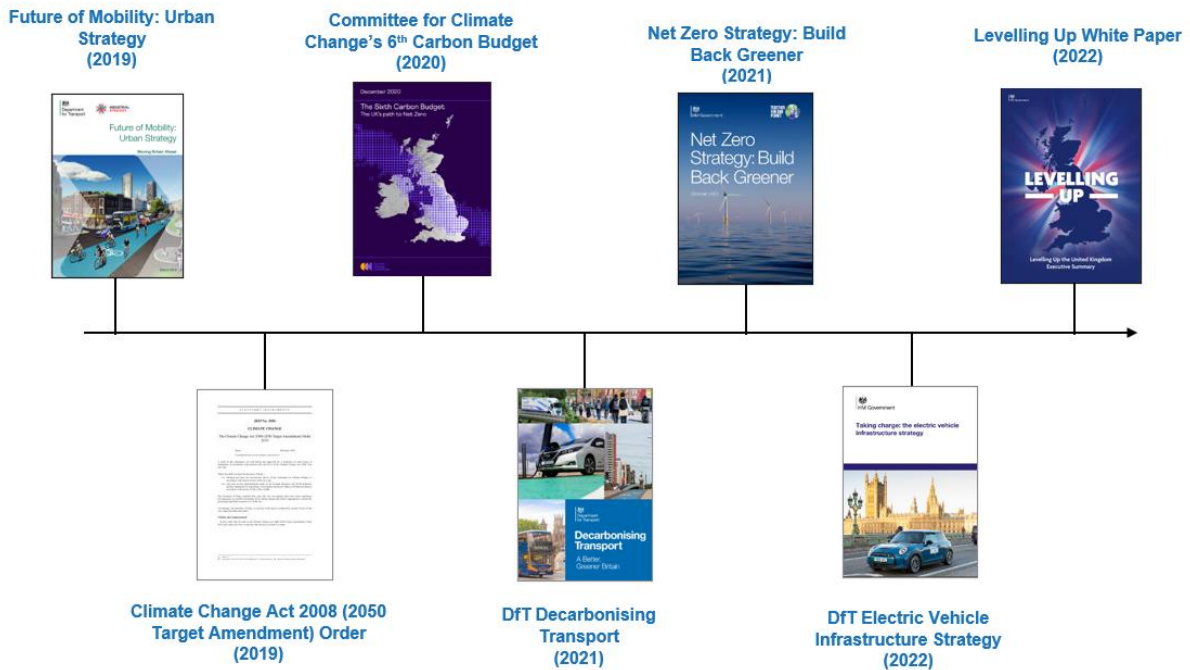
National Commitments

In 2019 the UK Government pledged to deliver 'net zero emissions by 2050' across all sectors, including transport, with strong legislative and policy support. The national carbon policy, set out in the 2021 '**Net Zero Strategy: Build Back Greener**'[17], expands on the UK Government's commitment to achieving 'net-zero'. This includes an interim pathway for transport in 2035 where residual emissions would need to fall by 65-76% relative to 2019 levels. Crucially, the report emphasises the scale of the challenge when it acknowledges that *"we cannot simply rely on the electrification of road transport, or believe that zero emission cars and lorries will solve all our problems"*.

The Net Zero Strategy fits the recommended carbon trajectory set out by the independent Committee for Climate Change (CCC)[18], where half of the required emissions reductions to 2050 would need to take place over the next 15 years. Four key steps are laid out within the budget plan to ensure key targets are met (Figure 2-3). These indicate a phased ambition for carbon reduction at the national level, first providing new opportunities and alternatives to existing carbon-intensive modes, before targeting behavioural change and demand reduction in the longer term. Whilst all four steps are critical to ensuring national, cross-sector decarbonisation, steps 1 and 3 represent important considerations for developing the national transport network.

Figure 2-3: Phased approach for carbon reduction at the national level

1. Take up of low-carbon solutions;
2. Expansion of low-carbon energy supplies;
3. Reducing demand for carbon-intensive activities; and
4. Land and greenhouse gas removals.

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[17] HM Government (2021) Net Zero Strategy: Build Back Greener
[18] Climate Change Committee (2020) The Sixth Carbon Budget: The UK's path to Net Zero

With the eventual phasing out of high-carbon transport options planned for the network, measures to encourage their replacement with low- and zero-carbon transport solutions need to be supported. At the national level, it is crucial that such steps are included within policy and legislation to force meaningful behavioural change. Reducing demand for carbon-intensive travel behaviours and processes represents a longer-term challenge, but one that should be central to any Peninsula Transport Carbon Transition strategy.

The government has recognised the significant role that transport should play in achieving meaningful carbon reductions. Published in 2021, the **Department for Transport's 'Decarbonising Transport'** strategy[19], sets out the proposed pathway towards 2050 net-zero for the UK's transport network. To help guide and streamline decarbonisation measures at the national scale, the strategy identified six strategic priorities for change.

- Accelerating modal shift for public and active transport;

- Decarbonisation of road vehicles;

- Decarbonising how we get our goods;

- Place-based solutions;

- UK as a hub for green transport technology and innovation; and

- Reducing carbon in a global economy.

These priorities will help to shape more specific, local and regional transport carbon policy (including this strategy), serving to highlight the primary means by which decarbonisation can and should be achieved, and recognising opportunities to promote co-benefits.

The government has recognised the importance of charging infrastructure in the transition to EVs. Published in 2022 the Department for Transport's '**Taking charge: the electric vehicle infrastructure strategy**'[20] sets out the vision to remove charging infrastructure as a real barrier to EV adoption. The strategy sets the goal of 300,000 public charging points by 2030.

Whilst the strategy highlights the importance of local authority knowledge of the network and population needs, it also emphasises the importance of regional STBs in coordinating assessment of regional infrastructure demand. This will help electricity network operators to plan their networks, and private sector investment in infrastructure, to accommodate this demand. To help achieve consistent outcomes throughout the country, the government has placed a £500m local infrastructure support programme, which includes £450m local EV infrastructure fund, for places that don't have enough demand to support investment.

Any carbon transition strategy needs to understand the challenges faced by the stakeholders involved to build a well-planned network of charging infrastructure that fulfils the needs of residents and businesses.

> ### Box 3: Catapult Innovating to Net Zero Strategy, 2020[21]
>
> The national commitment to decarbonisation innovation has been further supported by the 'Catapult Innovating to Net Zero' strategy, published in 2020. This report identifies the technologies, products and services which are most critical to meeting Net Zero across the UK, with a particular focus on required infrastructure and innovation.

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[19] Department for Transport (2021) Decarbonising Transport: A Better, Greener Britain
[20] HM Government (2022): Taking Charge: the electric vehicle infrastructure strategy
[21] Catapult (2020) Innovating to Net Zero: UK Report

The DfT's '**Future of Mobility: Urban Strategy**'[22] report outlines the desired benefits sought from mobility innovation, alongside the principles required to help achieve these within an urban context. The 2019 report sets out four new areas of focus for regulatory review, each representing a relative new transport solution being applied in limited areas or through trials across the country: Micromobility vehicles; Mobility as a Service; Transport data; and, Modernising bus, taxis and private hire vehicles legislation. Whilst not necessarily applicable to all areas of the peninsula, it is critical that this strategy accounts for these more innovative transport measures, acknowledging the opportunities that could be presented by each for achieving meaningful decarbonisation – e.g. new technologies and trends within the micromobility sector, with improved batteries and motors facilitating the introduction of new designs and blurring traditional vehicle definitions.

The forthcoming '**Future of Mobility: Rural Strategy**[23] should help provide additional insight, guidance and innovation to meet the needs of those living, working, or visiting the areas beyond the urban settlements in the peninsula. The accompanying Peninsula Transport WP10: Rural Mobility report provides an in-depth review of the needs and interventions, as well as potential pilots, for application in the South West region (including both the Peninsula Transport and Western Gateway STB areas).

Across all sectors, current government strategy is focused on the core principles of 'levelling-up'[24] – a social, economic, and moral programme of development ambitions intended to guide governmental action in order to spread improved equality of opportunity across the nation. A focus on improving the value of individual capital across the nation (Physical, human, intangible, financial, social and institutional) includes significant funding allocations for improved transport systems in more rural and deprived areas, seeking to improve connectivity for everyone closer to London standards. In addition, the **Levelling Up White Paper**[24] also seeks to improve digital connectivity by 2030, in the form of "nationwide gigabit-capable broadband and 4G coverage, with 5G coverage for the majority of the population". Consideration of additional co-benefits and digital connectivity will therefore be crucial in ensuring that the maximum benefits can be obtained from this decarbonisation strategy.

The need to achieve net zero has also been emphasised in the plans and activities of 'arm's length' Government bodies such as National Highways and Network Rail. Published in July 2021, National Highway's '**net zero highways**' plan[25] outlines *"an ambitious programme putting roads at the heart of Britain's net zero future"* up to 2050 and presents a significant number of commitments to cut emissions during this period to meet corporate, maintenance and construction, and road user net zero targets. In addition, Network Rail's **Environmental Sustainability Strategy**[26] and **Traction Decarbonisation Network Strategy**[27] outline how rail operations and infrastructure can support the lower carbon movement of people and goods, whilst providing co-benefits such as reduced journey times. Peninsula Transport will therefore need to work alongside these significant organisations as they continue to develop and implement low-carbon commitments, to ensure that local interests and needs are reflected in future strategic networks.

Regional Commitments

The potential role of the STB in coordinating regional EV demand estimates has already been recognised, but the range of other policies targeted at the regional scale is potentially more limited than either national or local. However, with regional representation from co-opted STB members, such as National Highways, Network Rail and the Local Enterprise Partnerships (LEPs), there is a useful understanding of how national policy and local

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[22] Department for Transport (2019) Future of Mobility: Urban Strategy
[23] The Department for Transport is now developing a future of rural mobility strategy turning the focus to our countryside and coasts following its call for evidence in 2020
[24] HM Government (2022) Levelling Up the United Kingdom
[25] National Highways (2021) Net Zero Highways: Our 2030/2040/2050 Plan
[26] Network Rail (2020) Environmental Sustainability Strategy. 2020-2050
[27] Network Rail (2020) Traction Decarbonisation Network Strategy. Interim Programme Business Case

strategies are bridged. For instance, the two neighbouring LEPs in the peninsula, the
Cornwall and Isles of Scilly (CIOS) LEP and The Heart of the South West (HotSW) LEP,
have each developed strategies for improved productivity and clean, inclusive growth across
their regions (see Table 2-1).

**Table 2-1: Key strategic regional visions of significance to the decarbonisation
strategy.**

LEP	Key Document	Strategic Vision
HotSW	Build Back Better: Transformational Opportunities in The Heart of the South West	• **Energy Futures:** Capitalising on the area's nuclear and renewables potential and becoming the UK's first regional net-exporter of low carbon energy. • **Engineering Futures:** Building a high-tech marine cluster focussed on autonomous and digital systems, clean propulsion and cyber-secure smart ports. Delivering a Future of Flight Programme for sustainable aviation and technologies and fuels. • **Digital Futures:** Tackling economic and societal challenges through analytics and digital innovation. • **Places & Infrastructure:** Supporting left behind places in our cities, rural areas, coastal communities and market towns, also ensuring strategic connectivity.
CIOS	2030 Vision	• **Inclusive Growth:** Linking education providers, business and areas of deprivation. Local transport to support rural/coastal areas. • **Vibrant Communities:** Investment in natural capital and environmental growth. Developing the economic vibrancy of town centres. • **Global Presence:** Further investment in national and global connectivity: digital, road, rail and air.

It is important that any Carbon Transition Strategy recognises how national and regional
policy and ambitions inform and guide local strategy. With the Peninsula Transport region
stretching over five local authorities, incorporating the two LEPs, an awareness of these
regional economic LEP ambitions is critical if decarbonisation measures recommended
throughout the region are to achieve desired co-benefits, outside of the transport sector.

Local Commitments

All five local authorities in the Peninsula Transport region have declared climate
emergencies, with ambitious goals for transport decarbonisation. Table 2-2 outlines the high-
level decarbonisation target timescales for each Local Authority. Whilst four have pledged to
target carbon neutrality (offsetting emissions that cannot be reduced – See Box 1) by 2030,
the current Devon Carbon Plan has outlined an ambition to become Net-Zero (emissions
equal or less than emissions removed) by 2050, with an interim target of 50% reduction on
2010 carbon emissions by 2030.

Table 2-2: Overview of Peninsula Local Authority Climate Emergency Targets

Council	Key Document	Target	Climate Emergency Declared?
Cornwall	Cornwall Climate Change Plan (2019)	Carbon Neutral by 2030	Yes
Devon	Interim Devon Carbon Plan	Net-zero by 2050 (at the latest) Interim target of 50% reduction by 2030 below 2010 levels	Yes
Somerset	Somerset Climate Emergency Strategy: 'Towards a Climate Resilient Somerset' (2020):	Carbon Neutral by 2030	Yes
Plymouth	Plymouth climate emergency action plan (2019):	Carbon Neutral by 2030	Yes
Torbay	Torbay Local Transport Action Plan 2021-2026: Moving towards net-zero	Carbon Neutral by 2030	Yes

These commitments to rapid decarbonisation across the Peninsula will support ambitious carbon reduction measures as part of the Peninsula Transport Strategy. However, it is important to acknowledge the need for a balanced approach, in line with the Peninsula Transport Goals (Figure 1-4). Success in meeting target emissions reductions by 2030 need to be accompanied by improved connectivity, sustainable economic growth in local areas, as well as improved quality of life and a protected local environment.

2.3 Socio-economic Context

Much of the peninsula region is relatively remote, with population growth driven by internal migration – people relocating from other parts of the UK. The population age-profile is skewed towards older age groups compared with the average across the UK. . The region also has a much lower average income and economic performance than the rest of the UK, with pockets of deprivation, particularly to the further west and northwest of the region. Good transport connectivity is a key driver of economic prosperity in the peninsula, but the impacts of peripherality eventually outstrip this. For example, the areas in the peninsula which fall within the least deprived 10% nationally are all within and to the east of Plymouth along Priority Corridor 1 (M5, Plymouth-Bristol rail mainline)[28]. Conversely, Cornwall is home to many of the most deprived areas in the peninsula, with clusters also in locations such as Torbay.

Internal migration into the peninsula has been increasing in response to the Covid-19 pandemic resulting in above average increases in property prices. There is limited consensus on the long-term validity of recent trends. We should therefore anticipate a range of migratory outcomes for the peninsula region, with recommendations made that will

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[28] Three key priority transport corridors were identified in Peninsula Transport's Economic Corridor Studies

provide solutions across a range of short- and long-term demographics. It is imperative that the Peninsula Transport STB and constituent local authorities make suitable and sufficient provision to help support efficient rural travel across the region. This will include ensuring that connectivity and accessibility is high for a range of people, place types and transport modes. Decarbonisation of transport represents an important opportunity for reducing transport-related social exclusion and a central principle of this strategy is ensuring that decarbonisation measures optimise co-benefits such as physical health, improved air quality and increasing levels of mobility for all communities and areas across the peninsula.

Transport decarbonisation opportunities and affordability will vary significantly across the region, particularly when coupled with different levels of remoteness and an ageing population. In the pursuit of transport decarbonisation – and delivery of the goal to "deliver affordable, zero-emissions transport for everyone" –parallel opportunities to improve connectivity to these areas should be taken. Recognition of the inherent cost to the user associated with many low-carbon solutions (such as private EVs) should be acknowledged within any policy recommendations, ensuring that existing transport poverty is not exacerbated because of the drive to decarbonise.
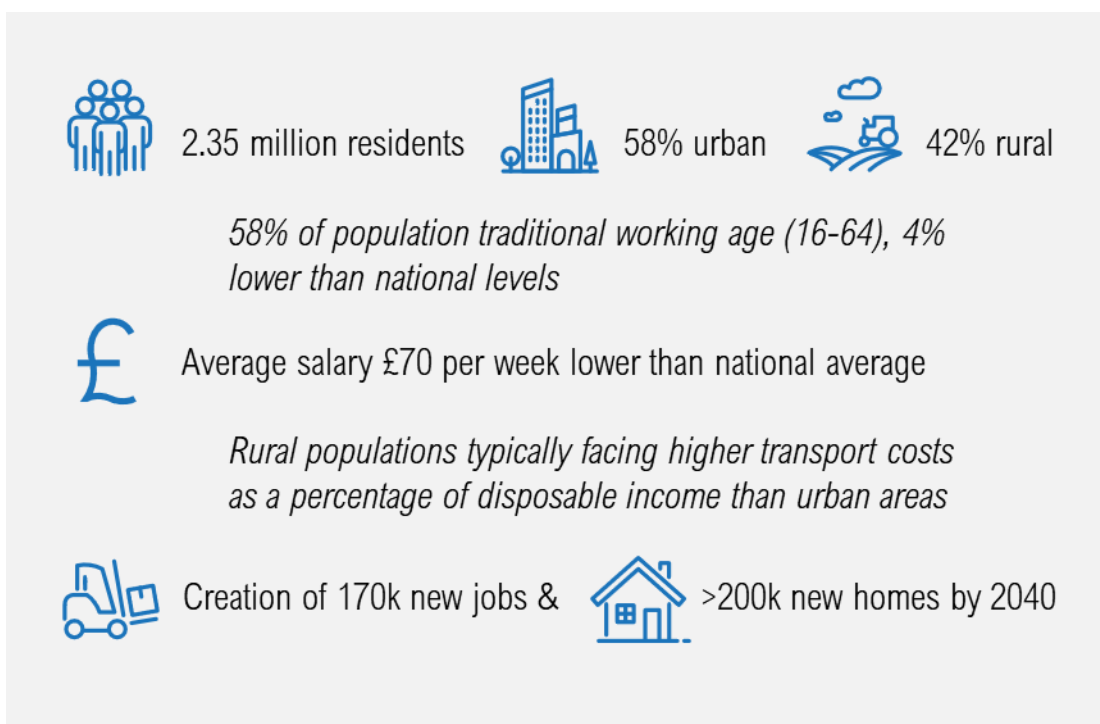
2.4 Transport Context

The unique geographical and demographic layout of the Peninsula Transport region creates a multitude of challenges both for the provision of an effective and efficient transport network, and its eventual decarbonisation.

The Economic Corridors Study (WP05) set out the peninsula's key travel corridors, recognising the importance of the strategic road and rail connections generally aligned east-west providing a central spine and some additional connectivity closer to the south coast and southern parts of region. There are also critically important north-south corridors linking into the West of England growth area, the Midlands, and the North.

The stark separation of rural and urban areas, with many areas of low population density, have resulted in significant blank spots in the public transport (and often communication) network, and an associated high car dependency. Despite important passenger and freight rail connections in the peninsula, many locations within the region are a significant distance

from a rail station and typically require an access journey by car (Figure 2-4). In addition, the cost, coverage and frequencies of public transport services can still be deterrents even for those with close access to networks.

The challenge for the Carbon Transition Strategy will be to balance ensuring widespread connectivity for all residents and visitors, whilst maximising the efficiency of the multi-modal transport system across the region.

Figure 2-4: Peninsula Rail Station Accessibility Analysis[29]
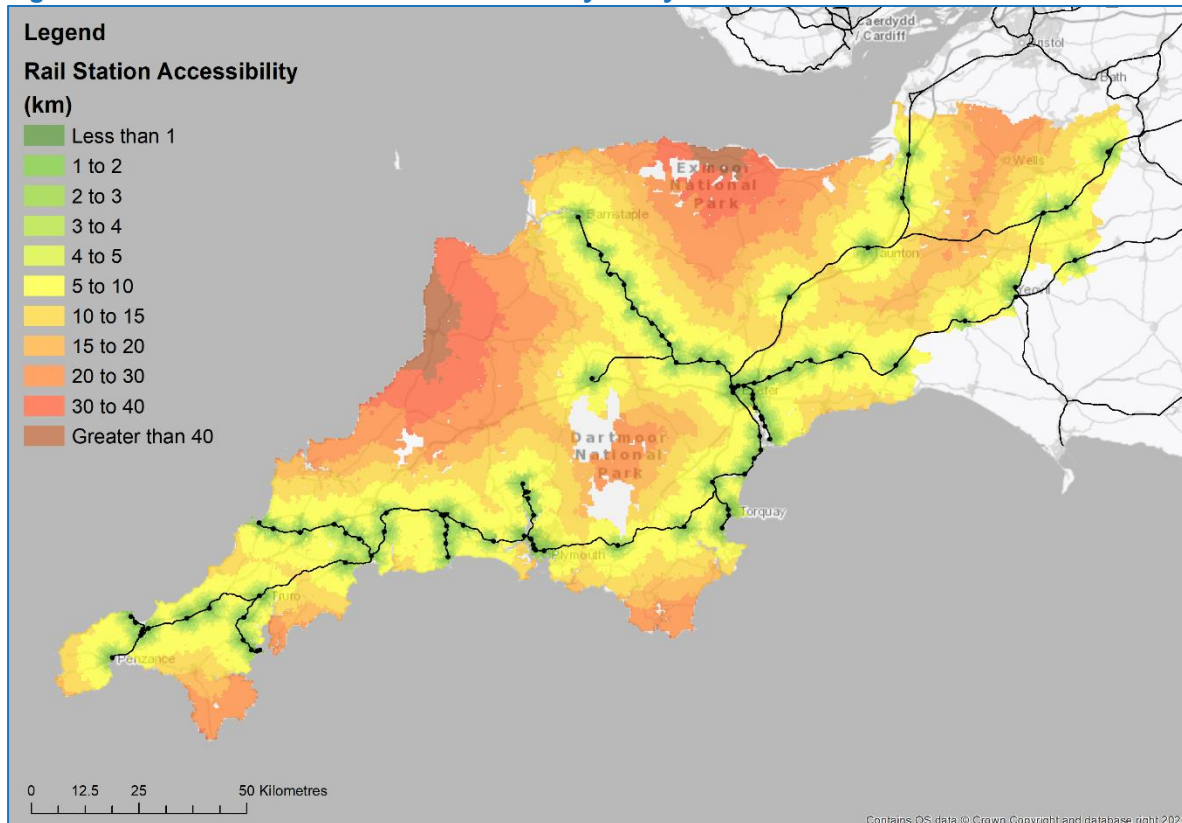
None of the rail network within the Peninsula is electrified. Even with electrification of the rail network throughout the Peninsula Transport region, the significant infrastructure costs associated with this transition presents a challenge to both national and regional funding budgets. More immediate, cost-effective measures are likely to be more beneficial in the short-term – for instance, the better use of existing infrastructure to meet changing demands (see the Rail Study (WP08)).

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[29] Updated from Peninsula Transport (2020) Economic Connectivity Study

None of rail network is electrified, compared to 38% nationally

£1.2 billion costs as a result of disruption to Dawlish and Somerset Levels following 2014 floods

Approximately 43% of trips nationally were under 2 miles before the pandemic

Car ownership is the second highest of any region in England (1.39 cars per household)

Over 6,300 miles travelled per person, per year on average – the highest private transport distance nationally

Ultra-low emission vehicle growth of over 3,000% since 2011 (0.7% of vehicles, compared to 1.4% nationally)

Less than 50 electric vehicle charging devices per 100,000 population in all authorities

Over 90% of landmass in Cornwall, Devon and Somerset does not have access to 'good' 4G signal

More than 20% of households in locations such as South Hams and eastern Somerset do not have access to 'decent' broadband

2.5 Peninsula Needs and Opportunities

The transport and mobility needs of the people and businesses in the peninsula region are at the heart of our Vision. At the start of this chapter, Figure 2-1 set out the key challenges for Peninsula Transport identified through previous work. This included issues of: Decarbonisation, Digitalisation, Urbanisation, Flexibility of Lifestyles, and Changing Work Habits. Throughout the Chapter, many of the key policy aspirations at both national, regional and local level have been outlined, underlying these challenges to ultimately inform the recommendations laid out in this report. It is important that the work of Peninsula Transport recognises these initial challenges to work out the key needs for different groups throughout the region, as well as the opportunities that exist to provide efficient and effective solutions. Figure 2-5 summarises the key challenges, needs and opportunities for the Peninsula that will underline the remainder of this report, seeking to frame the recommended approaches to be taken forward to allow for meaningful transport decarbonisation.

Figure 2-5: Examples of transport and mobility needs and opportunities in the Peninsula.

Needs:

- Communities in large rural areas
- Connectivity and accessibility
- Reflecting changing work patterns
- Making the region more attractive to younger people
- Overcoming high deprivation levels in some places
- Social interaction
- Access to services dependent on improved transport or mobility
- Climate emergency declarations - carbon neutral and net zero ambition
- Active, sustainable and green travel
- Protecting & valuing the environment
- Reducing need and distance of travel
- Productivity and rebalancing the economy
- Supporting the Industrial Strategies
- Addressing seasonality impacts (e.g. visitor economy and busier transport networks)
- Employment and housing growth
- Access to the Peninsula and network resilience
- Overcoming the reliance on private cars
- Balancing local and strategic connections
- Social and economic recovery from COVID-19

Challenges:

1. Decarbonisation: Reaching zero emissions in a timely and economically viable manner

2. Digitalisation: Ensuring that the Peninsula is not left behind in terms of technology and digital connectivity

3. Urbanisation: Ensuring that growth in urban areas is clean and sustainable

4. Flexible Lifestyles: Increasingly blurred boundaries between home and workplace changing travel behaviours

5. The World of Work: Expansion of key sectors across the Peninsula altering demand

Opportunities:

- Good community engagement and support
- Co-operation between stakeholders in Peninsula – one voice
- Wide range of industries
- Social equality
- Green industry
- Uniqueness of Peninsula region
- Exploiting technology
- Sustainable travel as response to environmental challenges
- Influence policy development
- Network planning and reliability
- Future travel solutions
- Mobility "hubs"
- Strategic connections within and to/from Peninsula
- Electrification of transport network
- Expand successful policies across region
- Changes to digital communication networks

3. **Future Transport Emissions**

3.1 **Overview**

This chapter presents the results of modelling future transport emissions in the Peninsula for four future transport scenarios developed with the stakeholders for this strategy. These range from a 'Low Ambition' approach, approximating the current policy landscape with limited other measures, to a 'Maximum Ambition' approach, combining significant behavioural and technological changes for travel in the Peninsula.

The remainder of this chapter provides some context in terms of trends and developments which may influence future transport emissions and then presents the results of the emissions modelling for the four scenarios.

3.2 **Travel trends**

The Peninsula Economic Connectivity Study presented key trends expected to influence the way people in the Peninsula connect. Each of these trends include elements which are expected to impact carbon emissions and these are summarised below. The Covid-19 pandemic and resulting travel restrictions disrupted many existing patterns of activity and it is not yet fully understood which of these will remain and which will partly or fully revert to pre-pandemic trends – this uncertainty is important context for considering future connections and interactions.

- **A growing population:** the peninsula population is expected to grow by around 13% between now and 2050[30]. Currently, peninsula population growth is predominantly driven by internal migration (relocation from other parts of Great Britain). Population growth generally drives increased activity, which – in the absence of mitigating factors – correlates with increased carbon emissions. DfT Road Traffic Statistics for the South West region highlight the challenge of population growth for transport: in the period from 2010 – 2019 vehicle kilometres in the South West grew by 18%. The Covid-19 pandemic restrictions reduced vehicle kilometres substantially in 2020 to around the same levels seen in 2001, but a return to traffic levels close to the pre-pandemic situation is now evident in many locations.

- **Carbon and the environment:** the principal source of transport emissions in the peninsula is from road vehicles. National policy will drive substantial changes to the light vehicle fleet in the United Kingdom, with the phase out of the sale of new petrol and diesel cars and vans by 2030 and the requirement for all new cars and vans to be zero emission at the tailpipe from 2035. A DfT consultation is in progress on setting an end date for the sale of new, non-zero emission buses, at the very latest by 2032. The impact of these policy changes will be to reduce tailpipe emissions per kilometre driven in the period to 2035; however, the scale of reductions will also depend on the adoption rates of new vehicles in the fleet. Economic factors will of course play a role in purchase decisions, but the provision of the necessary infrastructure to support electric vehicles will also be critical. Tailpipe emissions from HGVs per kilometre will also decrease over time as newer, cleaner vehicles are introduced, but there is more uncertainty about when zero emission technology will be able to support the energy requirements of these vehicles. Tailpipe emissions do not account for the emissions associates with electricity generation or the production of other zero emission fuels such as hydrogen for fuel cells. In 2021 the generation of each kWh of electricity in the UK was responsible for 291.3 g CO_2e. Rail, domestic

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[30] Extrapolation of population projections for local authority areas in Great Britain

aviation and domestic maritime modes are also likely to improve their efficiency and reduce emissions over time - but at a slower rate due to the longer expected lifespan of their fleets.

-   **Lifestyles and behaviour:** prior to the pandemic, trends towards flexible working and home working affected the Peninsula more than most places. The Covid-19 pandemic stress-tested the ability of different sectors to support remote working and in some cases has produced permanent changes - often in the form of formal changes to hybrid working for employees. Online shopping has widened the range of available goods and services available with modern delivery systems often able fulfil these needs on the same or the next day. A consequence of this has been the rapid increase in couriers and small vans making 'last mile' deliveries. Changes in lifestyles and behaviours are complex and predicting the changes in emissions associated with trends is difficult: an increase in remote working may be expected to reduce the transport emissions associated with commuting but will potentially create increased emissions in the other sectors because of the energy requirements of IT equipment and digital communications. Individuals may also replace commuting journeys with other trips and changes to online shopping habits has an impact on the emissions from freight and logistics providers. The Peninsula Freight Study (WP09) has provided an opportunity to better understand the performance of the freight network and identify inefficiencies, such as the high proportion of empty-running, which when resolved will be able to support a reduction in transport emissions.

-   **World of work:** the peninsula has a productivity challenge, with levels below the average in the UK. Driving this poor performance are a number of factors including the industry mix and the peripherality of parts of the region. A shift towards regional growth sectors including advanced manufacturing, marine, and energy alongside a more general move towards business and consumer services is expected. This may enable reduced transport emissions, as an increasing proportion of the workforce has the option of remote working and the business mix becomes on a freight supply chain. However, as with lifestyles and behaviour, system complexity makes it difficult to draw definite conclusions about the precise impact of changes on transport and wider carbon emissions.

-   **The future of transport:** emerging technologies are already changing travel choices and behaviours. The Technology and EV Strategy (WP07) is considering the impact of these in detail. The importance of a fast and reliable internet connection is recognised as a key enabler for both trends in behaviour (e.g. remote working and online retail) and the development of other technologies and services such as travel apps and connected and – in the longer term - autonomous vehicles. Peninsula Transport is currently engaged in work to improve mobile rail connectivity for the benefit passengers, operators and communities near the railway. Technology will be fundamental to supporting transport decarbonisation across the peninsula.

-   **Spatial planning:** historic patterns of spatial development have been dominated by the megatrend of urbanisation. However, in the peninsula, population growth has been observed across every type of area from deeply rural to urban[31]. Major housing development in the peninsula is both well-aligned to the existing major road and rail networks and close to existing urban areas. This indicates potential to limit the additional transport emissions associated with population growth by making use of the good accessibility of new dwellings and proximity to employment and services.

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[31] Connected Economics analysis of Census data (2001 and 2011)

3.3 Adaption and resilience

Resilience is a key consideration for the peninsula because of the peripherality of the region and the large proportion of rural landscape. Previous work has highlighted the limited strategic transport connections in the region, particularly west of Exeter, and the importance of keeping these links operational to prevent disruption to activity. A key facet of building resilience is considering the impacts of Climate Change on infrastructure, particularly near to the extensive coastline. The new sea wall and associated works protecting the railway around Dawlish are significant investments which have been necessary to maintain the operation of the only main line for trips in the western part of the region.

It will not always be possible to maintain transport infrastructure in the face of rising sea levels, more frequent flooding and other climate-related events such as droughts or extreme heat. For many communities, adaptation will be necessary, potentially with transport route options and capacity reduced. An example is Hayle in Cornwall, where the Causeway Road, which runs close to the Hayle estuary will eventually become unusable due to rising sea levels putting additional pressure on other routes around the town.

3.4 Possible Carbon Future Scenarios

Four possible future scenarios have been developed to enable a quantification of future transport emissions in the peninsula to understand the scale of reductions which is possible under different scenarios, and most importantly the quantum of emissions which remain in each scenario.

The scenarios were developed with the project stakeholders considering the following factors:

- Growth in population and economic activity;

- Spatial distribution arising from planning policy and economic growth;

- Behavioural and societal change;

- Technological advances; and

- National policy on Net Zero transport and environment.

The four scenarios agreed are as follows (also summarised in Figure 3-1):

1. **Low Ambition**: A scenario to illustrate missed targets and lack of progress across a range of transport areas. This has been modelled including business-as-usual assumptions and with a low-level of ambition for all other areas of carbon reduction.

2. **Behavioural Focus:** A scenario with high behavioural and societal change, that boosts the uptake of public transport instead of private transport and sees significant increase of active travel. This has been modelled by setting a high-level of ambition for demand reduction and mode shift, and a low-level of ambition for electrification/technological change.

3. **Technological Focus:** A scenario where decarbonisation is mainly achieved by replacing current technologies with low-carbon equivalents, but with smaller changes to travel patterns and behaviour-led change. This has been modelled by setting a low-level of ambition for demand reduction and mode shift, and a high-level of ambition for electrification/technological changes.

4. **Maximum Ambition:** A scenario that combines both high behavioural and societal changes and the uptake of low-carbon technologies, to show what can be achieved

through a high-ambition carbon transition strategy. This has been modelled by setting a high-level of ambition for all areas.

Figure 3-1. Identified scenarios to develop as potential decarbonisation pathways

3.5 Carbon Modelling Approach

Baseline Model

A transport carbon appraisal model for the peninsula area has been developed, drawing on data and analysis from various sources. The aim of this model is to characterise the transport emissions of the peninsula region and to evaluate the impact of different elements of decarbonisation policy and investment approaches.

An energy and greenhouse-gas emissions baseline was created for the peninsula area, the primary data sources used were:

- Sub-national total final energy consumption data;

- UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019; and

- Government emission conversion factors for greenhouse gas company reporting.

For the purposes of this project, only transport related emissions were considered as a part of the baseline. These include:

- Rail coal consumption;

- Rail petroleum products consumption; and

- Road transport petroleum products consumption.

To facilitate the forecasting of emissions in future years, other data sources were used to estimate the fundamental drivers of emissions in terms of energy consumption and the emissions associated with generation:

- Projections of changes in energy consumption in both domestic and non-domestic sectors; and

- ▪ Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for an appraisal (for forecasts for the decarbonisation of electricity).

Interventions Modelling

After the baseline emissions were established, consideration of existing policies, plans and trends was made to analyse the impact these are likely to have on Peninsula's emissions, if no other action was taken – defining the Business as Usual scenario. The biggest factors driving decarbonisation in this scenario relate to the decarbonisation of grid electricity and the electrification of transport modes resulting from existing policies such as the ban on the sales of new ICE cars and LGVs from 2030.

A long list of interventions was developed, covering 83 activities centred around the key themes from the Department for Transport's Net Zero strategy. The list of interventions was reviewed and prioritised by a range of stakeholders as outlined in Appendix A. The output of this exercise has influenced the development of the modelled scenarios and interventions. The scores per intervention can also be seen in Appendix C.

The prioritised interventions were used to develop packages of measures which influence future carbon emissions in the model. These packages were applied differentially across the four scenarios to represent the required approach. Table 3-1 summarises the packages of interventions used in the modelling.

Table 3-1: Packages of interventions as applied in the carbon model

Intervention Package	Description	Start Year	End Year
Business as Usual	This considers the fleet electrification driven by existing national policies. This results in a conservative uptake of electric vehicles and LGVs, of 46% and 25% of penetration by 2050.	2022	2050
Transport Demand Reduction	This intervention considers: • the reduction in personal business and retail trips enabled by local service delivery in our communities, as well as a move to online services; • the energy and carbon savings that can be achieved with a higher percentage of home working, enabled by improved digital connectivity; and • improvements in the management and routeing of freight (route optimisation, consolidation centres) in order to reduce their associated carbon emissions.	2022	2040/2050
Mode Shift	This includes the impact from a range of measures aimed at shifting journeys from private vehicles to active travel and public transport. This is achieved by: • initiatives to promote public transport and improve their services; • the development of infrastructure to increase active travel; • schemes which restrict the usage of private vehicles, such as low traffic neighbourhoods, the reallocation of road space to active travel or green space.	2022	2050
Electrification	This includes the decarbonisation (electrification assumed) of taxis, buses, HGVs, cars, vans and rail beyond that driven by current policy. These have been modelled individually, so different levels of ambition and timescales have been considered based on the maturity of technologies for each application as well as key decarbonisation policy for each area.	2022	2040/2050

Further detail on the assumptions and calculations for each intervention package is provided in Appendix B.

3.6 Scenario Results

This section presents the results of the carbon modelling of the four scenarios for the period to 2050. These results represent the direct emissions from road and rail transport and also the emissions from electricity generation where this is an energy source (e.g. in a battery-electric vehicle).

Maximum Ambition Scenario

This scenario produces a reduction of 89% of transport carbon emissions by 2050, indicating the potential to achieve Net Zero emissions in the peninsula – but only with the achievement of ambitious policy, technology and behavioural change. This scenario estimates peninsula transport emissions or 497 $ktCO_2e$ per annum in 2050, from the baseline of 4,459 $ktCO_2e$ per annum in 2020.

Whilst sources of emissions remain in this scenario, the approach has been somewhat conservative on pricing and technological delivery standards. It is possible that by 2050 performance will exceed that assumed here. The analysis has not included any allowance for offsetting or carbon capture and storage – which are other possible mechanisms to help achieve Net Zero. The carbon reductions by 2050 per intervention package are shown in Figure 3-2.

Figure 3-2: Annual CO_2e emission forecasts for 2050 for the 'Maximum Ambition' scenario
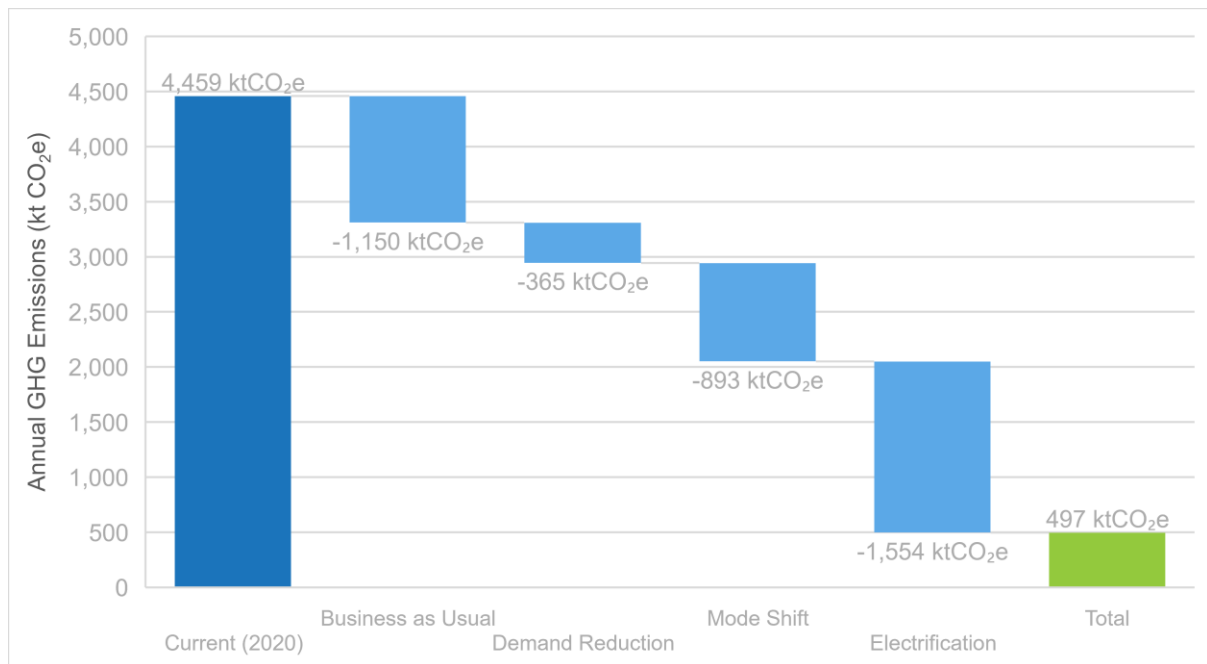
The carbon emissions trajectory for Peninsula, showing the impact for each intervention package, is shown in Figure 3-3.

Figure 3-3: Cumulative CO₂e emission reductions for the 'Maximum Ambition' scenario
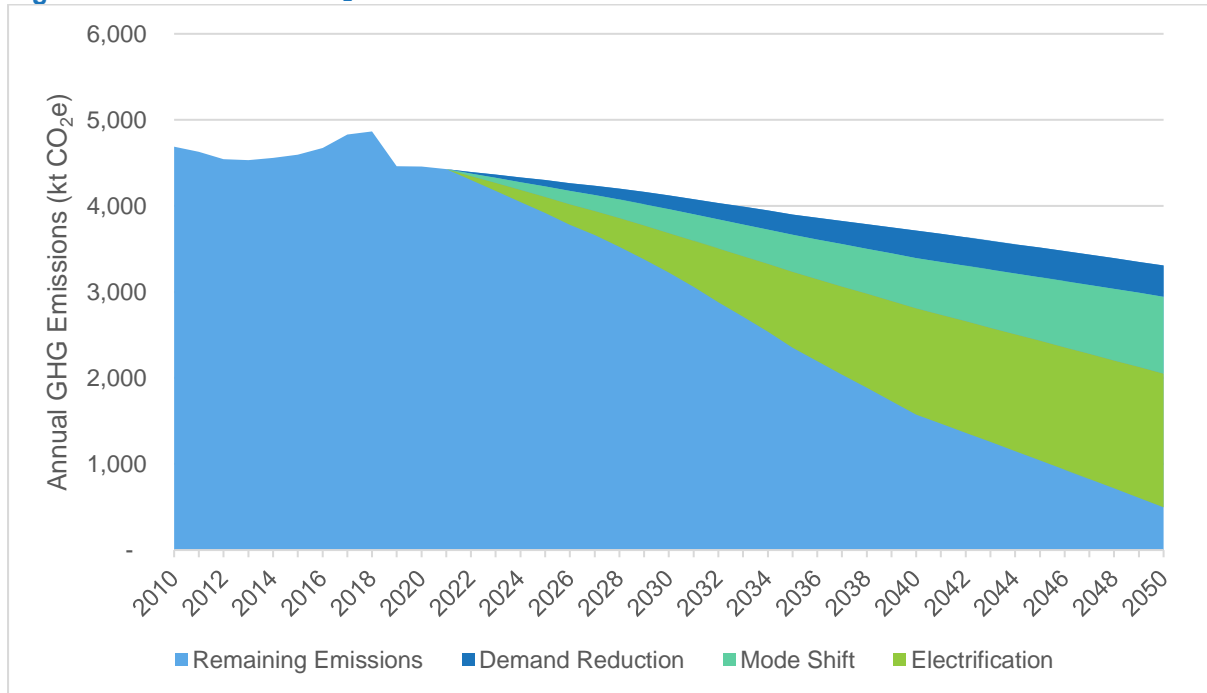
Low Ambition Scenario

This scenario produces a lower reduction of 72% of transport emissions in 2050, with annual transport emissions of more than 1,200 ktCO₂e per annum remaining. The carbon reductions per intervention package in 2050 are shown in Figure 3-4.

Figure 3-4: Annual CO₂e emission forecasts for 2050 for the 'Low Ambition' scenario
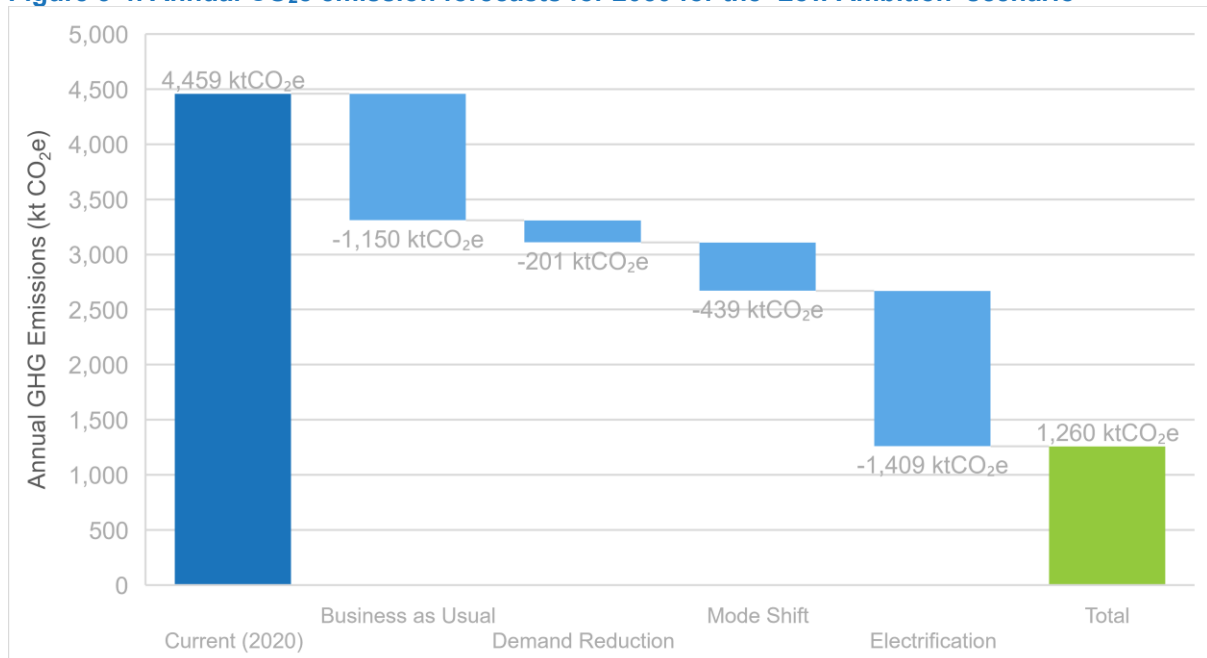
The lower ambition in terms of local policy and investment results in smaller reductions in emissions from demand reduction and mode shift. A consequence of this is that the emissions that need to be reduced by technological solutions (i.e. electrification) are increased, as vehicle kilometres are higher. As a result, the total reduction from electrification interventions is similar to the Maximum Ambition scenario, despite a smaller assumed uptake of these technologies across the transport modes. The carbon emissions trajectory for Peninsula for this scenario is shown in Figure 3-5.

Figure 3-5: Cumulative CO$_2$e emission reductions for the 'Low Ambition' scenario
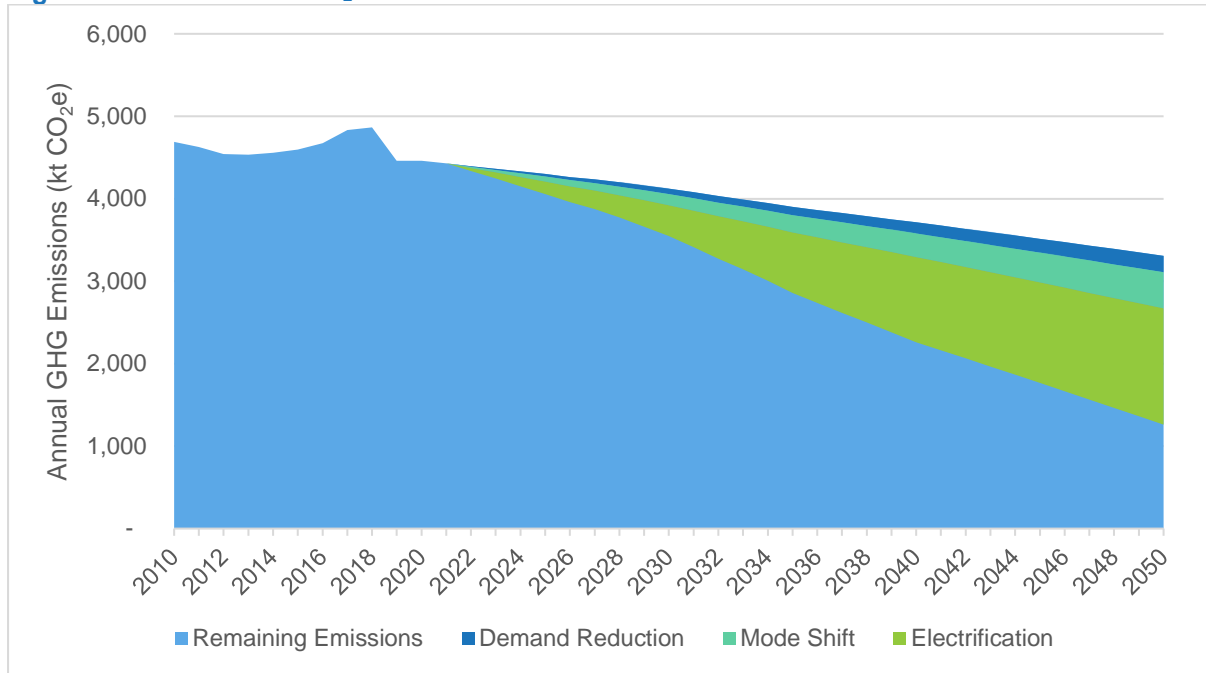
Technological Focus Scenario

This scenario achieves a slightly lower overall reduction than the 'Maximum Ambition' scenario, with an 84% reduction in transport emissions from the 2020 baseline. This results in less than 700 ktCO$_2$e per annum remaining by 2050. The results per intervention are shown in Figure 3-6.

Figure 3-6: Annual CO$_2$e emission forecasts for 2050 for the 'Technological Focus' scenario
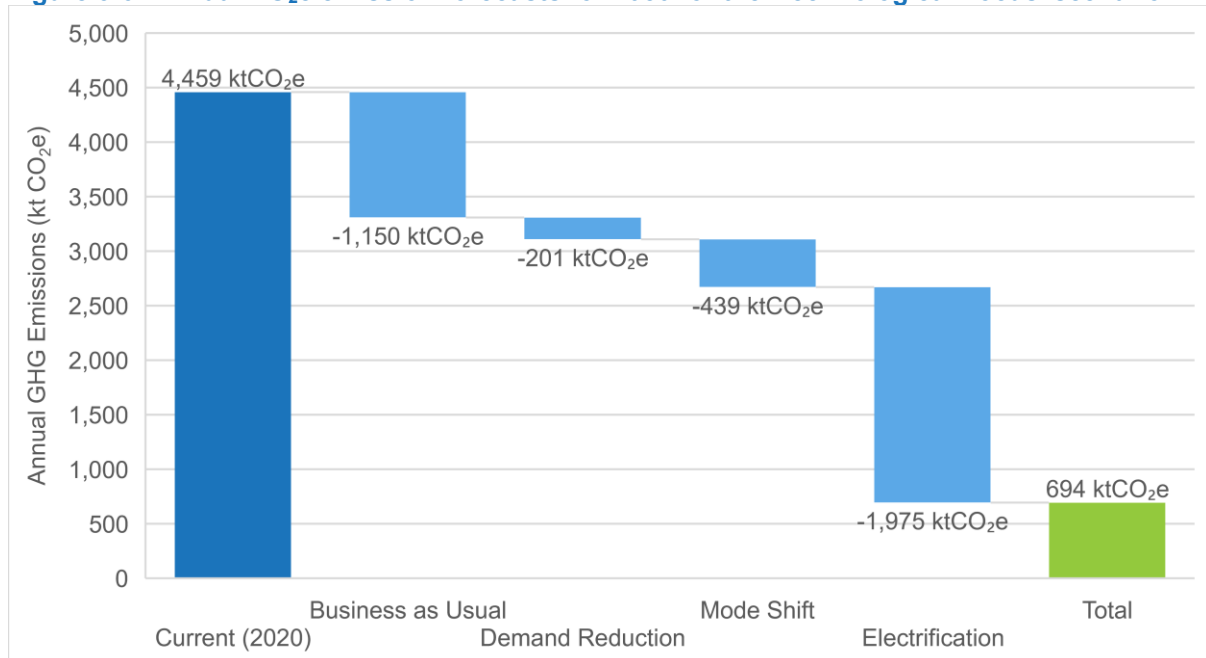
This scenario applies the low-ambition contributions from demand reduction and mode shift measures, which results in a larger share of emissions to be decarbonised by electrification measures. This explains why electrification measures, set at a high level of ambition, achieve a higher overall reduction than in the 'Maximum Ambition' scenario (1,975 ktCO$_2$e compared to 1,554 ktCO$_2$e). Despite this, remaining emissions are higher than in the 'Maximum Ambition' scenario.

The carbon emissions trajectory for Peninsula for this scenario is shown in Figure 3-7.

Figure 3-7: Cumulative CO₂e emission reductions for the 'Technology Focus' scenario
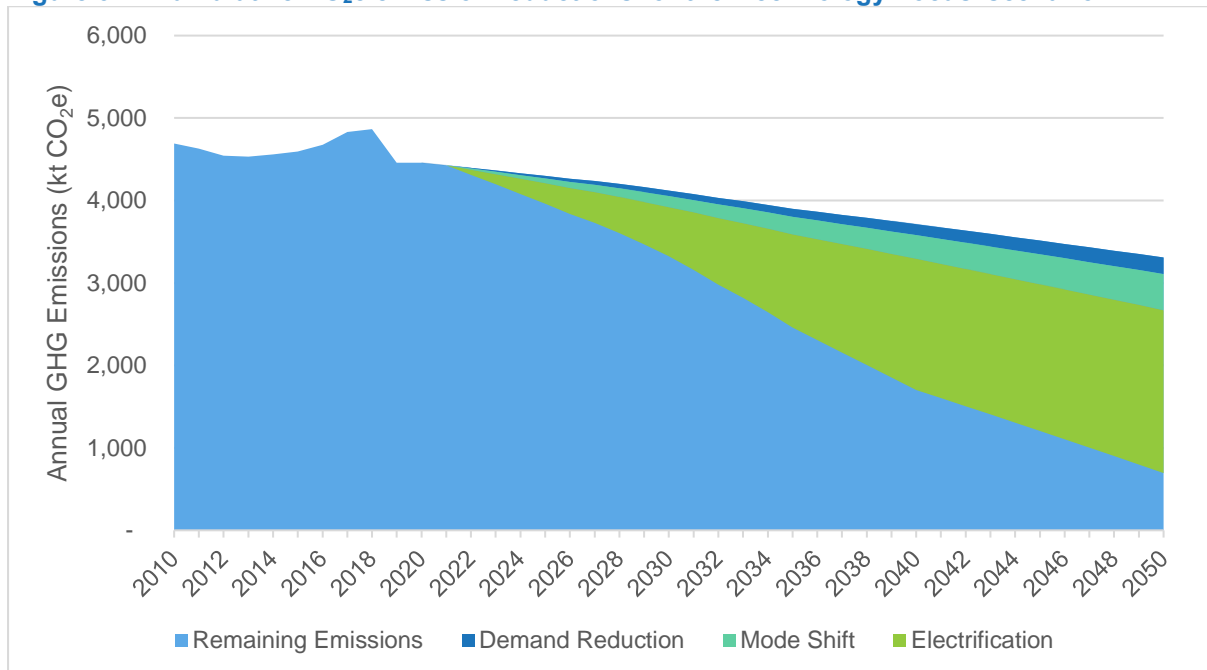
Behavioural Focus Scenario

This results in slightly higher carbon emissions than the 'Technological Focus' scenario. It achieves an 79% reduction in annual transport emissions by 2050, leaving annual emissions of 918 ktCO₂e. The results of this scenario are shown in Figure 3-8.

Figure 3-8: Annual CO₂e emission forecasts for 2050 for the 'Behavioural Focus' scenario
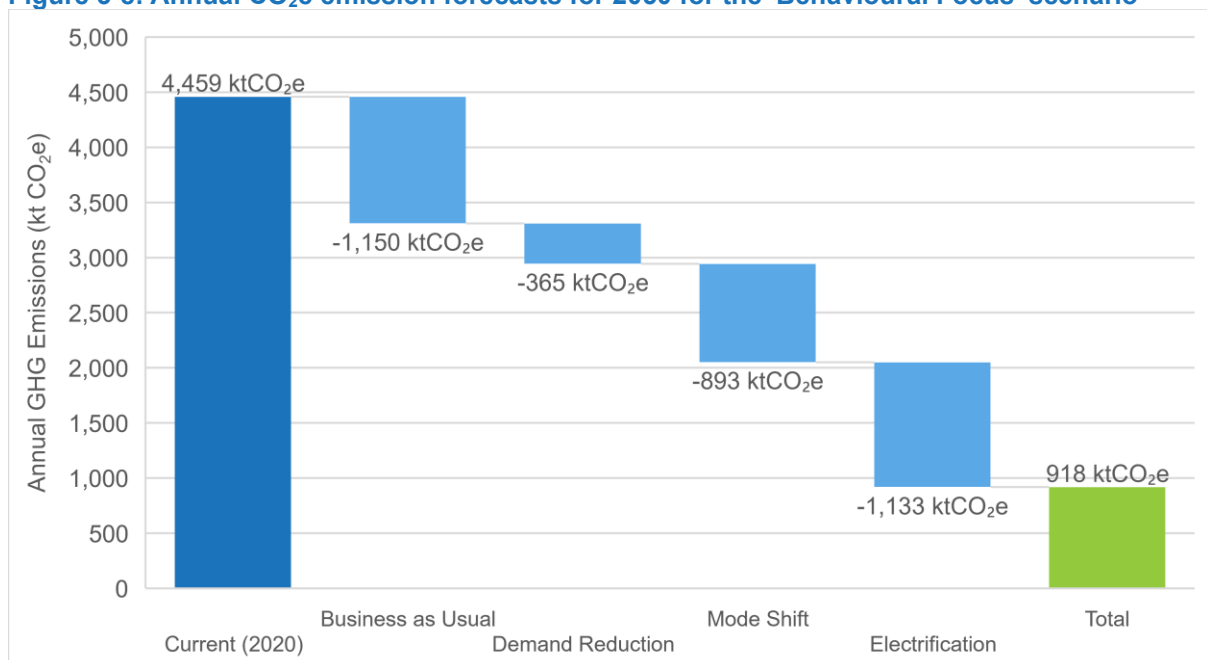
This scenario includes the ambitious reductions in demand reduction and mode shift intervention packages seen in the Maximum Ambition scenario, but the reduced level of ambition in terms of technological interventions more than offsets these reductions leaving an additional 224 ktCO₂e per annum in 2050 compared to the 'Technological Focus' scenario. The carbon emissions trajectory for Peninsula for this scenario is shown in Figure 3-9.

Figure 3-9: Cumulative CO$_2$e emission reductions for the 'Behavioural Focus' scenario
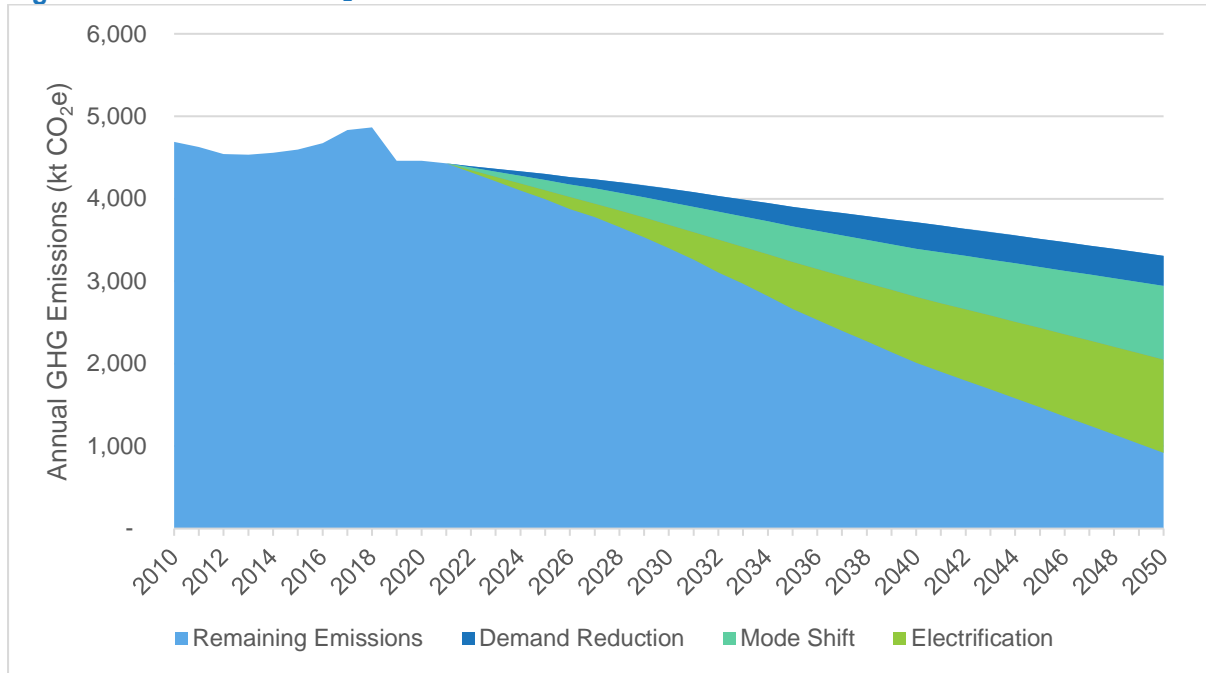
Results Summary

Overall, significant transport-related carbon emissions are still forecast in all scenarios by 2050. The 'Maximum Ambition' scenario forecasts an 88% reduction in direct transport emissions by 2050, which still leaves nearly 500kt CO$_2$e of annual transport emissions to tackle in order to achieve a Net Zero position.

A comparison of the Behavioural Focus and Technological Focus scenario results indicates the potential for emissions reduction in the peninsula in a range of national policy contexts. Important reductions can be achieved in the region through ambitions delivered locally, but if national policy continues to accelerate the impacts of technological change, especially the transition to electric vehicles, then even greater reductions in emissions can be achieved.

It is also important to consider cumulative emissions from the baseline of 2020 to 2050 as "cumulative emissions of carbon dioxide (CO$_2$) largely determine global mean surface warming by the late 21st century and beyond."[32] This is summarised for each scenario and by intervention package in

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[32] 2013 Scientific Assessment of the Intergovernmental Panel on Climate Change (IPCC)

Table 3-2.

Table 3-2: Cumulative carbon emissions by 2050 by scenario, showing reductions per intervention

Scenario (units ktCO$_2$e)	Low Ambition	Behavioural Focus	Technological Focus	Maximum Ambition
Business as Usual	-17,112	-17,112	-17,112	-17,112
Demand Reduction	-3,068	-6,728	-3,068	-6,728
Mode Shift	-6,578	-13,388	-6,578	-13,388
Electrification	-21,626	-16,922	-32,431	-25,249
Cumulative emissions 2020-2050 with just BAU reductions	112,198	112,198	112,198	112,198
Cumulative scenario emissions 2020-2050	80,926	75,161	70,120	66,834
Scenario decarbonisation savings compared to BAU	27.9%	33.0%	37.5%	40.4%

The Maximum Ambition scenario results in a reduction of 40.4% compared with a business-as-usual approach, producing an estimated 66,834 ktCO$_2$e of transport emissions in the period 2020-2050. By comparison, the Technological Focus scenario results in a reduction of 37.5%, the Behavioural Focus scenario in a reduction of 33.0% and the Low Ambition scenario in a reduction of 27.9%. Evidently, the earlier policy or investment is able to deliver reduced emissions in the peninsula, the greater the cumulative impact will be.

A full breakdown of carbon emission per year, intervention and scenario is provided in Appendix B.

4. Exploring Decarbonisation for the Peninsula

This section provides an overview of the key themes for achieving decarbonisation across the peninsula region, the intervention prioritisation approach and a final shortlist of interventions by relevant strategy theme. As outlined within Sections 2.3 and 2.4, each of the key themes are interwoven with the central issues affecting transport across the region: social exclusion and transport poverty, and the challenge of improving rural connectivity. Appendix A includes greater technical detail and context surrounding the development of themes, including relevant case studies from the Peninsula Transport area and further afield.

The challenges and potential interventions to support the carbon transition have been developed in collaboration with key stakeholders including the Heart of the South West Local Enterprise Partnership, Homes England, and Network Rail. This collaborative approach has been critical in developing realistic options which are grounded in clarity around the responsibilities and influence of Peninsula Transport as a STB. Two workshops were held to first understand the challenges, opportunities and priorities for decarbonisation and then subsequently develop a long list of potential interventions.

A wide range of solutions have been considered, including both measures to reduce carbon emissions by transport modes at source, as well as behavioural change aiming to reduce demand for transport altogether. The intervention list was then refined by stakeholders and the technical advisors to form the shortlist of 36 priority interventions for the next five to ten years. Whilst potential interventions were identified for longer timescales, progress in the next 5 to 10 years was considered the greatest priority to maximise effectiveness in achieving the net zero targets by 2050.

May 2020	August 2021	December 2021 - January 2022	February 2022
•Challenges, opportunities and priorities workshop	•Interventions workshop	•Interventions prioritisation exercise	•Intervention short-listing and packaging

4.1 Themes for Decarbonising Transport in the Peninsula

Five key themes were developed to reflect decarbonisation considerations for Peninsula Transport (Figure 4-1) reflecting the strategic areas outlined within the 'Decarbonising Transport' plan, stakeholder inputs and the peninsula context. These themes predominantly reflect two overarching principles of 'changing behaviours' and 'decarbonising modes'. The shortlisted interventions have subsequently been packaged based upon their alignment to the four themes, noting that some interventions support multiple themes.

Figure 4-1: The five Peninsula Transport Carbon Transition Strategy themes
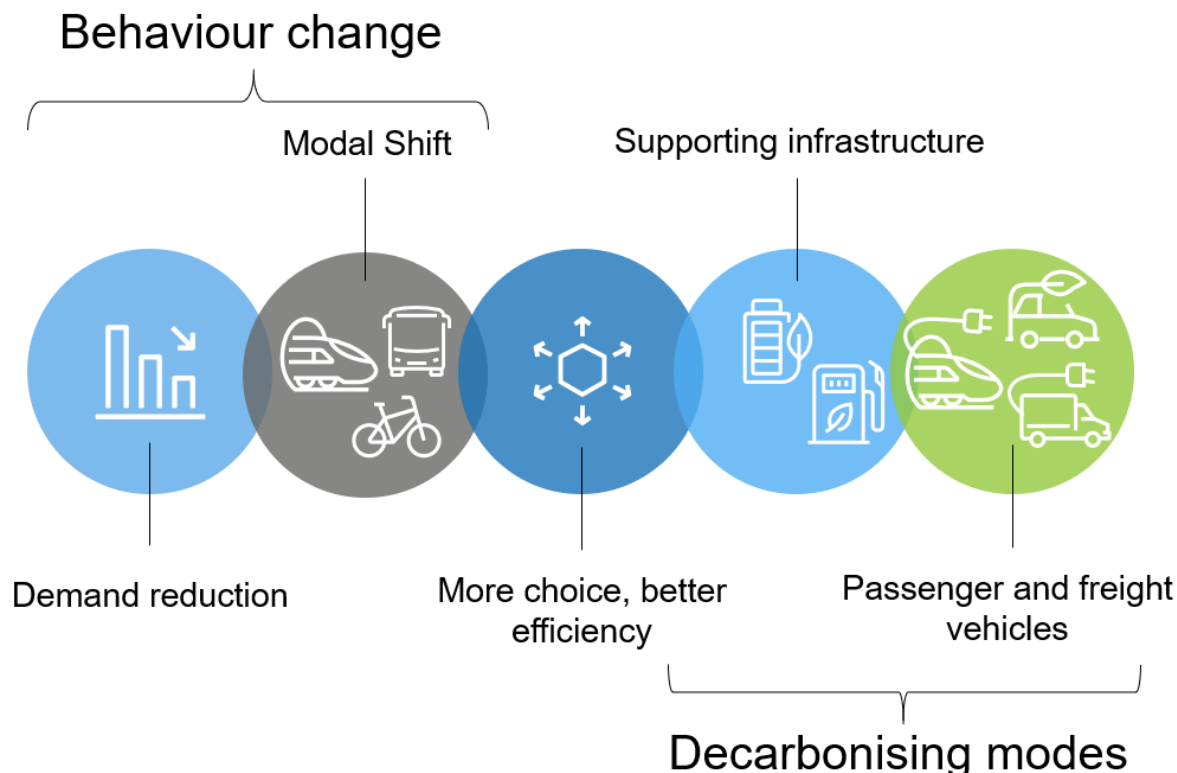
These five themes encompass a range of approaches to lowering the carbon emissions from transport across the region, from demand reduction to modal shift or use of alternative fuels within existing transport trips. Whilst the individual strategies for decarbonisation for each local authority will reflect their differing contexts and needs, good levels of collaboration and combined authority planning will be an important prerequisite for overall success in the region. The highly contrasting rural to urban demography of the region must therefore be accounted for, with acknowledgement given to the differing requirements and opportunities present for both.

A key consideration throughout this strategy, and cutting across all five themes, is that the best methods of pushing for decarbonisation should present parallel opportunities to provide social and economic benefits for the peninsula. If policies are well-selected and designed, then simultaneous improvements can be targeted in public health, access and mobility for disadvantaged groups, work flexibility, access to green space, as well as wider transport improvements to congestion and road accident levels. As acknowledged within Section 2.3, of particular importance to the peninsula will be pursuing measures that target reducing social exclusion across the region, in particular for vulnerable groups and those facing transport poverty.

Behaviour Change: Demand Reduction

Overview

As acknowledged by the Committee for Climate Change (Section 2.2), reducing the demand for carbon-intensive activities is integral to the meeting of decarbonisation targets. Demand reduction could follow many forms from a transport perspective, including no longer needing to travel to access opportunities or services. The lowest carbon trip is ultimately the trip not taken at all. If sufficiently widespread, demand reduction across the peninsula also presents the opportunity to avoid or minimise the need for capacity increases and make best use of the existing networks.

The Covid-19 pandemic demonstrated the potential for significant demand reduction in the face of disruptive events. For example, the closure of offices during lockdown periods has encouraged a shift towards increased home or flexible working patterns, with resultant falls in commuter trip demand. For many businesses, this model has represented alternative ways of working, with evidence suggesting a continued trend away from traditional office-based working. Whilst the remaining themes focus upon how the carbon impacts of necessary transport trips can be minimised, the potential for demand reduction must be considered at the early stages of all activities.

Behaviour Change: Modal Shift to Public Transport and Active Modes

Overview

Whilst measures to improve existing methods of travel are as important as transitionary solutions to achieve rapid emissions reductions, behavioural changes designed to alter the ways in which people travel will provide much of the long-term benefit to decarbonisation across the peninsula. As such, it is critical for local authorities within the region to find ways to shift journeys away from private to sustainable modes, as well as understanding how journeys can be avoided in the first place ('Demand Reduction' Theme). Modal shift away from private vehicles can support a range of wider co-benefits to a region, with potential improvements in air quality, reduced congestion, and reductions in transport related social exclusion. Encouraging the transition towards active travel[33,34] for instance, can bring a range of health benefits to users, both mental and physical.

Reducing the demand to travel by personal vehicles requires significant behavioural change; in order to be effective on a large scale, a culture traditionally focused around personal car use needs to be realigned to values based on shared mobility and active travel. It will be the role of local authorities to facilitate this realignment, setting it firmly within a comprehensive range of supporting infrastructure and policy. It is critical that a place-based approach is embedded to underlie actions, supported by low-carbon alternatives such as buses, shared mobility and active travel. This will realise a range of co-benefits, whilst also reducing emissions quickly at source.

Shortlisted Interventions and Priority Actions

Twelve interventions have been grouped within the 'mode shift to public transport and active modes' theme. The interventions have an emphasis on supporting modal shift away from private vehicles by a mixture of incentives and disincentives, through the increased prioritisation and integration of lower carbon modes alongside measures aimed at financially capturing some of the externalities of car reliance. As the responsibility for implementing many of the actions lies beyond the Peninsula Transport, the STB will have an important co-ordinating and enabling role in stimulating the delivery of the interventions.

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[33] DfT (2021) 'Gear Change'
[34] Connected Places Catapult (2021) 'Accelerating the Active Travel Market'

TOP 3 - Behaviour Change: Modal Shift to Public Transport and Active Modes

1. Improve integration between public transport services and as well as active modes for more seamless multi-modal journeys
2. Implement low-emission zones / road user charges and create car-free city centres / zones
3. Shared mobility schemes e.g. bike and e-scooters

All the interventions within the modal shift theme involve short-term actions to support early progress towards meeting decarbonisation goals. For many interventions, the nature of nearly half of the interventions means that implementation would be expected to continue in the medium-term (up to 2030) as a minimum. For example, the development of cycle lanes and infrastructure would require early work to further develop and coordinate delivery of a comprehensive network across the peninsula, potentially utilising the recent Local Cycling and Walking Infrastructure Plans (LCWIPs), in advance of scheme funding and implementation across the region over a number of years. A priority action of delivering 'Public Transport Prioritisation' to support decarbonisation has been identified for this theme, using existing and planned activities Peninsula Transport is engaged in including a cross-cutting review of BSIPs and the Strategic Implementation Plan which supports strategy delivery (see Section 5.3).

More Choice, Better Efficiency

Overview

The Covid-19 pandemic and its after-effects have initiated several significant changes in transport behaviours across the country, altering both the movement of people and goods. Commute trips by all modes are lower than before the pandemic. Initially reduced travel opportunities supported the increased demand for online shopping, which has continued as restrictions have eased. For example, online retail transactions in October 2021 were nearly 40% higher than the same period two years earlier[35], creating a greater number of delivery and logistical operations across the transport network.

The growing importance of digital platforms in influencing how and when people travel, as well as changing preferences for the types of transport chosen, present both new challenges as well as opportunities for a changing transport network. By facilitating demand for greater choice in how we travel, local authorities across the peninsula can seize the opportunity to

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[35] Statista (2022) Transaction volume of card payments, either debit card or credit card, conducted online in the United Kingdom (UK) from February 2018 to October 2021

promote and embed more sustainable and efficient methods, which can ultimately contribute towards decarbonisation.

Shortlisted Interventions and Priority Actions

Eight interventions have been grouped within the 'More Choice, Better Efficiency' theme. The interventions have an overarching emphasis on proactively supporting the provision of greater travel choices, many of which strongly support the modal shift to public transport and active travel (Modal Shift Theme). Peninsula Transport has a critical role in co-ordinating many of the interventions to enable consistency across the local authorities, particularly when supporting spatial planning policies and region-wide ticketing ambitions.

TOP 3 - More Choice, Better Efficiency
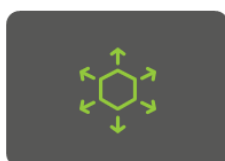
1. Improve rail journey connectivity with walking, cycling and other modes of transport
2. Spatial planning policy - everyday needs should be accessible within a 20-minute walk, cycle or public transport trip
3. Improving alternatives to domestic flights (ground travel > air travel)

Nearly all the interventions within the theme involve short-term actions to stimulate early action towards meeting decarbonisation goals. Most of the interventions would be expected to continue in the medium-term (up to 2030) as a minimum, due to the investment period nature of rail and planning policy cycles. For example, renewal of Local Plans to fully incorporate the 20-minute sustainable trip principles typically takes several years to progress from site allocation to adoption by the Secretary of State, even before site delivery begins.

Decarbonising Modes: Passengers and Freight Vehicles

Overview

Decarbonisation via behavioural and technological improvements represents a key priority across all the authorities within the Peninsula Transport region. With the region's rurality presenting a number of challenges to the creation of an expansive and efficient public transport network, recognising the role of zero- and low-emissions vehicles as means to bridge these gaps will play a critical part in the creation of a decarbonised transport network. The Covid-19 pandemic has illustrated the scale of the challenge presented to the transport sector, still one of the most significant sources of carbon emissions across the country.

Pathways to decarbonisation across the Peninsula will need to consider methods to either reduce demand for transport, or reduce the carbon emitted by transport at source. Electrification is the most likely route, with hydrogen fuel cell vehicles potentially playing an

important role, especially in heavier vehicles (see section 3.3). Enabling smart charging will be essential to allow an efficient and smooth transition to electrified transport.

Shortlisted Interventions and Priority Actions

Ten interventions have been grouped within the 'decarbonising transport modes' theme. The interventions focus upon supporting the movement away from fossil fuel propulsion for the movement of people and goods, including the potential for Peninsula Transport to support early research, development and testing of cutting-edge technology. The STB will have much greater involvement in the development and delivery of actions within this theme, particularly alongside Local Enterprise Partnerships, other STBs and central Government.

TOP 3 - Decarbonising Modes: Passenger and Freight Vehicles

1. Support and encourage modal shift of freight from road to more sustainable alternatives such as rail, cargo bike and inland waterways

2. Internal and external knowledge sharing to ensure appropriate actions are taken within a rapidly evolving landscape

3. Freight - Electrification of freight/delivery vehicles

Nearly all the interventions within the theme involve short-term actions to support early action towards meeting decarbonisation goals. Most of the interventions would be expected to continue in the medium-term (up to 2030) as a minimum, given the scale of the challenge in developing and transitioning to alternative propulsion methods. For example, the current private vehicle market composition is dominated by petrol and diesel vehicles (see Appendix A), with any transition to lower tailpipe emission vehicles strongly linked to availability of supporting infrastructure, consumer needs, and behaviours, including vehicle retention lengths. A priority action of developing an initial plan for 'Zero Emission Bus Fleet Implementation' in the next year has been identified for this theme, making use of Peninsula Transport's strategic role and insight in the region to bring together the necessary information (see Section 5.3).

Decarbonising Modes: Supporting infrastructure to deliver carbon reductions

Overview

Whilst the chosen pathway of measures to decarbonisation for each local authority in the peninsula may vary in approach, it is critical that each be supported by appropriate and

requisite transport infrastructure. This is of particular importance to the peninsula – a region with unique geographical constraints, where a more specific and tailored set of decarbonisation approaches might be required to work alongside more conventional improvements to the existing transport network.

To encourage behavioural change and growth in zero-emission travel, authorities must ensure that such transitions can be facilitated by the network, for all residents regardless of their location within the region. If either behavioural change, encompassing a shift away from private vehicle use, or changes in technology such as the shift to EVs are to occur on a mass scale, both the road and rail networks, as well as subsidiary considerations such as fuel/charging infrastructure, must be in place at an early stage. Integrating decarbonisation measures and targets into existing and future programmes and infrastructure projects will support many of the goals identified by Peninsula Transport and fulfil central Government expectations.

Shortlisted Interventions and Priority Actions

Six interventions have been grouped within the 'Supporting Infrastructure to Deliver Carbon Reductions' theme, reflecting the priority to deliver decarbonisation by making best use of existing major infrastructure where possible. The interventions place emphasis on enabling alternatives to travel through digital connectivity improvements, whilst supporting the transition to electric vehicles. The STB has less direct influence on the interventions but will still have an important role in working alongside stakeholders to identify potential priority areas.

TOP 3 - Decarbonising Modes: Supporting infrastructure to deliver carbon reductions

1. Ensuring people can access broadband internet at home

2. Market-led development of a charging infrastructure network to meet drivers needs

3. Readying the energy system - demand capacity

All the interventions within the supporting infrastructure theme involve short-term actions to support early progress towards meeting decarbonisation goals. For many interventions, implementation would be expected to continue in the medium-term (up to 2030) as a minimum. For example, the development of electric vehicle charging infrastructure will need to be incorporated into planning policies, with market-led wider networks continuing to expand as demand changes. A priority action of developing an 'Electric Network of the Future' in the next six to twelve months has been identified as a key step for this theme (see Section 5.3).

5. Next Steps

5.1 Overview

This section summarises recommendations for funding considerations, sources and practical next steps for implementing the actions outlined in Section 4. A holistic view has been taken when developing the practical next steps, with consideration given to the overarching strategy's other work packages and the role of Peninsula Transport in influencing, coordinating, or funding actions. Appendix C presents more detail on how the recommendations align with the intervention shortlist and potential indicative costs for each intervention, acknowledging that more certain costs will be established as part of the priority actions themselves.

5.2 Funding

The transport funding landscape is changing, with the longer-term impacts of the Covid-19 pandemic and the impacts of the United Kingdom's departure from the European Union still uncertain. This section therefore reflects recent and current funding opportunities from a variety of different avenues, but also presents how Peninsula Transport can support delivery through its strategic role.

The Role of Peninsula Transport

The greatest strength and opportunity provided by STBs, and Peninsula Transport specifically, is being able to speak with one voice on the priorities on behalf of the region. Whilst direct funding will not allow Peninsula Transport to deliver all of its objectives, the STB can provide a facilitation role between delivery partners, setting out the requirements for public and private sector in the short to longer term and articulate what is needed beyond the likely, market-led, initial investments.

Funding Considerations

Recognising the possible sources of funding and their characteristics, considerations for maximising opportunities to access funding to enable effective strategy delivery include:

- **Investigate the potential to move away from 'Business as Usual' when allocating existing funding pots**. Consider decarbonisation priorities when allocating revenue grants and/or renewals. For example, could traffic light renewals also be an opportunity to introduce bus or cycle priority measures and/or increase pedestrian crossing timings to support modal shift?

- **Think strategic**: collective action in scheme development avoids the risks associated with having multiple similar schemes and can help to address cross-boundary issues. Multiple schemes are difficult to manage and can entail repetitive costs incurred by each local authority.

- **Think long-term…** Accept that funding opportunities might be piecemeal, with limited or short-term delivery horizons. Realising Net Zero is the long-term destination, so local authorities need a plan which breaks this into manageable chunks and to develop the capacity and skills needed.

- **…but be ready to act quickly.** The competitive nature of grant funding often means short application timescales. Having prioritised projects ready to go and that can be scaled or consolidated into larger programmes, if necessary, means local authorities can take advantage of these bidding opportunities.

- **Recognise value for money.** Recognise the long-term goals for Net Zero and consider quantifying the cost implications of not acting or the benefits of acting sooner.

Peninsula Transport's strategic role as the regional voice on strategic transport issues will be important in funding considerations.

Potential Funding Sources

Local authorities receive funding from a range of central Government sources and from locally collected council tax. The degree of discretion available to local authorities on how these funds are used varies. Some of the allocation may be locally determined, whilst some must be used for prescribed or statutory purposes. Net Zero activities by local authorities may be funded via the following sources:

- **Core settlement funding:** The annual settlement to local authority from Government by the Ministry of Housing, Communities & Local Government. Whilst spending from this allocation is likely to be under considerable pressure, local authorities can use core settlement funding on Net Zero activities. Transport-related funding from this source may include:

  - Local Highways Maintenance Funding

  - Integrated Transport Block

- **Dedicated grant funding:** Funding allocated by government departments for specific purposes, frequently targeted to achieve particular policy objectives. Grant funding is typically competitive, which local authorities bid for. The extent to which different local authorities have benefitted from grant allocations has resulted in national and local imbalances with some authorities successfully bidding for and receiving significant funds, whilst other authorities have received nothing. The range of transport-related dedicated grant funds include:

  - Active Travel Fund

  - Rural Mobility Fund

  - All Electric Bus Town

  - Bikeability

  - On-street Resident Chargepoint Scheme

  - Local Electric Vehicle Infrastructure Fund (LEVI; 2022-2025 [£450m])

  - Rapid Charging Fund (2023- [£950m])

  - Hydrogen Transport Programme

- **Wider funding:** Other funding addressing broad productivity, economy, or social outcomes – including health – which may directly or consequently enable, support, or deliver net zero activities. A recent example of this has been the Transforming Cities Fund.

- **Hypothecated spending:** The assignment of tax revenues to a specific end. Potential charging examples include a Workplace Parking Levy, Clean Air Zones, Council Parking charges, Section 106 agreements/CIL. Revenues generated from such charging regimes could then subsequently be ring-fenced to deliver low or zero carbon infrastructure and incentives.

5.3 Next Step Priority Actions

The next steps have been developed with the intention of providing guidance on short-term actions that the STB can take on delivering the shortlisted interventions. This sub-section presents a series of actions for the peninsula to be progressed in the near-term under the five themes presented earlier, subject to funding. Figure 5-1 presents the recommended next step actions to support the carbon transition within the peninsula. Appendix C presents greater detail around the links between the actions and the interventions/themes outlined previously, and alignment to the DfT's Decarbonising Transport plan.

The three priority actions support packages of complementary interventions in the context of the role of Peninsula Transport – driving coordination and facilitating strategic transport improvements in the region. The priority actions have direct links to recent central Government policy or funding announcements, including the Electric Vehicle Infrastructure Strategy. A number of other supporting actions are also introduced, presenting ways in which Peninsula Transport can strategically support the development of decarbonisation opportunities, including as part of existing activities and/or committed future Work Packages.

Given the role of the Peninsula Transport STB as a strategic body, and not as a statutory organisation with decision-making and/or devolved spending powers, some decarbonisation priorities will involve further stakeholder engagement, coordination and creation of cohesive action plans across partners to draw upon existing and leverage emerging opportunities.

Figure 5-1: Carbon Transition Recommended Next Step Action Summary

Priority	Demand Reduction	Modal Shift	Demand Reduction, more choice, better efficiency	Passenger freight and vehicles	Supporting infrastructure
Highest (STB role to lead)		Public Transport Prioritisation		Zero Emission Bus Implementation	Electric Network of the Future
Medium (potential co-ordination or intervention pilot opportunities)		Multi-Modal Coordination Plan	Future Funding Focus		
	Promotional Activities linking to existing STB Communications Plan				
Lowest (integrated into other activities / business as usual)	Identification of Spatial Planning Opportunities	Identification of Strategic Active Travel Opportunities	Partnership and Engagement Activities	Rail Action Plan	
		Digital Connectivity Action Plan		Freight Decarbonisation Plan	

High Priority Actions

Priority Action 1: Electric Network of the Future

This action involves the delivery of a plan defining the creation of the electric network of the future, which would then be used to support delivery and work with partners. This action will directly support central Government's requirement for STBs to produce regional assessments to support energy system stakeholders and local authorities in planning charging infrastructure provision[36]. The work will support the development of electric vehicle charging infrastructure and will involve stakeholder engagement working alongside local authorities, energy network operators, private sector charging providers and National Highways to understand potential demand and identify a cohesive electric vehicle network for the peninsula. Continued central Government funding opportunities for future activities may arise from strategic alignment to the commitment to transition to zero emissions cars and vans by 2035[37], in addition to the Decarbonising Transport plan.

Priority Action 2: Zero Emission Bus Fleet Implementation

Peninsula Transport is commencing a strategic review of the 'Bus Service Improvement Plans' (BSIPs)[38] for its five local authorities in order to identify opportunities for sharing best practice and delivering enhanced benefits through collaboration. Individual authorities are also developing plans for decarbonising local bus fleets. Peninsula Transport has an opportunity to use its strategic position to understand the operational and funding situation across the region and develop an implementation plan to accelerate and support the delivery of the required infrastructure and fleet through working with local authorities and operators. The work will identify and overcome potential electrification challenges, including potential demand for charging facilities (complementing Priority Action 1). Central Government funding opportunities may arise from strategic alignment of activities to the 2021 'Bus Back Better' vision for buses, in addition to the Decarbonising Transport plan.

Priority Action 3: Public Transport Prioritisation

The five BSIPs for the peninsula outline investments to improve bus services across the region and have significant potential to support decarbonisation through encouraging modal shift. Peninsula also has an emerging Rail Strategy which has been produced through extensive collaboration with partners including Network Rail. Alongside supporting actions to increase the reliability and frequency of public transport services, Peninsula Transport can use its strategic position to lead on the delivery of region-wide opportunities such as ticket interoperability across the region. Using planned strategic review activities to develop a short implementation plan now – identifying the key areas of focus/investment - will give the STB clear goals for public transport to support decarbonisation efforts. The existing Strategic Implementation Plan work package could be used to support this, e.g. through the application of its appraisal framework to 'score' the decarbonisation benefits of a range of public transport options.

Other Actions

Nine additional actions of support to the future delivery of decarbonisation interventions have been identified (Figure 5-1; Appendix C). These actions are intended to stimulate future activities and do not necessarily have to be comprehensive work packages. The early stages of actions can be progressed in next six to twelve months, with many involving initial discussions around clearly defining Peninsula Transport's desired role, including through the agendas planned for future Board meetings. Subsequently, STB activities in progressing the

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[36] DfT (2022) Taking charge: the electric vehicle infrastructure strategy, Annex 1
[37] HM Government (2021) Transitioning to zero emission cars and vans: 2035 delivery plan
[38] Department for Transport (2021) National Bus Strategy: Bus Service Improvement Plans Guidance to local authorities and bus operators

actions may consist of promoting trials, co-ordinating stakeholder engagement and/or integrating actions alongside those identified in other work packages or into the final strategy.

Appendix A Evidence Review Technical Annex
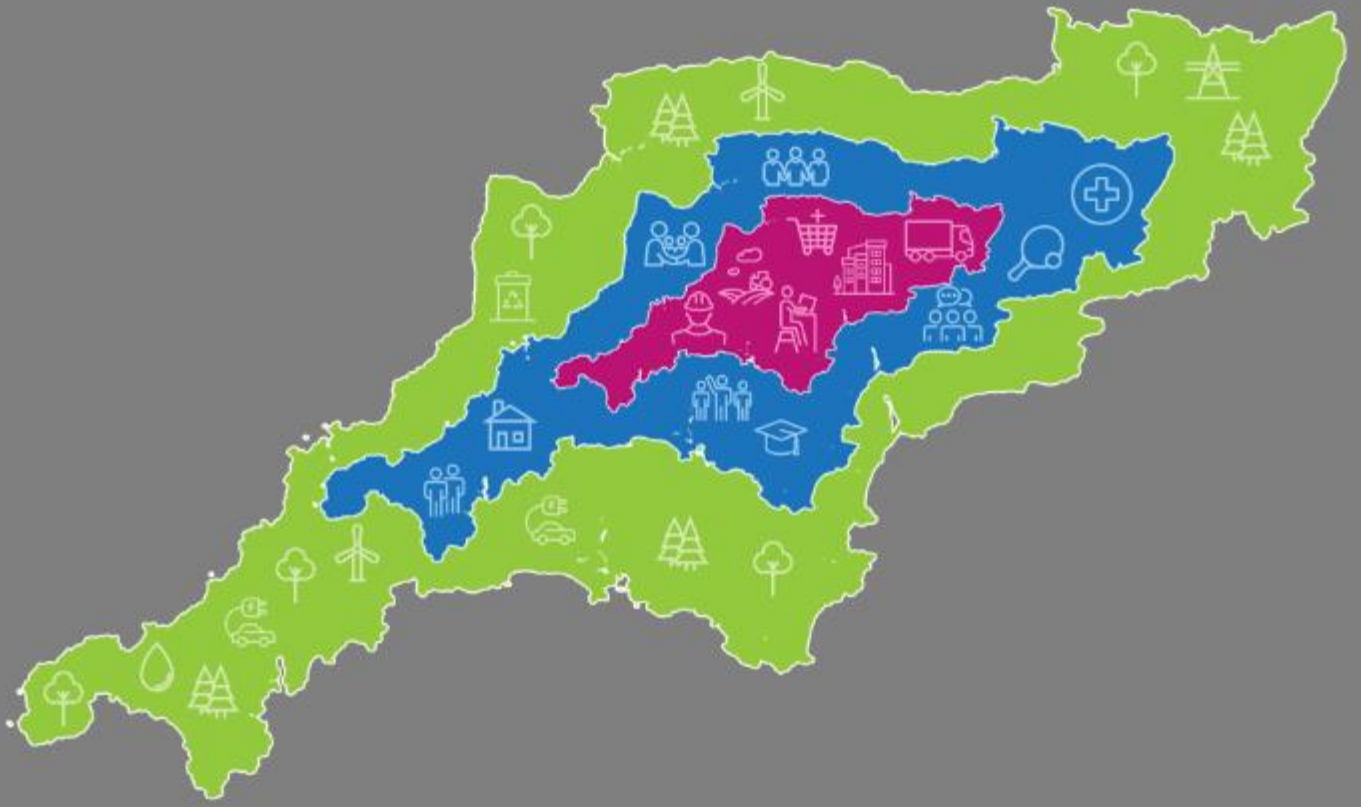
Peninsula Transport Shadow Sub-National Transport Body

WP06 Carbon Transition Strategy: Technical Annex

Quality information

Prepared by	Checked by	Verified by	Approved by
Ben MacLeod Alex Bertram	Richard Adams	Peter Wright	Nick Woollett

Prepared for:

Peninsula Transport Shadow Sub-National Transport Body

Prepared by:

Lead Consultant
Richard Adams
Associate Director

AECOM Limited
Winslade Park
Manor Drive
Exeter
EX5 1FY

T: +44 1392 663200
aecom.com

Supporting Consultant
Adrian Regueira-Lopez
Principal Consultant

WSP
Kings Orchard
1 Queen Street
Bristol
BS2 0HQ

T: +44 117930 6200
wsp.com

Table of Contents

Glossary of terms

Abbreviation	Description
Adaptation	The process of adjusting to the current and future effects of climate change (e.g. building flood defences to protect against sea-level rise).
BEV	Battery Electric Vehicle
Carbon Neutral	Defined by an internationally-recognised standard – PAS 2060. Under this definition, a carbon neutral footprint is a 'condition in which during a specified period there has been no net increase in the global emission of greenhouse gases to the atmosphere as a result of the greenhouse gas emissions associated with the subject during the same period'.
CAV	Connected and autonomous vehicles
CNG	Compressed Natural Gas
E-bikes / e-scooters	Electric bikes / scooters
EV	Electric Vehicle (generic)
FCEV	Fuel Cell Electric Vehicle
GHG	Green House Gas
ICE	Internal Combustion Engine
KtCO2e	Kilotonnes of carbon dioxide equivalent. Relates to the combined emissions of carbon dioxide, methane, nitrous oxide, and the four F-gases (hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride)
LPG	Liquefied Petroleum Gas
LNG	Liquid Natural Gas
LA	Local Authority
MaaS	Mobility as a Service
Mitigation	Mitigation means making the impacts of climate change less severe by reducing the sources of greenhouse gases emissions and/or enhancing the sinks (e.g. increasing the size of forests).
Net Zero	Where total greenhouse gas emissions are equal to or less than the emissions removed from the environment. Net zero can be achieved by a combination of reducing emissions and removal by offsetting and/or carbon trading. Emissions can also be removed or absorbed by natural processes such as tree planting or by using technologies like carbon capture and storage
PHEV	Plug-in Hybrid Electric Vehicle
TDM	Travel Demand Management
ULEZ	Ultra-Low Emission Zone
ZEV	Zero Emission Vehicle

1. Introduction

1.1 Overview

This document provides a contextual review to support the development of Peninsula Transport's Carbon Transition Strategy for the south-west peninsula of England. Peninsula Transport is the shadow sub-national transport body (STB) for the South West Peninsula. We represent five local authorities and two Local Enterprise Partnership areas and work closely with co-opted members and key stakeholders from the private and public sector (Figure 1-1). Along with our neighbouring STB, Western Gateway, we are responsible for defining and delivering the strategic transport priorities for most of South West England (Figure 1-2).

Figure 1-1: Peninsula STB local authorities and key stakeholders

Figure 1-2: Peninsula and Western Gateway STB

1.2 Peninsula Transport Strategy

The vision for Peninsula Transport was published for consultation in Autumn 2021 and adopted in Spring 2022. Building on the unique aspects of the peninsula identified in previous analysis – including the Regional Evidence Base (REB)[1] and Economic Connectivity Study (ECS)[2], the following vision was agreed:

"Transforming transport across the Peninsula to enable our society and economy to thrive and our unique and outstanding environment to flourish."

The full Peninsula Transport Strategy is now being developed to deliver that vision. It will address the challenges, opportunities and priorities for the Peninsula STB over the next 30 years – to 2050. Whilst analysis and reporting will focus on the five authorities within the region, cross-border and national consideration will also be included where relevant. The Strategy will particularly seek best possible alignment and synergies with the Western Gateway STB where practicable and appropriate.

Delivering the vision will take a concerted effort from stakeholders within and beyond the region, including Government, businesses and the people who live, work and visit here. Reducing the environmental impact of transport is fundamental to achieving this vision, hence there will be plans to reduce the carbon footprint and emissions across the Peninsula.
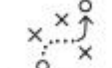
Work Package 6 (WP06), the 'Carbon Transition Strategy' represents the focus of this paper and is one of seven specifically assigned work packages contributing to WP15 – The Full Transport Strategy (as shown within Figure 1-3). This document constitutes the finalised technical report for WP06, incorporating detailed analysis, assumptions, and the appropriate evidence base gathered.

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[1] Peninsula Transport (2019) Regional Evidence Base
[2] Peninsula Transport (2020) Economic Connectivity Study

Figure 1-3: Peninsula Transport Strategy work packages

The *Vision* for the Peninsula Transport Strategy is supported by five goals which cut across the sustainability pillars (Figure 1-4)[3]. Although this paper primarily focuses upon the zero-carbon emission and network resilience goals, emphasis has also been placed upon the achievement of potential 'co-benefits' associated with carbon transition; *"the positive effects that a policy or measure aimed at one objective might have on other objectives"[4]*. From a transport perspective, co-benefits of appropriate carbon reduction interventions can include improved air quality and health outcomes, reduced congestion and opportunities for new jobs through innovation[5].

Figure 1-4: Peninsula Transport Strategy Goals[6]

We will improve connections between people, businesses, and places

We will enhance the resilience of the transport network

We will deliver affordable, zero-emissions transport for everyone

We will help to improve the health and wellbeing of communities in the Peninsula

We will help the Peninsula to be a great place to live and work

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[3] Peninsula Transport (2021) Vision for Public Consultation
[4] Intergovernmental Panel on Climate Change (2014) Fifth Assessment Report, Annex I Glossary
[5] DfT (2021) Decarbonising Transport: A Better, Greener Britain
[6] Peninsula Transport (2021) Vision for Public Consultation

1.3 Decarbonising Transport

As acknowledged by numerous policy documents (see Section Policy Context2.2) and the UK's recent presidency of the UN climate summit, tackling climate change is a key Government priority. In 2019, the UK government announced a target of net zero for UK greenhouse gas (GHG) emissions by 2050. The legislation for this target subsequently amended the goal of the Climate Change Act 2008, which had previously set a target of an 80% reduction in GHG emissions compared with the 1990 levels.

> **What do 'Net Zero' and 'Carbon Neutral' mean?** [7][8]
>
> 'Net zero' means that total greenhouse gas emissions are equal to or less than the emissions removed from the environment. Net zero can be achieved by a combination of reducing emissions and removal by offsetting and/or carbon trading. Emissions can also be removed or absorbed by natural processes such as tree planting or by using technologies like carbon capture and storage.
>
> 'Carbon neutrality' is defined by an internationally-recognised standard – PAS 2060. Under this definition, a carbon neutral footprint is a 'condition in which during a specified period there has been no net increase in the global emission of greenhouse gases to the atmosphere as a result of the greenhouse gas emissions associated with the subject during the same period'.

The UK as a whole has witnessed progressive reductions in GHG emissions since 1990, although changes vary greatly by sector. Much of the change has been driven by the power sector, with energy generation switching from coal towards gas and renewable energy. Achieving net zero requires that emissions continue to reduce not only through energy generation but across all parts of society.

The transport sector[9] is the largest GHG-emitting sector in the UK, accounting for approximately 27% of UK emissions in 2019 (almost entirely through carbon dioxide emissions; Figure 1-5). Between 1990 and 2019, there has been relatively little overall change in the level of greenhouse gas emissions from the transport sector, with 2019 emissions believed to be around 5% lower in 2019 than 1990. Road transport is the most significant source of emissions in this sector, in particular passenger cars and taxis (55.4%[10]). Although fuel efficiency in passenger cars has generally improved over the period, vehicular traffic increases have largely offset any efficiency improvements[11]. Urgently tackling emissions from surface transport is therefore critical if UK-wide emissions reductions are to be sustained or accelerated.

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[7] House of Commons Library (2019) Net zero in the UK
[8] Carbon Trust (2022) Briefing: Net Zero for Corporates
[9] consisting of emissions from road transport, railways, domestic aviation, shipping, fishing and aircraft support vehicles
[10] DfT, Transport Decarbonisation Plan (2021), 2019 UK Domestic Transport Emissions
[11] Department for Business, Energy and Industrial Strategy (2021) 2019 UK Greenhouse Gas Emissions, Final Figures

Figure 1-5: UK Territorial Greenhouse Gas Emissions, 2019, by Sector[12]

Others include Public, Industrial Processes and the Land Use, Land Use Change and Forestry (LULUCF) sectors. The percentages may not sum to 100% due to rounding.

Impact of COVID-19 on Decarbonisation

The global impacts of the COVID-19 pandemic resulted in large changes in travel patterns and behaviours in 2020 and 2021 compared to previous years. At a national level, territorial carbon dioxide emissions from the transport sector were nearly 20% lower than in 2020 than 2019[13]. However, the sizeable reductions in travel demand seen during the lockdown were reversed in many places, including across the peninsula region, as restrictions lifted, providing an indication of demand changes associated with restrictions on movement. The extent to which travel behaviour impacts arising from COVID-19 restrictions will remain in the medium to long-term is uncertain, with any behaviour changes both reflecting and altering the relationship between peninsula's socio-economic characteristics and transport demand (see Sections 2.3 and 2.4).

The 'new normal'? Post-pandemic behaviour change

The potential to 'lock-in' pandemic-related behaviour change is not universal amongst the population and may have complex consequences resulting from those who do. For example, the increases in remote working during the pandemic attracted much media attention and demonstrated the potential for significant travel reductions for some businesses. However, it is important to note that many sectors cannot operate remotely, with only 47% of people in employment conducting at least some of their work from home during the period of greatest restrictions[14]. For those with the ability to work remotely, there is also the potential for longer distance commutes facilitated by more attractive housing options or greater leisure travel.

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[12] Department for Business, Energy and Industrial Strategy (2021) 2019 UK Greenhouse Gas Emissions
[13] Department for Business, Strategy and Industrial Strategy (2021) 2020 UK greenhouse gas emissions, provisional figures
[14] DfT (2020) Union Connectivity Review Analytical Report

Decarbonisation remains a priority for each of the authorities represented in the Peninsula (see Section 2.2). The lockdown evidence has further revealed the scale of the challenge for the transport sector, with transport still a substantial emitter of carbon dioxide despite the limitations on movement that were in place. The Peninsula Transport Strategy will therefore need to be adaptable to the challenges and opportunities that COVID-19, and other unforeseen events, may generate.

1.4 About this report

This technical report provides an indication of the state of transport decarbonisation throughout the Peninsula, as well as the need for future change and intervention. Surface transport forms the primary focus of the report as the dominant component of transport emissions, although air and water-based interventions are considered as part of a holistic approach to decarbonisation. The report covers the following key areas:

- **Section 2- Contextual evidence:** Background including policy, socio-demographic data and trends.

- **Section 3- Exploring decarbonisation for the Peninsula**: Setting regionally relevant themes for achieving decarbonisation. Outlines how carbon transition interventions have been developed and short-listed.

2. Contextual Evidence

2.1 Overview

This section provides information and analysis to help frame the policy, socio-economic and transport context for mobility and emissions in the Peninsula region. The contextual evidence demonstrates that whilst the unique characteristics of the Peninsula create challenges, the decarbonisation of the transport system has the potential to leverage many opportunities and support policy aspirations across the region.

Figure 2-1 outlines the five key challenges and opportunities for the Peninsula, which formed the central focus of Peninsula Transport's Economic Connectivity Study (2020). Whilst Decarbonisation represents the central strand of this report, it is important to recognise the interconnected nature of the five themes, with potential measures and solutions likely to involve several at once. This interconnected nature of solutions to decarbonisation is a running theme, reflected throughout the policy context examined below, across a range of scales of governance.

Figure 2-1: Economic Connectivity Study Key Challenges and Opportunities[15]

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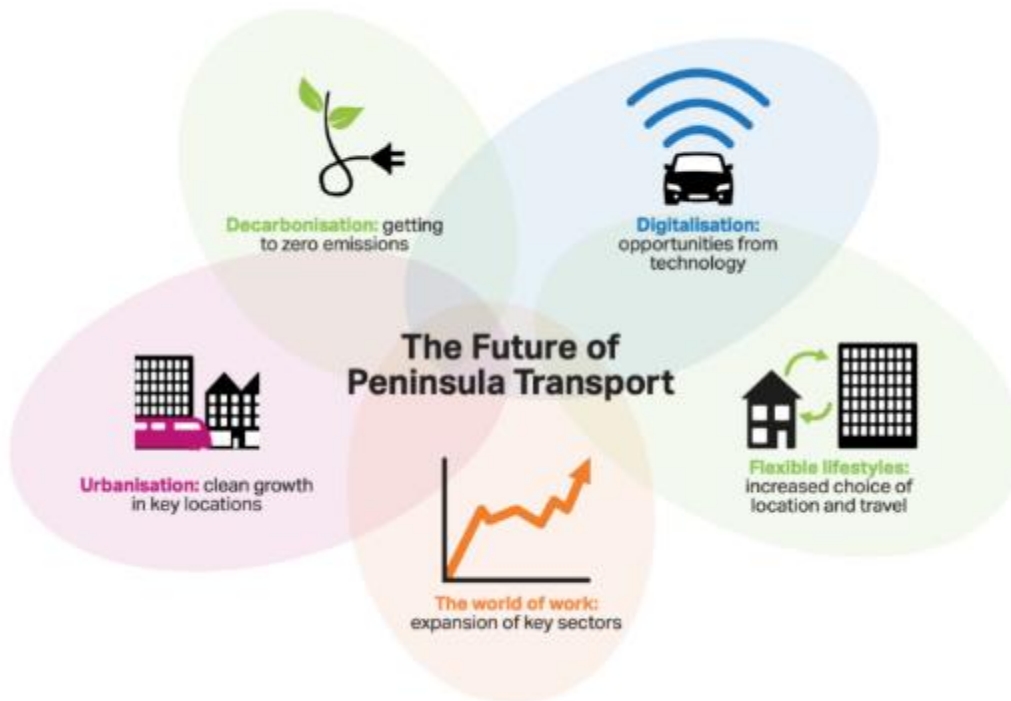
[15] Peninsula Transport (2020) Economic Connectivity Study

2.2 Policy Context

Summary

- Climate change is recognised as one of the most urgent and fundamental challenges facing the planet – with national, regional and local commitments (including net zero and carbon neutral targets for all Peninsula Transport authorities).

- The quantified pathway for transport in the 2021 'Net Zero Strategy: Build Back Greener' sets out that residual emissions in 2035 would need to fall by 65-76% relative to 2019 levels, representing a substantial challenge. Crucially, the report further emphasises the scale of the challenge when it acknowledges that *"we cannot simply rely on the electrification of road transport, or believe that zero emission cars and lorries will solve all our problems"*.

- Policy aspirations determine that it is critical for Peninsula Transport to adopt an innovative approach to solving current emissions issues, keeping up to date with the latest technological and best-practice measures. It is important that national policy recommendations are applied with awareness of the specific contextual needs of the region, in particular its significant rural to urban split – links to WP10: Rural Mobility as a "box"?

- Whilst all four steps are critical to ensuring national, cross-sector decarbonisation, steps 1 and 3 represent important considerations for developing the national transport network. With the eventual phasing out of high-carbon transport options planned for the network, measures to encourage their replacement with low- and zero-carbon transport solutions need to be supported. At the national level, it is crucial that such steps are included within policy and legislation to force meaningful behavioural change. Reducing demand for carbon-intensive travel behaviours and processes represents a longer-term challenge, but one that should be central to any Peninsula Transport Carbon Transition strategy.

- With the eventual phasing out of high-carbon transport options planned for the network, measures to encourage their replacement with low- and zero-carbon transport solutions need to be supported. At the national level, it is crucial that such steps are included within policy and legislation to force meaningful behavioural change. Reducing demand for carbon-intensive travel behaviours and processes represents a longer-term challenge, but one that should be central to any Peninsula Transport Carbon Transition strategy.

- Add Figure 9 (with EV Infrastructure Strategy doct) – making brief summary of key issues, including importance of "digital" as an enabler

- LEPs have made clear the importance of principles of inclusive and clean growth informing all aspects of the measures recommended, in order to promote improved connectivity and quality of life across the region.

- Table 2-2 sets out LA commitments – refer to role of STB to support them in meeting these targets; highlighting opportunities to coordinate/increase synergies, which will be value for money and efficiencies for LAs and DfT

This section highlights key policy relevant to carbon and transport for the UK and the Peninsula, helping to identify local and strategic issues and drawing in the latest guidance. A more detailed summary of the national, regional, and local policies and strategies is provided in Appendix A.

National Commitments

As introduced in Section 0, tackling climate change represents a key national priority across all sectors, not merely transport. The UK Government has pledged to deliver 'net zero emissions by 2050', with strong legislative and policy support. The 2019 amendment to the Climate Change Act (2008) represents the UK's Nationally Defined Contribution (NDC) to the 2015 Paris Agreement, and provides indication of the national commitment towards achieving 'net-zero' across all sectors of UK industry and the economy.

A more recent addition to national carbon policy, the 'Net Zero Strategy: Build Back Greener'[16] published in 2021, expands on the UK Government's commitment to achieving 'net-zero'. The policy combines aspirations from several sectors into a cohesive strategy for collectively achieving national emissions targets. Using a range of 'scenarios', different pathways to meeting the 2050 net-zero target are set out, reflecting differing options for decarbonisation, and recognising the uncertainties involved with each. Each of these pathways represents the national drive towards 'phased ambition', with long-term ambitions to be achieved through the achievement of smaller, short term targets. The quantified pathway for transport in 2035 sets out that residual emissions would need to fall by 65-76% relative to 2019 levels, representing a substantial challenge. Crucially, the report further emphasises the scale of the challenge when it acknowledges that *"we cannot simply rely on the electrification of road transport, or believe that zero emission cars and lorries will solve all our problems"*.

In support of the Government's long-term, net-zero ambition, the Committee for Climate Change's (CCC) 6th Carbon Budget[17] (published in 2020) sets out the recommendation for the UK Government to target a reduction in national greenhouse gas emissions of 78% by 2035 relative to 1990 – a 63% reduction on 2019 levels. If adopted, this recommended budget would achieve well over half of the required emissions reductions to 2050 over the next 15 years, in line with the Net Zero Strategy. Such early action would help to support the required increase in global ambition, ensuring the national commitment to decarbonisation is clear and world leading. Four key steps are laid out within the budget plan to ensure key targets are met. These indicate a phased ambition for carbon reduction at the national level, first providing new opportunities and alternatives to existing carbon-intensive modes, before targeting behavioural change and demand reduction in the longer term (Figure 2-2).

Figure 2-2: Phased approach for carbon reduction at the national level

1. Take up of low-carbon solutions;
2. Expansion of low-carbon energy supplies;
3. Reducing demand for carbon-intensive activities; and
4. Land and greenhouse gas removals.

Whilst all four steps are critical to ensuring national, cross-sector decarbonisation, steps 1 and 3 represent important considerations for developing the national transport network. With the eventual phasing out of high-carbon transport options planned for the network, measures to encourage their replacement with low- and zero-carbon transport solutions need to be supported. At the national level, it is crucial that such steps are included within policy and legislation to force meaningful behavioural change. Reducing demand for carbon-intensive travel behaviours and processes represents a longer-term challenge, but one that should be central to any Peninsula Transport Carbon Transition strategy.

The Government has recognised the significant role that transport should play in achieving meaningful carbon reductions. Published in 2021, the Department for Transport's

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[16] HM Government (2021) Net Zero Strategy: Build Back Greener
[17] Climate Change Committee (2020) The Sixth Carbon Budget: The UK's path to Net Zero

'Decarbonising Transport' strategy[18], sets out the proposed pathway towards 2050 net-zero for the UK's transport network. To help guide and streamline decarbonisation measures at the national scale, the strategy identified six strategic priorities for change (Figure 2-3). These priorities will help to shape more specific, local and regional transport carbon policy, serving to highlight the primary means by which decarbonisation can and should be achieved, and recognising opportunities to promote co-benefits.

Figure 2-3: Decarbonising Transport Strategic Priorities[19]

Accelerating modal shift to public and active transport
- Help make public transport and active travel the natural first choice for daily activities
- Support fewer car trips through a coherent, convenient and cost-effective public network; and explore how we might use cars differently in future
- Encourage cycling and walking for short journeys
- Explore how to best support the behaviour change required

Decarbonisation of road vehicles
- Support the transition to zero emission road vehicles through:
  - regulatory framework
  - strong consumer base
  - market conditions
  - vehicle supply
  - refuelling and recharging infrastructure
  - energy system readiness
- Maximise benefits through investment in innovative technology development, and development of sustainable supply chains

Decarbonising how we get our goods
- Consider future demand and changing consumer behaviour for goods
- Transform 'last-mile' deliveries – developing an integrated, clean and sustainable delivery system
- Optimise logistics efficiency and explore innovative digitally-enabled solutions, data sharing and collaborative platforms

Place-based solutions
- Consider where, how and why emissions occur in specific locations
- Acknowledge a single solution will not be appropriate for every location
- Address emissions at a local level through local management of transport solutions
- Target support for local areas, considering regional diversity and different solutions

UK as a hub for green transport technology and innovation
- Utilise the UK's world-leading scientists, business leaders and innovators to position the UK as an internationally recognised leader of environmentally sustainable technology and innovation in transport
- Build on expertise in the UK for technology developments and capitalise on near market quick wins

Reducing carbon in a global economy
- Lead international efforts in transport emissions reduction
- Recognise aviation and maritime are international by nature and require international solutions
- Harness the UK as a global centre of expertise, driving low carbon innovation and global leadership, boosting the UK economy

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[18] Department for Transport (2021) Decarbonising Transport: A Better, Greener Britain
[19] Department for Transport (2020) Decarbonising Transport: Setting the Challenge

<div style="border: 2px solid blue;">

Catapult Innovating to Net Zero Strategy, 2020[20]

The national commitment to decarbonisation innovation has been further supported by the 'Catapult Innovating to Net Zero' strategy, published in 2020. This report identifies the technologies, products and services which are most critical to meeting Net Zero across the UK, with a particular focus on required infrastructure and innovation. As part of a fundamental transformation of the transport network that will be required by 2050, the report states the necessity for road transport to virtually eliminate fossil fuel consumption. In its place, national level funding should focus on the place of electrification, with developments in both hydrogen fuel cells for heavier vehicles, and smart charging opportunities essential to allow an efficient and smooth transition to a fully electrified network.

</div>

Policy aspirations determine that it is critical for Peninsula Transport to adopt an innovative approach to solving current emissions issues, keeping up to date with the latest technological and best-practice measures. It is important that national policy recommendations are applied with awareness of the specific contextual needs of the region, in particular its significant rural to urban split (Section 2.3).

The DfT's 'Future of Mobility: Urban Strategy'[21] report outlines the desired benefits sought from mobility innovation, alongside the principles required to help achieve these within an urban context. The 2019 report sets out four new areas of focus for regulatory review, each representing a relative new transport solution being applied in limited areas or through trials across the country: Micromobility vehicles; Mobility as a Service; Transport data; and, Modernising bus, taxis and private hire vehicles legislation. Whilst not necessarily applicable to all areas of the Peninsula, it is critical that this strategy accounts for these more innovative transport measures, acknowledging the opportunities that could be presented by each for achieving meaningful decarbonisation – e.g. new technologies and trends within the micromobility sector, with improved batteries and motors facilitating the introduction of new designs and blurring traditional vehicle definitions.

The forthcoming 'Future of Mobility: Rural Strategy'[22] should help provide additional insight, guidance and innovation to meet the needs of those living, working, or visiting the areas beyond the urban settlements in the peninsula. The accompanying Peninsula Transport *WP10: Rural Mobility* report provides an in-depth review of the needs and interventions, as well as potential pilots, for application in the south west region (including both the Peninsula Transport and Western Gateway STB areas). The supporting interventions include:

- Behaviour change

- Electrification of publicly-accessible modes

- Freight on passenger transport

- Railway line and station reopening

- Electricity generation and distribution

- Digital communications enhancements

Across all sectors, current government strategy is focused on the core principles of 'levelling-up'[23] – a social, economic, and moral programme of development ambitions intended to guide governmental action in order to spread improved equality of opportunity across the

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[20] Catapult (2020) Innovating to Net Zero: UK Report
[21] Department for Transport (2019) Future of Mobility: Urban Strategy
[22] The Department for Transport is now developing a future of rural mobility strategy turning the focus to our countryside and coasts following its call for evidence in 2020
[23] HM Government (2022) Levelling Up the United Kingdom

nation. A focus on improving the value of individual capital across the nation (Physical, human, intangible, financial, social and institutional) includes significant funding allocations for improved transport systems in more rural and deprived areas, seeking to improve connectivity for everyone closer to London standards. In addition, the Levelling Up White paper also seeks to improve digital connectivity by 2030, in the form of *"nationwide gigabit-capable broadband and 4G coverage, with 5G coverage for the majority of the population"*. Consideration of additional co-benefits and digital connectivity will therefore be crucial in ensuring that the maximum benefits can be obtained from this decarbonisation strategy.

The need to achieve net zero has also been emphasised in the plans and activities of 'arm's length' Government bodies such as National Highways and Network Rail. Published in July 2021, National Highway's 'net zero highways' plan[24] outlines *"an ambitious programme putting roads at the heart of Britain's net zero future"* up to 2050 and presents a significant number of commitments to cut emissions during this period to meet corporate, maintenance and construction, and road user net zero targets. In addition, Network Rail's Environmental Sustainability Strategy[25] and Traction Decarbonisation Network Strategy[26] outline how rail operations and infrastructure can support the lower carbon movement of people and goods, whilst providing co-benefits such as reduced journey times. Peninsula Transport will therefore need to work alongside these significant organisations as they continue to develop and implement low-carbon commitments, to ensure that local interests and needs are reflected in future strategic networks.

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[24] National Highways (2021) Net Zero Highways: Our 2030/2040/2050 Plan
[25] Network Rail (2020) Environmental Sustainability Strategy. 2020-2050
[26] Network Rail (2020) Traction Decarbonisation Network Strategy. Interim Programme Business Case

Figure 2-4: Recent National Policy Context Summary (see Appendix A for more details)

Future of Mobility: Urban Strategy (2019)

Committee for Climate Change's 6th Carbon Budget (2020)

Net Zero Strategy: Build Back Greener (2021)

Levelling Up White Paper (2022)

Climate Change Act 2008 (2050 Target Amendment) Order (2019)

DfT Decarbonising Transport (2021)

DfT Electric Vehicle Infrastructure Strategy (2022)
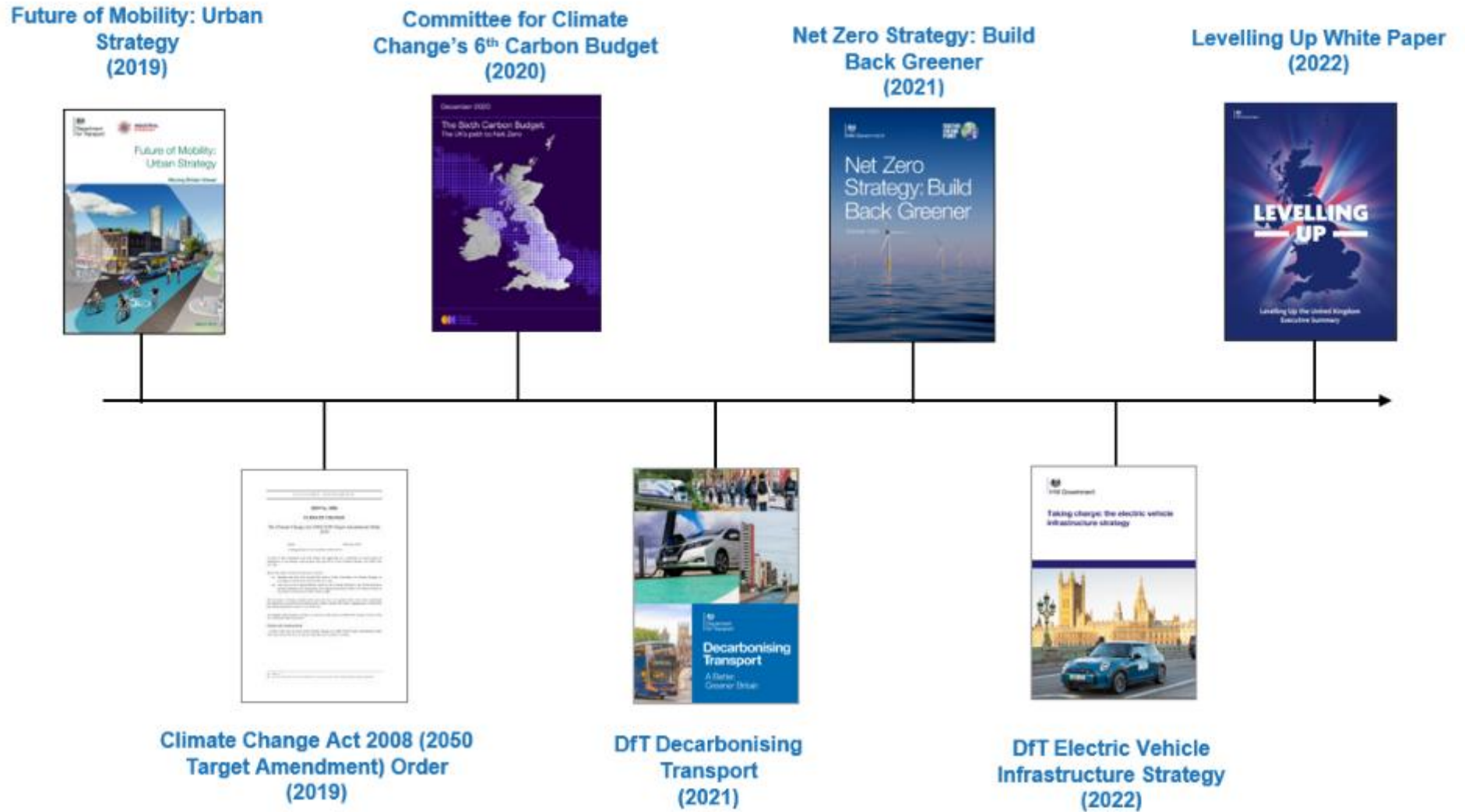
Regional Commitments

Whilst the range of policy targeted at the regional scale is more limited than either national or local, an awareness of the vision and ambitions of Local Enterprise Partnerships (LEPs) within the Peninsula is useful in understanding how national policy and local strategies are bridged. Across England, LEPs represent regional partnership groups set up between local authorities and businesses, to determine local economic priorities and guide economic growth within a regional area. Whilst there are 38 such LEPs in total across England, the Peninsula STB region is home to two neighbouring LEPs, each developing strategies for improved productivity and growth across the area:

Cornwall and Isles of Scilly (CIOS) LEP	Works to drive economic growth and job creation, to realise key environmental, quality of life, and community benefits for local people and businesses.	
The Heart of the South West (HotSW) LEP	Covering Devon, Plymouth, Somerset, and Torbay, the HotSW LEP represents a business led partnership aiming to influence economic growth, job creation and prosperity across the four authority areas.	

Both LEPs in the peninsula set out a range of economic ambitions for delivering regional development and growth, with a particular focus between the two on ensuring any such growth is both clean and inclusive. For the HotSW LEP, a Build Back Better Plan[27] has been developed, to guide recommendations for economic recovery in a post-covid peninsula. The ambition for clean and inclusive growth is outlined through a focus on energy, high-value engineering, and digital connectivity as the dynamic heart of the local economy. It identifies a range of opportunities for growth across multiple sectors. Economic aims of particular relevance to decarbonisation in the Peninsula STB region include:

Energy Futures:

Capitalising on the area's nuclear and renewables potential and becoming the UK's first regional net-exporter of low carbon energy.

Engineering Futures:

Building a high-tech marine cluster focussed on autonomous and digital systems, clean propulsion and cyber-secure smart ports.
Delivering a Future of Flight Programme for sustainable aviation and technologies and fuels.

Digital Futures:

Tackling economic and societal challenges through analytics and digital innovation.

Places & Infrastructure:

Supporting left behind places in our cities, rural areas, coastal communities and market towns, also ensuring strategic connectivity.

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[27] Heart of the South West LEP (2021) Build Back Better: Transformational Opportunities in the Heart of the South West

The importance of ensuring equality of opportunity, and developing regional connectivity, should be a critical component of any Carbon Transition Strategy. This acknowledgement of co-benefits also forms a key part of CIOS LEP's '2030 Vision' document[28] – outlining the economic and social developmental targets of the region up to 2030. Here too, clean and inclusive growth forms a central focus of the vision, with a number of key opportunities relevant to decarbonisation highlighted:

Inclusive Growth:

Linking education providers, business and areas of deprivation.
Local transport to support rural/coastal areas.

Vibrant Communities:

Investment in natural capital and environmental growth.
Developing the economic vibrancy of town centres.

Global Presence:

Further investment in national and global connectivity: digital, road, rail and air

It is important that any Carbon Transition Strategy recognises how national and regional policy and ambitions inform and guide local strategy. With the Peninsula Transport region stretching over five local authorities, incorporating the two LEPs, an awareness of these regional economic LEP ambitions is critical if decarbonisation measures recommended throughout the region are to achieve desired co-benefits, outside of the transport sector. Principles of inclusive and clean growth should inform all aspects of the measures recommended, in order to promote improved connectivity and quality of life across the region.

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[28] Cornwall and Isles of Scilly LEP (2017) Vision 2030: Strategic Economic Plan 2017-2030

Local Commitments

All five local authorities making up the Peninsula Transport region have declared climate emergencies, representing a common commitment to lowering carbon emissions, with ambitious goals for transport decarbonisation. Table 2-1 outlines the high-level decarbonisation target timescales for each Peninsula Local Authority. Whilst four have pledged to target carbon neutrality by 2030, the current Devon Carbon Plan has outlined an ambition to become Net-Zero by 2050 (with an interim target of 50% reduction on 2010 carbon emissions by 2030).

Table 2-1: Overview of Peninsula Local Authority Climate Emergency Targets

Council	Key Document	Target	Climate Emergency Declared?
Cornwall	*Cornwall Climate Change Plan (2019)*	Carbon Neutral by 2030	Yes
Devon	*Interim Devon Carbon Plan*	Net-zero by 2050 (at the latest) Interim target of 50% reduction by 2030 below 2010 levels	Yes
Somerset	*Somerset Climate Emergency Strategy: 'Towards a Climate Resilient Somerset' (2020):*	Carbon Neutral by 2030	Yes
Plymouth	*Plymouth climate emergency action plan (2019):*	Carbon Neutral by 2030	Yes
Torbay	*Torbay Local Transport Action Plan 2021-2026: Moving towards net-zero*	Carbon Neutral by 2030	Yes

These commitments to rapid decarbonisation across the Peninsula should allow any Carbon Transition Strategy to be much more ambitious in its objectives and recommendations. It is important to acknowledge the need for a balanced approach however, with the success of meeting target emissions reductions by 2030 needing to be accompanied by sustainable economic growth in local areas, as well as improved quality of life and a protected local environment. As such, local authorities have outlined how these targets should be achieved through the adoption of a range of decarbonisation measures. For example, within the Interim Devon Carbon Plan, eight objectives have been developed alongside overall emissions targets, in order to focus ambitions into more tangible outcomes. These include:

The phasing out of fossil fuels as an energy source;

Minimising energy consumption;

Resilient local economies with access to green finance;

A circular use of resources.

The focus on building resilience towards climate change, and ensuring that future adaptation is possible, represent key parts of these local authority strategies. The concept of adopting a 'phased approach' to decarbonisation is once again supported at the local level, structuring how and when measures should be implemented. For example, the Plymouth Climate

Emergency Action Plan (2019) outlines a 3-phase timeline to guide meeting 2030 carbon neutrality targets:

1 **Emergency Response Phase (2019-21):**
Assessing where action and policy change is needed most, and setting out the vision for achieving decarbonisation;

2 **Transitional Phase (2021-23):**
Ramping up delivery of decarbonisation projects, identifying and prioritising key actions;

3 **Acceleration Phase (2023-30):**
Implementation of all identified measures and projects, with zero carbon working and living practices embedded across the city.

Within this phased timeline, the Plan highlights the importance of recognising the contribution of transport-specific objectives and schemes outlined by local authorities in relation to the wider decarbonisation agenda. Table 2-2 outlines some of the key transport-related objectives and commitments made by local authorities across the Peninsula Transport region to encourage carbon reductions and help to meet overall decarbonisation ambitions. Common themes that emerge across these areas include a desire to promote modal shift and behavioural change, aiming to reduce the number of journeys taken or shift existing road trips to sustainable modes. In turn, a focus on providing requisite infrastructure is clear, whether committing funding to the development and procurement of EV technologies, or the installation of the necessary charging networks to support their use.

Table 2-2: Key Local Authority Transport Objectives, relating to decarbonisation

Council	Key Document	Transport-Specific Objectives / Measures
Cornwall	*Cornwall Climate Change Plan (2019)*	• A range of measures to reduce council-operating emissions, e.g.: £16m investment programme into deployment of renewables across the council's estate. • Switching to a zero-emission bus fleet by 2030. • Development of EV charging for CORMAC's van fleet and local electric buses. Also bio-methane refuelling hubs for CORMAC heavy vehicles and buses, at 3 strategically located 'super depots' across Cornwall.
Devon	*Interim Devon Carbon Plan*	• Encouraging a 5% modal shift to sustainable transport by 2030, and a 10% shift by 2050. • Switching to a zero-emission bus fleet by 2050, with promotion of rail electrification or hydrogen power. • Development of the EV charging network, with 3,900 fast and 350,000 slow chargers installed by 2050.
Somerset	*Somerset Climate Emergency Strategy: 'Towards a Climate Resilient Somerset' (2020):*	• Targeting behavioural change in transport modes used, encouraging car-sharing and increased sustainable travel mode use. • Encouraging uptake in EV ownership.

Council	Key Document	Transport-Specific Objectives / Measures
Plymouth	*Plymouth climate emergency action plan (2019):*	• Installation of new electric vehicle charging points in places of work and public car parks across the city. • Funding commitments to improving rail and bus station accessibility and quality of information provision. • Delivery of a host of cycling network improvements to expand and develop the existing network across the city and beyond.
Torbay	*Torbay Local Transport Action Plan 2021-2026: Moving towards net-zero*	• Investigation into the introduction of an e-bike hire scheme across Torbay. • Continued development of public transport across the region, e.g. the construction of a new rail station at Edginswell.

More specific transport strategy and policy documents outline how each local authority intends to develop and improve their existing transport network, in order to ultimately meet overarching carbon reduction targets. A brief summary of the Exeter Transport Strategy (2020-2030) is provided below, detailing the ways in which the wider decarbonisation agenda has been linked back to specific transport-orientated ambitions.

Exeter Transport Strategy (2020-2030)[29]

Building upon the work of the Local Transport Plan 3 (2011-2026), the Exeter Transport Strategy (2020-2030) represents an updated plan for developing and enhancing the transport network across the city, better reflecting current travel trends, community needs, and the County Council's commitment to reducing carbon emissions. Alongside ambitions to support economic growth across the city, and improve quality of life for residents and visitors, the strategy represents the first stage in the city's transition towards net zero carbon.

Decarbonisation will be facilitated through the creation of a comprehensive, accessible, and cohesive active travel network across the city, with an aim for 50% of trips made within Exeter being made on foot or by bike. Alongside reductions to carbon emissions, this target will help to tackle existing inactivity across the city, aiding Exeter's ambition to become the most active city in the country. Additional key measures to improve the sustainable transport network and lower carbon emissions include:

• Creation of 'green lanes' to enable active travel access from villages on the city edge.

• Enhanced bus frequency on key interurban routes, aiming to achieve a 15-minute bus frequency or higher, enabling a shift towards 'turn-up-and-go' service levels.

• Bus fleet improvements using low-emissions technology, as well as ensuring mobile connectivity and Wi-Fi provision across the entire fleet.

• Continued expansion of Exeter's existing on-street e-bike shared mobility schemes.

• Plans for the UK's first zero-emission transport subscription service, across electric buses, car club vehicles, and e-bikes hire.

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[29] [Devon County Council (2020) Exeter Transport Strategy](#)

2.3 Socio-economic Context

Demographics

The unique location and geography of the Peninsula Transport region has played a major part in shaping the demographic trends and composition seen across the area today. Combining the five local authorities partnered within the STB, the Peninsula is home to almost 2.35 million residents (2020 estimate[30]). Of this total, around 1.37 million residents are of traditional working age (16-64), representing around 58.3% of the region's population – a figure over 4% lower than the national proportion of 16–64-year-olds (62.4%).

The total population of the Peninsula region grew by almost 500,000 people between 1981 and the 2011 census, a growth value of nearly 70%. From 2001 to 2011, the largest growth was seen in Devon, followed by both Cornwall and Somerset. Figure 2-5 displays the population change across the five local authorities making up the Peninsula Transport region. It indicates that a greater growth in population has been found in the region when compared to the UK as a whole up until 2001, where the rate of growth dropped off slightly. If such trends continue, it is likely that the population of the region will continue to grow over the next few decades, creating additional transport demand that must be met in a sustainable, carbon-friendly manner.

Figure 2-5: Population of the South West Peninsula at the UK Census[31]
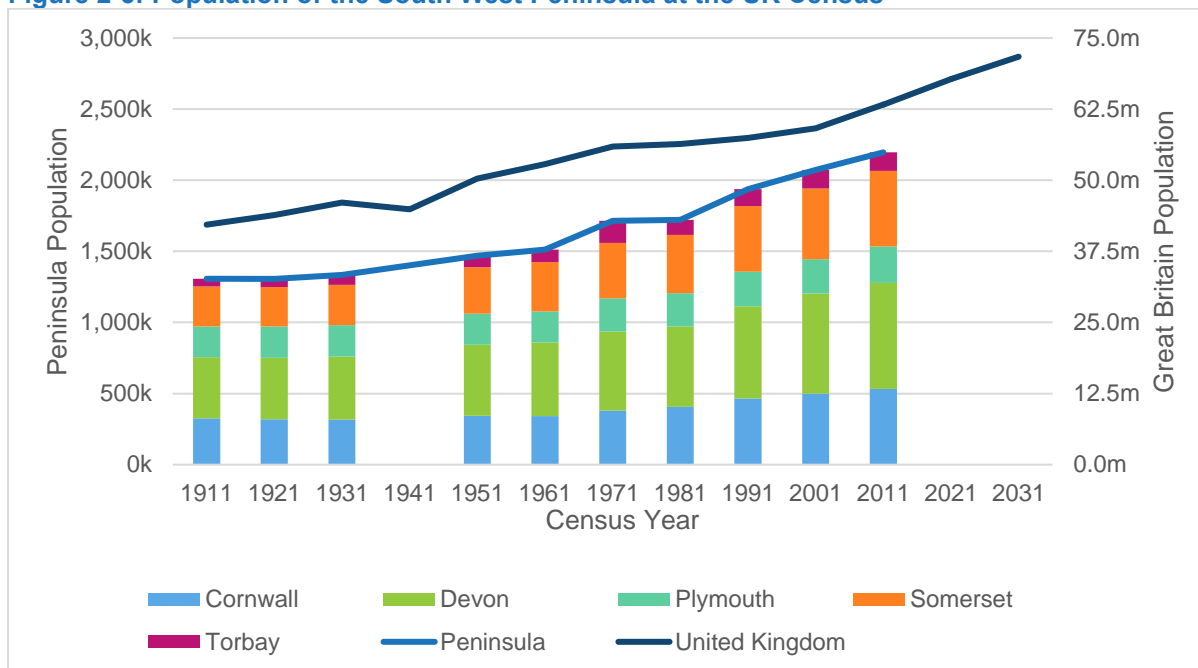
The average age of residents within the Peninsula is higher than the national average – in many parts a reflection of its largely rural setting and high retired population. The region represents a popular destination for retirees to settle, creating a steady rise in an older population across the Peninsula. This trend is set to continue, with increased average life expectancy causing people to live longer throughout the country. When allied to its role as a popular destination for retirement for older people across the country, this aging trend is likely to exacerbate the proportion of older and retired residents living across the Peninsula.

When considering future transport infrastructure changes, the ageing demographic needs to be taken into consideration due to their differing socioeconomic and mobility needs and the fact they make up a large proportion of the rural population. The older generation typically

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[30] ONS (2020) Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland
[31] Peninsula Transport (2019) Regional Evidence Base

rely more heavily on public transport and community lift sharing, as they often have less access to independent forms of mobility. This may be due to decreasing physical and mental capacity, the economic responsibility of owning a car, or reduced road confidence[32]. For these reasons and more, older populations require more reliable and regular access to public transport to support their social wellbeing, access essential services, and contribute to their local communities.

Figure 2-6 outlines the projected increase in the proportion of older people (aged 65 and over) throughout the UK. Whilst only one local authority district in the Peninsula (West Somerset) had more than 30% of its population aged over 65 years in 2016, by 2039 all districts (excluding Exeter and Plymouth) are projected to reach this percentage of an older population. The needs of an ageing demographic must be therefore be reflected in any decarbonised transport system.

Figure 2-6: Project changes in the proportion of the UK population aged 65 years and over (2016 and 2039)[33]
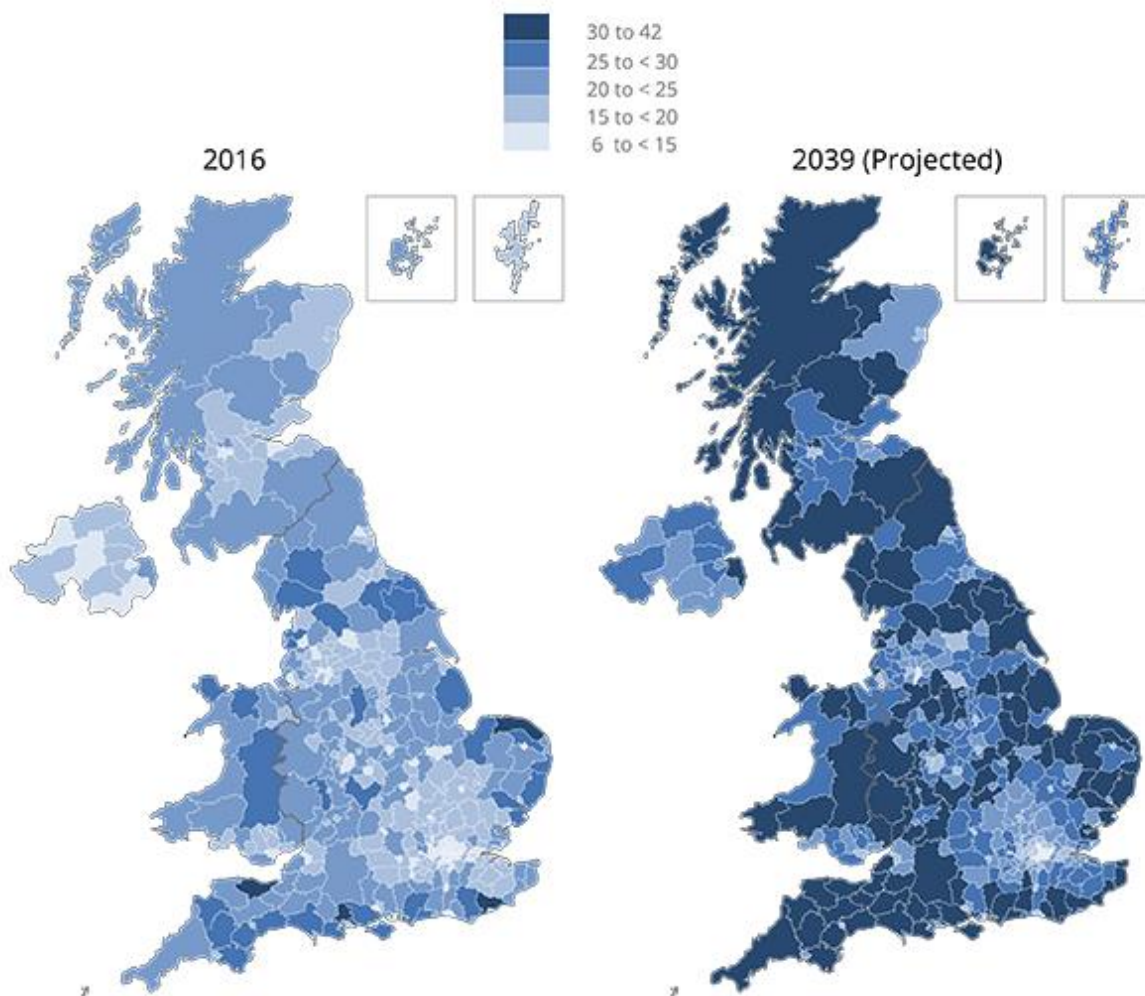
With low organic growth and relatively limited international migration into the area, recent population growth has stemmed from internal migration (i.e. within the UK) – a factor exacerbated by the COVID-19 pandemic. The Peninsula Transport region holds the highest net rate of internal migration across any region in the UK.

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[32] Shergold (2019) Taking part in activities, an exploration of the role of discretionary travel in older people's wellbeing
[33] ONS (2018) Living longer: how our population is changing and why it matters

Table 2-3 outlines the net rates of population growth accountable to inward internal migration across the local authorities making up the Peninsula from 2018 to 2020. The population change from internal migration across the Peninsula is almost 40% higher total than that of the wider South West region within which it is contained. With the wider net % change across the South West also representing a significantly higher proportional population change than the national average, the even higher levels of migration into the region outline its popularity as a destination for permanent residence (in conjunction with its touristic value).

Table 2-3: 2018-2020 Internal Migration Rates across the Peninsula, South West and England (ONS)[34]

Region	Local Authority	Mid-2020 Population Estimate	Change from 2018
Peninsula	All	2,362,565	1.38%
Peninsula	Cornwall	578,234	1.84%
Peninsula	Devon	819,237	2.06%
Peninsula	Somerset	566,044	1.02%
Peninsula	Plymouth	262,404	-0.66%
Peninsula	Torbay	136,646	0.90%
South West		5,686,195	0.95%
England		56,529,845	0.07%

Continued population growth within the Peninsula Transport region is set to be facilitated by local authority plans for growth in available housing, with a combined total of almost 200,000 new dwellings set to be built across the region by 2040. Figure 2-7 outlines the quantities of housing proposed within local plan documents for each local authority within the Peninsula. This housing and associated population growth will place further stress onto the existing transport network and potentially increase transport emissions from the region. Such growth trends therefore reinforce the need for a thorough and sustainable mobility strategy to target both a cleaner and more reliable transport system across the Peninsula Transport region.

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[34] ONS (2021) Internal migration: detailed estimates by origin and destination local authorities, age and sex

Figure 2-7: Planned Housing and Employment Growth in the Peninsula[35]
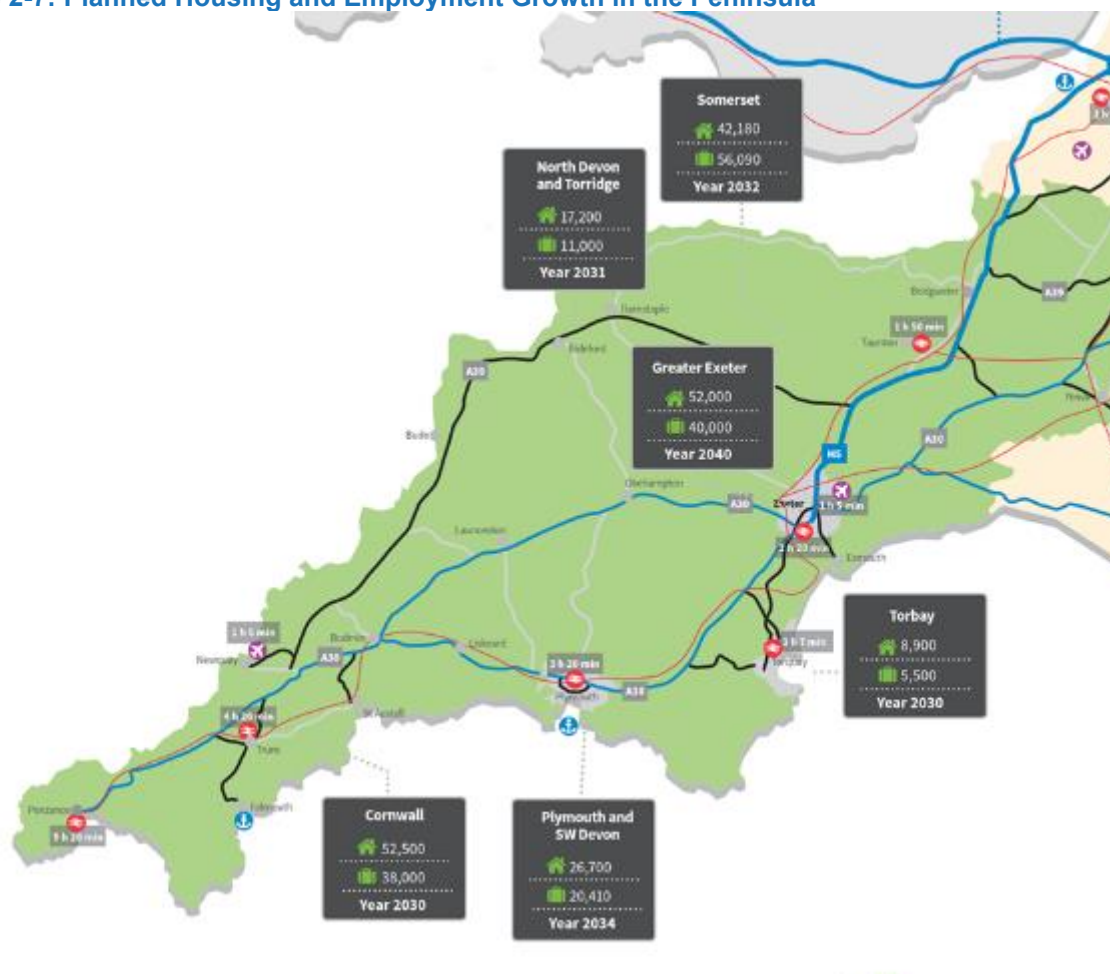
Urban and Rural

The travel and mobility needs of people living and working in the peninsula are impacted by the geography and low population density of the region. Spanning a geographical area of almost 14,500 km^2, the south west Peninsula Transport region covers a large expanse of relatively rural land, with its population of around 2.3 million people spread relatively widely (in relation to other areas of England).The Peninsula is a unique and diverse region, with people reasonably evenly split between living in urban (58%) and rural areas (42%)[36] (Figure 2-8 and Figure 2-9). However, outside of the largest urban areas, such as Plymouth (population c. 240,000), Exeter (c. 125,000) and Torbay (c. 120,000), people in the Peninsula overwhelmingly live in rural and often isolated locations – with 17% living in coastal and estuarial locations (in comparison to only 3% in the neighbouring Western Gateway region)[37].

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[35] Peninsula Transport (2019) Regional Evidence Base
[36] Peninsula Transport and Western Gateway STB (2022) Rural mobility Strategy (Draft)
[37] WP10: Rural Mobility Strategy Paper

Figure 2-8: Rural and Urban Classification, 2011 Census

Figure 2-9: Characteristics of Peninsula Places

Total population: **2,387,000**

Number of places: **538**

Largest place: **240,000**

Urban: **1,322,000**

Smallest place: **42**

Rural: **1,065,000**
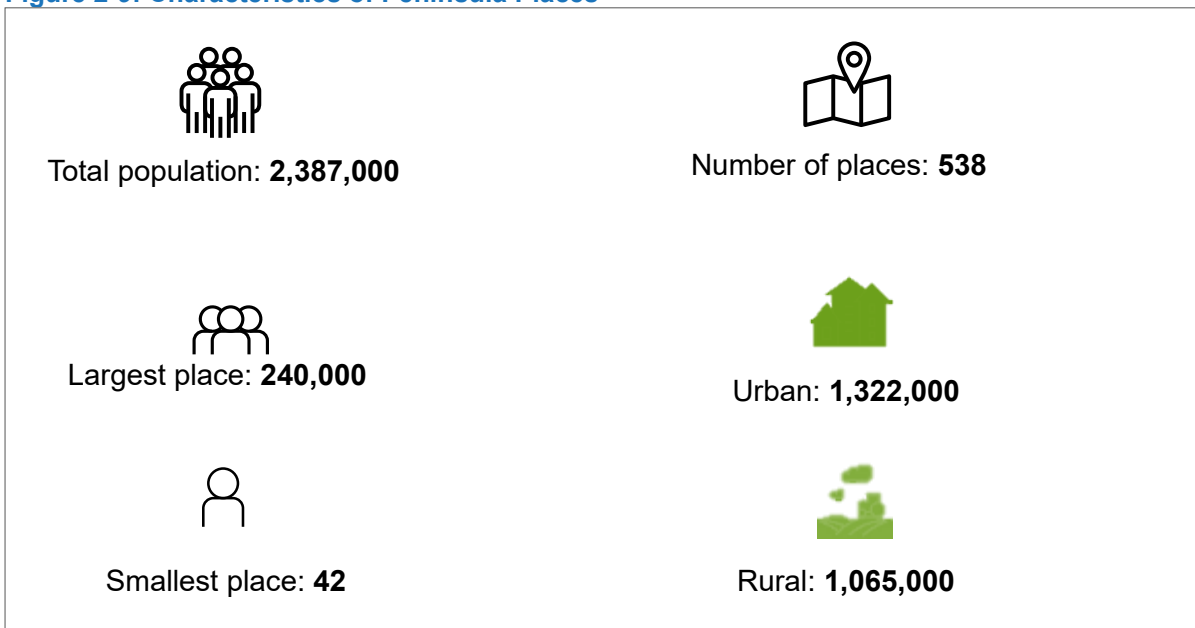
Reflected in its extensive coastline, the geography of the region limits the quantity of potential land routes to provide external connections between the south west peninsula and other regions of the UK, with all inter-regional trips requiring sometimes significant east-west distances. In turn, the rural nature of the area locates many smaller settlements a long way from key towns and existing transport-access destinations, limiting internal connectivity for residents and local businesses.

In isolated and rural areas, transport-related social exclusion is far more likely to occur due to barriers to accessing essential services and activities. When these barriers are removed, participation and community activity are facilitated, which in turn leads to a healthier and more economically active society[38]. Barriers to access are not exclusively transport related,

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[38] Luz and Portugal (2021) Understanding transport-related social exclusion through the lens of capabilities approach

however traditionally rural areas have less regular and diverse transport services - for example the average rural bus availability rate from 2002 to 2012 remains 45% lower than urban areas[39]. In addition, people living in rural areas travelled twice the distance of those in urban areas during the period of 2018 to 201938[38]. Furthermore, over 80s are the most likely to experience social exclusion, in respect to both social contact and access to services (see Figure 2-6). Although social exclusion is a complex issue relating not only to transport but also socioeconomic demographics and needs[40], comprehensive planning must therefore address the needs of rural communities whilst simultaneously working to address the Climate Emergency. For more background on the diverse rural communities of the south west region, please see WP10: Rural Mobility Strategy)

De-Urbanisation

Exacerbated by the COVID-19 pandemic, some emerging evidence has indicated that there has been an increase in de-urbanisation across the country – with higher numbers of people moving out of cities and areas of high population density[41][42]. House prices in cities like London have shown lower growth during the pandemic, when compared with smaller urban areas – a reversal of pre-covid trends[43]. Even before the pandemic, the Peninsula Transport region received the highest levels of inward migration of any area across the UK. However post-pandemic trends are indicating a likely further rise as the South West is identified as a key relocation destination for people across the country, with property prices rising accordingly. It is important to note that the 'post-pandemic' landscape is highly varied and constantly fluctuating however, and as such there is limited consensus on the long-term validity of these trends[44]. We should therefore anticipate a range of migratory outcomes for the peninsula region, with recommendations made that will provide solutions across a range of short- and long-term demographics.

If these de-urbanisation trends continue to grow, it is imperative that the Peninsula Transport STB and constituent local authorities make suitable and sufficient provision to help support efficient rural travel across the region. This will include ensuring that connectivity and accessibility is high for a range of people, place types and transport modes. Decarbonisation of transport represents an important opportunity for reducing transport-related social exclusion. A central part of this strategy will therefore be devoted to ensuring that decarbonisation measures optimise co-benefits such as physical health, improved air quality and increasing levels of mobility for all communities and areas across the peninsula.

Economic

The Peninsula Transport area is a growing economic region with strengths in defence, medical research high-tech manufacturing, marine, clean energy, agriculture, and tourism sectors. The South-West region's gross value added (GVA) contributes nearly £44 billion (2016) to the national economy[45]. However, the Peninsula has lower productivity than any other part of the south of England and there is also considerable disparity between the productivity of different parts of the region.

The visitor economy represents one of the most important sectors contributing towards the Peninsula economy, accounting for almost 4.5% of economic output and 14% of employment. Around 21 million incoming domestic visitors made the South West the most visited region in the UK in 2017, contributing £4.5 billion to the national economy. With the majority of these visitors originating from outside of the Peninsula, significant seasonal increases in demand for key services result in added pressure during peak periods; the

[39] Department for Environment, Food and Rural Affairs (2022) Statistical Digest of Rural affairs
[40] Gray (2006) Community transport, social capital and social exclusion in rural areas
[41] LSE (2020) Covid-19 has turned cities' main economic assets into their worst enemies
[42] The Guardian (2021) Escape to the country: how Covid is driving an exodus from Britain's cities
[43] ONS (2021) Understanding towns in England and Wales: house price analysis
[44] The Guardian (2022) Fears of pandemic exodus from England's cities prove unfounded
[45] ONS (2017) Regional gross value added (balanced) by local authority in the UK

transport system is particularly badly affected, with resulting issues of congestion and capacity issues common along many of the Peninsula's key transport corridors.

Figure 2-10 outlines average GVA across England and Wales by district, with the locations of the 10% most and least deprived neighbourhoods across the country highlighted. Productivity levels across the peninsula region are very low when compared with the country as a whole, when measured through average GVA, with Exeter the only districts above the 3rd GVA quintile (4th quintile). Nationally, trends indicate that the highest levels of economic activity appear to be commonly focused around major urban areas, with proximity to these employment hubs an important determinate in accessing 'trickle-down' prosperity. As such, the lack of many large cities across the peninsula may represent a constraint to economic development, with effective, sustainable transport improvements critical to accessing larger economic hubs.

Figure 2-10: Gross Value Added (GVA) by District (2019), alongside locations of the 10% most and least deprived neighbourhoods across the country. Categories have been assessed in comparison to UK-wide data, but only England and Wales are shown above.[46]
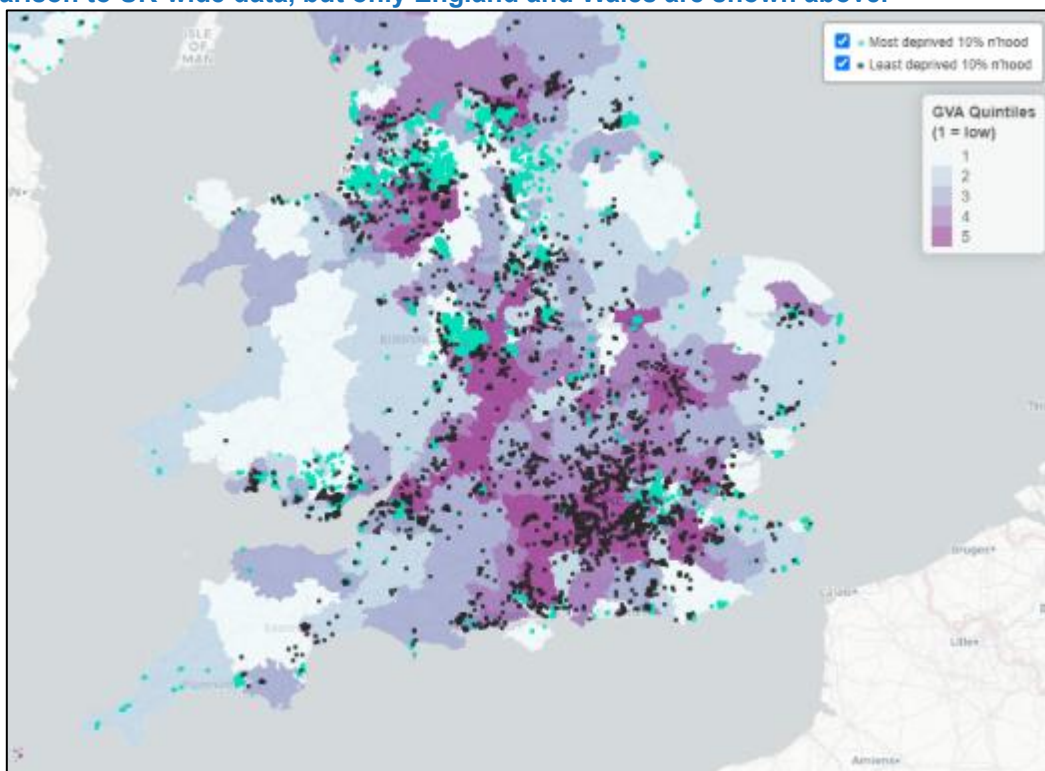
Across the Peninsula Transport region, there are limited numbers of either most or least deprived neighbourhoods, indicating mostly average levels of deprivation within the region. Within the peninsula, clusters of areas falling within the most deprived nationally are located in Plymouth, Paignton and throughout Cornwall (Figure 2-10). In contrast, some of the least deprived areas nationally include clusters within Exeter and Taunton. The existence and location of such deprived areas within the peninsula highlights the scale of existing issues such as social exclusion and transport poverty, with limited access to transport denying many areas the chance to grow economically. The location of these areas, primarily to the south and south-west of the region, supports this assertion; these areas represent some of the most isolated parts of the country, with significant journey times via both road and public transport restricting accessibility to regional and national business and employment opportunities. In the pursuit of transport decarbonisation – and delivery of the goal to "deliver

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[46] COVID Recovery Mission (2022) Gross Value Added (GVA) per head by Local Authority and most deprived neighbourhoods: England and Wales

affordable, zero-emissions transport for everyone" – it should be ensured that parallel opportunities to improve connectivity to these areas are taken, with alternative forms of transport implemented and improvements made to the existing network. Recognition of the inherent cost to the user associated with many low-carbon solutions (such as private EVs) should be acknowledged within any policy recommendations, ensuring that existing transport poverty is not exacerbated as a result of the drive to decarbonise.

The proportion of economically active residents across the Peninsula is broadly similar to the national average (Table 2-4). However, the average salary within the Peninsula is over 10% lower than the national average, equating to approximately £70 per week[47] (Figure 2-11). Within the Peninsula itself, there is substantial variation in average salaries between the five local authorities. Cornwall and Plymouth both display significantly lower average pay, between £20-26 less than Torbay, and £45-51 lower than Somerset and Devon. As noted in WP10: Rural Mobility Strategy, rural areas have higher transport costs as a percentage of disposable income than urban areas, with rural villages facing the highest transport costs overall. Alongside higher house prices, this creates a financial burden for rural residents, as well as equity concerns.

An understanding of regional wage trends can provide indications of relative productivity levels across each local authority area. As such, both wages and associated productivity outputs are lower across the peninsula when compared to the national average. With lower levels of disposable income available per capita, it is to be expected that residents of the region would have relatively less financial capacity for expenditure on transport. When accompanied with lengthy journey distances and subsequently high public transport prices, this lack of disposable income is likely to lead to more car usage for both local and regional trips (for those who can afford to have access to a car). It is important that transport decarbonisation strategies account for this disparity in financial capital, with the promotion of economic growth and employment opportunities crucial to eventual behavioural change and modal shift to more carbon-friendly options.

Table 2-4: Proportions of economically active residents across the Peninsula (2020-2021)[48]

	Cornwall	Devon	Somerset	Plymouth	Torbay	Peninsula	GB
Economically Active	77.3	79.5	78.2	79.4	78.8	77.3	78.4
In employment	73.6	76.9	75.2	75.2	77.0	74.3	74.4
Unemployed	4.0	3.2	3.6	4.7	4.3	3.7	5.0

Source: NOMIS

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[47] ONS (2021) Earnings and hours worked, place of residence by local authority
[48] NOMIS (2021) Local Authority Profiles

Figure 2-11: A comparison of 2021 average weekly pay across the Five Peninsula Transport authority areas alongside regional and national aggregates[49]
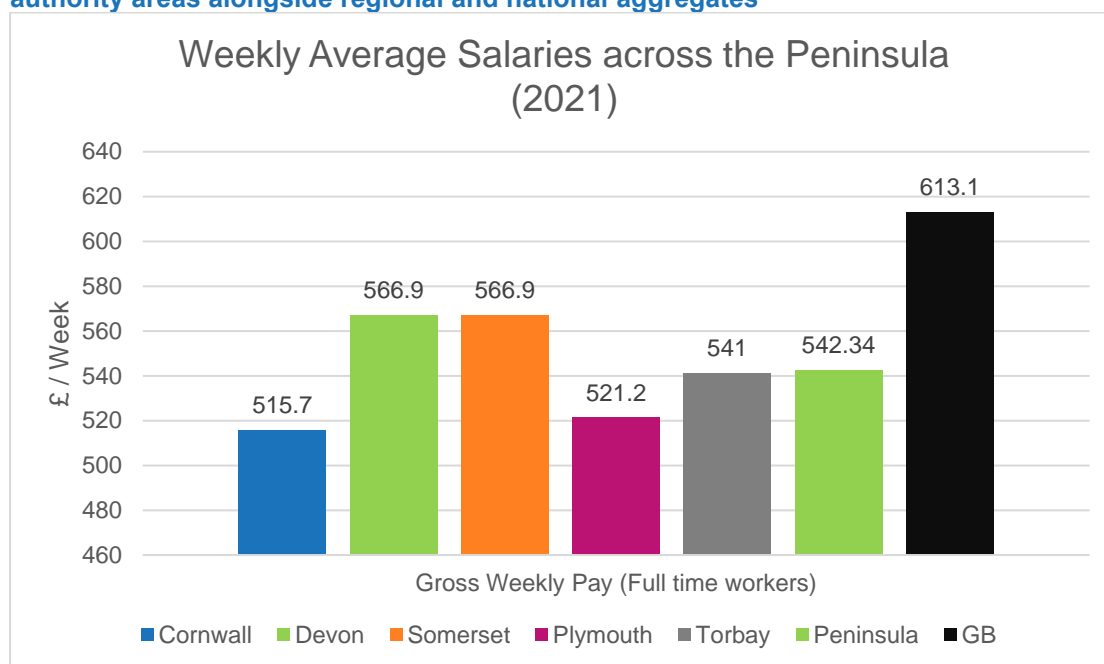
Despite the high rurality of the peninsula region, job density (representing the number of jobs available for the potential workforce of an area) remains on a par with national levels – both at a ratio of 0.87 jobs per working aged resident (as shown in Table 2-5). Both Torbay and Plymouth hold lower job density than either Cornwall, Somerset or Devon, again a reflection of the limited impact of rurality on the availability of jobs across the peninsula region. When considered alongside the lower average salaries in place across the region, relative job density suggests that it is the types of employment, rather than significantly different unemployment rates, that is driving lower productivity/GVA across the region.

Table 2-5: Employment Opportunity across the Peninsula (2019), indicated by Job Density (Number of Jobs over potential workforce, 16–64-year-olds)[50]

Authority	Number of Jobs	Job Density
Cornwall	282,000	0.85
Devon	424,000	0.91
Somerset	287,000	0.89
Plymouth	134,000	0.81
Torbay	59,000	0.76
Peninsula	1,186,000	0.87
GB	35,388,000	0.87

Source: NOMIS

The five local authorities have plans for the creation of a combined total of over 170,000 new jobs by 2040 (see Figure 2-7). This growth will help to provide employment opportunities for the expanding population, as well as attracting skilled labour to the region. Dependent on continuing inwards migration trends, the creation of new employment opportunities may help

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[49] However, it should be acknowledged that this national figure includes London salaries which, averaging out at £728.40 per week in 2021, are likely to inflate this figure in comparison with wages elsewhere.
[50] NOMIS (2021) Local Authority Profiles

to improve existing job density, potentially raising average figures above the national average. As such, it is important for future transport strategies to account for the potential changes in commuter demand and a larger residential population across the region placing additional strain upon the network. Appropriate contingency planning should therefore be made around developing public transport infrastructure within existing settlements throughout the peninsula, ensuring that facilities and services are suitable for dealing with future demand.

Social exclusion

Whilst decarbonisation remains the central focus of this report, and the recommended package of measures set out in Section 3.3, social exclusion within transportation must be addressed in tandem with measures aiming to limit carbon emissions across the peninsula. Access to the transport network represents a critical determinant of an individual's level of social and economic inclusion, affecting their quality of life, access to key services, and level of deprivation (see previous sub-Section). If spending is directed solely at improving or expanding existing transport infrastructure, with little regard or even cuts made to support for transport services, those on lower incomes could be shut out of opportunities permanently.

In the peninsula, the unique rural to urban population split results in a balancing act for policymakers; whilst the majority of the population live within towns, a smaller proportion of residents are spread across highly rural areas. Those living in rural areas without access to private transport face acute challenges in accessing employment opportunities due to both poor transport provision and a lack of affordable social housing near these employment locations. Availability and poor quality of digital and communication networks can also limit opportunities to access work, education and services from these communities.

There may also be a reluctance to move closer to jobs if it means leaving informal networks of support or family commitments in the rural areas within which they currently reside. Ensuring that funding for transport services is targeted at improving connectivity and accessibility across the whole of the region to enable rural to urban opportunity access is a challenging prospect, but one that must be pursued if issues of social exclusion are to be addressed. Although access to a car represents one of the primary measures of transport poverty / likely social exclusion, a recent rise in alternative forms of transport for rural/vulnerable populations could provide support to the wider public transport network.

Community Transport

Recent growth in 'Community Transport' provision has provided an external means of increasing transport connectivity for more isolated communities or older residents living in rural areas. Such services range from provision of low-emissions vehicles to facilitate commuting journeys, to organised lifts for those unable to use the existing public transport network (Figure 2-12).

Figure 2-12: Recent Community Transport Initiative Examples

Voluntary (Community) Car Schemes:

- Organised lifts provided by volunteers. This can be using their own vehicles, or those provided by a charity or community body. A rate per mile charge and/or council funding is used to cover vehicle upkeep and fuel charges.

Community Bus Services:

- Regular journeys following a timetable that focus around connecting smaller communities to larger transport hubs/destinations.

Dial-a-Ride (Demand Responsive) Services:

- Door-to-Door services requiring passengers to register and pre-book seats before travelling.

Shopmobility:

- A nation-wide scheme providing mobility equipment for hire in towns and city centres, such as wheelchairs and electric scooters.

Wheels to Work / Wheels to Learn:

- Provision of low-cost mopeds or bicycles for a minor loan, along with advice for travel. Service is reserved for those at risk of losing, or with the promise of a place at either education or work.

Cornwall for example, is home to several organisations providing community transport including Voluntary Car; Community Bus; Section 19; Section 22; Wheels to Work; and, Shopmobility Schemes for those unable to access suitable alternative transport. Many of these services work closely with Cornwall County Council, receiving funding and support for their role in bridging existing gaps in the existing public transport network. Such groups are key in reducing the impact of social and rural isolation on health and wellbeing, as well as providing solutions to overcoming transport poverty and facilitating commuter journeys. In recent years, many of these organisations have sought to commence the shift to electric vehicles, helping to combine increased connectivity to the wider transport network with lower emissions output.

> **Case Study: Age UK Transport Access People Exeter Transport Strategy (2020-2030)[51]**
>
> Charities have begun to arrange door-to-door transport services for people with difficulty accessing other forms of public or private transport. Age UK's Transport Access People specialise in assisting with transport access to non-emergency healthcare appointments, library trips, memory café's, meeting friends for lunch and shopping excursions. As of 2019, volunteers working for the charity had facilitated over 120,000 journeys in Cornwall and South Devon. Such schemes currently rely on a combination of local authority funding, fundraising, and user fees to provide the necessary funds for vehicle upkeep and fuel prices. Recently, Age UK have expanded into electric vehicles, purchasing 6 EVs alongside a set of designated charge points across Cornwall and South Devon. These require Age UK Cornwall membership to enable use and are designed to be used by local groups and members.

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[51] Age UK (2022) Transport Services

2.4 Transport Context

Overview

The transport network in the Peninsula Transport area is, to a large extent, constrained by the geography of the region with the strategic road and rail connections generally aligned east-west providing a central spine and some additional connectivity closer to the south coast and southern parts of region (Figure 2-13). There are also critically important north-south corridors linking into the West of England growth area, the Midlands, and the North. The major road network (MRN) provides some critical spurs from the strategic road network (SRN) to key population / employment centres as well as some important corridors linking communities and providing a route through the region (e.g. the A361 and A39 corridors in north Cornwall and north Devon).

Figure 2-13: Peninsula Strategic Transport Network[52]
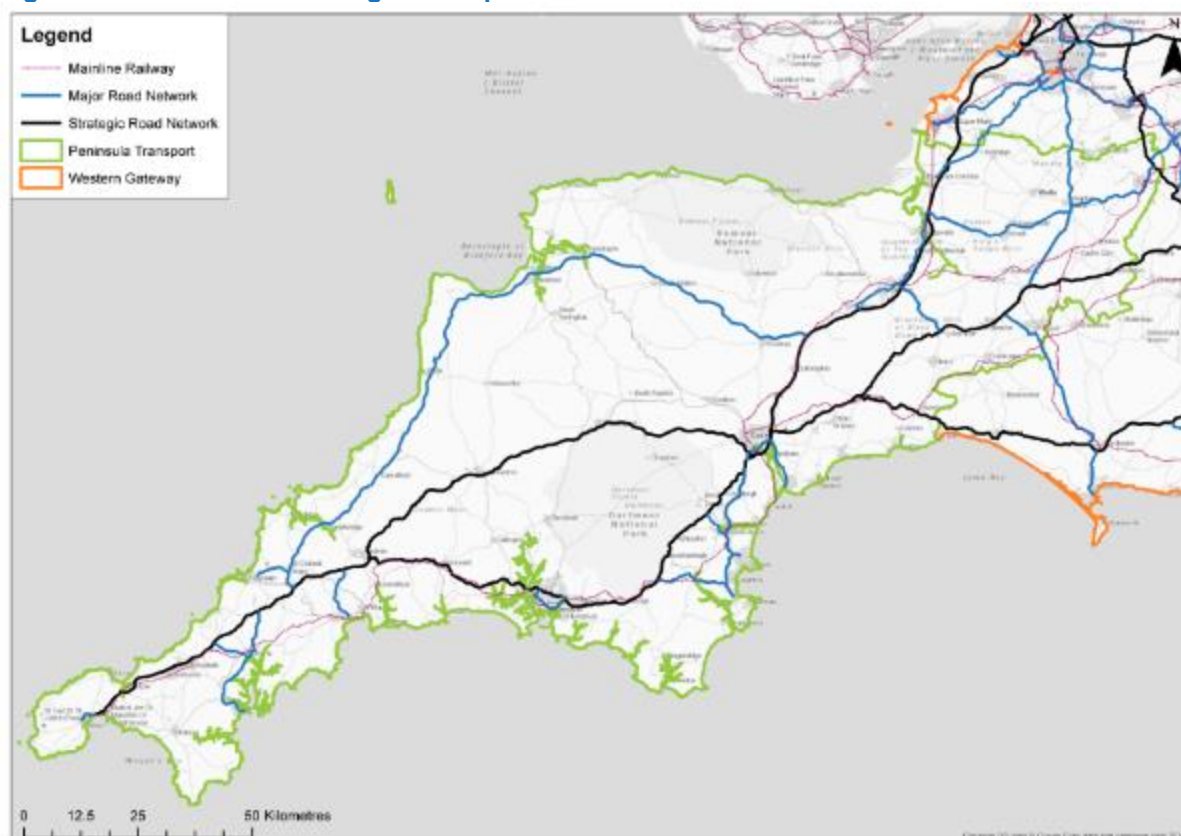
Whilst most places are within 10km of the top two tiers of the road network (as represented by the SRN and MRN), there are a number of places with poor highway network access and no rail network access. Such locations include the Lizard Peninsula (and some other south Cornwall coastal communities), the South Hams, West Devon, parts of North Devon and West Somerset. The unique geographical and demographic layout of the Peninsula region create a multitude of challenges both for the provision of an effective and efficient transport network, and its eventual decarbonisation. The stark separation of rural and urban areas, with many areas of low population density, have resulted in significant blank spots in the public transport (and often communication) network, and an associated high car dependency. The challenge for any Carbon Transition Strategy will be to balance ensuring widespread connectivity for all residents and visitors, whilst maximising the efficiency of the multi-modal transport system across the region.

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[52] Peninsula Transport (2019) Regional Evidence Base

Peninsula Rail Network

The peninsula rail network is vital for both passenger and freight transport across the region and to destinations outside the South West including Bristol, London, Birmingham, Manchester, Cardiff and Southampton, providing critical access to domestic and international gateways. There are also several branch lines providing important local connections, including Barnstaple (Exeter to North Devon), Exmouth (Exeter to Exmouth) and Falmouth Docks (Truro to Falmouth Docks)[53]. However, many locations within the region are a significant distance from a rail station and typically require an access journey by car (Figure 2-14).

Figure 2-14: Peninsula Rail Station Accessibility Analysis[54]
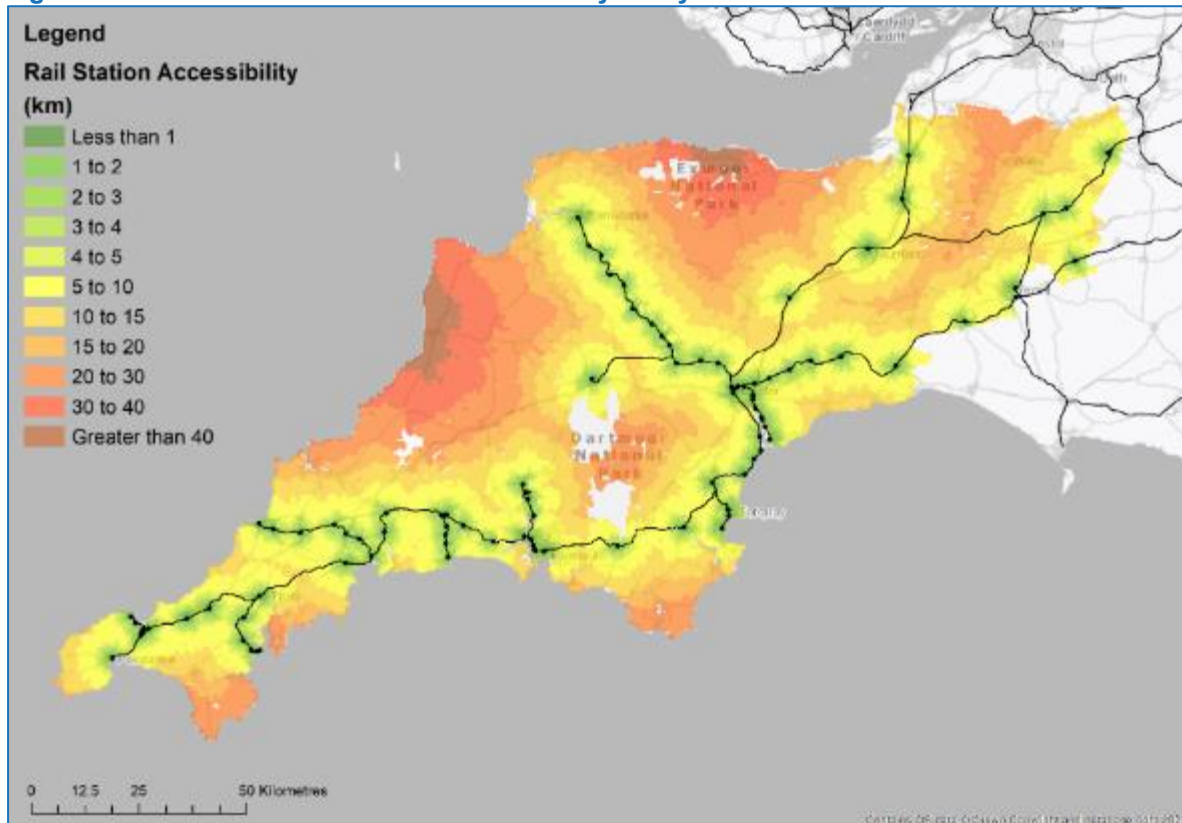
Most of the Peninsula rail network falls within Network Rail's Wales and Western region with the remainder within in the Southern region. The network experiences several challenges, with the Peninsula Rail Taskforce's ambition for a 21st century rail network underpinned by three priorities[55] around quality, resilience and connectivity (Figure 2-15).

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[53] Greater rail context can be found in the full rail strategy for the region, which is being developed in Work Package 08.
[54] Updated from Peninsula Transport (2020) Economic Connectivity Study
[55] Peninsula Rail Taskforce (2016) Closing the gap

Figure 2-15: Peninsula Rail Taskforce Strategic Priorities
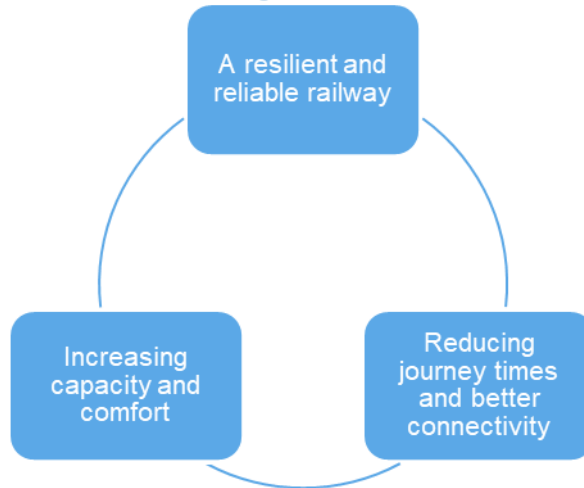
From a decarbonisation perspective, none of the rail network within the region is electrified (Figure 2-16), although services operating to/from London Paddington operate on bi-modal trains with the potential to run using electricity where infrastructure is available. Whilst electrification of the rail network throughout the Peninsula Transport region would enable fully electric services to run through the region, the significant infrastructure costs associated with this transition presents a challenge to both national and regional funding budgets. As such, it is likely that this infrastructural transition represents a longer-term target, with more immediate, cost-effective measures preferred in the short-term. Additional concerns are currently present concerning the range of battery powered rolling stock however, for services beyond the current range. It is therefore clear that there is no one single solution to the decarbonisation of the rail network across the region, with a range of full- and hybrid-electric alternatives required to operate in parallel. For more details on the rail challenges and opportunities, see WP08: Rail Strategy Phase 1.

Figure 2-16: Rail Electrification in the United Kingdom[56]

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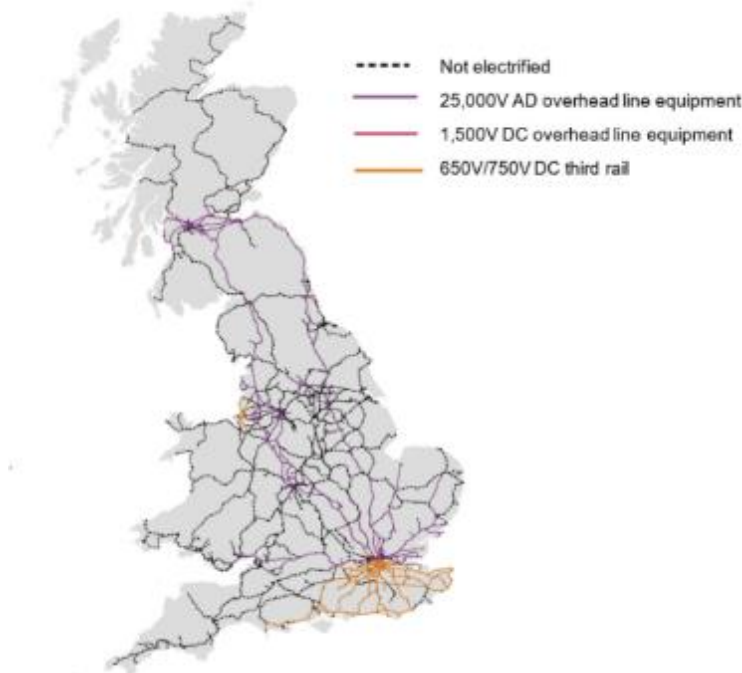
[56] Office of Rail and Road (2021) Rail Infrastructure and Assets, 2020-21

Peninsula Road Network

The Peninsula road network hierarchy consists of the SRN, MRN and other local roads (Figure 2-13). There are several sections of SRN within the Peninsula, which provide crucial connections between key settlements within the region and to wider national and international locations (via the Peninsula's ports and airports). The MRN in the Peninsula consists of twenty corridors generally working from west to east) providing a combination of spurs to key towns off the SRN to long corridors linking communities and serving as the main road corridor through part of the region.

The local road network also provides crucial links to these routes but also everyday activities, including for those walking, wheeling or using bus services. Approximately 43% of trips nationally were under 2 miles before the pandemic[57], particularly those within highly populated urban areas, meaning that many people will rely upon the local road networks for a large number of trips every year. As such, it is critical that the infrastructure and technology is in place to encourage modal shift to public transport and especially active travel modes across the local road network. The role of Peninsula Transport STB could be in defining minimum expectations for the local networks operated by each of the Local Authorities in the region – consistent quality is likely to be important for changing behaviours at the start and end of strategic journeys in the region.

Travel Characteristics

A particular challenge for the peninsula is journey distance, given the large rural hinterland and the distances required to travel across the region and to other parts of the country. There is an extremely high car dependency across the region, with c.90% of all journeys to work being taken by car[58]. Furthermore, private car ownership within the Peninsula (1.39 cars per household) is the second highest of any region in England (with a national average of 1.30, excluding London)[59].

As Figure 2-17 illustrates, the South West, including the Peninsula Transport area, has the highest private transport mileage per person (car driver, car passenger, motorcycle etc.) of any region in England. Whilst this represents a significant opportunity for emissions reductions, it also highlights an interesting inter-relationship between travel needs and network resilience. With the long distances of travel currently required both for internal journeys within the peninsula and national trips, residents are contributing high levels of emissions per capita relative to the rest of the country. Higher emissions are likely to play a part in exacerbating the climate crisis even further, increasing incidence of extreme weather events. In doing so, the resilience of the transport network – already vulnerable within the South West – is put under more strain, risking larger issues and periods of inoperability.

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[57] DfT (2020) National Travel Survey 2019. Data table NTS0307.
[58] Peninsula Transport (2019) Regional Evidence Base
[59] *ibid*

Figure 2-17: Average Miles Travelled by Mode and Region[60]
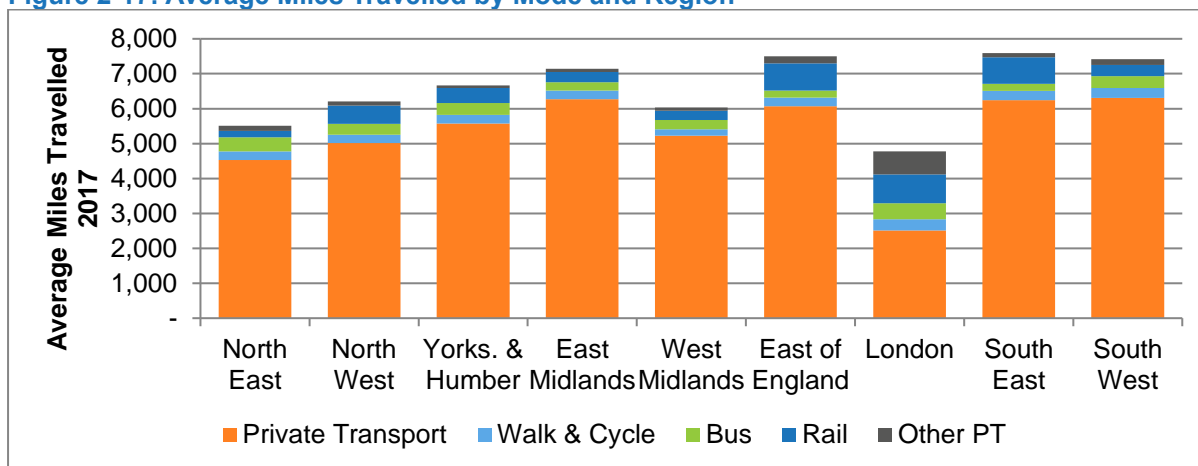
Network Resilience

The current and future resilience of the Peninsula Transport network is a central issue for consideration within any transport strategy for the region. Considering the predicted continuing effects of climate change, many existing road and rail networks will remain highly vulnerable to coastal and inland flooding. With the implications of the region's geography limiting the potential for a large range of transport corridors into and out of the peninsula, the implications of such climatic events risk undermining the critical resilience of the transport network, without suitable development.

The 2014 floods across the Peninsula Transport area provided stark indications of these weaknesses within the network, with a resulting range of social, economic and transport impacts (Figure 2-18). The continued resilience of the transport system is also at risk from capacity constraints along both the Strategic Road Network and rail corridors.

Figure 2-18: Impacts of the 2014 Flooding[61]

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[60] *ibid*
[61] Peninsula Rail Task Force (2016) Closing the Gap, the South West Peninsula Strategic Rail Blueprint

As a result of such limited resilience, less than 50% of long-distance trains arrived at their peninsula destinations in time throughout the 2014 floods. Figure 2-19 maps out the areas within the Peninsula which are susceptible to flooding, with the Somerset Levels, and areas around major rivers such as the River Exe (Exeter), River Taw (near Barnstaple) and the River Teign (Newton Abbot), most at risk. With continued climatic changes, it is likely that the extent of the areas at risk of future flooding is likely to expand considerably, with resultant impacts on the resilience of the transport network.

In the event of extreme climatic events such as storms or periods of high rainfall, the unique shape of the peninsula region can result in severe severance across the network and significant disruption to both road and rail travel. With limited routes in and out, the region is highly vulnerable to such events, with areas to the south-west such as Cornwall most at risk of disruption if severance occurs anywhere along the network to the north-east.

Figure 2-19: Peninsula Flood Map[62]
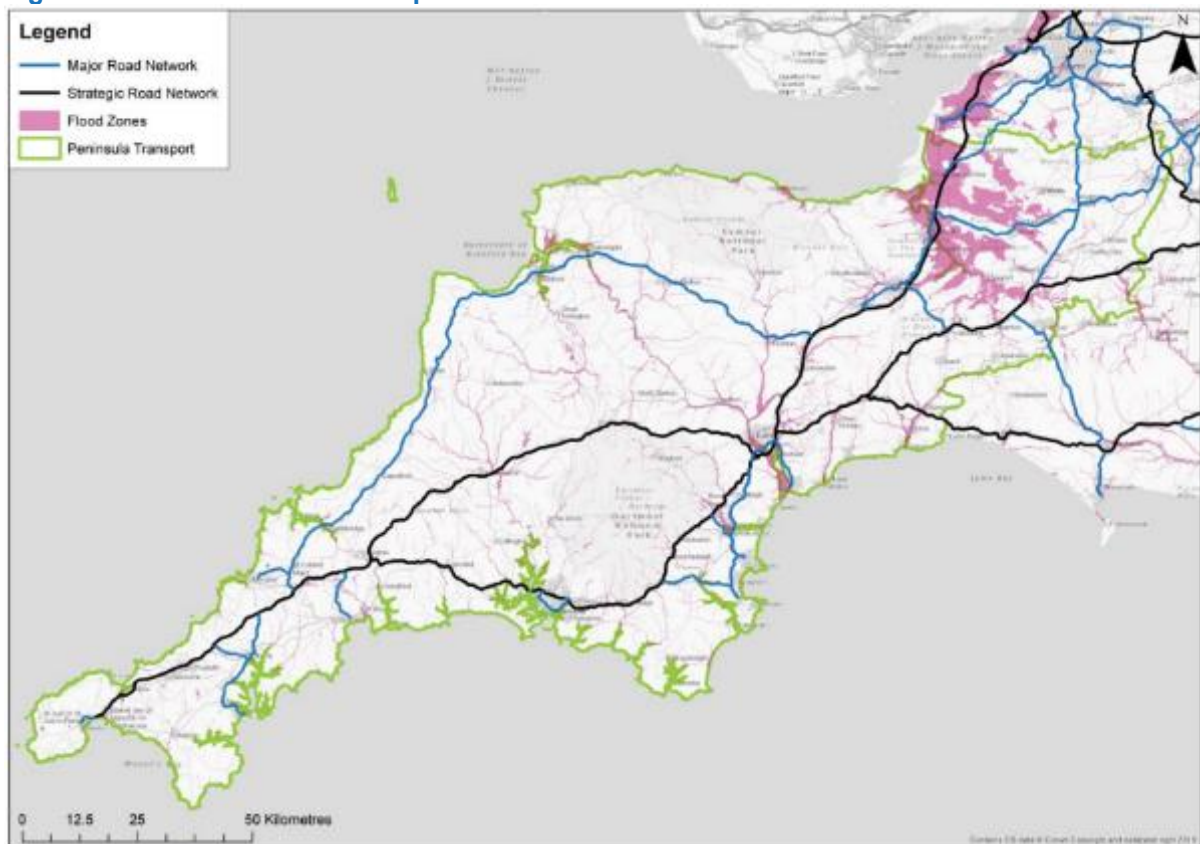
Ultra-Low Emission Vehicles

ULEVs (Ultra Low Emission Vehicles) include plug in hybrid cars and battery electric vehicles and have significant potential to reduce carbon emission levels within the transport industry. The national use of ULEVs has increased significantly between 2011 and 2020, with growth of over 4,000% in England, which translates to around 365,000 ULEVs on English roads (Figure 2-20). However, as a proportion of total vehicles, ULEVs are still less prominent, equating to only 1.36% of all cars in England.

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[62] Peninsula Transport (2019) Regional Evidence Base

Figure 2-20: Ultra Low Emission Vehicle Market Share[63]

Ultra Low Emission Vehicle Market Share, 2010 and 2020

■ 2020 ULEV % ▨ 2011 ULEV %
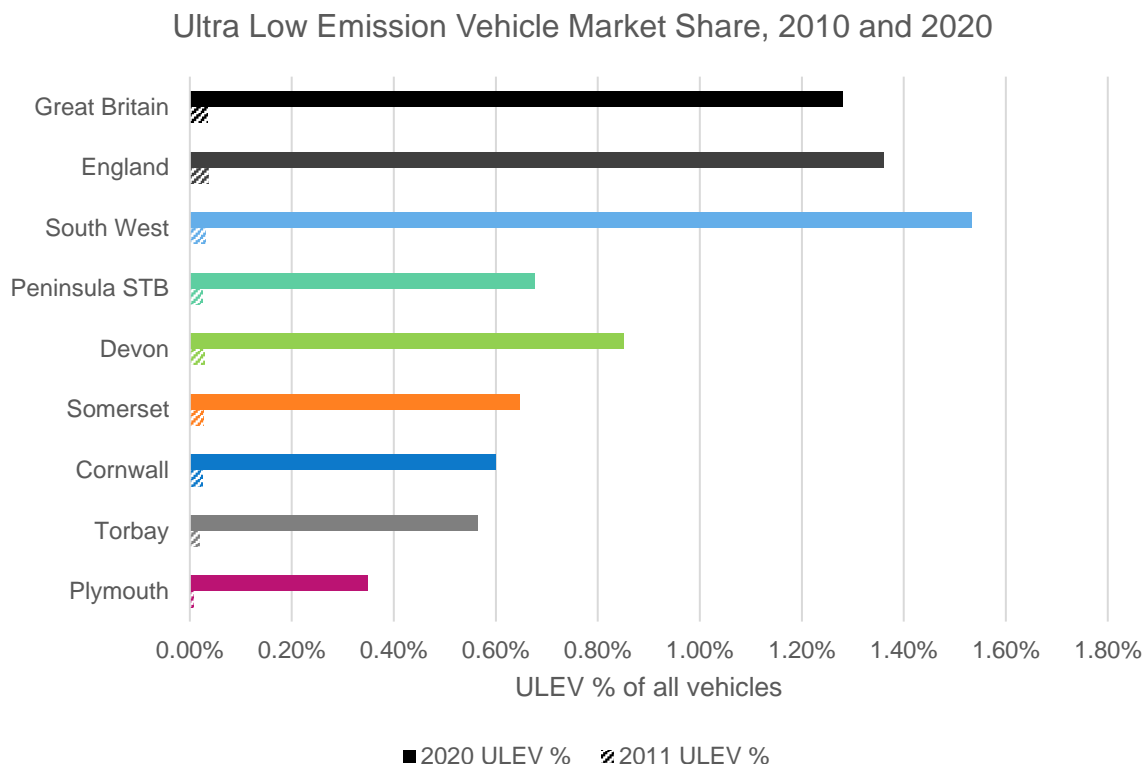
Within the peninsula, ULEV ownership has grown by just over 3,000% since 2011, a rate below both the South West average of nearly 6,000% and the national average. Additionally, only 0.68% of cars in the peninsula are ULEVs, exhibiting relatively low ownership rates in the area. 39% of these ULEVs are PHEVs (plug-in hybrid electric vehicles) which typically have a significantly shorter battery range, with direct carbon emissions likely for longer journeys.

A post-covid decline in new car sales, potentially in response to economic uncertainty, low vehicle availability and lower average distances travelled, may present issues in the switch to Ultra Low Emission cars. Year-on-year new car sales in the UK were down 46% in March 2020, and 97% in April 2020[64]. The increase in sales of new electric cars means that they are taking a larger market share, with Tesla's Model 3 accounting for almost 15% of all UK sales in April 2020 – becoming the country's best-selling new car model. However, if ULEVs are to become affordable to the mass market, it is important that there are enough vehicles in circulation to provide second-hand alternatives.

As of 1st January 2022, there were nearly 23,000 public electric vehicle charging devices available in the UK[65]. Of these, just over 4,000 were rapid charging devices. Growth in public charging points across the UK has been significant, with nearly eight times as many charge points in 2021 than in 2015[66]. Whilst overall growth has been steady, it is geographically uneven; seven of the 10 local authorities with the highest number of devices are located in London. Figure 2-21 outlines this growth in public charging devices across each local authority area in the UK, with Peninsula growth firmly concentrated in Cornwall. Despite this growth, the number of public charging points remain extremely low per capita, with no local authority in the region having more than 50 charging points per 100,000 population (Figure 2-22). Improved charging infrastructure is essential if both personal and commercial journeys

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63 DfT (2022) Statistical Dataset VEH0132. Licensed ultra low emission vehicles by local authority: United Kingdom
64 McKinsey & Company (2020) Moving forward: How COVID-19 will affect mobility in the United Kingdom
65 DfT (2022) Electric vehicle charging device statistics: January 2022
66 DfT (2021) Transport and Environment Statistics

by EV are to be supported through the region, especially for those without access to private charging infrastructure.

Figure 2-21: Growth in the UK charging devices 2015-2020, by local authority[66]
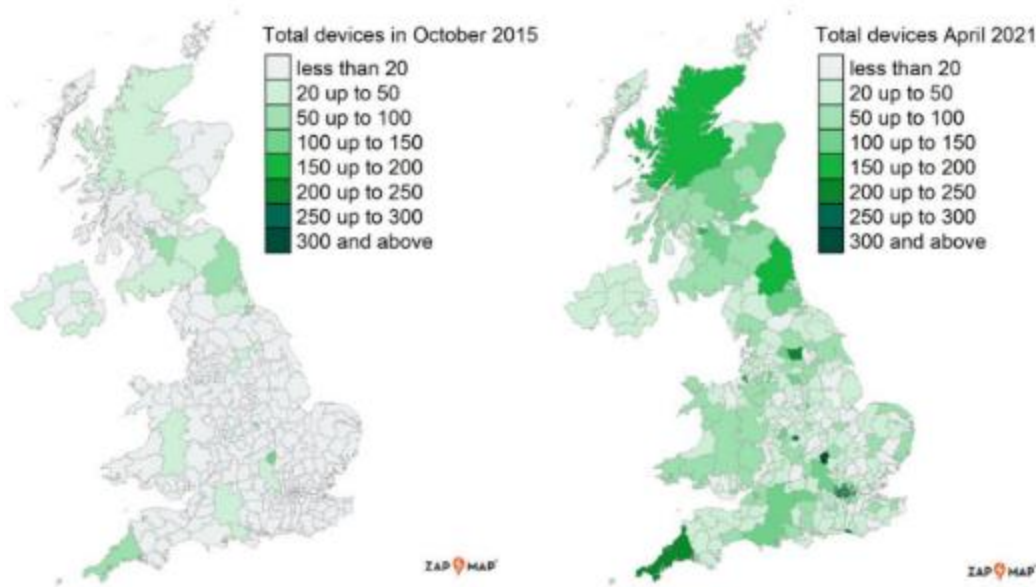
Figure 2-22: Charging points per 100,000 population[67]
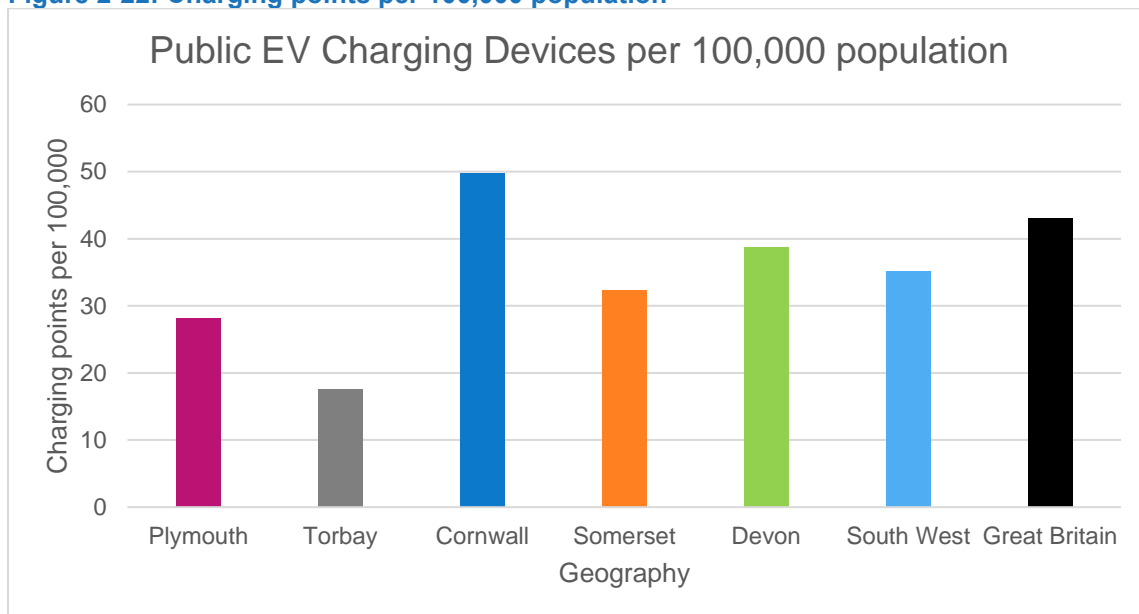
Digital Connectivity

The rapid increase in working from home necessitated by the Covid-19 pandemic, for those able to do so (Section 0), demonstrated the importance of digital connectivity. From a transport perspective, this increased digital connectivity has the potential to reduce commuting demand, particularly at the peak periods where capacity is most greatly challenged. As such, the need for transport connectivity is increasingly intertwined with digital connectivity.

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[67] DfT (2022) Electric vehicle charging device statistics: January 2022

In the 2011 Census, around 150,000 people worked at or mainly from home in the Peninsula Transport region[68], a figure which is likely to currently be much higher (and potentially remain so). This is almost 15% of employed people and compares to only around 10% in England and Wales as a whole[69]. Broadband provision across the Peninsula is varied for those working from home and/or needing virtual connectivity for other reasons (Figure 2-23), with locations such as South Hams, central and eastern Devon and eastern Somerset receiving a higher proportion of average download speeds below the 10 Mbps considered a decent standard by Ofcom (all more than 20% of households).

Figure 2-23: Lack of 'Decent' Broadband Speed Coverage[70]
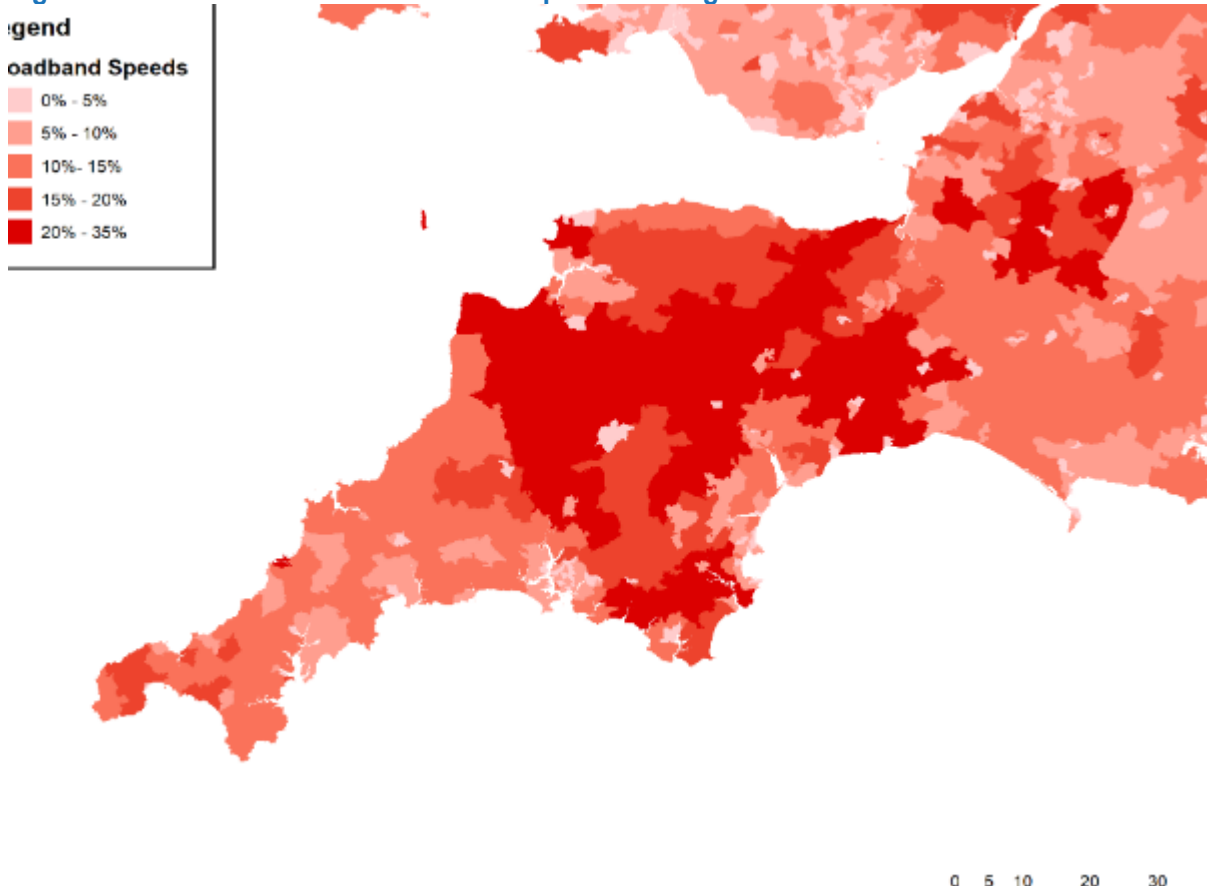
Currently, 91% of the UK landmass is covered by 'good' outdoor 4G connection from at least one operator. As shown in Figure 2-24, coverage across the Peninsula is considerably poorer than the UK average, with only Plymouth displaying higher than average 'good' levels of signal. In fact, across Cornwall, Devon and Somerset, there are huge disparities in 4G coverage, with all three holding less than 10% of 'good' outdoor connection range. As such, it is clear that there is a significant need to promote and support vast improvements to digital connectivity across the Peninsula, both on and away from the transport network. Improving digital connectivity across residential areas should allow for more efficient working from home setups, reducing demand for commuter journeys at source. In addition, improved connectivity can support future network efficiencies in terms of journey planning, smart charging and would be integral to enabling Connected Autonomous Vehicles. Enhancing connectivity on-board public transport services would also be expected to improve journey quality, encouraging greater uptake in sustainable travel modes.

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[68] Peninsula Transport (2020) Economic Connectivity Study
[69] *ibid.*
[70] House of Commons Library (2022) Data dashboard: broadband coverage and speeds

Figure 2-24: Share of landmass that has a good 4G connection, 2018 (OFCOM)[71]

2.5 Peninsula Needs and Opportunities

The transport and mobility needs of the people and businesses in the peninsula region are at the heart of our *Vision*. At the start of this chapter, Figure 2-1 set out the key challenges for Peninsula Transport identified through previous work. This included issues of: Decarbonisation, Digitalisation, Urbanisation, Flexibility of Lifestyles, and Changing Work Habits. Throughout the Chapter, many of the key policy aspirations at both national, regional and local level have been outlined, underlying these challenges to ultimately inform the recommendations laid out in this report. It is important that the work of Peninsula Transport recognises these initial challenges to work out the key needs for different groups throughout the region, as well as the opportunities that exist to provide efficient and effective solutions. Figure 2-25**Error! Reference source not found.** summarises the key challenges, needs and opportunities for the Peninsula that will underline the remainder of this report, seeking to frame the recommended approaches to be taken forward to allow for meaningful transport decarbonisation.

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[71] OFCOM (2018) Communications Market Report

Figure 2-25: Examples of transport and mobility needs and opportunities in the Peninsula.

Challenges:

1. Decarbonisation: Reaching zero emissions in a timely and economically viable manner

2. Digitalisation: Ensuring that the Peninsula is not left behind in terms of technology and digital connectivity

3. Urbanisation: Ensuring that growth in urban areas is clean and sustainable

4. Flexible Lifestyles: Increasingly blurred boundaries between home and workplace changing travel behaviours

5. The World of Work: Expansion of key sectors across the Peninsula altering demand

Needs:

- Communities in large rural areas
- Connectivity and accessibility
- Reflecting changing work patterns
- Making the region more attractive to younger people
- Overcoming high deprivation levels in some places
- Social interaction
- Access to services dependent on improved transport or mobility
- Climate emergency declarations - carbon neutral and net zero ambition
- Active, sustainable and green travel
- Protecting & valuing the environment
- Reducing need and distance of travel
- Productivity and rebalancing the economy
- Supporting the Industrial Strategies
- Addressing seasonality impacts (e.g. visitor economy and busier transport networks)
- Employment and housing growth
- Access to the Peninsula and network resilience
- Overcoming the reliance on private cars
- Balancing local and strategic connections
- Social and economic recovery from COVID-19

Opportunities:

- Good community engagement and support
- Co-operation between stakeholders in Peninsula – one voice
- Wide range of industries
- Social equality
- Green industry
- Uniqueness of Peninsula region
- Exploiting technology
- Sustainable travel as response to environmental challenges
- Influence policy development
- Network planning and reliability
- Future travel solutions
- Mobility "hubs"
- Strategic connections within and to/from Peninsula
- Electrification of transport network
- Expand successful policies across region
- Changes to digital communication networks

3. Exploring Decarbonisation for the Peninsula

Decarbonisation remains a priority for all local authorities within the Peninsula Transport region. With a range of existing and emerging solutions and strategies possible for implementation, it is important to set out the most critical areas requiring change within the specific context of the peninsula. Through obtaining an understanding of the existing strengths and weaknesses of the region's existing sustainable transport, we can help to guide recommendations for specific policy and interventions.

This section provides an overview of the key themes for achieving decarbonisation across the peninsula region, the intervention prioritisation approach and a final shortlist of interventions by relevant strategy theme. As outlined within Sections 2.3 and 2.4, each of the key themes are interwoven with the central issues affecting transport across the region: social exclusion and transport poverty, and the challenge of improving rural connectivity. Appendix B presents greater technical details surrounding the development of themes, including relevant case studies from the Peninsula Transport area and further afield.

The challenges and potential interventions to support the carbon transition have been developed in collaboration with key stakeholders including the Heart of the South West Local Enterprise Partnership, Homes England, and Network Rail. This collaborative approach has been critical in developing realistic options which are grounded in clarity around the responsibilities and influence of Peninsula Transport as a STB. Two workshops were held to first understand the challenges, opportunities and priorities for decarbonisation and then subsequently develop a long-list of potential interventions.

A wide range of solutions have been considered, including both measures to reduce carbon emissions by transport modes at source, as well as behavioural change aiming to reduce demand for transport altogether. The intervention list was then refined by stakeholders and the technical advisors to form the shortlist of 36 priority interventions for the next five to ten years. Whilst potential interventions were identified for longer timescales, progress in the next 5 to 10 years was considered the greatest priority to maximise effectiveness in achieving the net zero targets by 2050.

May 2020	August 2021	December 2021 - January 2022	February 2022
•Challenges, opportunities and priorities workshop	•Interventions workshop	•Interventions prioritisation exercise	•Intervention short-listing and packaging

3.1 Themes for decarbonising transport in Peninsula

The DfT's 'Decarbonising Transport' Strategy (published in July 2021) outlines the National Government's continued commitment to widespread decarbonisation and lowering of emissions across the national transport network (Section 2.2). Commitments and actions set out within the report covered both decarbonisation of transport itself, alongside strategies for

multi-modal decarbonisation, with reference to the key enablers for this process. The key themes emerging from this national strategy are outlined in Figure 2-3. Reflecting the strategic areas outlined within this updated 'Decarbonising Transport' Plan, stakeholder inputs and the peninsula context, the following four key themes were developed to reflect decarbonisation considerations for Peninsula Transport (Figure 3-1).

Figure 3-1: The Five Peninsula Transport Carbon Transition Strategy themes
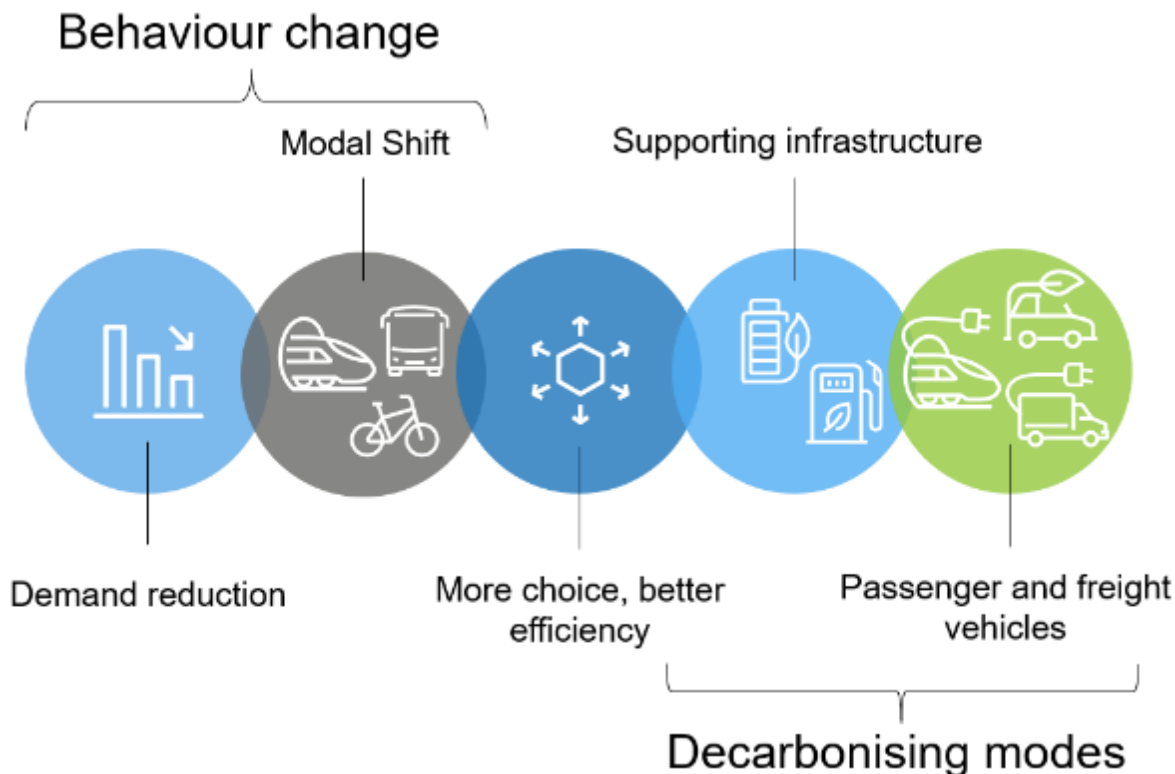
These five themes encompass a range of approaches to lowering the carbon emissions from transport across the region, from trip substitution to modal shift or use of alternative fuels within existing transport trips. Throughout the chapter, reference will be made to the unique geographical constraints present across the peninsula, and their impact upon determining choice of decarbonisation strategy. The highly contrasting rural to urban demography of the region must similarly be accounted for, with acknowledgement given to the differing requirements and opportunities present for both.

A key consideration throughout this strategy, and cutting across all four themes, is that the best methods of pushing for decarbonisation should present parallel opportunities to provide social and economic benefits for the peninsula. If policies are well-selected and designed, then simultaneous improvements can be targeted in public health, access and mobility for disadvantaged groups, work flexibility, access to green space, as well as wider transport improvements to congestion and road accident levels. As acknowledged within Section 2.3, of particular importance to the peninsula will be pursuing measures that target reducing social exclusion across the region, in particular for vulnerable groups and those facing transport poverty.

Behaviour Change: Demand Reduction

As acknowledged by the CCC (Section 2.2), reducing the demand for carbon-intensive activities is integral to the meeting of decarbonisation targets. Demand reduction could follow many forms from a transport perspective, including no longer needing to travel to access opportunities or services. The lowest carbon trip is arguably the trip not taken at all. If

sufficiently widespread, demand reduction across the peninsula also presents the opportunity to avoid or minimise the need for capacity increases and make best use of the existing networks.

The Covid-19 pandemic demonstrated the potential for significant demand reduction in the face of disruptive events. For example, the closure of offices during lockdown periods has encouraged a shift towards increased home or flexible working patterns, with resultant falls in commuter trip demand. For many businesses, this model has represented alternative ways of working, with evidence suggesting a continued trend away from traditional office-based working. Whilst the remaining themes focus upon how the carbon impacts of necessary transport trips can be minimised, the potential for demand reduction must be considered at the early stages of all activities.

Behaviour Change: Modal shift to Public Transport and active modes

Whilst measures to improve existing methods of travel are as important as transitionary solutions to achieve rapid emissions reductions, behavioural changes designed to alter the ways in which people travel will provide much of the long-term benefit to decarbonisation across the peninsula. As such, it is critical for local authorities within the region to find ways to shift journeys away from private to sustainable modes, as well as understanding how journeys can be avoided in the first place. Such "travel demand" reduction can provide a range of wider benefits to a region, with improvements in air quality, reduced congestion, and an improved ability to prevent transport related social exclusion. Encouraging the transition towards active travel,[72,73] for instance, can bring a range of health benefits to users, both mental and physical.

Reducing the demand to travel requires significant behavioural change; in order to be effective on a large scale, a culture traditionally focused around personal car use needs to be realigned to values based on shared mobility and active travel. It will be the role of local authorities to facilitate this realignment, setting it firmly within a comprehensive range of supporting infrastructure and policy. More needs to be done to reduce reliance on individually-owned private car travel. It is critical that a place-based approach is embedded to underlie actions, supported by low-carbon alternatives such as buses, shared mobility and active travel. This will realise a range of co-benefits, whilst also reducing emissions quickly at source.

More choice, better efficiency

The Covid-19 pandemic and after-effects has initiated several significant changes in transport behaviours across the country, altering both the movement of people and goods. The closure of offices during lockdown periods has encouraged a shift towards increased home or flexible working patterns, with resultant falls in commuter trip demand. For many businesses, this model has represented alternative ways of working, with evidence suggesting a continued trend away from traditional office-based working. Commute trips by all modes are lower than before the pandemic. Reduced travel opportunities has increased demand for online shopping, which have continued as restrictions have eased. For example, October 2021 were nearly 40% higher than the same period two years earlier[74], creating a greater number of delivery and logistical operations across the transport network.

The growing importance of digital platforms in influencing how and when people travel, as well as changing preferences for the types of transport chosen, present both new challenges as well as opportunities for a changing transport network. By facilitating demand for greater choice in how we travel, local authorities across the peninsula can seize the opportunity to

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[72] DfT (2021) 'Gear Change'
[73] Connected Places Catapult (2021) 'Accelerating the Active Travel Market'
[74] Statista (2022) Transaction volume of card payments, either debit card or credit card, conducted online in the United Kingdom (UK) from February 2018 to October 2021

promote and embed more sustainable and efficient methods, that can ultimately contribute towards decarbonisation.

Decarbonising Modes: Passengers and Freight Vehicles

Decarbonisation via behavioural and technological improvements represents a key priority across all of the authorities within the Peninsula Transport region. With the region's rurality presenting a number of challenges to the creation of an expansive and efficient public transport network, recognising the role of zero- and low-emissions vehicles as means to bridge these gaps will play a critical part in the creation of a decarbonised transport network. The Covid-19 pandemic has illustrated the scale of the challenge presented to the transport sector, still one of the most significant sources of carbon emissions across the country.

Pathways to decarbonisation across the Peninsula will need to consider methods to either reduce demand for transport, or reduce the carbon emitted by transport at source. Electrification is the most likely route, with hydrogen fuel cell vehicles playing an important role especially in heavier vehicles (see section **Error! Reference source not found.**). Enabling smart charging will be essential to allow an efficient and smooth transition to electrified transport.

Decarbonising Modes: Supporting infrastructure to deliver carbon reductions

Whilst the chosen pathway of measures to decarbonisation for each Local Authority in the Peninsula Transport STB may vary in approach, it is critical that each be supported by appropriate and requisite transport infrastructure. This is of particular importance to the peninsula – a region with unique geographical constraints, where a more specific and tailored set of decarbonisation approaches might be required to work alongside more conventional improvements to the existing transport network.

To encourage behavioural change and growth in zero-emission travel, authorities must ensure that such transitions can be facilitated by the network, for all residents regardless of their location within the region. If either behavioural change, encompassing a shift away from private vehicle use, or changes in technology such as the shift to EVs are to occur on a mass scale, both the road and rail networks, as well as subsidiary considerations such as fuel/charging infrastructure, must be in place at an early stage. Integrating decarbonisation measures and targets into existing and future programmes and infrastructure projects will support many of the goals identified by Peninsula Transport.

3.2 Intervention Short-listing

The second workshop in 2021 provided stakeholders with the opportunity to develop an intervention long-list within the priorities outlined previously. 83 interventions were identified through this process and carried forward into an option prioritisation process (Appendix B). The prioritisation process involved ten stakeholders from the constituent authorities and co-opted members (5) and the technical consultant representatives (5) scoring the interventions against their priority to meet local, regional, and national decarbonisation ambitions. Interventions were scored on a five-point scale, from 'very low priority' (1) to 'top priority' (5).

A wide range of scores were found for each of the interventions on the long-list, with a minimum average score of 1.9 (overhead power for trolley buses) countered by a top score of 4.8 (improve rail journey connectivity with other modes of transport). Overall, the vast majority (77 [90%]) of the long-list interventions short-list were found to be of relatively high priority, scoring at least three on average (Figure 3-2). Subsequently, the criteria for inclusion in the short-list was therefore considered to be the 36 (40%) schemes which scored, on average, within the highest band of four or above. Despite not being considered highest priority at this stage, the other items in the long-list (particularly averaging above three) could still be supported if opportunities arise on an ad-hoc basis.

Figure 3-2: Stakeholder Scoring Overview
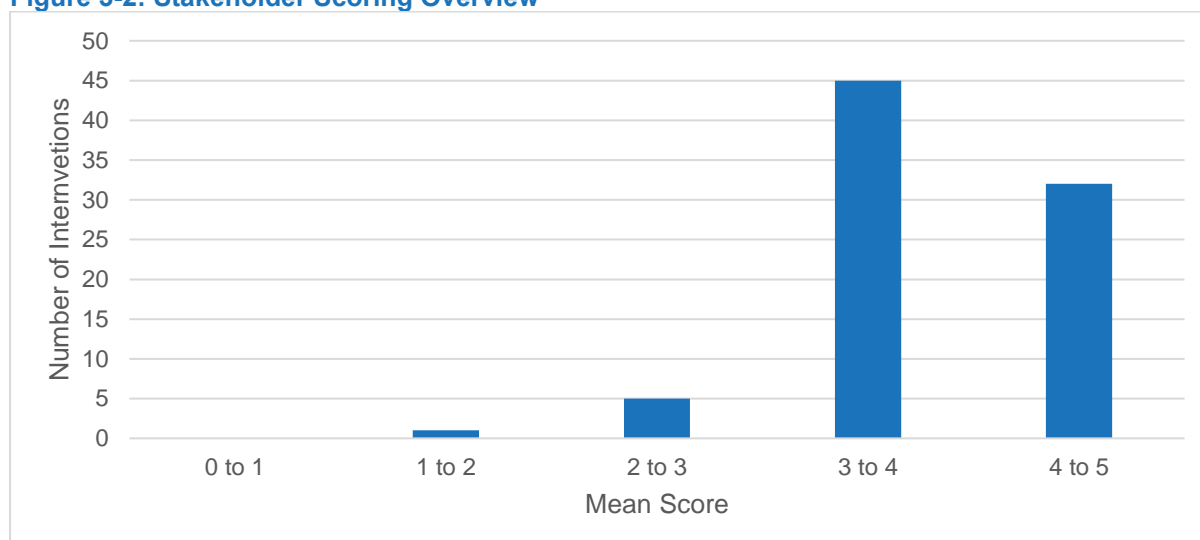
The top ten (and equal) interventions reflect the workshop priorities and strategy themes to make best use of existing major transport infrastructure where possible (Table 3-1), with priority also placed on measures which support lower carbon accessibility choices for people and goods. As such, some of the interventions encompass support for alternatives to travel, including virtual accessibility, or removing the need for vehicular travel through the integration of transport and spatial planning policies. However, the overarching emphasis of the intervention long-list is the need to:

- improve integration between lower carbon transport modes across the whole journey to encourage behaviour change; supported by

- the enabling of lower-carbon vehicular transport for those with more limited opportunities to change mobility behaviours.

Table 3-1: Top Ten (and equal) Stakeholder Interventions

Rank	Name	Mean Score
1	Improve rail journey connectivity with walking, cycling and other modes of transport	4.8
2=	Support and encourage modal shift of freight from road to more sustainable alternatives such as rail, cargo bike and inland waterways	4.7
2=	Spatial planning policy - everyday needs should be accessible within a 20-minute walk, cycle or public transport trip	4.7
2=	Improve integration between public transport services and as well as active modes for more seamless multi-modal journeys	4.7
5=	Improving alternatives to domestic flights (ground travel > air travel)	4.6
5=	Ensuring people can access broadband internet at home	4.6
5=	Knowledge sharing	4.6
8=	Market-led development of a charging infrastructure network	4.5
8=	Freight - Electrification of freight/delivery vehicles	4.5
8=	Implement low-emission zones/ road user charges and create car-free city centres/zones	4.5

3.3 Short-listed Interventions

The 36 highest scoring interventions have been packaged based upon their alignment to the four Carbon Transition Strategy themes (Figure 3-1), noting that some interventions support multiple themes. Whilst the individual strategies for decarbonisation for each local authority will reflect their differing contexts and needs, good levels of collaboration and combined authority planning will be an important prerequisite for overall success in the region. Six intervention 'types' have been presented across the themes to illustrate the potential co-dependencies and role of each intervention in supporting decarbonisation (Figure 3-3). Alignment of the interventions to DfT's ambitions, as outlined in the Transport Decarbonisation Plan, can be found in **Error! Reference source not found.**.

Figure 3-3: Carbon Transition Strategy Theme Supporting Types

Alternatives to Travel — Reducing the need for people to physically access opportunities and key services.

Aspirational Active Travel — Supporting a culture where those who can travel by active modes feel confident and empowered to do so.

Creating Better Public Places — Cities, towns and villages where people and business can thrive.

Decarbonisation Lite — The continuation of historic mobility trends, albeit with reduced carbon impacts at the point of use.

Policy Enabler — Provides the conditions for other activities to occur and be maximised.

Seamless Public Transport — The creation of public transport network where attractive door-to-door journeys are available for the majority.

Theme 1: Mode Shift to Public Transport and Active Modes

Twelve interventions have been grouped within the 'mode shift to public transport and active modes' theme (

Table 3-2). The interventions have an overarching emphasis on supporting modal shift away from private vehicles by a mixture of incentives and disincentives, through the increased prioritisation and integration of lower carbon modes alongside measures aimed at financially capturing some of the externalities of car reliance (see Section **Error! Reference source not found.**). As the responsibility for implementing many of the actions lies beyond the Peninsula Transport, the STB will have an important co-ordinating and enabling role in stimulating the delivery of the interventions.

Table 3-2: 'Mode Shift to Public Transport and Active Modes' Priority Interventions

Intervention	Type	Timescales
Set targets for reallocating road space to cycling, walking and green space each year		2022-2024
Improved bike parking and cycling facilities		2022-2024
Shared mobility schemes e.g. bike and e-scooters		2022-2024
Improve integration between public transport services and as well as active modes for more seamless multi-modal journeys		2022-2024
7 days a week public transport connectivity		2022-2024
Parking management (removal, user charges) in town / city centres and leisure destinations		2022-2024
Develop integrated network of cycle lanes and infrastructure to LTN 1/20: covering rural, semi-urban and urban settings		2022-2029
Low traffic neighbourhoods		2022-2029
Increase reliability and frequency of services e.g. by investing in bus priority measures		2022-2029
Make public transport more accessible and affordable		2022-2029
Implement low-emission zones / road user charges and create car-free city centres / zones		2022-2029
Develop Journey planning, mobility-as-service (Maas) platforms and mobility credit systems to link public transport journey stages and increase accessibility		2022-2029

All the interventions within Theme 1 involve short-term actions to support early action towards meeting decarbonisation goals. The nature of nearly half of the interventions means that implementation would be expected to continue in the medium-term (up to 2030) as a minimum. For example, the development of cycle lanes and infrastructure would require early work to further develop and coordinate network plans across the peninsula, potentially utilising the recent Local Cycling and Walking Infrastructure Plans (LCWIPs), in advance of scheme funding and implementation across the region over a number of years.

Theme 2: Decarbonising Transport Modes

Ten interventions have been grouped within the 'decarbonising transport modes' theme (Table 3-3). The interventions focus upon supporting the movement away from fossil fuel propulsion for the movement of people and goods, including the potential for Peninsula Transport to support early research, development and testing of cutting-edge technology. The STB will have much greater involvement in the development and delivery of actions within this theme, particularly alongside Local Enterprise Partnerships, other STBs and central Government.

Table 3-3: 'Decarbonising Transport Modes' Priority Interventions

Intervention	Type	Timescales
Invest in zero emission HGV technology and trials		2022-2024
Encouraging and investing in local innovation projects		2022-2024
Bus - electric bus fleet investment and adoption		2022-2029
Develop electric bus charging infrastructure network/strategy		2022-2029
Encourage transition from conventional ICE to electric (Cars)		2022-2029
Promote fleet transformation across business community and public service vehicles		2022-2029
Freight - Electrification of freight/delivery vehicles		2022-2029
Support and encourage modal shift of freight from road to more sustainable alternatives such as rail, cargo bike and inland waterways		2022-2029
Knowledge sharing		2022-2029
Rail - Electrification of traction and infrastructure (Shared with WP09)		2025-2029

Nearly all the interventions within Theme 2 involve short-term actions to support early action towards meeting decarbonisation goals. Most of the interventions would be expected to continue in the medium-term (up to 2030) as a minimum, given the scale of the challenge in developing and transitioning to alternative propulsion methods. For example, the current private vehicle market composition is dominated by petrol and diesel vehicles (see Section 2.4), with any transition to lower tailpipe emission vehicles strongly linked to availability of supporting infrastructure, consumer needs, and behaviours, including vehicle retention lengths.

Theme 3: More Choice, Better Efficiency

Eight interventions have been grouped within the 'More Choice, Better Efficiency' theme (

Table 3-4). The interventions have an overarching emphasis on proactively supporting the provision of greater travel choices, many of which strongly support the modal shift to public transport (Theme 1). Peninsula Transport has a critical role in co-ordinating many of the interventions to enable consistency across the local authorities, particularly when supporting spatial planning policies and region-wide ticketing ambitions.

Table 3-4: 'More Choice, Better Efficiency' Priority Interventions

Intervention	Type	Timescales
Improve rail journey connectivity with walking, cycling and other modes of transport		2022-2024
Car sharing incl. car clubs and car sharing apps		2022-2024
Increase reliability, frequency and integration of services		2022-2024
Make rail more accessible, affordable and easy to use		2022-2029
Modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys		2022-2029
Improving alternatives to domestic flights (ground travel > air travel)		2022-2029
Spatial planning policy - everyday needs should be accessible within a 20-minute walk, cycle or public transport trip		2022-2029
Increase capacity on the rail network to meet growing passenger and freight demand and support significant shifts from road to rail		2025-2029

Nearly all the interventions within Theme 3 involve short-term actions to support early action towards meeting decarbonisation goals. Most of the interventions would be expected to continue in the medium-term (up to 2030) as a minimum, due to the investment period nature of rail and planning policy cycles. For example, renewal of Local Plans to fully incorporate the 20-minute sustainable trip principles typically takes several years to progress from site allocation to adoption by the Secretary of State, even before site delivery begins.

Theme 4: Supporting Infrastructure to Deliver Carbon Reductions

Six interventions have been grouped within the 'Supporting Infrastructure to Deliver Carbon Reductions' theme (Table 3-5), reflecting the priority to deliver decarbonisation by making best use of existing major infrastructure where possible. The interventions place emphasis on enabling alternatives to travel through digital connectivity improvements, whilst supporting the transition to electric vehicles. The STB has less direct influence on the interventions but will still have an important role in working alongside stakeholders to identify potential priority areas.

Table 3-5: 'Supporting Infrastructure to Deliver Carbon Reductions' Priority Interventions

Intervention	Type	Timescales
Ensuring people can access fast and reliable broadband internet		2022-2024
Improving 4G mobile coverage		2022-2024
Flexible mobile / digital provision of a range of local council, health and other services		2022-2029
Home charging - planning requirement		2022-2029

Intervention	Type	Timescales
Market-led development of a charging infrastructure network to meet drivers needs		2022-2029
Readying the energy system - demand capacity		2022-2029

All the interventions within Theme 4 involve short-term actions to support early action towards meeting decarbonisation goals. The nature of nearly half of the interventions means that implementation would be expected to continue in the medium-term (up to 2030) as a minimum. For example, the development of electric vehicle charging infrastructure will need to be incorporated into planning policies (see Theme 3), with market-led wider networks continuing to expand as demand changes.

Appendix A Policy Overview

National

This section provides an overview of policies and strategies that have been developed at a national (England or UK) level.

Climate Change Act 2008 (2050 Target Amendment) Order 2019

The 2019 amendment to the Climate Change Act 2008 (2019) commits the UK government by law to reducing greenhouse gas emissions by at least 100% of 1990 levels by 2050. The 2008 Act had set the target at 80%. This 2019 amended target represents the UK 's Nationally Defined Contribution (NDC) to the 2015 Paris Agreement.

This reduction of 100% by 2050 is otherwise known as a 'net zero' target because some emissions can remain if they are offset by removal from the atmosphere and/or by trading in carbon units.

The Paris Agreement was the first legally binding global climate deal involving 195 countries under the United Nations Framework Convention on Climate change. Under the agreement, Governments agreed to limit global average temperature increase to below 2°c above pre-industrial levels and to aim to limit the increase to 1.5°c. At these levels it was hoped that we might significantly reduce the risks and impacts of climate change.

DfT Road Towards Zero (2018)

The Road to Zero Strategy outlines how the government will support the transition to zero emission road transport and reduce emissions from conventional vehicles. The mission is to put the UK at the forefront of the design and manufacturing of zero emission vehicles, and for all new cars and vans to be effectively zero emission by 2040. The long-term ambition is for almost every car and van to be zero emission by 2050. The government want to see at least 505, and as many as 70%, of new car sales and up to 40% of new van sales being ultra-low emission by 2030.

The policy at a glance:

- Reduces emissions from the vehicles already on the road

- Drives uptake of the cleanest new vehicles

- Reduces emissions from heavy goods vehicles (HGV's) and road freight

- Puts the UK at the forefront of the design and manufacturing of zero emission vehicles

- Supports the development of one of the best electric vehicle infrastructure networks in the world

- Supports local action

DfT Decarbonising Transport (2021)

This document prepared by the Department for Transport notes out the Government's ambitious plan to decarbonise transport to achieve net zero emissions from all modes by 2050. This document is intended to create discussion and engage with and among stakeholders and groups, with outcomes and feedback informing the final plan due to be issued in Autumn 2020.

As part of the Transport Decarbonisation Plan, six strategic priorities have been identified below.

Accelerating modal shift to public and active transport

- Help make public transport and active travel the natural first choice for daily activities
- Support fewer car trips through a coherent, convenient and cost-effective public network; and explore how we might use cars differently in future
- Encourage cycling and walking for short journeys
- Explore how to best support the behaviour change required

Decarbonisation of road vehicles

- Support the transition to zero emission road vehicles through:
  - regulatory framework
  - strong consumer base
  - market conditions
  - vehicle supply
  - refuelling and recharging infrastructure
  - energy system readiness
- Maximise benefits through investment in innovative technology development, and development of sustainable supply chains

Decarbonising how we get our goods

- Consider future demand and changing consumer behaviour for goods
- Transform 'last-mile' deliveries – developing an integrated, clean and sustainable delivery system
- Optimise logistics efficiency and explore innovative digitally-enabled solutions, data sharing and collaborative platforms

Place-based solutions

- Consider where, how and why emissions occur in specific locations
- Acknowledge a single solution will not be appropriate for every location
- Address emissions at a local level through local management of transport solutions
- Target support for local areas, considering regional diversity and different solutions

UK as a hub for green transport technology and innovation

- Utilise the UK's world-leading scientists, business leaders and innovators to position the UK as an internationally recognised leader of environmentally sustainable technology and innovation in transport
- Build on expertise in the UK for technology developments and capitalise on near market quick wins

Reducing carbon in a global economy

- Lead international efforts in transport emissions reduction
- Recognise aviation and maritime are international by nature and require international solutions
- Harness the UK as a global centre of expertise, driving low carbon innovation and global leadership, boosting the UK economy

Reducing carbon in a global economy is UK priority. Transport is a crucial element of our international economy, the DfT decarbonisation strategy aims to harness the UK to steer low carbon innovation that helps a global transition of low carbon and will boost the UK economy, leading the change internationally.

Zero Emission Vehicle Plans and Strategies (2021 and 2022)

Recent national ambitions for decarbonisation of road transport reflected in the 2021 'Transitioning to zero emission cars and vans: 2035 delivery plan'[75] and 2022 'Taking charge: the electric vehicle infrastructure strategy'[76].

The 2021 delivery plan emphasised the commitment to phasing out the sale of new petrol and diesel cars and vans by 2030, with all new cars and vans fully zero emissions at the tailpipe from 2035. Emphasis is placed on the potential co-benefits of commitments and relationship to other flagship ambitions, including 'Levelling-Up', 'Powering our Net Zero Future' and the 'Ten Point Plan for a Green Industrial Revolution'. Key commitments within the plan include:

- aim to introduce a new road vehicle CO_2 emissions regulatory regime in 2024
- invest £582 million for the plug-in grants to reduce zero emission vehicle sticker price until at least 2022/23
- Zero emission cars receiving favourable company car tax rates until at least March 2025
- introduction of regulations for infrastructure provision in new homes

The 2022 electric vehicle infrastructure strategy is presented as one of the key commitments in the 2021 plan. The strategy presents an overarching future vision of "charging infrastructure that works for everyone, wherever they live, work and travel". Seven key objectives are identified to address a wide variety of challenges potentially inhibiting EV uptake, including slow deployment of public on-street charging, cost of connecting new chargepoints and the shortcomings of the public charging network 'letting people down').

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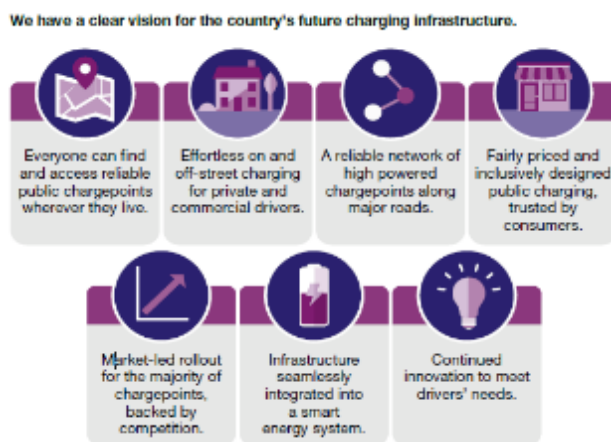
[75] DfT (2021) Transitioning to zero emission cars and vans: 2035 delivery plan
[76] DfT (2022) Taking charge: the electric vehicle infrastructure strategy

Net Zero Strategy: Build Back Greener (2021)

Policy paper outlining how central Government plan to meet their mission of reaching net zero, whilst leveraging opportunities to provide jobs and prosperity. Outlines that total transport emissions would need to drop by 76%-86% by 2050, relative to 2019 levels. Identifies that domestic emissions would need to fall by 56-76% by 2035 if wider targets are to be met.

HM Government Clean Growth Strategy (2018)

Clean growth means growing our national income while cutting greenhouse gas emissions. Achieving clean growth, while ensuring an affordable energy supply for businesses and consumers, is at the heart of the UK's Industrial Strategy.

- Accelerating Clean Growth

- Improving Business and Industry Efficiency – 25% of UK Emissions

- Improving Our Homes – 13% of UK Emissions

- Accelerating the Shift to Low Carbon Transport – 24% of UK Emissions

- Delivering Clean, Smart, Flexible Power – 21% of UK Emissions

- Enhancing the Benefits and Value of Our Natural Resources – 15% of UK Emissions

- Leading in the Public Sector – 2% of UK Emissions

- Government Leadership in Driving Clean Growth

In the context of the UK's legal requirements under the Climate Change Act, the approach to reducing emissions has two guiding objectives:

- To meet our domestic commitments at the lowest possible net cost to UK taxpayers, consumers and businesses.

- To maximise the social and economic benefits for the UK from this transition.

Committee for Climate Change's 6th Carbon Budget (2020)

The Climate Change Committee recommend that the UK sets a Sixth Carbon Budget to require a reduction in UK greenhouse gas emissions of 78% by 2035 relative to 1990, a 63% reduction from 2019. The Sixth Carbon Budget provides ministers with advice on the volume of greenhouse gases that the UK can emit during the period 2033-2037.

The recommended budget would achieve well over half of the required emissions reduction to 2050 in the next 15 years. This early action is vital to support the required increase in global ambition.

The Sixth Carbon Budget can be met through four key steps:

- **Take up of low-carbon solutions.** People and businesses will choose to adopt low-carbon solutions, as high carbon options are progressively phased out. By the early 2030s all new cars and vans and all boiler replacements in homes and other buildings are low-carbon – largely electric. By 2040 all new trucks are low-carbon. UK industry shifts to using renewable electricity or hydrogen instead of fossil fuels, or captures its carbon emissions, storing them safely under the sea.

- **Expansion of low-carbon energy supplies**. UK electricity production is zero carbon by 2035. Offshore wind becomes the backbone of the whole UK energy system, growing from the Prime Minister's promised 40GW in 2030 to 100GW or more by 2050. New uses for this clean electricity are found in transport, heating and industry, pushing up electricity demand by a half over the next 15 years, and doubling or even trebling demand by 2050. Low-carbon hydrogen scales-up to be almost as large, in 2050, as electricity production is today. Hydrogen is used as a shipping and transport fuel and in industry, and potentially in some buildings, as a replacement for natural gas for heating.

- **Reducing demand for carbon-intensive activities.** The UK wastes fewer resources and reduces its reliance on high-carbon goods. Buildings lose less energy through a national programme to improve insulation across the UK. Diets change, reducing our consumption of high-carbon meat and dairy products by 20% by 2030, with further reductions in later years. There are fewer car miles travelled and demand for flights grows more slowly. These changes bring striking positive benefits for health and well-being.

- **Land and greenhouse gas removals.** There is a transformation in agriculture and the use of farmland while maintaining the same levels of food per head produced today. By 2035, 460,000 hectares of new mixed woodland are planted to remove CO2 and deliver wider environmental benefits. 260,000 hectares of farmland shifts to producing energy crops. Woodland rises from 13% of UK land today to 15% by 2035 and 18% by 2050. Peatlands are widely restored and managed sustainably.

Catapult Innovating to Net Zero (2020)

The Catapult Innovating Net Zero identifies the technologies, products and services which are most important to meeting Net Zero. For the UK Parliament to deliver Net Zero levels of investment, infrastructure and innovation this report recommends what needs to happen.

One of the key messages the report outlines is that the transport sector requires the greatest increase in ambition from previous 80% pathways and must be fundamentally transformed by 2050. For Net Zero, road transport requires the virtual elimination of fossil fuel consumption. Electrification is the most likely route, with hydrogen fuel cell vehicles playing an important role especially in heavier vehicles. Enabling smart charging will be essential to allow an efficient and smooth transition to electrified transport.

The Carbon Plan - Delivering our low carbon future (2011)

This plan sets out how the UK will achieve decarbonisation within the framework of our energy policy: to make the transition to a low carbon economy while maintaining energy security, and minimising costs to consumers, particularly those in poorer households.

The vision for 2050 is to have transformed buildings, transport and industry, the way in which we generation electricity and our agriculture and forestry.

A step-change is needed to move away from fossil fuels and towards ultra-low carbon alternatives such as battery electric or fuel cell vehicles. New technologies will have implications for energy security, with increased demands likely to be placed on the grid by ultra-low emission vehicles (such as electric cars), as well as presenting new opportunities for vehicles to help balance variations in demand for electricity over time and reducing our exposure to volatile oil prices.

National Highways: Net Zero Highways (2021)

Published in July 2021, National Highway's 'net zero highways' plan outlines *"an ambitious programme putting roads at the heart of Britain's net zero future"* up to 2050. The plan presents a significant number of commitments to cut emissions during this period to meet corporate, maintenance and construction, and road user net zero targets.

CORPORATE EMISSIONS
Net zero by 2030

Net zero for our own operations by 2030
This area covers energy used to light and power our network, travel by our traffic officers, and the energy used in our offices and other travel. We also include the carbon locked up in trees and plants on our motorway verges in this target.

MAINTENANCE & CONSTRUCTION EMISSIONS
Net zero by 2040

Net zero for our maintenance and construction activities by 2040
This target covers the greenhouse gases emitted in making the materials we use to keep our network in good condition. This includes cement, steel and asphalt. We also include the transport of materials to where we use them and emissions from construction on our sites.

ROAD USER EMISSIONS
Net zero by 2050

Net zero carbon travel on our roads by 2050
The largest source of emissions comes from the vehicles driving on our network. Government has set its trajectory for net zero road transport by 2050. This is a rapid transition with up to a 55% reduction in emissions by 2030 and up to a 90% reduction in emissions by 2040. Our plan will enable this transition by providing the infrastructure needed for zero carbon motoring on the Strategic Road Network.

The indicative roadmap contained within the plan introduces a number of immediate actions which National highways are to progress in the near future, including the launch of a zero carbon materials innovation programme, re-moding trials and providing support to 'project rapid' at Motorway Service Areas. Specifically from a road user perspective, National highways have committed to undertaking the following activities over the next 5-6 years:

- Present a report to government on global HGV technology trials and their proposals for UK trials in 2022

- Publish a blueprint for EV charging services and energy storage by 2023

- Publish a plan to improve public transport on the SRN in 2023 and implement through Road Period 3

- Report in 2023 how empty lorry movements on the SRN can be reduced

- Develop a preferred plan for HGV charging by 2028, for Road Period 4 implementation

- Integrate net zero into our statutory consultee responses to planning applications from 2022

- Work with the sub-national transport bodies to agree priorities and actions to support delivery of our net zero strategies by 2022

- Implement a comprehensive plan to reduce, remode and retime journeys in the third road period

- Work alongside Network Rail and HS2 to increase freight and rail passengers on rail as part of the 18 Route Strategies

Regional

This section provides an overview of policies and strategies that have been developed at a region level. Region geography covers the Peninsula Transport Sub-National Transport Body (Cornwall, Devon, Plymouth, Somerset and Torbay Councils).

Peninsula Transport Shadow Sub-National Transport Body Regional Evidence Base and Economic Connectivity Studies

Peninsula Transport is committed to making the most of opportunities provided by the rapid changes taking place in the transport industry both in terms of improving connections and productivity for the region, but also in terms of reducing transport emissions towards zero.

The first part of Peninsula Transport's Long Term Strategy, the Economic Connectivity Study, is asking a series of challenging questions to help understand the required direction of travel and pace of change to deliver clean growth in the Peninsula. Figure 3-4 shows the scenarios the study focuses on.

Figure 3-4: Peninsula Transport study focuses, Source: Peninsula Transport
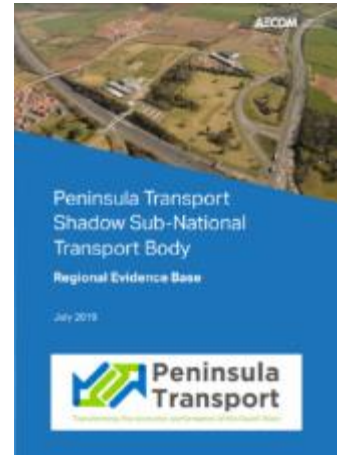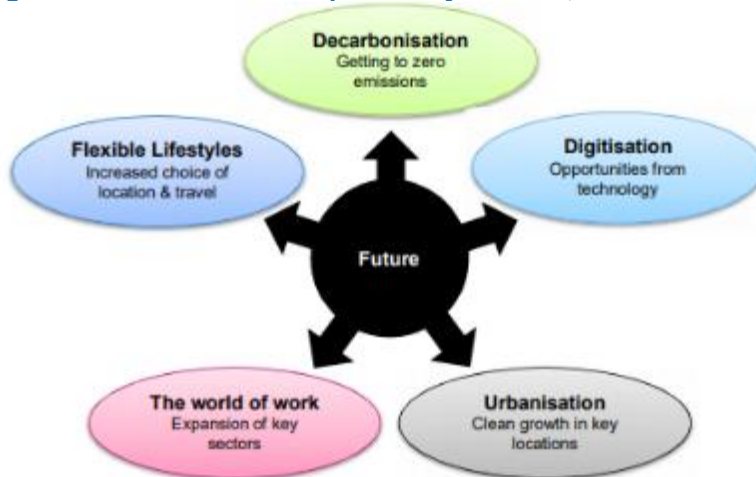
The connectivity study represents the first step in the development of a Peninsula Strategic Transport Strategy. It examines the region's economic geography and the role of transport in enabling intraregional, inter-regional and international connections. Analytical work has been directed in two ways:

- Using existing data to examine the demographics, transport connectivity and economics of the Peninsula; and

- Considering the future for transport in the Peninsula thematically by extrapolating some key technological and social trends through to a 2050 horizon.

Peninsula Transport recognises the critical and urgent challenges posed by rising levels of CO_2 in the atmosphere, and all the Peninsula authorities have declared Climate Emergencies.

Peninsula Transport has made transitioning to a low carbon transport system the central tenet of its transport strategy development and is investing in understanding the decarbonisation challenge across the surface transport network.
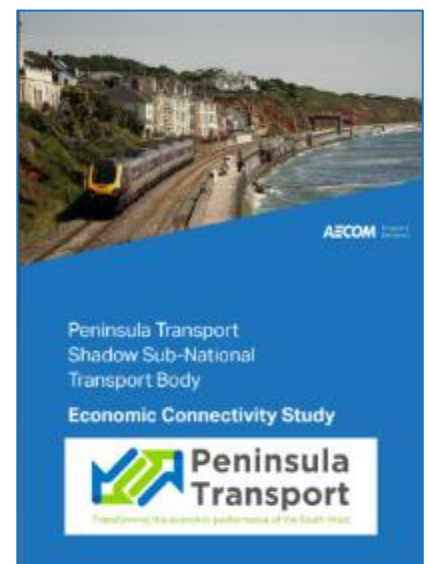
The Interim Devon carbon plan summary

The Interim Devon Carbon Plan defines 'Net-Zero' as "the total of active removals from the atmosphere offsets any remaining emissions from the rest of the economy". The plan lays out a roadmap for Devon to achieve net-zero carbon by 2050 at the latest, with an interim target of 50% reduction by 2030 below 2010 levels.

Eight objectives have been developed that demonstrates what the plan needs to achieve by 2050 at the latest. These are:

- Fossil fuels phased out as an energy source

- Minimise energy consumption

- Engaged communities acting for resilience and a net-zero carbon Devon

- Carbon captured and stored from the burning of fuels

- Minimise fugitive greenhouse gas emissions

- Resilient local economies with access to green finance

- A circular use of resources

- Maximise carbon storage in marine and terrestrial environments
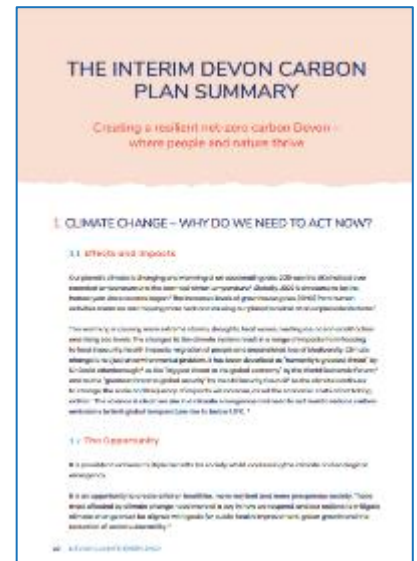
Plymouth & southwest Devon joint local plan 2014-2034

Plymouth and South West Devon (P&SWD) have developed a joint Local Plan. Reference to this area's Local Plan should be considered, as Plymouth has strong links to South East Cornwall and people in communities commute to Plymouth for work. Some specific policies that have links to WP06 are detailed in the table below **Error! Reference source not found.**.

Plymouth & South West Local Plan, selected policies

Policy Ref	Policy Name	Links to WP06
Policy SPT1	Delivering sustainable development	Reference to supporting a sustainable economy where: Opportunities for business growth are both encouraged and supported. Environmentally conscious business development takes place. Strategically important economic assets are protected for the purpose of economic activity. A low carbon economy is promoted.
Strategic Objective SO10	Maintaining a naturally beautiful and thriving countryside	Reference to contributing to carbon reduction measures by reducing the need to travel and responding positively to the challenges of climate change, reducing carbon emissions and creating more resilient communities.

Councils

This section provides an overview of policies and strategies that have been developed at a local level.

Somerset's Climate Emergency Strategy (2020)

'Towards a Climate Resilient Somerset' - is Somerset's response to the Climate Emergency declarations. Each of the 5 Somerset Councils has passed resolutions declaring or recognising a Climate Emergency. Each declaration aspires to:

- A Carbon Neutral Somerset by 2030

- Building our resilience for, or adapting to, the impacts of a changing climate.

The Climate Emergency Strategy for Somerset built around these 3 Goals:

- To decarbonise Local Authorities, the wider public sector estates and reduce our carbon footprint

- To work towards making Somerset a Carbon Neutral County by 2030

- To have a Somerset which is prepared for, and resilient to, the impacts of Climate Change

A primary objective of this Strategy is to identify clear pathways by which carbon emissions from all sectors within and beyond Somerset can be directly reduced, avoided or mitigated against.

Devon County Council's Climate Change Strategy (2018)

This strategy is an update of DCC's ambition to demonstrate leadership on mitigating greenhouse gas emissions and improving resilience to a changing climate to encourage others across Devon to continue their efforts. It identifies priorities for the authority to focus its resources on, based on analysis by the UK Committee on Climate Change and the Centre for Energy and Environment at Exeter University.

There have been 11 objectives identified. Key objectives relating to WP06 are listed below:

- Objective 1: DCC will ensure that active plans that contribute to reducing DCC's own greenhouse gas emissions by 50% by 2030 in comparison to 2012/13 levels are being delivered through the governance arrangements for the Environmental Policy

- Objective 2: DCC will contribute to the reduction of GHG emissions from buildings by working in partnership to plan for new low-carbon development and to retrofit energy efficiency and low-carbon heating measures.

- Objective 11: DCC will consider the effects of climate change on policy, decisions, projects and infrastructure.
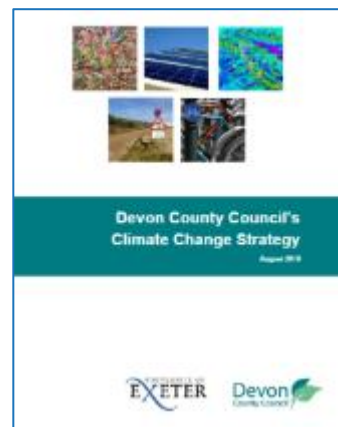
Connecting Cornwall: 2030 moving towards a green peninsula (2011)

This Local Transport Plan from Cornwall Council covers the period 2011-2030. The vision within the document is "Transport in Cornwall will be excellent. Our transport system will connect people, communities, businesses and services on a way that is reliable, efficient, safe, inclusive and enjoyable". Six goals have been identified, each with two or three supporting objectives:

- Tackling climate change.
  Three objectives around low carbon technologies, reducing need for travel, living locally and adapting and improving the transport network to be resilient to climate change.

- Supporting economic prosperity.
  Three objectives around improving connectivity of Cornwall globally, resilient and reliable transport network (for goods and people), supporting town centres and rural communities.

- Respecting and enhancing the environment.
  Three objectives around opportunities to protect and enhance the environment, minimising waster and sustainable access to Cornwall's environment.

- Encouraging healthy active lifestyles.
  Two objectives around improving health of communities through active travel and increase awareness of active travel health benefits.

- Supporting community safety and individual wellbeing.
  Three objectives around improving road safety, public confidence in a safer transport network and reducing air quality and noise impacts.

- Supporting equality of opportunity
  Three objectives around access to employment, healthcare, leisure and public transport and encouraging community participation in shaping and delivering transport services.
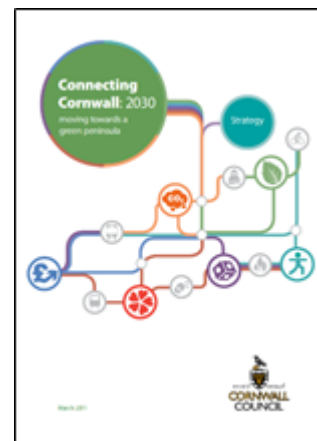
Connecting Cornwall is supported by implementations plans, which cover three- or four-years periods throughout the life of the strategy (2011-2015 and 2015-19). These enable the overarching strategy to review the progress to date, opportunities that remain or have emerged and react to new challenges that were not originally foreseen. These implementation plans also set out the ambitions for scheme delivery beyond the period of the individual plan. The 2015-19 Implementation Plan identified the Newquay Growth Area NSR 1 Growth Deal 1 (cost £2,930,000).

In addition, the Implementation Plan has developed an approach for prioritising schemes that supports various other acts, plans and strategies including the Cornwall Council Highway Authority statutory obligations (under the Transport Act 2008) which covers:

- Maintaining public highway

- A 'duty of care' to the public

- Managing the movement of traffic on the road network

- Home-to-school/college transport

- Meeting social need for public transport, including publicity of all public transport

Clean Air for Cornwall Strategy (2019)

This strategy brings together local and national planning policy and legislation and incorporates the action plans for Cornwall's Air Quality Management Areas (AQMAs). The strategy has five objectives:

- "Raise awareness of air quality problems in Cornwall and provide an integrated approach to improvement";

- "Reduce pollution levels in Air Quality management Areas to below objective levels and improve air quality in Cornwall as a whole";

- "Raise awareness of the links between health and travel in respect of air quality and personal fitness";

- "Provide and approach for reducing emissions of fine particulates (PM2.5) to improve public health": and

- Improve Cornwall Council's emissions performance and provide strong leadership on environmental stability, ensure all Council activity takes into account its effect on air pollution"

Cornwall is an area popular with tourists and is home to over 530,000 residents. The figure below outlines the traffic and pollution challenges in Cornwall, in relation to road traffic.

Road traffic pollution and traffic in Cornwall, Source: Cornwall Council
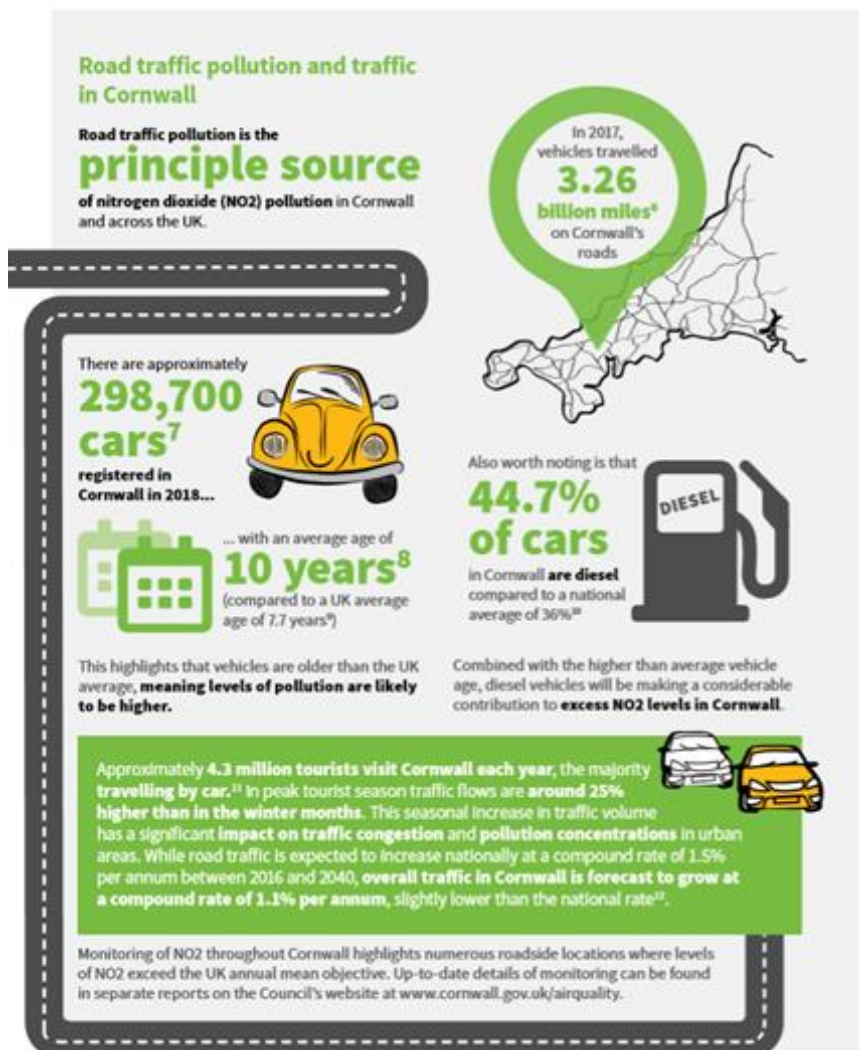
Cornwall Local Plan (2016)

Cornwall's Local plan (adopted in 2016) provides a planning policy framework for the county, it sets out to bridge inequality gaps and make a positive difference to people's lives. The Local plan intends to make better places where people can work, live and play, whilst facilitating growth in jobs, new homes, schools and infrastructure. The Local Plan also provides an opportunity to protect and enhance the environment. Cornwall Council see "good planning is central to delivering our strategy and building healthy and sustainable communities". The objectives are based on those of the Council's Future Cornwall document.
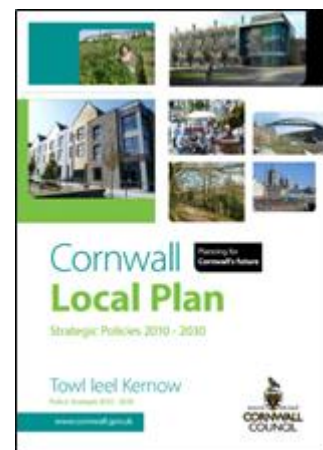
Cornwall has been divided into 17 Community Network Areas (CNA), CNA PP12 covers Camelford. It outlines the objectives to be addressed in planning for the Camelford Community Network. The objectives most relevant to the A39 Camelford scheme include:

- Objective 2- Congestion Address congestion within Camelford town centre.

- Objective 4- Community Facilities and Services: Strengthen Camelford's role as a local centre by supporting and enhancing the town's community facilities and services, and sustain the community infrastructure of surrounding villages, including through co-location of facilities

Climate Emergency Development Plan Document (2020)

Cornwall Council undertook a consultation exercise on their Climate Emergency Development Plan Document (DPD) (Draft Policies consultation, dated August 2020). The document presents the policies, which are emerging, to articulate the requirements of this DPD.

The DPD forms part of the Council's response to the climate emergency and has strong links to Cornwall's Climate Change Action Plan. In developing the DPD there are six guiding themes, Cornwall Council will:

- "Create policy that helps to develop the right things in the right location, supporting sustainable practice, environmental growth and carbon reduction";

- "Develop approaches that recognise the current situation in terms of finances, technology and skills (including viability), but be forward looking and as adaptable as we can be, to get to where we need to be faster, particularly in terms of investments and practice";

- "Be clear what we can and can't do – and what we need from Government and our partners both inside and outside of the Council to achieve the right change";

- "Use the process of developing this plan to understand where we need to be now and what needs to inform the development of the next local plan";

- "Balancing interventions. Our plans must reflect all three types of intervention noted above and ensure we carefully evaluate the balance of what they deliver and their impact against the relative return on investment in both the short and long term"; and

- "We must consider carefully the balance between investing in incremental changes to the way we live now through mitigation measures and those needed to help Cornwall to address climate change. Some changes may be seen initially as radical and could feel a little uncomfortable but will rapidly come to feel normal."

Plymouth climate emergency action plan (2019)

The Plymouth climate emergency action plan sets out how Plymouth City Council intend to respond to the climate emergency and explains why the 2030 target is imperative to tackling climate change. The Action Plan assesses Plymouth's current carbon emissions and outlines the challenges associated with this ambitious 2030 target.

This climate emergency response needs to deliver three key objectives:

- Facilitate a city-wide conversation
- Inspire rapid local action
- Create bottom up pressure on government

The action plan is focused on the six key themes below.
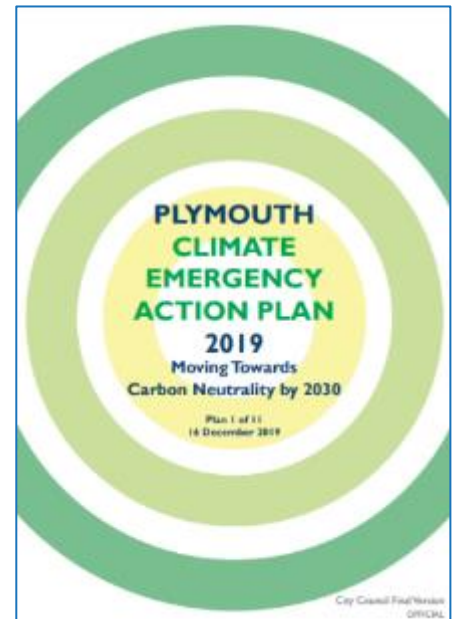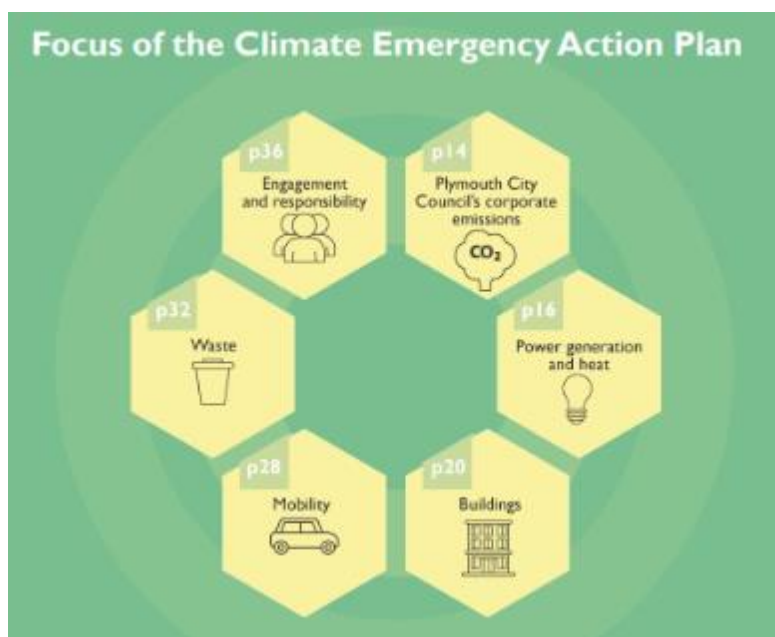
The Plymouth Plan 2014-2034

The Plymouth Plan is a ground-breaking plan which looks ahead to 2034. It sets a shared direction of travel for the long term future of the city bringing together a number of strategic planning processes into one place.

The plan is based around ley themes:

- A Green City

- A Welcoming City

Plymouth's vision is to be one of Europe's most vibrant waterfront cities where an outstanding quality of life is enjoyed by everyone.

Some specific policies that have links to WP06 are detailed in the following table.

Policy Ref	Policy Name	Links to WP06
Policy GRO7	Reducing carbon emissions and adapting to climate change	The City will deliver significant reductions in carbon emissions in Plymouth, aiming to halve 2005 levels of carbon emissions by 2034 through: Seeking solutions that reduce the need to travel, and facilitate the move towards sustainable modes of travel. Using planning powers to promote development that reflects the risks posed by climate change and the need for society to move towards a low carbon future.
Policy INT6	Enhancing Plymouth's 'green city' credentials	The City will actively pursue measures that build upon its current strengths in green technologies as well as its exceptional natural environment, to become one of the leading green cities in Europe. This will include: Reducing transport related carbon emissions by offering an efficient and attractive choice of sustainable travel options for all sectors of the community, visitors, businesses and commuters within pleasant and secure environments and actively supporting the transition to low emission vehicles.
Policy HEA6	Delivering a safe, efficient, accessible, sustainable and health-enabling transport system.	The City will deliver a transport system that enables and encourages sustainable and active travel choices, provides good accessibility for the city's population to jobs and services, and supports a healthy environment. The planning process will be used to: deliver safe and convenient facilities for walking, cycling and public transport; address air quality, carbon emissions and noise pollution; actively promote sustainable travel choices

Policy Ref	Policy Name	Links to WP06

Energy and Climate Change Strategy 2014-2019

Torbay Council's energy and climate change policies have been set out in the Energy and Climate Change Strategy to help create a low carbon future, resilience to the changing climate and keep resources in the Bay. Relevant policies to WP06 are shown in the table below.

Energy and Climate Change Strategy 2014-2019, selected policies

Policy Ref	Policy Name	Links to WP06
Energy and Climate Change Policy 5	Planning and transport	Torbay Council will ensure local planning and transport policies contribute to tackling the causes and effects of climate change.
Energy and Climate Change Policy 6	Torbay Council's carbon reduction target	Torbay Council will aim to reduce its energy consumption and carbon emissions in line with national targets whilst delivering council services and efficiently managing its assets and estate.

Devon and Torbay Local Transport Plan 2011-2016

The Devon and Torbay Local Transport Plan aims to deliver a transport system that can meet economic, environmental and social challenges. It also seeks to deliver the aspirations of Devon &Torbay Councils, stakeholders, businesses and the public.

The vision for Devon & Torbay's transport system will offer business, communities and individuals safe and sustainable travel choices. The transport system will help to deliver a low carbon future, a successful economy and a prosperous, healthy population living in an attractive environment.

The LTP follows the 5 goals in the national guidance for LTP's and the local authority's responsibility for public health improvements, providing a positive link between sustainable travel and delivering health improvements.

To achieve Devon & Torbay's vision the strategy has five key objectives:

- Deliver and support new development and economic growth

- Make best use of the transport network and protect the existing transport asset by prioritising maintenance

- Work with communities to provide safe, sustainable and low carbon transport choices

- Strengthen and improve the public transport network

- Make Devon the 'Place to be naturally active'

Local Transport Action Plan 2021-2026: Moving towards net-zero

The Torbay Local Transport Action Plan sets out the planned investments and commitment of the transport capital grant received from Government, alongside other funding the Council has or is able to achieve.

The strategy sets out the importance of strategic connectivity, in particular with reference to making best use of the strategic network and improving connections with London and the rest of the UK.

Torbay Council recognise that low carbon transport is essential for addressing the climate emergency and the transport sector, excluding aviation and shipping accounts for 30% of Torbay's 2016 emissions.

There are three broad categories of intervention which can deliver the decarbonisation of transport fitting into a framework of "Avoid, Shift, and Improve":

- Less travel can be undertaken (sometimes referred to as Avoid actions)

- More of the travel that is undertaken is by public transport and active modes (Shift actions

- The emissions of motorised transport are reduced to zero (Improve actions)

Appendix B Exploring Decarbonisation Detailed Analysis and Case Studies

Introduction

Decarbonisation remains a priority for all local authorities within the Peninsula Transport region. With a range of existing and emerging solutions and strategies possible for implementation, it is important to set out the most critical areas requiring change within the specific context of the peninsula. Through obtaining an understanding of the existing strengths and weaknesses of the region's existing sustainable transport, we can help to guide recommendations for specific policy and interventions.

It is important that a range of solutions are considered, including both measures to reduce carbon emissions by transport modes at source, as well as behavioural change aiming to reduce demand for transport altogether. Whilst the individual strategies for decarbonisation for each local authority will reflect their differing contexts and needs, good levels of collaboration and combined authority planning will be an important prerequisite for overall success in the region.

The following section provides an overview of the key themes for achieving decarbonisation across the peninsula region. For each, a summary of key existing regional strengths and challenges is followed by an assessment of potential interventions and key opportunities for improvement. As outlined within Sections 2.3 and 2.4, each of these key themes is interwoven with the central issues affecting transport across the region: Social exclusion and transport poverty, and the challenge of improving rural connectivity. Both challenges have been considered throughout the process of developing this strategy alongside key stakeholders, with considerations for effective solutions included throughout the remainder of this document.

Stakeholder Challenges, Opportunities and Priorities

The challenges and potential interventions to support the carbon transition have been developed in collaboration with key stakeholders including the Heart of the South West Local Enterprise Partnership, Homes England, and Network Rail.

This collaborative approach has been critical in developing realistic options which are grounded in clarity around the responsibilities and influence of Peninsula Transport as a STB. Two workshops were held to first understand the challenges, opportunities and priorities for decarbonisation and then subsequently develop a long-list of potential interventions.

The first half-day stakeholder workshop to establish decarbonisation challenges, opportunities and priorities was conducted in 2020. A wide variety of issues were identified by stakeholders, encompassing all transport modes. The challenges and opportunities identified for transport decarbonisation in the region ranged across the 'PESTLE' (Political, Economic, Social, Technological, Legal and Environmental) spectrum and are summarised in Figure 3-5 and Figure 3-6.

Key challenges included the transboundary nature of policies and interventions, and the need for strategic approaches both within and beyond the peninsula region. Stakeholders also noted that the mechanisms for funding schemes is evolving, moving away from established practices toward competitive 'challenge' funding geared at delivering outcomes to solve a particular issue or policy. However, stakeholders also acknowledged that these challenges provide the basis for potential opportunities to support both decarbonisation and the other 'co-benefits' such as greater equity in physical and virtual service accessibility – issues which align with the Peninsula Transport goals.

Figure 3-5: Stakeholder Workshop 1 'PESTLE' Challenges

Political and Legal

- **Transboundary policy/interventions**
- Potential for **Peninsula Transport to play a role** – recognised by TAs
- **Leadership** / scene setting

Social / Environmental

- Devon used citizen panel to **communicate/engage public** on cost/equality issues and burden on industry/business/govt
- **Logistics consolidation**, shared hubs. & EV last mile

Technological

- **Co-ordination of networks infrastructure** for charging & hydrogen e. g. strategic routes
- **Strategic approach** in regional charging hub infrastructure
- **Rail consolidation**
- **Rail motive technologies**

Economic

- **Devolution of funding schemes** (moving funding away from road construction and towards decarbonisation)

Figure 3-6: Stakeholder Workshop 1 'PESTLE' Opportunities

Political and Legal

- Understanding the **role of Peninsula STB** alongside Transport Authorities
- National **funding opportunities** are bias towards road construction
- Clarify context and potential **alignment of targets and dates** among LAs

Social / Environmental

- Conversations around **cost/equality issues** and burden on industry, business and government
- **Planning settlements for accessibility**

Technological

- Understanding the **effectiveness of different technological options** for decarbonisation
- Strategic **fuelling/refuelling** network
- **Rural broadband**

Economic

- **Mass transit viability** – cost of delivery
- **Private sector investment** in infrastructure e.g. EV charging network
- **Funding opportunities** for mass-adoption of infrastructure for EV charging hubs

Building on the first workshop, a second stakeholder workshop in 2021 led to the development of an overarching set of priorities for decarbonising transport in the Peninsula Transport region (Figure 3-7). The priorities cover all forms of transport and influence the strategy themes presented in Section 3. The priorities place emphasis on making the best use of existing infrastructure for door-to-door journeys, with any interventions to be supplemented by technological advances in the short to long-term.

Figure 3-7: Stakeholder Workshop Priorities
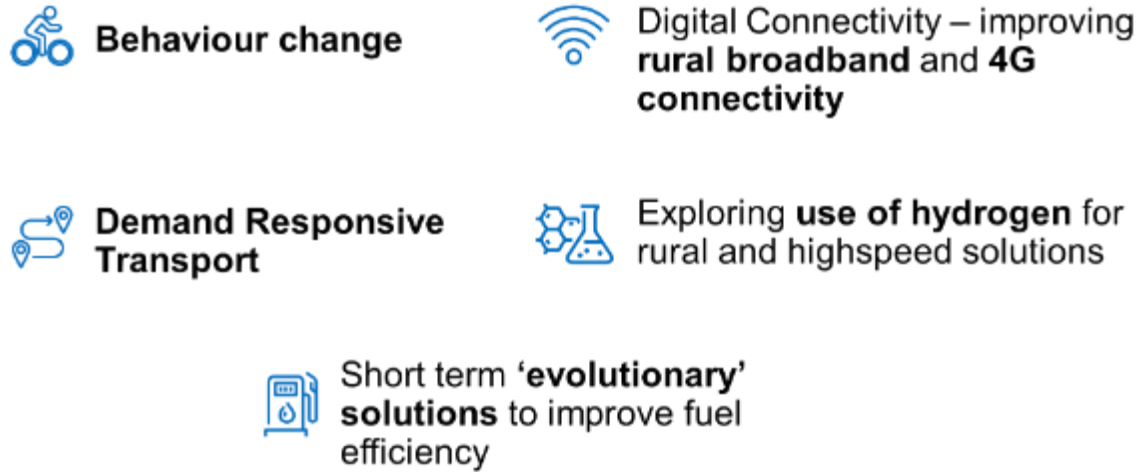
Themes for decarbonising transport in Peninsula

The DfT's 'Decarbonising Transport' Strategy (published in July 2021) outlines the National Government's continued commitment to widespread decarbonisation and lowering of emissions across the national transport network. Commitments and actions set out within the report covered both decarbonisation of transport itself, alongside strategies for multi-modal decarbonisation, with reference to the key enablers for this process. The two sets of themes emerging from this national strategy are outlined in Figure 3-8 and Figure 3-9**Error! Reference source not found.**.

Figure 3-8: Part 2a: Decarbonising all forms of transport
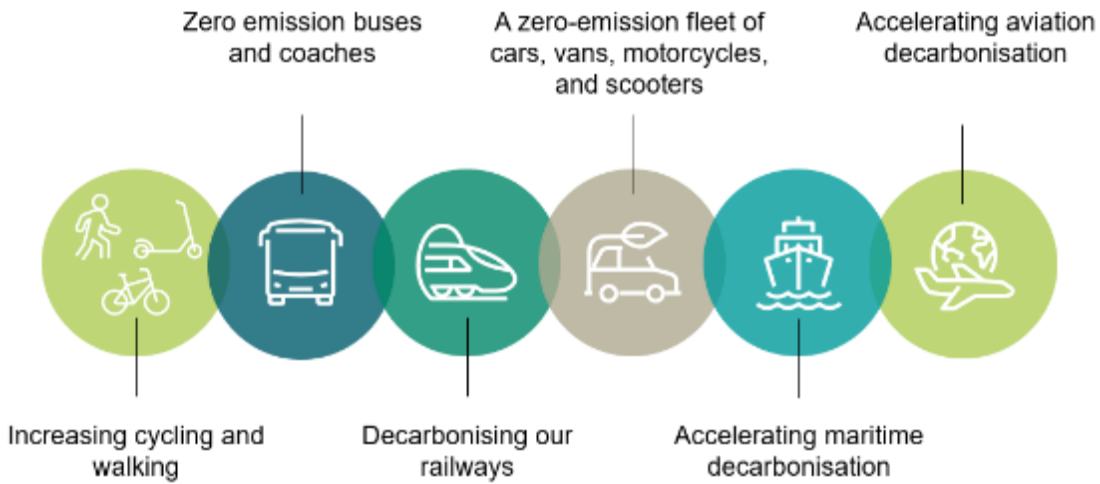
Figure 3-9: Part 2b: Multi-modal decarbonisation and key enablers
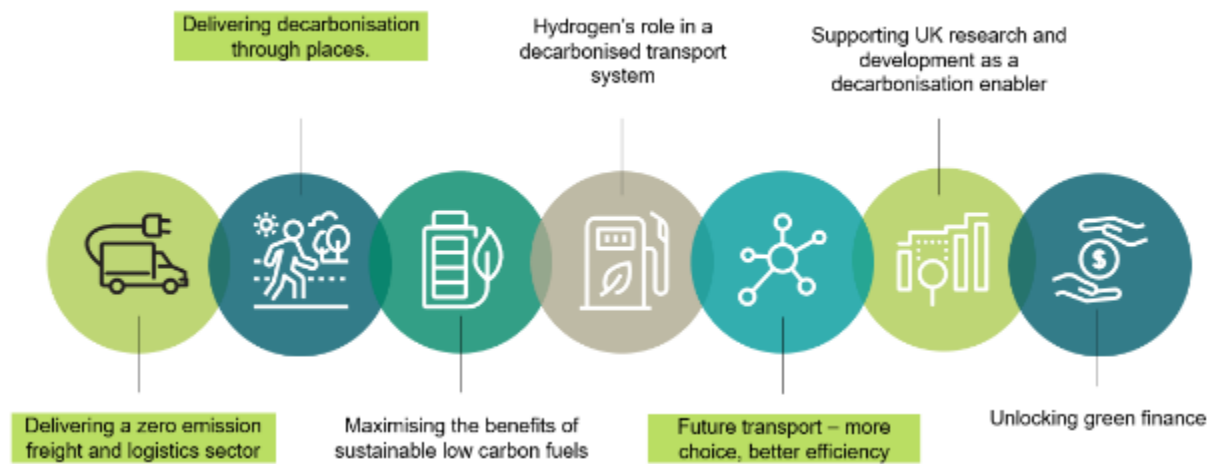
Reflecting the strategic areas outlined within this updated 'Decarbonising Transport' Plan, the following five key themes were developed to reflect decarbonisation considerations when applied to the Peninsula Transport region context (Figure 3-10).

Figure 3-10: The four Peninsula Transport Carbon Transition Strategy themes

These five themes encompass a range of approaches to lowering the carbon emissions from transport across the region, from trip substitution to modal shift or use of alternative fuels within existing transport trips. Throughout the chapter, reference will be made to the unique geographical constraints present across the peninsula, and their impact upon determining choice of decarbonisation strategy. The highly contrasting rural to urban demography of the region must similarly be accounted for, with acknowledgement given to the differing requirements and opportunities present for both.

A key consideration throughout this strategy, and cutting across all five themes, is that the best methods of pushing for decarbonisation should present parallel opportunities to provide social and economic benefits for the peninsula. If policies are well-selected and designed, then simultaneous improvements can be targeted in public health, access and mobility for disadvantaged groups, work flexibility, access to green space, as well as wider transport improvements to congestion and road accident levels. As acknowledged within Section 2.3, of particular importance to the peninsula will be pursuing measures that target reducing social exclusion across the region, in particular for vulnerable groups and those facing transport poverty.

Behaviour Change: Demand Reduction

As acknowledged by the CCC (Section 2.2), reducing the demand for carbon-intensive activities is integral to the meeting of decarbonisation targets. Demand reduction could follow many forms from a transport perspective, including no longer needing to travel to access opportunities or services. The lowest carbon trip is arguably the trip not taken at all. If sufficiently widespread, demand reduction across the peninsula also presents the opportunity to avoid or minimise the need for capacity increases and make best use of the existing networks.

The Covid-19 pandemic demonstrated the potential for significant demand reduction in the face of disruptive events. For example, the closure of offices during lockdown periods has encouraged a shift towards increased home or flexible working patterns, with resultant falls in commuter trip demand. For many businesses, this model has represented alternative ways of working, with evidence suggesting a continued trend away from traditional office-based working. Whilst the remaining themes focus upon how the carbon impacts of necessary transport trips can be minimised, the potential for demand reduction must be considered at the early stages of all activities.

Modal shift to Public Transport and active modes

Whilst measures to improve existing methods of travel are as important as transitionary solutions to achieve rapid emissions reductions, behavioural changes designed to alter the ways in which people travel will provide much of the long-term benefit to decarbonisation across the peninsula. As such, it is critical for local authorities within the region to find ways to shift journeys away from private to sustainable modes, as well as understanding how journeys can be avoided in the first place. Such "travel demand" reduction can provide a range of wider benefits to a region, with improvements in air quality, reduced congestion, and an improved ability to prevent transport related social exclusion. Encouraging the transition towards active travel,[77,78] for instance, can bring a range of health benefits to users, both mental and physical.

Reducing the demand to travel requires significant behavioural change; in order to be effective on a large scale, a culture traditionally focused around personal car use needs to be realigned to values based on shared mobility and active travel. It will be the role of local authorities to facilitate this realignment, setting it firmly within a comprehensive range of supporting infrastructure and policy. More needs to be done to reduce reliance on private car travel. It is critical that a place-based approach is embedded to underlie actions, supported by low-carbon alternatives such as buses, shared mobility and active travel. This will realise a range of co-benefits, whilst also reducing emissions quickly at source.

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[77] DfT (2021) 'Gear Change'
[78] Connected Places Catapult (2021) 'Accelerating the Active Travel Market'

Regional Strengths

- **Support for Modal Shift to Public Transport:** There is strong support across the region for the development and improvement of public transport networks, to alter behaviours and encourage modal shift from private vehicle use. For instance, a desire to encourage increased use of improved walking, cycling and public transport infrastructure is outlined as a key transformational ambition within the Devon Climate Declaration and Devon Interim Carbon Plan[79]

- **Ambitions for Zero- and Low-Carbon Public Transport Networks:** Plans across the region are in place to create zero- and low-carbon public transport networks, especially within major cities and towns. For instance, as laid out within the Torbay Local Transport Action Plan 2021-2026, funding is being committed to decarbonising the public transport system within and through the area as a priority.

- **Rail Decarbonisation:** Linking to the Great Western Rail Line, the South West is well placed to benefit from a national acceleration of rail electrification programmes, aiming to decarbonise the full network.

Regional Challenges

- **Topography:** Across some parts of the peninsula, such as Cornwall, topographical issues may act as a barrier to active travel uptake. Whilst this represents a challenge that cannot be physically resolved, it is important that feasible alternatives, such as promotion of electric bikes, be explored to overcome barriers to active modes.

- **Existing Bus Services:** Often due to the rurality of many settlements in the peninsula, local bus services are often historically considered unreliable and expensive. Central to any package of measures encouraging increased public transport uptake should be the aim to maximise the efficiency and minimise reasonable costs of bus services, in order to appeal to and cater for a larger future demand across the entire region.

- **Gaps in the Public Transport Network:** Some rural areas are poorly serviced by existing public transport, whilst in some locations there are no direct rail alternatives for passenger movements. This can create a reliance on the Strategic Road Network, in turn potentially reducing its resilience at times of peak demand. Poor access to public transport can create reinforce the perception that existing rail and bus infrastructure requires improvement and better maintenance before any investment in decarbonisation programmes should begin.

Regional Opportunities and Peninsula Interventions

Addressing Car Dependency & Encouraging Behavioural Change

Although decarbonising via electrification of vehicles is important, it will take time for new EV sales to replace internal combustion engine (ICE) vehicles and transform the fleet[80] (see Section 2.4). Even when powered by renewable energy, EVs still have significant carbon footprints through the emissions embodied in their manufacture, whilst tyres and brakes continue to generate harmful particulates. It is important to note that the electrification of cars has little impact upon existing car dependency, road safety, or the inequalities of transport poverty in rural areas and among the poorest in society.

Ensuring fewer journeys are made by private car is essential, both by shifting journeys to active and sustainable modes and reducing the need to travel at all where appropriate.

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[79] Devon Climate Emergency (2022) Interim Devon Carbon Plan
[80] Keith *et al.* (2019) 'Vehicle fleet turnover and the future of fuel economy'

Influencing such travel behaviours could involve a reduction in the need to travel or relocation of destinations to more easily accessible areas. To reduce travel requirements, greater online access to a range of services should be encouraged, such as local council, health, and education providers. Development of a range of employment opportunities throughout the peninsula and in local centres will help to reduce long-distance commuting, with new housing aimed at having a range of essential facilities accessible within a 20-minute trip via sustainable travel modes.

In turn, to reduce car dependency, local authorities might pursue a more direct approach, with the instigation of a range of parking restrictions and the setting of emissions zones. More direct measures to discourage car ownership would be more directed at the urban areas of the peninsula, with more limited scope for impact in rural zones. Here, incentivised transition to EV, car share or public transport use would offer greater impact towards reduced motorised car dependency.

> ## Case Study: Workplace Parking Levy, Nottingham City Council
>
> A workplace parking levy (WPL) is a form of congestion charging on employers who provide workplace parking for employees and / or visitors. Nottingham City Council has introduced such a WPL to tackle issues caused by congestion across the city. Whilst acting as an incentive for employers to manage their workplace parking provision, the scheme also serves to generate funds for major council-led transport infrastructure initiatives. Projects funded by the scheme so far have included NET Phase 2 (extensions to the existing tram system, which now carries more than 17m passengers a year), and the redevelopment of Nottingham Station. If introduced by councils or local authorities across the Peninsula, such schemes could help to encourage modal shift for commuter journeys, whilst simultaneously providing funds for additional decarbonisation schemes.

The following strategies entail a range of alternative means by which car dependency can be addressed and replaced, encouraging behavioural change towards use of an improved sustainable transport network across the Peninsula.

Encouraging Public Transport Use

The challenges presented by the unique geographic layout of the peninsula, provide both distinct challenges and opportunities for local authorities to bridge the rural / urban divide, and provide a fully connected public transport network that is appealing to all demographics. In the wake of Covid-19 induced physical distancing requirements, we have already seen changes in the mobility mix, consumer behaviour, and transportation needs, with public transport use one of the first areas to suffer from heavily reduced demand. However, whilst such changes are expected to be more permanent in large cities, the same impacts should be more limited in non-urban areas[81].

Before any influence can be exerted over these existing travel behaviours, significant and targeted investment will be required for both bus and rail infrastructure. Public transport networks must be easily accessible, well-connected, and affordable, in order to present viable alternatives to existing private vehicle use. For bus and rail services, investment should be targeted to deliver several key areas of improvement:

- *Improved journey times and reliability:* Reductions to journey times associated with public transport modes represents a primary means of increasing its attractiveness and generating increased demand for use. Measures such as increased numbers of services per route or demand responsive methods could be employed to generate these improvements, ensuring that public transport can be relied upon by residents of both rural and urban areas.

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[81] McKinsey & Company (2020) Moving forward: How COVID-19 will affect mobility in the United Kingdom

- *Network Expansion:* Ensuring that both bus and rail services connect to areas across the whole of the Peninsula is critical if greater public transport usage is to be generated, by both residents and tourists alike. Expanding the existing network to ensure that all residents have the opportunity to access public transport will help to combat issues of social exclusion and transport poverty, alongside decarbonisation targets.

Case Study: Reopening of the Dartmoor Rail Line[82]

The Dartmoor Rail Line, connecting Okehampton to Exeter St Davids, was the first line to be reinstated under the DfT's 'Restoring your Railway' Initiative in November 2021. The line aims to reconnect areas of North Devon into the main rail network, operating services every two hours each way, seven days a week between Okehampton, Crediton and Exeter. With a journey time of approximately 40 minutes, the scheme represents a move to expand the existing coverage of the Peninsula rail network, providing improved connectivity for both commuters and tourists alike.
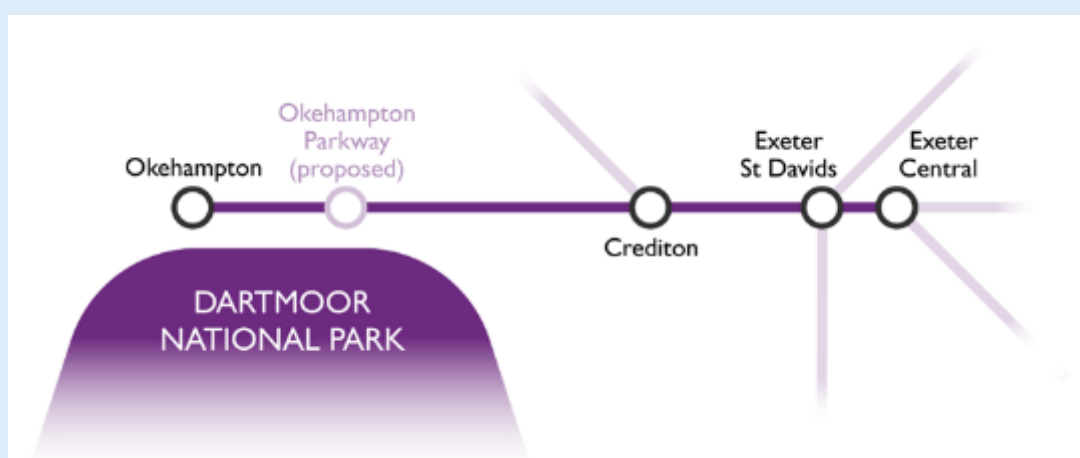
- *Fleet improvements:* As discussed in section 0, the transition to an electric / hybrid bus network will require significant funding and may be more appropriate in more urban areas of the region, however it will be critical to ensuring any long-term increase in public transport usage actually represents meaningful decarbonisation. Ongoing efforts to electrify the train network should be equally supported, in partnership with National Rail and GWR.

- *Reduction and flexibility of fares:* Subsidised ticket fares and other means to reduce the price of public transport would allow all residents to access public transport services (as currently trialled in Cornwall). Shared ticketing between modes would also make multi-modal journeys simpler and smoother for the user. Such integration between public transport services could provide more efficient links between modes, opening up a greater number of journeys to be possible across the region.

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[82]Devon & Cornwall Rail Partnership and Dartmoor (20XX) The Dartmoor line

> **Case Study: One Public Transport System for Cornwall (2016-2020)**
>
> The One Public Transport System for Cornwall (OPTSfC) project was created to deliver a fully integrated and sustainable public transport network across the county, providing multi-modal, integrated ticketing and timetables, as well as infrastructural improvements, in order to increase patronage on bus and rail networks. Between 2016-2020, the project included:
>
> • £17m of private investment from operators on new, low emissions vehicles;
>
> • Development of a single brand for all public transport, Transport for Cornwall;
>
> • New electronic ticket machines on all buses in Cornwall, accepting a range of contactless, mobile and smartcard tickets;
>
> • Bus station upgrades at Newquay, Penzance & Truro, alongside 80 new bus shelters/stop upgrades on key corridors;
>
> • 335 Real Time Passenger Information (RTPI) displays at bus stops and RTPI/wayfinding at mainline rail stations.
>
> Prior to the Covid-19 Pandemic, these measures displayed improvements in public transport patronage and experience, including:
>
> • A 2% year-on-year increase in bus patronage between 2017/18 and 2019/20;
>
> • A 3% increase in overall satisfaction to 93% in 2019 (from 90% in 2018).

Improving the quality and efficiency of the public transport network, as well as extending its coverage across the peninsula, would help to connect residents in rural areas to the employment and social opportunities available in other parts of the region on a regular basis. In order to ensure that both bus and rail transport is more appealing than car use, local authorities must ensure that 7-day a week connectivity can be established over the majority of the network. For bus travel in particular, improvements to the coverage of routes should be carried out, ensuring that even those in the most remote locations have good access to a route. It is important that developments occur across modes of sustainable travel, to enable multi-modal journeys via a combination of bus, train, or active travel.

Shared Mobility

Shared mobility modes, 'transport services and resources that are shared among users'[83], can take a number of different forms – from public transit modes to micromobility or car-sharing. In any of its forms, shared mobility services can offer a means of optimising transport efficiency across the network, providing reliable means of individual or group travel that reduces reliance upon private car use. Additional benefits can include encouraging rental rather than ownership of modes of transport, making multi-modal journeys more convenient, integrated and seamless, and providing first-and-last-mile transport solutions.

Age and location appear to play an increasingly large role in informing customer purchase decisions when selecting transport modes. For example, pre-covid trends for many younger, and millennial aged people who lived in cities was to favour such shared mobility platforms over car ownership[84]. Due to the contrastingly more rural, older population of the peninsula, similar forms of shared mobility are not as commonplace at present, but there is an increasingly important opportunity for shared mobility platforms to play a part in reducing car dependence throughout the region in the transition to a fully decarbonised transport system.

Car-pooling or ridesharing is a key means by which road-based trips can be optimised, to ensure that fewer individual trips are made across the network, and overall emissions are

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83 Shared-Use Mobility Center (2022) What is Shared Mobility
84 McKinsey & Company (2020) Moving forward: How COVID-19 will affect mobility in the United Kingdom

reduced. For local authorities, such behavioural change can be encouraged in two ways: via recommendations or incentives provided to local businesses and within council departments, and through supporting the implementation and use of shared mobility platforms and apps. Whilst private platforms offering these services are numerous, only a few are currently in use within the UK and Peninsula Transport area. Encouraging growth in the use of these apps for car-sharing in particular, would represent a cost-effective means to both lower emissions, and reduce road demand across the region.

Case Study: BlaBlaCar (Car-pooling / Car-sharing service)[85]

Founded in 2004, BlaBlaCar has grown into the world's leading community-based car-sharing network, with over 100 million members globally in 2021. The app uses technology to facilitate car-pooling, connecting drivers and passengers willing to travel together along specific routes, in order to share the cost of the journey and reduce emissions outputs. In recent years, the app has also provided means to connect people to appropriate bus services for their trip. As of 2018, individual journeys avoided through use of the app were estimated to save around 1.6m tonnes of CO_2 each year, with approximately €1.4bn saved in transport fees for users since its creation. Whilst usage remains low within the UK compared to mainland Europe, use of the app grew steadily up to the start of the COVID-19 pandemic, with long distance journeys into or out of the Peninsula common.

Mobility-as-a-Service (MaaS)

It is suggested that shared mobility may be key to our transition to more sustainable transport, particularly in urban areas, encourging people to hire the most convenient and suitable mode of transport when required, rather than owning and relying on cars. This supports the parallel concept of 'Mobility as a Service' (Maas), whereby the information and payment functions of various modes of transport are integrated into a single mobility service, allowing people to easily plan and pay for multi-modal journeys[86].

Local authorities may wish to implement MaaS principles into their own public or mass transit services, allowing for more efficient multi-modal travel. This could involve combined ticketing across modes, as well as creation of a single platform or app for use of the service. A number of private MaaS companies are already in operation within the peninsula, and can offer indications of best practice for creation of a simple and direct user interface.

Across the Peninsula Transport area, commercial operators of public transport services commonly set their own individual pricing structures and ticket options. The resulting array of fares and ticketing products can be a source of confusion for the user, with differentials in on-bus and in-app purchased tickets adding to the issue. In turn, there can be a distinct lack of interoperability in place between these public transport providers; along many routes,

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85 Bla Bla Cars (2022) About Us
86 MaaS Alliance (no date) What is MaaS?

services run by different bus operators serve the same corridor but provide no interoperability in terms of shared or integrated ticketing.

Case Study: Ola

Launched in 2010, Ola represents an app-based MaaS platform, offering ride hailing services across both private hire vehicles or metered taxis. The app was launched across Exeter, Bristol and Bath in 2018, and remains the only ride-hailing service in operation within Exeter. The app allows the user to hail a ride, handling payments within the app, as well as sharing journey information with family and friends. A unique emergency button within the app allows the passenger to be put through to a call centre to ensure safety.
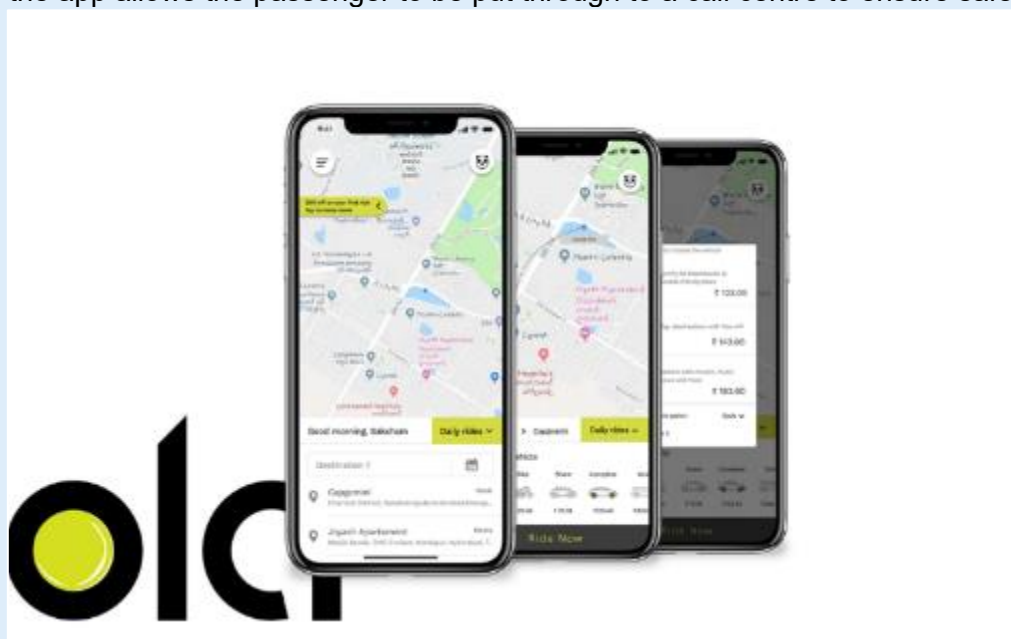
Case Study: Tower Cabs

As a local business based in Plymouth, Tower Cabs taxi service have developed their own specialised app platform to integrate with GPS and enable customer bookings in real time across the Plymouth area. Offering a range of taxi services (e.g. airport / corporate / executive transfers), the app allows the user to get a pre-booking quote on pricing, before making their booking, as well as an estimation of journey times and taxi availability.

Providing the means for more integration across public transport modes, different service providers, and across Peninsula Transport authority regions, represents a key opportunity to improve the attractiveness of public transport for both local residents and the tourist market. Whilst the nature of the tendered network may prevent full integration of ticketing and pricing structures, the provision of overarching regional tickets and passes would reduce the confusion associated with navigating multi-modal or multi-operator journeys, serving to improve the experience of public transport across the Peninsula, with resultant increases in patronage. In some areas, issues of interoperability have already been addressed via integrated ticketing, such as the 'Ride Cornwall' ticket across Cornwall and Plymouth.

> ## Case Study: Ride Cornwall Ticket[87]
>
> Aimed at providing a simpler ticketing system for the tourist market, the Ride Cornwall Ticket represents a multi-modal pass offering unlimited travel on bus and rail within Cornwall and between Cornwall and Plymouth. The ticket covers travel across the four key rail and bus providers across the region: GWR, CrossCountry, First Kernow and Go Cornwall Bus services. The current pricings per day of the ticket are:
>
> - Adult: £18
> - Child: £9
> - Family: £36 (up to two adults and 3 children)
>
>

Micromobility

Micromobility modes are defined as small mobility devices, designed to carry one or two people, or 'last mile' deliveries, such as e-bikes and e-scooters[88]. New technologies and trends are rapidly developing within the micromobility sector, with improved batteries and motors facilitating the introduction of new designs and blurring traditional vehicle definitions. These vehicles may be owned by individuals and lent out, or form part of a fleet maintained and operated by companies or transport authorities. In a post-pandemic context within Cornwall, continued apprehension over shared spaced like buses may increase the attraction of methods of Shared Mobility, representing an alternative offering increased flexibility and independence.

Several companies offering micromobility solutions are already in operation across the peninsula, providing both shared bike and scooter options to local residents and tourists alike, albeit largely focussed upon more urban areas. Whilst many of these companies offer electric-powered modes, in a few instances across the country, low or zero-emissions business models have been put in place, providing additional decarbonisation benefits along a reduction in car dependency. Whilst unlikely to be applicable to the most rural areas, recent trials in use of e-scooters have proven highly successful, offering a different micromobility solution for first-and-last-mile or short journeys across urban areas.

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[87] Devon & Cornwall Rail Partnership (2022) Ride Corwal & Cornwall Ranger
[88] DfT (2019) Future of Mobility: Urban Strategy

Case Study: Co Bikes, Exeter[89]

The UK's first electric bike hire scheme, operated by Co Bikes, was established in 2016 in Exeter, with the scheme now also available in Falmouth. With use of the nextbike app, users can unlock electric bikes located across the city via QR codes located on the frame of each bike. Whilst traditionally based around a 'docked-based' system (with bikes only able to be unlocked and parked at purpose-built 'stations' in key locations), from 2021, the company have introduced its first dockless stations using geo-fenced technology. Whilst the scheme requires collection, charging and redistribution of the bikes via road-based logistics, it has provided a more appealing active travel-based mode of transport around the city for residents and visitors alike.

Case Study: HumanForest, London[90]

HumanForest e-bikes, available across areas of London, are powered fully by renewable energy and operations have been designed to reduce associated carbon emissions. Emissions generated during the manufacturing of the e-bikes is also offset within six weeks of production. HumanForest uses electric vans to move e-bikes and has a team who manage the fleet called 'Gardeners'. The company also try to avoid moving bikes as much as possible to increase energy efficient. The company's warehouse, called the 'Greenhouse', is based in central London to help limit maintenance miles. They're also working on creating battery stations across London by repurposing London's iconic telephone boxes by turning them into battery charging points and storage units so users can swap their own batteries in exchange for extra free minutes.

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[89] Co Bikes (no date) About Us
[90] Human Forest (various) Blog

> ### Case Study: Voi Scooters, Bristol[91]
>
> The DfT is currently trialling rental e-scooters in around 35 regions across England. This is in large part as a result of the fall in public transport usage during the Covid-19 pandemic. The trials commenced in July 2020 in 57 locations, working with 12 individual companies, to assess whether e-scooters should be legalised and if so, how to regulate their use. The trial in the West of England is one of the largest in the country, with Voi Scooters operating across areas of Bristol, Bath and South Gloucestershire. At present, Voi's operating area covers around 50% of Bristol, entailing around 75% of the city's population. Key findings from the initial 12-month trial period include:
>
> - A fleet size of around 2,700 across Bristol and South Gloucestershire has provided over 2.6m rides to a total of c.200,000 unique riders;
>
> - An average number of rides per scooter per day of 5;
>
> - A high proportion of younger users, with around 75% of journeys made by those aged 30 and under;
>
> - Initial survey results suggest that e-scooter journeys have caused modal shift of 36% from car and taxi use, with an estimated 900,000 of the 2.5 million total journeys made in Bristol replacing short car journeys – saving an estimated 480 tonnes of CO2.
>
> Similar e-scooter trials are already occurring in locations across the Peninsula including:
> - Somerset: Taunton, Minehead, Crewkerne, Chard, and Yeovil;
>
> - Devon: Barnstaple.

Decarbonising transport modes (People and goods)

Decarbonisation via behavioural and technological improvements represents a key priority across all of the authorities within the Peninsula Transport region. With the region's rurality presenting a number of challenges to the creation of an expansive and efficient public transport network, recognising the role of zero- and low-emissions vehicles as means to bridge these gaps will play a critical part in the creation of a decarbonised transport network. The Covid-19 pandemic has illustrated the scale of the challenge presented to the transport sector, still one of the most significant sources of carbon emissions across the country.

Pathways to decarbonisation across the Peninsula will need to consider methods to either reduce demand for transport, or reduce the carbon emitted by transport at source. Electrification is the most likely route, with hydrogen fuel cell vehicles playing an important role especially in heavier vehicles (see section **Error! Reference source not found.**). Enabling smart charging will be essential to allow an efficient and smooth transition to electrified transport.

Regional Strengths

- **Existing Strategic Charging Network:** Parts of the Peninsula region currently offer some of the most expansive regional charging networks outside of the South East. This is particularly offered within Cornwall, although the rest of the peninsula is currently far behind in development, offering very limited charging provision. Whilst continued development will be required, it is this infrastructure that will facilitate the growth in electric and zero-emissions vehicles.

- **Regional Support for Decarbonising Technologies:** There is exceptionally strong regional support for decarbonisation through lower emitting technologies and practices in transport. Peninsula Transport have set out a vision to deliver

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[91] TravelWest (no date) E-scooter trial

a net-zero carbon transport system, emphasising the need for ultra-low emission charging facilities as well as finalising the switch away from fossil fuels.

Regional Challenges

- **Distance from Automotive Industry:** With the Peninsula located far from the predominant sources of Electric Vehicle production in the UK, with the majority of production centred in the Midlands. If proactive steps are not taken to encourage increased uptake of EVs, this distance may slow the initial pace of transition unless South West demand can be grown.

- **Infrastructure Requirements:** To facilitate the transition to low-emitting or zero-emissions transport modes, requisite infrastructure must often be in place to encourage and provide for this transition. Nowhere is this better seen than through the Electric Charging network for EVs – a central infrastructural requirement needed to facilitate smooth journeys across a range of distances.

Regional Opportunities and Peninsula Interventions

Zero Emissions Vehicles (ZEVs)

In November 2020, the Government announced the phase-out of the sale of new petrol and diesel cars and vans by 2030, and hybrid cars and vans by 2035. Although variable, the life expectancy of cars is currently around 15 years. As a result, it is likely that this also represents the amount of time required for ZEVs to become the dominant technology within the private vehicle landscape, providing critical emissions reductions in order to meet Government targets.

A focus on interventions seeking to promote the transition from ICE vehicles to ZEVs across the peninsula region would represent a highly effective means of reducing vehicle emissions across the region, without significant changes to the physical infrastructure of the transport network. In light of such a clear dependence on independent modes of travel across the region (Section 2.4), it is unlikely that rapid modal shift away from car use would be feasible under any short timescales. Encouraging the switch to ZEVs therefore could fill the gap in the transitionary period, maintaining levels of personal autonomy alongside significant reductions in emissions.

It is simultaneously important that behavioural changes are targeted, with consumers needing discouraging from continued purchase of internal combustion engine (ICE) cars. It is critical that ZEVs become affordable to the mass market if they are to be relied upon for a portion of wider decarbonisation. As a result of the covid-19 pandemic and its economic impacts, it is likely that lower average distances travelled may result in a reversion to the second-hand market (as well as a preference for smaller vehicles). This could prevent new electric vehicles from entering the market, in order to replace current and older models of ICE cars.

Whilst ZEVs currently represent a much more substantial investment to buy, from the mid-2020s, it is predicted that cost parity will be achieved in the most part with ICE vehicles. Once an equality of price has been established by the wider market, it will be the place for fiscal policy to shift towards increasing the cost of buying and running ICE vehicles. In tandem with policies actively encouraging use of ZEVs via subsidies / loans, local authorities in the Peninsula can help to swing the balance of vehicle ownership, ensuring substantial emissions cuts.

If efforts to encourage the transition to ZEVs are to be successful, it is crucial that all potential users have sufficient access to the right charging infrastructure. This can take the form of both private charging points (often connecting the national grid to vehicle via charging ports on driveways), or public charging (including rapid charging hubs).

ZEV Buses

Electric and Hybrid-electric buses are being increasingly trialled and incorporated into fleets across urban areas throughout the UK, with the dual aims of improving urban air quality and reducing overall vehicle emissions. With the UK Government's 'Bus Back Better' strategy reaffirming a £3bn funding commitment towards levelling up bus services outside of London[92], there is an opportunity for Peninsula Transport authorities to take sizable steps towards the conversion of existing, fossil-fuelled bus fleets – for both urban and rural services. The national strategy further commits to the purchase of at least 4,000 new zero-emission buses (over 10% of the national fleet). In light of this national support, it is important that local authorities engage and work with bus operators in order to set targets and standards for the rapid roll-out of ZEV buses.

It is important to note that such ZEV buses are most commonly deployed on shorter service routes with higher capacity for recharging points. Until technological improvements and the recharging network allow for longer distance services to move to full zero-emissions solutions, it is likely that low-emissions or hybrid-electric buses will represent the optimum balance between low emissions and an efficient service network.

> ### Case Study: Hybrid-Electric Buses, Bristol City Council[93]
>
> In 2016, First West of England launched two hybrid-electric buses for service in Bristol, in partnership with the DfT, Bristol City Council, and the University of the West of England (UWE). The electric hybrid buses use Geo-fencing GPS technology to run on pure electric mode in areas of low air quality, producing zero emissions. Once in areas with higher air quality, a small diesel engine can be used, which charges the electric engine. The buses have been charged wirelessly via a special plate in the ground at UWE's Frenchay Campus (the terminus of their route).

Decarbonising Freight

Freight represents a key sector contributing to the peninsula economy, with the region home to key national ports, airports, and industries. As such, the peninsula region is well placed to lead the way on decarbonisation programmes within the freight, shipping, aviation, and fishing industries. More detailed context and analysis on the existing and future state of freight in the peninsula region is provided within the Work Package 9: Freight Strategy for the South West.

An estimated 3.6 million trips by HGVs across the South West each year contribute around 1.84 million tonnes of CO_2 emissions annually – a figure accounting for over 16% of total transport emissions across the region. Furthermore, high levels of empty vehicle running have been reported, with around 22% of vehicle kilometres attributed to empty vehicles. It is therefore critical that decarbonisation strategies focus not just on lowering emissions from vehicle, but encouraging higher logistical efficiency, in order to lower the quantity of trips required.

Opportunities for decarbonisation within Peninsula freight are nonetheless abundant, representing a priority area for implementation. Encouraging lower or zero-carbon infrastructure, technology and modes would help to lower existing emissions from road, rail, maritime and aviation freight sources. Low or zero-carbon technology within the freight sector is currently at a relatively low maturity level, with limited examples of implementation across the UK at present. This makes the delivery of significant emissions reductions highly challenging but provides an important opportunity for the peninsula region to lead the way on widescale freight decarbonisation. Bridging technologies should be adopted in the short term

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[92] DfT (2022) Bus Back Better
[93] European Commission (2015) Hybrid buses to be trialled in Bristol

to provide immediate emissions reductions, including use of alternative fuels for HGVs such as biomethane.

Due to its unique geography, the peninsula region contains several key road traffic pinch points – problematic links in the road network that are only exacerbated by freight movement. As such, opportunities to encourage modal shift from road to both a rail and maritime focus should be explored, with benefits to both emissions levels and traffic demand on the strategic and local road networks[94]. Regardless of mode, steps to improve freight operator behaviour with regards to optimisation should be taken, aiming to reduce empty vehicle running across companies and modes.

Case Study: Kronospan UK, Wales

Kronospan UK is a manufacturer of wood-based panels based in Chirk, Wales. With their production facility handling hundreds of road-based freight vehicles each day, they have implemented a successful backloading strategy, with lorries delivering raw materials to the site being backloaded with either finished products or waste materials to be recycled. This strategy has resulted in 92% of lorry journeys being backloaded (excluding their log carriers), cutting wasted mileage and emissions, and allowing Kronospan to obtain much more competitive haulage prices as a result.

Decarbonising Rail

The electrification of the rail network remains the core mechanism driving decarbonisation of rail transport, both for movement of people and freight. However, the significant upfront cost of line electrification limits the routes on which this solution can be cost effective. It is therefore likely that decarbonisation should be targeted via a combination of electrification and use of alternative fuels, such as the introduction of battery and hydrogen powered trains. Whilst these technologies are not currently in operation on trains in the UK, battery and hydrogen passenger trains are being developed by several rolling stock manufacturers, with introduction possible in the next few years. For shorter routes, as well as those with incomplete overhead electrification, battery and battery-electric hybrid trains represent the best replacement for diesel drivetrains[95]. Over longer distances, use of hydrogen fuel cell trains should be preferential.

Peninsula Transport and Local Authorities will continue working with Network Rail and train operating companies to ensure service patterns are based around the progression of electrification, with minimal use of diesel-only trains. Collaboration will be required to progress electrification projects and explore on what lines it might be appropriate to operate battery and/or hydrogen fuel cell powered fleets to allow early replacement of diesel trains.

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[94] Data indicates that a single freight train holds the potential to replace up to 76 HGV journeys, reducing emissions per tonne km by an estimated 76% to 90%. McKinnon, A (2007) 'CO$_2$ Emissions from Freight Transport: An Analysis of UK Data'
[95] Rail Engineer (2020) GWR's bi-mode trains to become tri-modes

> ### Case Study: Tri-mode trains, South West Metro
>
> Transport for Wales (TfW) has ordered several tri-mode diesel-electric-battery hybrid units from Stadler Rail. This is in addition to five diesel-battery hybrid units from Vivarail, all to be delivered by 2023. These trains are intended to be run on the South Wales Metro, an integrated public transport network enabling easier travel across the Cardiff Capital Region. Adding an additional battery to the bi-modal trains already in operation across the UK will aim to supplement the power of diesel engines on non-electrified sections of the network. In turn, when travelling and out of stations and surrounding urban areas, the trains will reply on battery power only. This should provide reductions to fuel usage and carbon emissions by over 20% annually.

Decarbonising Ports/Water

The maritime industry represents a crucial part of the peninsula region economy, providing over 15,000 full time equivalent jobs and almost £3 billion GVA to the national economy each year. Alongside the key gateway ports of Falmouth and Plymouth, numerous smaller ports support a range of important sectors, with fishing and trade central.

Decarbonisation of the shipping industry is in a very early stage of development due to the challenges of regulation of a global industry. It is likely that battery electric, hydrogen fuel cells, or ammonia fuel cells propulsion could be viable to aid in decarbonisation of certain shipping sectors. Local authorities will need to work with both local and national businesses operating out of peninsula ports to establish pathways to decarbonisation.

Decarbonising Aviation

Whilst aviation represents a minor proportion of overall travel into and out of the Peninsula, two commercial airports, Exeter International and Cornwall Airport, both provide a range of internal and international flights. Internal flight connections to major UK hub airports such as those in the South East are important in providing a wider range of destinations and choice. Bristol Airport, located in the neighbouring Western Gateway Region, is also located close to the Eastern boundaries of the Peninsula region, with around 25% of its patrons originating within the Peninsula.

Due to the isolated nature of areas within the peninsula region, air travel represents a critical means of access for communities with limited alternative modal options. Aviation represents the key means of connecting to the mainland for residents of the Isles of Scilly for example. This is crucial for a range of touristic, supply-chain logistical, and healthcare purposes – with no hospitals across any of the islands, rapid and reliable air connectivity to Penzance is essential to ensure appropriate levels of healthcare can be assured.

Aviation is an extremely challenging sector to decarbonise, as there are currently no known zero-emissions fuels or energy storage technologies that can achieve the requisite energy densities required for aviation and remain economically viable. It is likely that development of electric or electric-hybrid propulsion aircraft will not enter the market until at least the mid-2030s[96]. As such, short-term decarbonisation is likely to revolve around the transition to sustainable aviation fuels, as well as encouraging behavioural change away from flying. With short-distance flights likely to remain essential to facilitate transport connectivity across certain parts of the peninsula network, these areas perhaps represent opportunities to trial new technologies – becoming test-beds for wider aviation decarbonisation advances.

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[96] Element Energy (2021) Decarbonising the Scottish Transport Sector

Supporting infrastructure to deliver carbon reductions

Whilst the chosen pathway of measures to decarbonisation for each Local Authority in the Peninsula Transport STB may vary in approach, it is critical that each be supported by appropriate and requisite transport infrastructure. This is of particular importance to the peninsula – a region with unique geographical constraints, where a more specific and tailored set of decarbonisation approaches might be required to work alongside more conventional improvements to the existing transport network.

To encourage behavioural change and growth in zero-emission travel, authorities must ensure that such transitions can be facilitated by the network, for all residents regardless of their location within the region. If either behavioural change, encompassing a shift away from private vehicle use, or changes in technology such as the shift to EVs are to occur on a mass scale, both the road and rail networks, as well as subsidiary considerations such as fuel/charging infrastructure, must be in place at an early stage.

Integrating decarbonisation measures and targets into existing and future programmes and infrastructure projects will support many of the goals identified by Peninsula Transport.

Regional Strengths

- **SRN Key Corridors:** Whilst presenting challenges to resilience and connectivity, the sparse Strategic Road Network through the region allows for greater efficiency of EV charging point locations. With a large majority of strategic or tourist traffic utilising the main road routes through the peninsula, the placement of key charging point locations at pinch points and key gateways along the SRN will ensure a high quantity of road users have access along a portion of their journey.
- **Renewable Energy Generation:** The South West provides a large proportion of clean electricity generation year-round, derived from a range of nuclear, on- and off-shore forms. In 2020, the South West held the highest number of renewable sites in the UK, the majority of which representing solar farms[97]. The rise in electricity demand expected from growth in EV usage will benefit from the region's commitment to clean energy production.
- **Regional Drive for Infrastructural Development:** Across the peninsula region, some local authorities have already demonstrated an awareness of the importance of embedding infrastructural change within policy, before providing the funding required for implementation. Development of an effective Electric Vehicle charging network throughout the region has progressed significantly in recent years, but its relevance within local policy must continue to be recognised[98], with a co-ordinated and strategic approach required to provide confidence to residents, businesses, and visitors.

Regional Challenges

- **High Rurality:** The high proportion of rural areas throughout the peninsula region creates a challenge in providing reasonable access to the EV charging network for everyone across the region. This also poses challenges to the installation of effective EV charging infrastructure, as well as its maintenance and operation.
- **Uneven National Distribution:** The majority of charging infrastructure provision is predominantly market-led, which has led to an uneven geographical distribution of in the existing EV charging landscape within the UK. Whilst the peninsula has maintained a greater provision of charging points than some other regions (in particular the North of England), when compared to areas such as London and the South East, it is clear that peninsula local authorities must continue to be proactive in embedding an EV charging network that should facilitate the switch to EVs.
- **Low-Carbon HGVs:** There is currently an absence of a Europe-wide strategy for low-carbon HGVs. Investment in infrastructure will be at risk until this can be established and progressed.

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[97] Department for Business, Energy & Industrial Strategy (2021) Energy Trends
[98] BBC News (2020) £3.5m for 150 new electric vehicle points in Cornwall

Regional Opportunities and Peninsula Interventions
Strategic Charging Network:

One of the largest barriers to widescale adoption of EVs is the availability of public, strategic refuelling infrastructure. This will be a critical factor in determining public confidence and uptake of EVs for private and commercial purposes across the region and will require significant planning and investment into the creation of an extensive, reliable charging network. As discussed in Section 2.4, whilst charging infrastructure has undergone significant expansion across Cornwall in recent years, the network remains sparse within the other local authorities in the peninsula. To enable longer distance journeys to be made using both the strategic and local road networks, it is important that charging infrastructure is of an equal quality and coverage across all Peninsula Transport authorities. This will require co-ordination across local authorities, our co-opted members, and with other STBs to support development of an inter-regional network, both within the peninsula, and further afield.

Clear infrastructure plans setting out the minimum number of electric refuelling points/locations required across the peninsula should be created and implemented, along with capability and installation timescales to aid residents and businesses in planning their own transition to zero-emissions vehicle use. Infrastructure itself can be based around either a public or private model. Whilst the former would require local authority or council funding, the latter entails a more collaborative approach, working with relevant private businesses and communities to plan and implement their own charging stations.

For the peninsula in particular, effort should be made to develop charging infrastructure that services rural tourist hotspots to counter range anxiety. It is important that these be developed to avoid unsustainable traffic levels within protected rural areas however (such as charging infrastructure developed within park-and-ride sites servicing National Parks and other key environmental destinations).

Case Study: Cornwall Council Funding for EV Charging points[99]

In November 2020, joint funding of £3.5m from both Cornwall Council and the EU's European Regional Development Fund (ERDF) was announced to be spent on the installation of 150 new electric vehicle charging points around Cornwall. These were planned to be installed in a range of locations including council-owned car parks and areas currently offering few or no charging facilities. This funding is set to bring the total number of public charging points in Cornwall to 360 by 2023.

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[99] Cornwall & IoS Growth Programme (2020) £2.9m ERDF funding awarded to Cornwall Council to install 150 new electric vehicle charge points

> ### Case Study: Cornwall Council & ENGIE's Genie Point Network[100]
>
> Cornwall Council is working in partnership with ENGIE's Genie Point network to provide electric vehicle charging points. These are intended for use by council staff, visitors, and the general public. The current network provides two types of charge points, superfast and fast:
>
> - Superfast: 43/50 kW (AC/DC) points deliver a 'rapid charge' for onward travel;
>
> - Fast: 7/22 kW (AC) points deliver a 'fast charge' for general day-to-day destination charging.
>
> Currently, the Genie Point Network consists of 27 charge points throughout Cornwall: 16 superfast, 10 fast, and 1 combined, multi-modal hub. ENGIE is responsible for charge pricing, with Cornwall Council taking no revenue from power supplied to customers. Customers are required to acquire an ENGIE charge point Genie card, and to download the ENGIE app.

Private Charging

If efforts are to be made to incentive EV uptake, then authorities must also realise the opportunity to encourage growth in home charging systems – not only serving to reduce the scale of the public charging network required, but also to free up additional public land for alternative use. Incentives for growth in home charging infrastructure could come via a range of direct council funding and awareness raising – for example, through telematic tests, or EV trials.

Reviewing planning regulations if necessary would be useful to ensure they are reflect the growing need for electric charging infrastructure in all avenues of everyday life, whether at home, in public, or at work. Subsidies to incentivise individual property charging points could be provided, whether to homeowners, landlords or businesses. Implementing changes to local authority regulations would ensure development of the overall charging network, helping to normalise and encourage the use of EVs.

Active Travel Infrastructure

Improving the safety, journey quality, and journey time for active travel trips is will help to enable and incentivise a shift towards their use. The identification and development of active transport 'corridors' and fully segregated routes, including at a regional level, will help to speed up active travel journeys. Providing consistency in the network quality and availability is one way to incentivise active transport, presenting it as more convenient than private cars. Both urban and rural networks need to be extensive, although different approaches may be required to reflect their nature and use; infrastructure within peninsula towns and cities may require a denser, interconnected network of cycling and walking paths, whilst rural areas may be more suited to longer cycle routes, with investment required to ensure extensive signage and wayfinding provision.

Active travel networks require effective planning to assess current active travel provision, identify improvements and define future requirements and ensure integration with spatial and wider transport planning infrastructure. The creation or updating of Local Cycling and Walking Plans (LCWIPs) help to determine which locations need infrastructure development and to identify the best solutions, aiding selection between potential options (e.g. segregated or on-road cycle lanes). Such improvements should help to create fully interconnected active travel networks across areas, serving to improve perceptions of safety and journey quality in generating modal shift.

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[100] Cornwall Council (2022) Pay as you go – electric vehicle chargers

Mobility Hubs

If MaaS and micromobility solutions are to be taken forward, both as alternatives to and enhancements of the existing public transport network across the peninsula, then it is critical that infrastructure is embedded at key locations to enable seamless interchange between modes. Mobility Hubs, offering the chance to integrate public transport services with shared mobility services and ZEV charging infrastructure, represent a valuable opportunity to create safe, accessible, and visible spaces that interlink these modes of sustainable transport.

The development of mobility hubs equally represents a chance to simultaneously provide public realm improvements or enhanced community facilities. As such, hubs are intended to act as a focus for economic growth in an area, creating extra incentive to visit commercial and community centres. With increased ease and attractiveness of use, such integrated infrastructure hubs should encourage increased uptake in sustainable travel across the region, reducing emissions from current journey modes and improving the user experience.

Case Study: Mobility Hubs, Plymouth[101]

Plymouth City Council has secured £6m of 'Transforming Cities Fund' funding to build 50 mobility hubs across the city by 2023. These are planned to include electric vehicle charging infrastructure, an e-car club, e-bikes and digital information boards. Additionally, an integrated MaaS platform will be developed to enable simpler multi-modal travel.

More choice, better efficiency

The Covid-19 pandemic and after-effects has initiated several significant changes in transport behaviours across the country, altering both the movement of people and goods. The closure of offices during lockdown periods has encouraged a shift towards increased home or flexible working patterns, with resultant falls in commuter trip demand. For many businesses, this model has represented alternative ways of working, with evidence suggesting a continued trend away from traditional office-based working. Commute trips by all modes are lower than before the pandemic. Reduced travel opportunities has increased demand for online shopping – the Office for National Statistics (ONS) reporting around a 13% increase in the online share of national transactions during the first UK lockdown compared with the period prior, creating a greater number of delivery and logistical operations across the transport network.

The growing importance of digital platforms in influencing how and when people travel, as well as changing preferences for the types of transport chosen, present both new challenges as well as opportunities for a changing transport network. By facilitating demand for greater choice in how we travel, local authorities across the peninsula can seize the opportunity to promote and embed more sustainable and efficient methods, that can ultimately contribute towards decarbonisation.

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[101] Plymouth City Council (2022) Mobility Hubs

Regional Strengths

- **LEP Support:** LEPs across the Peninsula display strong support for both MaaS and digital substitution within their strategies. As outlined within section 2.2 (regional policy), these represent key solutions for transport decarbonisation that tie into the overarching desires for *clean and inclusive growth*.

Regional Challenges

- **Limited Internet Coverage:** Ambitions for digitisation are hampered by the limited data and broadband coverage across the more rural areas of the peninsula region. These issues would need to be addressed, with coverage expanded to allow for effective employment of MaaS systems and platforms, as well as journey planning and information. The dispersed population, workforce and economy across the South West would benefit from such improvements, enabling effective digital substitution and improved customer experience on public transport.

Regional Opportunities and Peninsula Interventions

Technological Measures

It is important that potential solutions for improving rural connectivity should both enhance the quality of public transport and promote its use over private road vehicles, but also aim at reducing the need / demand to travel in the first place. In part because of the Covid-19 pandemic, many businesses are transitioning to more flexible models of working, often incorporating partial or full home working for employees. This flexibility reduces the need to maintain extensive office facilities, thereby reducing fixed costs and delivering business efficiencies. With commuting representing one of the highest sources of travel demand, or at least the most concentrated, local authority measures to encourage and support behavioural shift should represent a key opportunity to reduce travel demand at traditional peak commute hours.

Interventions that aim to improve the attractiveness of home working primarily centre around the enhancement of digital connectivity across the region (see below). The provision of high-speed internet to households in rural areas would improve digital equality of service, enabling a 'work anywhere' culture and reducing the need for travel to a fixed workplace. Such measures would require alignment and co-operation with existing schemes aimed at delivering this connectivity but represent an important opportunity to reduce demand on the transport network at source.

It is important to recognise the future role of electric vehicles in a decarbonised transport network, especially within rural areas. Developing charging infrastructure across rural areas of the peninsula should help to counter range anxiety, encouraging greater confidence in electric. As such, local authorities should explore the potential for an expanded regional EV charging network, in particular considering the needs of rural areas, including not only residents but also hotspot destinations such as key tourist or employment areas.

Digitalisation

Transport systems are increasingly reliant upon software, communications technologies, and a wider digital ecosystem of payment methods, GPS location services, and digital security[102]. Underlying these developments are key policy and legislative updates, which support this technological change and enable trials to take place to establish standards for digital security and effectiveness. The opportunity to incorporate these recent advancements in digitalisation into the peninsula transport landscape has grown as a result of ever-increasing public acceptance of new technologies. As more and more residents and businesses own or use smartphones, developing their own digital footprint, preferences for new products, habits and experiences are evolving – the development of autonomous vehicles and app-based mobility services are just some of the widening market built from digitalisation.

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[102] Peninsula Transport (2020) Economic Connectivity Study

Improving Digital Connectivity

As the process of digitalisation expands across more and more aspects of our transport experiences, passenger demand for a consistently high and reliable level of mobile and internet connectivity on board public transport will grow accordingly. In order to improve the attractiveness of both rail and bus travel throughout the peninsula, improvements in the coverage and quality of digital communications networks will be required, covering the many 'blank spots' that currently exist within non- or low-populated areas.

The process of digitalisation for both passenger and freight transport is reliant upon consistent, fast and reliable data connections over a wide area. In the case of passenger transport, areas of poor connectivity or blank spots in coverage risk issues in the use of many of these technologies, such as smart transport modes, route planning and online ticket purchasing, thereby reinforcing reliance on other, often car-based options.

Local Authorities across the peninsula region have an opportunity to work together to develop an overarching digital strategy for the region. This will require engagement and collaboration with both Superfast Cornwall and Connected Devon and Somerset, highlighting the importance of expansive and reliable digital communications coverage for smart public transport services to develop across the region. To ensure the fastest levels of connectivity possible, it will be important for authorities to explore local and regional rollout of 5G capabilities, potentially with encouragement and incentive for 5G innovation opportunities and programmes. Development and updating of Digital Infrastructure Plans for the two South West LEPs should be promoted where required, to support the wider transition towards 5G or other appropriate technologies, such as satellite broadband.

Case Study: Closing the Gap' on Mobile Connectivity[103]

The provision of reliable onboard mobile connectivity across the rail network has been a longstanding issue throughout the Peninsula. Produced in 2016, the Peninsula Rail Task Force's (PRTF) 'Closing the Gap' strategy identified improved, continuous mobile connectivity as one of the top three priorities for rail development across the network. The PRTF (now the strategic rail subgroup of Peninsula Transport), is working with Network Rail to assist in securing necessary funding to provide such continuous connectivity for rail passengers along all lines within the South West, aiming to eliminate significant 'not spots' that still preside over much of the network.

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[103] Peninsula Rail Task Force (2016) Closing the gap

Appendix C Intervention Long-List and Scoring

ID	Intervention	Mean	Rank
31	Improve rail journey connectivity with walking, cycling and other modes of transport	4.80	1
56	Support and encourage modal shift of freight from road to more sustainable alternatives such as rail, cargo bike and inland waterways	4.70	2
66	Spatial planning policy - everyday needs should be accessible within a 20-minute walk, cycle or public transport trip	4.70	2
81	Improve integration between public transport services and as well as active modes for more seamless multi-modal journeys	4.70	2
45	Improving alternatives to domestic flights (ground travel > air travel)	4.60	5
64	Ensuring people can access broadband internet at home	4.60	5
82	Knowledge sharing	4.60	5
34	Market-led development of a charging infrastructure network	4.50	8
52	Freight - Electrification of freight/delivery vehicles	4.50	8
71	Implement low-emission zones/ road user charges and create car-free city centres/zones	4.50	8
16	Increase reliability and frequency of services e.g. by investing in bus priority measures	4.40	11
38	Readying the energy system - demand capacity	4.40	11
78	Shared mobility schemes e.g. bike and e-scooters	4.40	11
83	Encouraging and investing in local innovation projects	4.40	11
28	Increase reliability, frequency and integration of services	4.33	15
1	Develop integrated network of cycle infrastructure to LTN 1/20 (rural & urban)	4.30	16
5	Improved bike parking and cycling facilities	4.30	16
7	Low traffic neighbourhoods (LTNs)	4.30	16
11	Bus - electric bus fleet investment and adoption	4.30	16
14	Develop electric bus charging infrastructure network / strategy	4.30	16
18	Make public transport more accessible and affordable	4.30	16
30	Modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys	4.30	16
15	7 days a week public transport connectivity	4.20	23
29	Increase capacity on the rail network to meet growing passenger and freight demand and support significant shifts from road to rail	4.20	23

ID	Intervention	Mean	Rank
32	Encourage transition from internal combustion to electric (Cars)	4.20	23
33	Promote fleet transformation across business community and public service vehicles	4.20	23
70	Parking management (removal, user charges) in town / city centres and leisure destinations	4.20	23
77	Car sharing incl. car clubs and car sharing apps	4.20	23
80	Develop journey planning, mobility-as-service (Maas) platforms and mobility credit systems	4.20	23
2	Set target for reallocating road space for active travel	4.10	30
26	Make rail more accessible, affordable and easy to use	4.10	30
65	Improving 4G mobile coverage	4.10	30
23	Rail - Electrification of traction and infrastructure	4.00	33
36	Home charging - planning requirement	4.00	33
54	Invest in zero emission HGV technology and trials	4.00	33
67	Flexible mobile / digital provision of a range of local council, health and other services	4.00	33
17	Marketing to re-build confidence in public transport following COVID-19	3.90	37
37	Develop charging infrastructure at tourist destinations	3.90	37
6	School Streets	3.89	39
3	Develop quality walking network incl. pedestrianisation	3.80	40
35	On-street parking charging infrastructure	3.80	40
46	Aviation demand management	3.80	40
50	Shipping - Increase uptake of low carbon and net zero fuels	3.80	40
57	Collaboration and tracking of goods / consolidation centres	3.80	40
60	Efficient supply chain logistics	3.80	40
69	Develop employment opportunities in local centres	3.80	40
79	Demand responsive transport	3.80	40
8	Incentive programme of grants/support to buy new cycles & e-bikes	3.70	48

ID	Intervention	Mean	Rank
10	Behavioural change programmes incl. marketing and communications	3.70	48
19	Mass-transit focus in urban areas	3.70	48
21	Park & Ride sites with integrated EV charging and cycle parking	3.70	48
41	Lead by example by implementing low or zero emission vehicles in local authority fleets	3.70	48
68	Encourage businesses to have a smaller, more localised approach to offices	3.70	48
4	Development of rural active travel corridors	3.60	54
9	Programmes of enabling activities for active mobility e.g. cycle training, targeted personal incentives e.g. GP prescribing	3.60	54
27	Marketing to re-build confidence in rail transport following COVID-19	3.60	54
47	Policy commitment to prevent airport expansion	3.60	54
76	Explore opportunities to diversify ports into renewable energy production	3.60	54
24	Rail - alternative traction technologies: Hybrid, Battery, Hydrogen, etc	3.50	59
48	All new vessels being ordered for use in Peninsula waters are designed with zero emission propulsion capability	3.50	59
51	Monitor and reduce port operation emissions - electric port vehicles, improved logistic efficiency, etc	3.50	59
53	Freight - Alternative motive technologies: Hybrid, biofuels, Hydrogen freight vehicles	3.50	59
63	Develop network of alternative fuel stations and promote existing sites	3.50	59
20	Public Transport Apps [distinct from MaaS apps]	3.40	64
42	Aviation - low carbon / sustainable aviation fuels (SAF) incl. biomass, biogenetic waste, synthetic jet fuel, etc.	3.40	64
49	Develop innovation and infrastructure associated with zero emission propulsion technologies, including bunkering of low or zero emission fuel	3.40	64
22	Bus subsidies	3.30	67
55	Stimulate demand for zero emission trucks through financial and non-financial incentives	3.30	67
59	Real time 3D routing	3.30	67
61	Freight - Use of 'evolutionary' technology solutions to improve existing fuel efficiency / reduce emissions	3.30	67
73	Development/testing alternative fuel technologies e.g. Biomethane	3.30	67
43	Electric powered light aircraft (realistically limited to domestic flights)	3.20	72

ID	Intervention	Mean	Rank
44	Aircraft fleet-efficiency improvements e.g. modernisation, operational optimisation, aircraft improvements	3.20	72
72	Biofuel blends - Government mandated fuel mix - bioethanol (E10) and biodiesel	3.20	72
74	Invest in hydrogen production and utilisation development	3.20	72
13	Bus - Alternative motive technologies: low carbon fuels - biofuel, synthetic, hydrogen, etc.	3.10	76
75	Invest in hydrogen re-fuelling infrastructure	3.10	76
25	Rail -Interim technology fixes to improve/clean diesel trains (until can be removed altogether)	3.00	78
39	Address backlog in traffic signal maintenance to improve traffic flow and reduce emissions	3.00	78
40	Support use of alternative/low carbon fuels (e.g. biofuels) during transition period	2.90	80
58	Autonomous delivery vehicles, esp. for first/last mile	2.80	81
62	Develop business case for coastal feeder services to help remove road vehicles	2.80	81
12	Trolley buses (overhead power)	1.90	83

Lead Consultant
Richard Adams
Associate Director

AECOM Limited
Belvedere House
Pynes Hill
Exeter EX2 5WS
United Kingdom

T: +44 1392 663200
aecom.com

Appendix B Model Results and Assumptions

Modelling Results and Assumptions

Introduction

The modelling carried out as part of this project was done using WSP's energy and carbon local authority model (which can also be applied to multiple local authorities, as it was done in this project). This model was created to assist in the quantification of baseline greenhouse gas (GHG) emissions as well as the potential cumulative benefits of a range of project-specific carbon reduction measures. Much of these processes has been automated. The main sources of this model are the sub-national dataset of total final energy consumption statistics[1] and government conversion factors[2].

In addition, for each of the measures modelled, two levels ("High" and "Low") have been developed, which vary the level of ambition for each intervention. This was automated so that each scenario selected the right level of ambition for each goal.

The measures or goals were largely based on specific Peninsula/South West literature or reports, input from the stakeholders consulted throughout this project, information from other Work Packages, as well as wider available projections, such as those from the CCC, and WSP's own calculations.

Lastly, a bottom-up model of trips by mode and distance was produced based on Government transport datasets[3]. The initial data, prior to any interventions, is shown in Table 1:

Table 1. Trips per person per mode for the South West area of the UK

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	268.8	26.49%	198.60	59.21	10.51	0.43	0.05	0.00	0.00	0.00
Bicycle	16.3	1.61%	2.47	5.09	5.84	1.88	0.89	0.13	0.00	0.00
Car/Van driver	443.8	43.74%	30.42	76.63	145.73	90.88	72.12	18.52	6.24	3.23
Car/Van passenger	218.8	21.56%	16.64	42.55	71.96	42.45	30.28	8.14	4.27	2.50
Motorcycle	3.8	0.37%	0.07	0.36	0.98	1.36	0.85	0.14	0.02	0.00
Other private transport	10.8	1.06%	1.11	1.24	3.13	1.98	1.71	0.80	0.40	0.38
Other local bus	36.2	3.56%	1.05	5.11	17.80	7.80	3.95	0.45	0.02	0.00

[1] https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level
[2] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[3] https://www.gov.uk/government/statistical-data-sets/nts03-modal-comparisons

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Non-local bus	0.7	0.07%	0.00	0.01	0.00	0.03	0.05	0.25	0.19	0.21
Surface Rail	8.1	0.79%	0.00	0.05	0.58	1.49	3.03	1.58	0.80	0.54
Taxi / minicab	7.2	0.71%	0.28	1.44	3.48	1.27	0.59	0.11	0.06	0.00
Other public transport[4]	0.2	0.02%	0.01	0.02	0.06	0.09	0.05	0.00	0.00	0.01
All modes	1014.6	100.00%	250.64	191.69	260.07	149.66	113.56	30.13	12.01	6.88

By using the average distance and population figure for the Peninsula area, the total number of miles is calculated:

Table 2. Distance per mode for the Peninsula area of the UK

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	537,559,148	2.92%	233,048,553	208,436,300	86,339,623	7,607,895	2,126,777	0	0	0
Bicycle	149,922,275	0.81%	2,901,456	17,916,649	47,962,391	33,091,529	36,573,481	11,476,769	0	0
Car/Van driver	10,310,558,283	56.04%	35,698,906	269,754,412	1,197,073,849	1,599,745,500	2,962,142,497	1,629,720,455	1,098,713,720	1,517,708,943
Car/Van passenger	5,394,202,064	29.32%	19,523,772	149,786,608	591,130,600	747,218,615	1,243,518,701	716,692,884	751,167,592	1,175,163,293
Motorcycle	83,995,481	0.46%	79,541	1,267,645	8,012,113	23,937,605	34,923,909	12,160,508	3,614,160	0
Other private transport	457,519,789	2.49%	1,302,073	4,352,079	25,684,507	34,931,267	70,192,981	70,432,127	71,154,568	179,470,186
Other local bus	508,394,143	2.76%	1,228,387	17,986,129	146,187,080	137,247,676	162,067,535	39,738,352	3,938,983	0
Non-local bus	159,432,033	0.87%	0	24,154	0	447,766	1,862,680	22,215,200	34,315,810	100,566,424
Surface Rail	687,212,130	3.74%	0	176,587	4,744,790	26,255,920	124,352,024	138,959,426	140,762,590	251,960,793
Taxi / minicab	102,477,137	0.56%	329,242	5,060,042	28,615,917	22,349,607	24,139,052	9,921,304	10,997,885	1,064,089
Other public transport	7,411,062	0.04%	9,872	64,393	531,545	1,529,880	2,157,615	46,203	179,148	2,892,407
All modes	18,398,683,545	100.00%	294,121,803	674,824,998	2,136,282,416	2,634,363,260	4,664,057,251	2,651,363,228	2,114,844,454	3,228,826,134

This will be used to interlink interventions and ensure that no double counting takes place across different types of interventions, such as demand reduction and electrification.

Interventions

Transport Demand Reduction

This intervention considers the potential of reducing the number of commuting, retail and personal business trips from increased remote working and digitalisation of services. This is assumed to be enabled by increased availability of fast broadband connections, a higher flexibility in public and private sector policies around working arrangements and other actions such as the creation of local flexible working spaces, thereby reducing commuting distances and the need for public or private transportation.

Working population, employment level data and the fraction of people who can work from home (45%) was identified from ONS research[4], and the frequency they are able to from an academic paper[5] from the Global e-Sustainability Initiative. A more conservative 40% was assumed in the intervention, however. The emissions savings are based on the number of miles saved across cars and public transport, taken from Government data[6], as well as fuel efficiency data for petrol and diesel cars[7]. Fuel efficiency data for buses was taken from Euro VI diesel buses averages over the LowCVP's UK Bus Cycle[8] (which includes inner and outer urban phases and a higher speed rural phase).

Data on the total retail and personal business trips distance is obtained from Government data. Total energy savings as distributed across the different fuels, in line with the electrification pathway assumed under the Business as Usual scenario to avoid double counting.

The impact on this measure is shown on Table 3 and Table 5, for the high level of ambition, and Table 4 and Table 6, for the low level of ambition:

Table 3. Trips per person following the implementation of the Transport Reduction intervention (High)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	268.8	28.59%	198.60	59.21	10.51	0.43	0.05	0.00	0.00	0.00
Bicycle	16.3	1.73%	2.47	5.09	5.84	1.88	0.89	0.13	0.00	0.00
Car/Van driver	396.2	42.15%	26.57	66.86	127.89	79.96	63.73	18.52	6.24	6.47
Car/Van passenger	194.7	20.71%	14.62	37.44	62.63	36.74	25.89	8.14	4.27	5.01
Motorcycle	3.8	0.40%	0.07	0.36	0.98	1.36	0.85	0.14	0.02	0.00
Other private transport	11.1	1.18%	1.11	1.24	3.13	1.98	1.71	0.80	0.40	0.76
Other local bus	32.1	3.41%	0.32	3.93	16.04	7.44	3.87	0.45	0.02	0.00

[4] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/regionallabourmarket/march2020
[5] http://www.gesi.org/research/download/13
[6] https://www.gov.uk/government/statistical-data-sets/tsgb01-modal-comparisons
[7] https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env
[8] https://www.zemo.org.uk/assets/reports/LowCVP%20Coach%20report%202020%20web%20version%20V2.pdf

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Non-local bus	1.0	0.10%	0.00	0.01	0.00	0.03	0.05	0.25	0.19	0.43
Surface Rail	8.6	0.91%	0.00	0.05	0.58	1.49	3.03	1.58	0.80	1.07
Taxi / minicab	7.2	0.77%	0.28	1.44	3.48	1.27	0.59	0.11	0.06	0.00
Other public transport	0.2	0.03%	0.01	0.02	0.06	0.09	0.05	0.00	0.00	0.01
All modes	940.1	100.00%	244.05	175.64	231.14	132.66	100.70	30.13	12.01	13.76

Table 4. Trips per person following the implementation of the Transport Reduction intervention (Low)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	268.8	28.29%	198.60	59.21	10.51	0.43	0.05	0.00	0.00	0.00
Bicycle	16.3	1.72%	2.47	5.09	5.84	1.88	0.89	0.13	0.00	0.00
Car/Van driver	402.8	42.40%	27.07	68.13	130.20	81.37	64.82	18.52	6.24	6.47
Car/Van passenger	198.2	20.86%	14.88	38.10	63.84	37.48	26.46	8.14	4.27	5.01
Motorcycle	3.8	0.40%	0.07	0.36	0.98	1.36	0.85	0.14	0.02	0.00
Other private transport	11.1	1.17%	1.11	1.24	3.13	1.98	1.71	0.80	0.40	0.76
Other local bus	32.1	3.38%	0.32	3.93	16.04	7.44	3.87	0.45	0.02	0.00
Non-local bus	1.0	0.10%	0.00	0.01	0.00	0.03	0.05	0.25	0.19	0.43
Surface Rail	8.6	0.91%	0.00	0.05	0.58	1.49	3.03	1.58	0.80	1.07
Taxi / minicab	7.2	0.76%	0.28	1.44	3.48	1.27	0.59	0.11	0.06	0.00
Other public transport	0.2	0.03%	0.01	0.02	0.06	0.09	0.05	0.00	0.00	0.01
All modes	950.1	100.00%	244.81	177.57	234.66	134.82	102.36	30.13	12.01	13.76

Table 5. Distance per mode following the Transport Reduction intervention (High)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	537,559,148	3.11%	233,048,553	208,436,300	86,339,623	7,607,895	2,126,777	0	0	0
Bicycle	149,922,275	0.87%	2,901,456	17,916,649	47,962,391	33,091,529	36,573,481	11,476,769	0	0
Car/Van driver	9,588,219,875	55.52%	31,174,031	235,377,760	1,050,550,673	1,407,438,274	2,617,536,019	1,629,720,455	1,098,713,720	1,517,708,943
Car/Van passenger	5,016,294,368	29.05%	17,156,481	131,801,683	514,473,682	646,608,734	1,063,230,018	716,692,884	751,167,592	1,175,163,293
Motorcycle	83,995,481	0.49%	79,541	1,267,645	8,012,113	23,937,605	34,923,909	12,160,508	3,614,160	0
Other private transport	457,519,789	2.65%	1,302,073	4,352,079	25,684,507	34,931,267	70,192,981	70,432,127	71,154,568	179,470,186
Other local bus	479,447,362	2.78%	379,508	13,843,011	131,755,236	130,924,656	158,867,617	39,738,352	3,938,983	0
Non-local bus	159,432,033	0.92%	0	24,154	0	447,766	1,862,680	22,215,200	34,315,810	100,566,424
Surface Rail	687,212,130	3.98%	0	176,587	4,744,790	26,255,920	124,352,024	138,959,426	140,762,590	251,960,793
Taxi / minicab	102,477,137	0.59%	329,242	5,060,042	28,615,917	22,349,607	24,139,052	9,921,304	10,997,885	1,064,089
Other public transport	7,411,062	0.04%	9,872	64,393	531,545	1,529,880	2,157,615	46,203	179,148	2,892,407
All modes	17,269,490,659	100.00%	286,380,757	618,320,304	1,898,670,478	2,335,123,133	4,135,962,171	2,651,363,228	2,114,844,454	3,228,826,134

Table 6. Distance per mode following the Transport Reduction intervention (Low)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	537,559,148	3.09%	233,048,553	208,436,300	86,339,623	7,607,895	2,126,777	0	0	0
Bicycle	149,922,275	0.86%	2,901,456	17,916,649	47,962,391	33,091,529	36,573,481	11,476,769	0	0
Car/Van driver	9,681,772,978	55.60%	31,760,066	239,830,025	1,069,527,509	1,432,344,797	2,662,167,462	1,629,720,455	1,098,713,720	1,517,708,943
Car/Van passenger	5,065,238,792	29.09%	17,463,079	134,130,987	524,401,844	659,639,145	1,086,579,968	716,692,884	751,167,592	1,175,163,293
Motorcycle	83,995,481	0.48%	79,541	1,267,645	8,012,113	23,937,605	34,923,909	12,160,508	3,614,160	0
Other private transport	457,519,789	2.63%	1,302,073	4,352,079	25,684,507	34,931,267	70,192,981	70,432,127	71,154,568	179,470,186
Other local bus	479,447,362	2.75%	379,508	13,843,011	131,755,236	130,924,656	158,867,617	39,738,352	3,938,983	0
Non-local bus	159,432,033	0.92%	0	24,154	0	447,766	1,862,680	22,215,200	34,315,810	100,566,424
Surface Rail	687,212,130	3.95%	0	176,587	4,744,790	26,255,920	124,352,024	138,959,426	140,762,590	251,960,793

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Taxi / minicab	102,477,137	0.59%	329,242	5,060,042	28,615,917	22,349,607	24,139,052	9,921,304	10,997,885	1,064,089
Other public transport	7,411,062	0.04%	9,872	64,393	531,545	1,529,880	2,157,615	46,203	179,148	2,892,407
All modes	17,411,988,186	100.00%	287,273,390	625,101,873	1,927,575,476	2,373,060,066	4,203,943,564	2,651,363,228	2,114,844,454	3,228,826,134

As it can be seen, this intervention resulted in a reduction of almost 75 fewer trips per person, resulting in almost one million miles less of travel. The share of car usage dropped from 65.3% to 62.86% (High) or 63.25% (Low), on a trips per person basis, or from 85.36% to 84.57% (High) or 84.69% (Low), on a miles' basis.

In addition, based on the work of the Freight Work Package, it was identified that 22 per cent (around a fifth) of the vehicle kilometres completed during 2019 were by empty vehicles. There is a significant number of vehicle kilometres which effectively are not serving a purpose – large quantities of GHG being emitted and emphasises the need for consolidation, backloading and modal shift, particularly towards the rail sector. This intervention models the elimination of these trips, in its High ambition, or the reduction to 50%, in its low ambition.

Transport Modal Shift

This goal analyses the carbon savings that can be achieved through a modal shift in the way we travel. Following from the transport reduction, the share of car usage is reduced to 63.25%. This intervention explores the impact of reducing it to 35% (High) or 50% (Low), through the improvement of public transport services' frequency, reliability and connectivity and the promotion of walking and cycling, by introducing adequate infrastructure. In addition, measures to discourage car usage, such as low-traffic neighbourhoods and reducing parking provision will also be necessary. This results in an increase in the share of trips carried out by public transport and active travel. This is in line with some other European cities, such as Munich, as reported in an academic paper[9]. Trips have been equally distributed across different public transport modes.

The number of trips for the South West and fuel efficiency data has been obtained from Government data[10,11] (specific to the South West) to calculate savings. The total energy saving is split across fuels (petrol, diesel and electricity) on an annual basis to avoid double counting carbon savings from the electrification of transport as assumed in the Business as Usual scenario.

The impact on this measure is shown on Table 7 and Table 9 (High) and Table 8 and Table 10 (Low)

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[9] https://www.researchgate.net/publication/301903071_Reducing_car_dependence_in_the_heart_of_Europe_Lessons_from_Germany_Austria_and_Switz_erland
[10] https://www.gov.uk/government/statistical-data-sets/nts03-modal-comparisons
[11] https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env

Table 7. Trips per person following the implementation of the Mode Shift intervention (High)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	268.8	28.59%	198.6	59.2	10.5	0.4	0.1	0.0	0.0	268.8
Bicycle	94.0	10.00%	14.3	29.3	33.7	10.8	5.1	0.8	0.0	94.0
Car/Van driver	217.9	23.18%	14.6	36.8	70.3	44.0	35.1	10.2	3.4	217.9
Car/Van passenger	107.1	11.39%	8.0	20.6	34.4	20.2	14.2	4.5	2.3	107.1
Motorcycle	3.8	0.40%	0.1	0.4	1.0	1.4	0.9	0.1	0.0	3.8
Other private transport	11.1	1.18%	1.1	1.2	3.1	2.0	1.7	0.8	0.4	11.1
Other local bus	178.7	19.01%	1.8	21.9	89.4	41.4	21.6	2.5	0.1	178.7
Non-local bus	5.3	0.57%	0.0	0.0	0.0	0.1	0.3	1.4	1.1	5.3
Surface Rail	47.9	5.10%	0.0	0.3	3.2	8.3	16.9	8.8	4.5	47.9
Taxi / minicab	4.0	0.42%	0.2	0.8	1.9	0.7	0.3	0.1	0.0	4.0
Other public transport	1.4	0.15%	0.0	0.1	0.4	0.5	0.3	0.0	0.0	1.4
All modes	940.1	100.00%	238.7	170.6	248.0	129.9	96.3	29.1	11.9	940.1

Table 8. Distance per mode following the Mode Shift intervention (High)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	537,559,148	3.08%	233,048,553	208,436,300	86,339,623	7,607,895	2,126,777	0	0	0
Bicycle	864,575,352	4.95%	16,732,186	103,322,158	276,590,662	190,833,020	210,912,822	66,184,504	0	0
Car/Van driver	5,273,806,649	30.20%	17,146,646	129,464,782	577,834,175	774,132,991	1,439,722,810	896,394,814	604,325,286	834,785,145
Car/Van passenger	2,759,111,382	15.80%	9,436,576	72,494,853	282,975,856	355,654,072	584,808,193	394,202,443	413,164,559	646,374,829
Motorcycle	83,995,481	0.48%	79,541	1,267,645	8,012,113	23,937,605	34,923,909	12,160,508	3,614,160	0
Other private transport	457,519,789	2.62%	1,302,073	4,352,079	25,684,507	34,931,267	70,192,981	70,432,127	71,154,568	179,470,186
Other local bus	2,671,761,963	15.30%	2,114,839	77,141,378	734,217,470	729,588,986	885,303,562	221,445,408	21,950,322	0
Non-local bus	888,448,815	5.09%	0	134,599	0	2,495,214	10,379,943	123,796,129	191,227,822	560,415,109
Surface Rail	3,829,549,131	21.93%	0	984,049	26,440,755	146,313,388	692,962,425	774,363,439	784,411,729	1,404,073,346

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Taxi / minicab	56,365,479	0.32%	181,093	2,783,174	15,739,607	12,292,950	13,277,198	5,457,013	6,049,164	585,281
Other public transport	41,298,785	0.24%	55,013	358,837	2,962,082	8,525,387	12,023,495	257,469	998,315	16,118,187
All modes	17,463,991,974	100.00%	280,096,519	600,739,854	2,036,796,850	2,286,312,774	3,956,634,114	2,564,693,854	2,096,895,926	3,641,822,083

Table 9. Trips per person following the implementation of the Mode Shift intervention (Low)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	268.8	28.29%	198.6	59.2	10.5	0.4	0.1	0.0	0.0	0.0
Bicycle	47.5	5.00%	7.2	14.8	17.0	5.5	2.6	0.4	0.0	0.0
Car/Van driver	314.6	33.11%	21.1	53.2	101.7	63.6	50.6	14.5	4.9	5.1
Car/Van passenger	154.8	16.29%	11.6	29.8	49.9	29.3	20.7	6.4	3.3	3.9
Motorcycle	3.8	0.40%	0.1	0.4	1.0	1.4	0.9	0.1	0.0	0.0
Other private transport	11.1	1.17%	1.1	1.2	3.1	2.0	1.7	0.8	0.4	0.8
Other local bus	110.2	11.60%	1.1	13.5	55.1	25.6	13.3	1.6	0.1	0.0
Non-local bus	3.3	0.34%	0.0	0.0	0.0	0.1	0.2	0.9	0.7	1.5
Surface Rail	29.5	3.11%	0.0	0.2	2.0	5.1	10.4	5.4	2.7	3.7
Taxi / minicab	5.7	0.60%	0.2	1.1	2.7	1.0	0.5	0.1	0.0	0.0
Other public transport	0.8	0.09%	0.0	0.1	0.2	0.3	0.2	0.0	0.0	0.0
All modes	950.1	100.00%	241.1	173.5	243.2	134.1	101.0	30.1	12.2	14.93

Table 10. Distance per mode following the Mode Shift intervention (Low)

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Walk	537,559,148	3.04%	233,048,553	208,436,300	86,339,623	7,607,895	2,126,777	0	0	537,559,148
Bicycle	436,893,569	2.47%	8,455,231	52,211,512	139,768,825	96,433,144	106,580,017	33,444,840	0	436,893,569
Car/Van driver	7,561,957,875	42.74%	24,806,230	187,319,466	835,355,465	1,118,734,248	2,079,288,396	1,272,894,692	858,151,383	7,561,957,875
Car/Van passenger	3,956,209,515	22.36%	13,639,555	104,763,133	409,584,552	515,211,774	848,674,304	559,773,650	586,700,153	3,956,209,515

	Total	Share	< 1 mile	1 - 2 miles	2 - 5 miles	5 - 10 miles	10 - 25 miles	25 - 50 miles	50 - 100 miles	> 100 miles
Motorcycle	83,995,481	0.47%	79,541	1,267,645	8,012,113	23,937,605	34,923,909	12,160,508	3,614,160	83,995,481
Other private transport	457,519,789	2.59%	1,302,073	4,352,079	25,684,507	34,931,267	70,192,981	70,432,127	71,154,568	457,519,789
Other local bus	1,646,964,792	9.31%	1,303,658	47,552,564	452,596,578	449,743,423	545,731,175	136,506,468	13,530,924	1,646,964,792
Non-local bus	547,670,017	3.10%	0	82,971	0	1,538,134	6,398,549	76,312,137	117,879,322	547,670,017
Surface Rail	2,360,664,114	13.34%	0	606,601	16,298,979	90,192,540	427,165,568	477,343,917	483,538,024	2,360,664,114
Taxi / minicab	80,039,864	0.45%	257,155	3,952,150	22,350,489	17,456,181	18,853,829	7,749,043	8,589,908	80,039,864
Other public transport	25,457,973	0.14%	33,912	221,199	1,825,928	5,255,338	7,411,690	158,713	615,395	25,457,973
All modes	17,694,932,137	100.00%	282,925,907	610,765,623	1,997,817,060	2,361,041,551	4,147,347,195	2,646,776,096	2,143,773,837	17,694,932,137

Bus and Taxi Fleets

This goal explores the electrification of buses and taxis in the Peninsula area. The number of licensed taxis and average distanced travelled per person in the Peninsula area is taken from Government data[12, 13]. Fuel consumption and efficiency data for ICE[14] (Government data) and electric cars[15] (Low Carbon Vehicle Partnership data) is used to calculate gasoline and diesel savings and increased electricity consumption.

Petroleum total consumption for buses in the Peninsula area is available from the model (based on sub-national Government data[16]) and fuel efficiency from fuel efficiency data from Euro VI diesel buses averages over the LowCVP's UK Bus Cycle[17] (which includes inner and outer urban phases and a higher speed rural phase). Electric bus energy consumption is taken from LowCVP data[18].

Heavy Goods Vehicle Fleet

This goal considers the decarbonisation of HGVs and its associated carbon reduction from lower consumption of diesel. While there is still uncertainty in terms of the technology which will displace conventional HGVs, it has been assumed that a direct-electric solution will be used, as it will provide the lowest operational costs. However, it is acknowledged that other solutions, such as hydrogen, could have a role in the decarbonisation of HGVs. A hydrogen solution will result in higher electricity requirements to decarbonise HGVs, owing to the energy lost in the production, transportation and storage of hydrogen when compared to a direct-electric solution.

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[12] https://www.gov.uk/government/statistical-data-sets/taxi01-taxis-private-hire-vehilces-and-their-drivers
[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/833569/taxi-and-phv-england-2019.pdf
[14] https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env
[15] https://www.lowcvp.org.uk/initiatives/lceb/local-policy/lta-toolkit.htm
[16] https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level
[17] https://www.zemo.org.uk/assets/reports/LowCVP%20Coach%20report%202020%20web%20version%20V2.pdf

[18] https://www.lowcvp.org.uk/initiatives/lceb/local-policy/lta-toolkit.htm

Petroleum total consumption for buses in the Peninsula area is available from the model (based on sub-national Government data[19]). Fuel efficiency for HGVs is taken from Government data[20], and energy efficiency for electric HGVs is taken from an academic analysis carried out by Transport & Environment[21]. The amount of required electricity to decarbonise HGVs can therefore be calculated.

Accelerated EV uptake

The Business as Usual scenario already considers the Green Book's electrification projections to 2050. This intervention includes the much higher uptake of EVs expected. As a low scenario, the projections from the EV Work Package were used, and the CCC's most recent analysis, published in December 2020 to meet their advised Sixth Carbon Budget (the Balanced Pathway scenario was used).

The EV uptake trajectory for each scenario can be seen below:

Table 11. EV Uptake Trajectory

Year	Peninsula EV Work Package	CCC's Balanced Pathway Scenario
2020	1.32%	1.19%
2021	1.52%	1.45%
2022	2.23%	2.31%
2023	3.20%	3.66%
2024	4.55%	5.80%
2025	6.42%	9.16%
2026	8.84%	13.02%
2027	11.98%	17.44%
2028	16.06%	22.51%
2029	21.40%	28.34%
2030	28.40%	35.05%
2031	33.87%	41.81%
2032	39.39%	48.61%

[19] https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level
[20] https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env
[21] https://www.transportenvironment.org/sites/te/files/publications/20180725_T%26E_Battery_Electric_Trucks_EU_FINAL.pdf

Year	Peninsula EV Work Package	CCC's Balanced Pathway Scenario
2033	44.85%	55.35%
2034	50.26%	62.03%
2035	55.23%	68.17%
2036	59.93%	73.96%
2037	64.22%	79.26%
2038	67.92%	83.82%
2039	70.68%	87.23%
2040	73.05%	90.16%
2041	74.97%	92.53%
2042	76.38%	94.27%
2043	77.20%	95.28%
2044	77.35%	95.47%
2045	77.43%	95.56%
2046	77.43%	95.56%
2047	77.75%	95.96%
2048	78.30%	96.63%
2049	79.15%	97.68%
2050	80.49%	99.34%

Rail Decarbonisation

This intervention is based on Network's Rail Traction Decarbonisation Network Strategy, which uses SBTi's approved methodology to establish an emissions reduction target for rail traction. Consideration of the technologies proposed by this Strategy was also taken; for the Peninsula region, decarbonisation is almost exclusively reliant on electrification, with the exception of some potential for battery trains. As such, electrification is assumed as the technology which displaces fossil fuels.

The proposed decarbonisation trajectory, based on science-based targets, is below:

Table 12. Proposed Decarbonisation Trajectory

Year	Decarbonisation Target
2025	15.0%
2030	27.5%
2035	40.0%
2040	52.5%
2045	65.0%
2050	77.5%

This trajectory has been assumed in the High ambition, whereas only a 75% of decarbonisation targets has been assumed in the Low ambition.

Intervention Summary
A summary of the interventions, broken down by ambition level, and their implementation timescales are summarised in below:

Table 13. Intervention Summary

Intervention	Ambition	Target	Target Year
Transport Demand Reduction	Low	26% people WFH, 13% reduction in trips	2050
Transport Demand Reduction	High	35% people WFH, 25% reduction in trips	2040
HGV Demand Reduction	Low	11% Reduction in Trips (Empty HGV travel)	2050
HGV Demand Reduction	High	22% Reduction in Trips (Empty HGV travel)	2040
Mode Shift	Low	50% of trips by car, 15% by PT, 5% Bike	2050
Mode Shift	High	35% of trips by car, 25% by PT, 10% Bike	2050
EV Uptake	Low	Electric cars grow to 80% of market	2050
EV Uptake	High	Electric cars grow to 99% of market	2050
Rail Decarbonisation	Low	58% Electrified (75% of 2C SBTi Trajectory)	2050

Intervention	Ambition	Target	Target Year
Rail Decarbonisation	High	77.5% Electrified (As per 2C SBTI Trajectory)	2050
Bus and Taxi Electrification	Low	100% by 2050	2050
Bus and Taxi Electrification	High	50% by 2040	2040
HGV Electrification	Low	100% by 2050	2050
HGV Electrification	High	50% by 2040	2040

Results

A breakdown of the results is shown below, with carbon reductions provided for each intervention and each scenario, for 2030, 2040 and 2050.

Table 14. Carbon reduction results for each intervention and scenario by 2030

Scenario	Minimum	High Policy	High Technology	Maximum
Current (2020)	4,459.0 $ktCO_2$	4,459.0 $ktCO_2$	4,459.0 $ktCO_2$	4,459.0 $ktCO_2$
Business as Usual	-337.7 $ktCO_2$	-337.7 $ktCO_2$	-337.7 $ktCO_2$	-337.7 $ktCO_2$
Demand Reduction	-66.3 $ktCO_2$	-160.0 $ktCO_2$	-66.3 $ktCO_2$	-160.0 $ktCO_2$
Mode Shift	-136.1 $ktCO_2$	-277.0 $ktCO_2$	-136.1 $ktCO_2$	-277.0 $ktCO_2$
Electrification	-372.5 $ktCO_2$	-282.6 $ktCO_2$	-594.8 $ktCO_2$	-456.8 $ktCO_2$
Total	3,546.4 $ktCO_2$	3,401.7 $ktCO_2$	3,324.1 $ktCO_2$	3,227.5 $ktCO_2$
Decarbonisation	20.5%	23.7%	25.5%	27.6%

Table 15. Carbon reduction results for each intervention and scenario by 2040

Scenario	Minimum	High Policy	High Technology	Maximum
Current (2020)	4,459.0 $ktCO_2$	4,459.0 $ktCO_2$	4,459.0 $ktCO_2$	4,459.0 $ktCO_2$
Business as Usual	-744.8 $ktCO_2$	-744.8 $ktCO_2$	-744.8 $ktCO_2$	-744.8 $ktCO_2$
Demand Reduction	-133.5 $ktCO_2$	-320.4 $ktCO_2$	-133.5 $ktCO_2$	-320.4 $ktCO_2$
Mode Shift	-287.3 $ktCO_2$	-584.8 $ktCO_2$	-287.3 $ktCO_2$	-584.8 $ktCO_2$

	Minimum	High Policy	High Technology	Maximum
Electrification	-1,032.9 ktCO$_2$	-799.9 ktCO$_2$	-1,591.0 ktCO$_2$	-1,235.4 ktCO$_2$
Total	2,260.5 ktCO$_2$	2,009.2 ktCO$_2$	1,702.4 ktCO$_2$	1,573.7 ktCO$_2$
Decarbonisation	49.3%	54.9%	61.8%	64.7%

Table 16. Carbon reduction results for each intervention and scenario by 2050

Scenario	Minimum	High Policy	High Technology	Maximum
Current (2020)	4,459.0 ktCO$_2$	4,459.0 ktCO$_2$	4,459.0 ktCO$_2$	4,459.0 ktCO$_2$
Business as Usual	-1,150.2 ktCO$_2$	-1,150.2 ktCO$_2$	-1,150.2 ktCO$_2$	-1,150.2 ktCO$_2$
Demand Reduction	-200.6 ktCO$_2$	-365.2 ktCO$_2$	-200.6 ktCO$_2$	-365.2 ktCO$_2$
Mode Shift	-438.5 ktCO$_2$	-892.5 ktCO$_2$	-438.5 ktCO$_2$	-892.5 ktCO$_2$
Electrification	-1,409.5 ktCO$_2$	-1,133.1 ktCO$_2$	-1,975.4 ktCO$_2$	-1,554.3 ktCO$_2$
Total	1,260.2 ktCO$_2$	918.0 ktCO$_2$	694.2 ktCO$_2$	496.7 ktCO$_2$
Decarbonisation	71.7%	79.4%	84.4%	88.9%

In addition, annual carbon emission reductions per intervention and year are shown below:

Table 17. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2021-2035) for the Maximum Ambition scenario

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-31.1	-63.5	-94.1	-127.9	-159.5	-194.7	-223.3	-258.9	-297.2	-337.7	-380.5	-426.6	-467.0	-511.5	-558.6
Demand Reduction	0.0	-18.3	-36.8	-54.7	-73.1	-90.6	-109.6	-127.0	-143.8	-160.0	-175.6	-190.4	-206.5	-221.6	-236.1
Mode Shift	0.0	-30.8	-61.6	-92.3	-123.1	-153.9	-184.7	-215.4	-246.2	-277.0	-307.8	-338.5	-369.3	-400.1	-430.9
Electrification	0.0	-46.1	-90.4	-139.9	-185.8	-238.6	-278.7	-332.7	-392.2	-456.8	-537.0	-625.5	-702.1	-788.8	-882.2
Total	4,427.9	4,300.3	4,176.2	4,044.0	3,917.5	3,781.2	3,662.6	3,524.9	3,379.5	3,227.5	3,058.1	2,878.0	2,714.0	2,536.9	2,351.3

Table 18. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2036-2050) for the Maximum Ambition scenario

	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-595.8	-633.0	-670.3	-707.5	-744.8	-784.3	-824.1	-864.1	-904.3	-944.7	-985.4	-1,026.2	-1,067.3	-1,108.6	-1,150.2
Demand Reduction	-252.9	-269.8	-286.7	-303.5	-320.4	-324.9	-329.3	-333.8	-338.3	-342.8	-347.3	-351.7	-356.2	-360.7	-365.2
Mode Shift	-461.7	-492.4	-523.2	-554.0	-584.8	-615.5	-646.3	-677.1	-707.9	-738.6	-769.4	-800.2	-831.0	-861.8	-892.5
Electrification	-952.8	-1,023.4	-1,094.1	-1,164.7	-1,235.4	-1,265.8	-1,296.6	-1,327.7	-1,359.1	-1,390.9	-1,422.9	-1,455.3	-1,488.0	-1,521.0	-1,554.3
Total	2,195.8	2,040.2	1,884.7	1,729.2	1,573.7	1,468.4	1,362.6	1,256.2	1,149.4	1,041.9	934.0	825.5	716.4	606.8	496.7

Table 19. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2021-2035) for the Technological Focus scenario

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-31.1	-63.5	-94.1	-127.9	-159.5	-194.7	-223.3	-258.9	-297.2	-337.7	-380.5	-426.6	-467.0	-511.5	-558.6
Demand Reduction	0.0	-7.6	-15.2	-22.6	-30.2	-37.5	-45.3	-52.6	-59.6	-66.3	-72.9	-79.1	-85.9	-92.2	-98.4
Mode Shift	0.0	-15.1	-30.2	-45.4	-60.5	-75.6	-90.7	-105.9	-121.0	-136.1	-151.2	-166.3	-181.5	-196.6	-211.7
Electrification	0.0	-61.3	-120.7	-185.5	-246.5	-314.7	-369.9	-439.3	-514.4	-594.8	-696.8	-807.4	-905.8	-1,014.5	-1,130.0
Total	4,427.9	4,311.5	4,198.7	4,077.5	3,962.2	3,836.4	3,729.6	3,602.3	3,466.8	3,324.1	3,157.5	2,979.5	2,818.8	2,644.1	2,460.3

Table 20. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2036-2050) for the Technological Focus scenario

	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-595.8	-633.0	-670.3	-707.5	-744.8	-784.3	-824.1	-864.1	-904.3	-944.7	-985.4	-1,026.2	-1,067.3	-1,108.6	-1,150.2
Demand Reduction	-105.4	-112.4	-119.4	-126.5	-133.5	-140.3	-147.1	-153.8	-160.6	-167.3	-174.0	-180.7	-187.3	-194.0	-200.6
Mode Shift	-226.8	-241.9	-257.1	-272.2	-287.3	-302.4	-317.6	-332.7	-347.8	-362.9	-378.0	-393.2	-408.3	-423.4	-438.5
Electrification	-1,222.2	-1,314.4	-1,406.6	-1,498.8	-1,591.0	-1,627.9	-1,665.2	-1,702.8	-1,740.7	-1,779.0	-1,817.6	-1,856.6	-1,895.9	-1,935.5	-1,975.4
Total	2,308.7	2,157.1	2,005.6	1,854.0	1,702.4	1,604.0	1,505.1	1,405.6	1,305.5	1,205.0	1,103.9	1,002.3	900.1	797.5	694.2

Table 21. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2021-2035) for the Behavioural Focus scenario

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-31.1	-63.5	-94.1	-127.9	-159.5	-194.7	-223.3	-258.9	-297.2	-337.7	-380.5	-426.6	-467.0	-511.5	-558.6
Demand Reduction	0.0	-18.3	-36.8	-54.7	-73.1	-90.6	-109.6	-127.0	-143.8	-160.0	-175.6	-190.4	-206.5	-221.6	-236.1
Mode Shift	0.0	-30.8	-61.6	-92.3	-123.1	-153.9	-184.7	-215.4	-246.2	-277.0	-307.8	-338.5	-369.3	-400.1	-430.9
Electrification	0.0	-27.4	-53.2	-83.6	-110.8	-143.9	-166.2	-200.4	-239.3	-282.6	-336.1	-396.8	-447.5	-506.9	-572.2
Total	4,427.9	4,319.0	4,213.3	4,100.4	3,992.5	3,875.9	3,775.1	3,657.2	3,532.5	3,401.7	3,259.0	3,106.6	2,968.7	2,818.8	2,661.2

Table 22. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2036-2050) for the Behavioural Focus scenario

	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-595.8	-633.0	-670.3	-707.5	-744.8	-784.3	-824.1	-864.1	-904.3	-944.7	-985.4	-1,026.2	-1,067.3	-1,108.6	-1,150.2
Demand Reduction	-252.9	-269.8	-286.7	-303.5	-320.4	-324.9	-329.3	-333.8	-338.3	-342.8	-347.3	-351.7	-356.2	-360.7	-365.2
Mode Shift	-461.7	-492.4	-523.2	-554.0	-584.8	-615.5	-646.3	-677.1	-707.9	-738.6	-769.4	-800.2	-831.0	-861.8	-892.5
Electrification	-617.7	-663.3	-708.8	-754.3	-799.9	-832.1	-864.5	-897.2	-930.2	-963.4	-996.8	-1,030.5	-1,064.5	-1,098.7	-1,133.1
Total	2,530.8	2,400.4	2,270.0	2,139.6	2,009.2	1,902.2	1,794.7	1,686.7	1,578.3	1,469.4	1,360.1	1,250.2	1,139.9	1,029.2	918.0

Table 23. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2021-2035) for the Low Ambition scenario

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-31.1	-63.5	-94.1	-127.9	-159.5	-194.7	-223.3	-258.9	-297.2	-337.7	-380.5	-426.6	-467.0	-511.5	-558.6
Demand Reduction	0.0	-7.6	-15.2	-22.6	-30.2	-37.5	-45.3	-52.6	-59.6	-66.3	-72.9	-79.1	-85.9	-92.2	-98.4
Mode Shift	0.0	-15.1	-30.2	-45.4	-60.5	-75.6	-90.7	-105.9	-121.0	-136.1	-151.2	-166.3	-181.5	-196.6	-211.7
Electrification	0.0	-37.3	-72.9	-113.3	-150.3	-193.5	-225.6	-269.7	-318.9	-372.5	-440.4	-515.7	-580.7	-654.6	-734.5
Total	4,427.9	4,335.5	4,246.5	4,149.7	4,058.4	3,957.6	3,874.0	3,771.8	3,662.3	3,546.4	3,414.0	3,271.2	3,144.0	3,004.0	2,855.8

Table 24. Carbon emission reductions (in ktCO$_2$e) per intervention and year (2036-2050) for the Low Ambition scenario

	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Current (2020)	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-595.8	-633.0	-670.3	-707.5	-744.8	-784.3	-824.1	-864.1	-904.3	-944.7	-985.4	-1,026.2	-1,067.3	-1,108.6	-1,150.2
Demand Reduction	-105.4	-112.4	-119.4	-126.5	-133.5	-140.3	-147.1	-153.8	-160.6	-167.3	-174.0	-180.7	-187.3	-194.0	-200.6
Mode Shift	-226.8	-241.9	-257.1	-272.2	-287.3	-302.4	-317.6	-332.7	-347.8	-362.9	-378.0	-393.2	-408.3	-423.4	-438.5
Electrification	-794.2	-853.8	-913.5	-973.2	-1,032.9	-1,069.4	-1,106.1	-1,143.1	-1,180.4	-1,217.9	-1,255.7	-1,293.8	-1,332.1	-1,370.6	-1,409.5
Total	2,736.8	2,617.7	2,498.6	2,379.6	2,260.5	2,162.5	2,064.1	1,965.2	1,865.9	1,766.1	1,665.8	1,565.1	1,463.9	1,362.3	1,260.2

The impact of the ambition for each intervention is shown below. This has been done from a baseline of all interventions being set at a high level of ambition.

Table 25. Carbon emissions reduction (in ktCO$_2$e) per intervention and level of ambition, per year (2021-2030)

Intervention Name	Goal	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Baseline	-	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-	-31.1	-63.5	-94.1	-127.9	-159.5	-194.7	-223.3	-258.9	-297.2	-337.7
Demand Reduction (Digital Connectivity)	Low	0.0	-2.1	-4.3	-6.3	-8.5	-10.5	-12.7	-14.7	-16.6	-18.4
Demand Reduction (Digital Connectivity)	High	0.0	-4.3	-8.7	-12.9	-17.3	-21.3	-25.9	-29.9	-33.8	-37.4
Demand Reduction	Low	0.0	-3.6	-7.2	-10.6	-14.2	-17.6	-21.3	-24.6	-27.8	-30.9

Intervention Name	Goal	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Demand Reduction	High	0.0	-8.9	-18.0	-26.7	-35.7	-44.1	-53.5	-61.9	-69.8	-77.3
HGV Demand Reduction	Low	0.0	-5.7	-11.4	-17.2	-22.9	-28.8	-34.4	-40.3	-46.5	-52.8
HGV Demand Reduction	High	0.0	-7.7	-15.4	-23.0	-30.7	-38.4	-46.1	-53.7	-61.4	-69.1
Mode Shift	Low	0.0	-27.5	-54.9	-82.4	-109.9	-137.4	-164.8	-192.3	-219.8	-248.7
Mode Shift	High	0.0	-30.8	-61.6	-92.3	-123.1	-153.9	-184.7	-215.4	-246.2	-277.0
Bus and Taxi Electrification	Low	0.0	-10.2	-20.3	-30.5	-40.6	-50.8	-60.9	-71.1	-81.2	-91.4
Bus and Taxi Electrification	High	0.0	-15.5	-31.0	-46.5	-62.0	-77.5	-93.0	-108.5	-123.9	-139.4
HGV Electrification	Low	0.0	-6.7	-13.1	-20.2	-26.8	-34.2	-40.2	-47.7	-55.9	-64.6
HGV Electrification	High	0.0	-13.3	-26.2	-40.3	-53.6	-68.4	-80.4	-95.4	-111.7	-129.1
Rail Decarbonisation	Low	0.0	0.8	1.9	2.3	3.2	3.1	4.8	4.6	3.6	1.9
Rail Decarbonisation	High	0.0	0.2	0.6	0.4	0.6	-0.1	0.9	0.0	-1.6	-4.0
Electrification of Cars	Low	0.0	-7.7	-14.5	-23.8	-31.4	-42.1	-47.1	-58.3	-72.1	-88.2
Electrification of Cars	High	0.0	-16.7	-32.6	-50.9	-67.5	-87.3	-101.3	-121.6	-144.5	-169.6
Electrification of LGVs	Low	0.0	-0.4	-0.6	-1.4	-1.8	-2.9	-2.7	-4.0	-5.8	-8.2
Electrification of LGVs	High	0.0	-0.8	-1.2	-2.6	-3.3	-5.3	-4.9	-7.2	-10.5	-14.7

Table 26. Carbon emissions reduction (in ktCO$_2$e) per intervention and level of ambition, per year (2031-2040)

Intervention Name	Goal	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Baseline	-	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-	-380.5	-426.6	-467.0	-511.5	-558.6	-595.8	-633.0	-670.3	-707.5	-744.8
Demand Reduction (Digital Connectivity)	Low	-20.1	-21.7	-23.5	-25.1	-26.7	-28.6	-30.5	-32.4	-34.3	-36.2
Demand Reduction (Digital Connectivity)	High	-40.9	-44.2	-47.8	-51.1	-54.2	-58.1	-62.0	-65.9	-69.7	-73.6
Demand Reduction	Low	-34.0	-36.8	-39.9	-42.9	-45.6	-48.9	-52.2	-55.5	-58.8	-62.1
Demand Reduction	High	-84.4	-90.9	-98.4	-105.1	-111.4	-119.4	-127.3	-135.3	-143.3	-151.2
HGV Demand Reduction	Low	-59.2	-65.9	-72.2	-78.8	-85.5	-91.6	-97.8	-103.9	-110.0	-116.1
HGV Demand Reduction	High	-76.8	-84.4	-92.1	-99.8	-107.5	-115.1	-122.8	-130.5	-138.2	-145.8

Intervention Name	Goal	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Mode Shift	Low	-281.6	-314.5	-347.5	-380.4	-413.3	-446.2	-479.1	-512.0	-544.9	-577.8
Mode Shift	High	-307.8	-338.5	-369.3	-400.1	-430.9	-461.7	-492.4	-523.2	-554.0	-584.8
Bus and Taxi Electrification	Low	-101.5	-111.7	-121.8	-132.0	-142.1	-152.3	-162.4	-172.6	-182.7	-192.9
Bus and Taxi Electrification	High	-154.9	-170.4	-185.9	-201.4	-216.9	-232.4	-247.9	-263.4	-278.9	-294.4
HGV Electrification	Low	-73.8	-83.9	-92.6	-102.4	-112.8	-120.8	-128.9	-136.9	-145.0	-153.0
HGV Electrification	High	-147.6	-167.8	-185.3	-204.8	-225.5	-241.6	-257.7	-273.9	-290.0	-306.1
Rail Decarbonisation	Low	-0.5	-3.9	-5.6	-8.6	-12.4	-13.3	-14.1	-15.0	-15.9	-16.8
Rail Decarbonisation	High	-7.0	-11.0	-13.4	-17.1	-21.5	-23.0	-24.6	-26.1	-27.6	-29.2
Electrification of Cars	Low	-112.3	-140.8	-164.0	-192.3	-224.1	-244.8	-265.5	-286.1	-306.8	-327.5
Electrification of Cars	High	-207.5	-249.8	-286.7	-328.7	-374.2	-408.6	-443.0	-477.3	-511.7	-546.1
Electrification of LGVs	Low	-11.1	-14.7	-17.1	-20.5	-24.4	-26.2	-27.9	-29.7	-31.4	-33.1
Electrification of LGVs	High	-19.9	-26.5	-30.8	-36.9	-44.0	-47.1	-50.3	-53.4	-56.6	-59.7

Table 27. Carbon emissions reduction (in ktCO$_2$e) per intervention and level of ambition, per year (2041-2050)

Intervention Name	Goal	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Baseline	-	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0	4,459.0
Business as Usual	-	-784.3	-824.1	-864.1	-904.3	-944.7	-985.4	-1,026.2	-1,067.3	-1,108.6	-1,150.2
Demand Reduction (Digital Connectivity)	Low	-38.0	-39.8	-41.6	-43.4	-45.2	-46.9	-48.7	-50.4	-52.2	-53.9
Demand Reduction (Digital Connectivity)	High	-73.4	-73.3	-73.1	-72.9	-72.8	-72.6	-72.4	-72.2	-72.1	-71.9
Demand Reduction	Low	-65.2	-68.2	-71.2	-74.2	-77.2	-80.2	-83.1	-86.1	-89.0	-92.0
Demand Reduction	High	-150.8	-150.5	-150.1	-149.7	-149.3	-149.0	-148.6	-148.2	-147.8	-147.4
HGV Demand Reduction	Low	-118.5	-121.0	-123.4	-125.9	-128.4	-130.9	-133.4	-136.0	-138.5	-141.1
HGV Demand Reduction	High	-145.8	-145.8	-145.8	-145.8	-145.8	-145.8	-145.8	-145.8	-145.8	-145.8
Mode Shift	Low	-600.7	-623.6	-646.4	-669.3	-692.2	-715.1	-738.0	-760.8	-783.7	-806.6
Mode Shift	High	-615.5	-646.3	-677.1	-707.9	-738.6	-769.4	-800.2	-831.0	-861.8	-892.5
Bus and Taxi Electrification	Low	-203.0	-213.2	-223.3	-233.5	-243.6	-253.8	-263.9	-274.1	-284.2	-294.4

Intervention Name	Goal	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Bus and Taxi Electrification	High	-294.4	-294.4	-294.4	-294.4	-294.4	-294.4	-294.4	-294.4	-294.4	-294.4
HGV Electrification	Low	-161.7	-170.3	-179.0	-187.8	-196.7	-205.6	-214.5	-223.5	-232.6	-241.7
HGV Electrification	High	-323.3	-340.6	-358.1	-375.7	-393.3	-411.1	-429.0	-447.0	-465.2	-483.4
Rail Decarbonisation	Low	-18.4	-20.0	-21.7	-23.5	-25.4	-27.3	-29.3	-31.4	-33.5	-35.7
Rail Decarbonisation	High	-31.4	-33.7	-36.1	-38.5	-41.0	-43.6	-46.2	-49.0	-51.8	-54.6
Electrification of Cars	Low	-332.8	-338.1	-343.4	-348.8	-354.3	-359.8	-365.3	-370.9	-376.5	-382.1
Electrification of Cars	High	-553.0	-559.9	-566.9	-573.9	-581.0	-588.1	-595.2	-602.4	-609.7	-616.9
Electrification of LGVs	Low	-35.4	-37.8	-40.1	-42.6	-45.1	-47.6	-50.2	-52.9	-55.6	-58.3
Electrification of LGVs	High	-63.8	-68.0	-72.3	-76.7	-81.2	-85.7	-90.4	-95.2	-100.0	-105.0

Cumulative carbon emission by scenario and intervention, for 2030, 2040 and 2050 are shown below:

Table 28. Cumulative carbon savings by scenario and intervention by 2030

Scenario	Minimum	High Policy	High Technology	Maximum
Current (2020)	40,130.6 ktCO$_2$	40,130.6 ktCO$_2$	40,130.6 ktCO$_2$	40,130.6 ktCO$_2$
Business as Usual	-1,756.9 ktCO$_2$	-1,756.9 ktCO$_2$	-1,756.9 ktCO$_2$	-1,756.9 ktCO$_2$
Demand Reduction	-337.0 ktCO$_2$	-813.8 ktCO$_2$	-337.0 ktCO$_2$	-813.8 ktCO$_2$
Mode Shift	-680.5 ktCO$_2$	-1,385.0 ktCO$_2$	-680.5 ktCO$_2$	-1,385.0 ktCO$_2$
Electrification	-1,754.0 ktCO$_2$	-1,307.5 ktCO$_2$	-2,847.2 ktCO$_2$	-2,161.3 ktCO$_2$
Total	35,602.3 ktCO$_2$	34,867.5 ktCO$_2$	34,509.1 ktCO$_2$	34,013.7 ktCO$_2$
Decarbonisation	11.3%	13.1%	14.0%	15.2%

Table 29. Cumulative carbon savings by scenario and intervention by 2040

Scenario	Minimum	High Policy	High Technology	Maximum
Current (2020)	84,720.1 ktCO$_2$	84,720.1 ktCO$_2$	84,720.1 ktCO$_2$	84,720.1 ktCO$_2$
Business as Usual	-7,452.4 ktCO$_2$	-7,452.4 ktCO$_2$	-7,452.4 ktCO$_2$	-7,452.4 ktCO$_2$
Demand Reduction	-1,362.7 ktCO$_2$	-3,277.2 ktCO$_2$	-1,362.7 ktCO$_2$	-3,277.2 ktCO$_2$
Mode Shift	-2,873.1 ktCO$_2$	-5,847.6 ktCO$_2$	-2,873.1 ktCO$_2$	-5,847.6 ktCO$_2$
Electrification	-9,247.4 ktCO$_2$	-7,111.0 ktCO$_2$	-14,434.8 ktCO$_2$	-11,167.3 ktCO$_2$
Total	63,784.5 ktCO$_2$	61,031.9 ktCO$_2$	58,597.1 ktCO$_2$	56,975.5 ktCO$_2$
Decarbonisation	33.0%	30.3%	28.4%	24.8%

Table 30. Cumulative carbon savings by scenario and intervention by 2050

Scenario	Minimum	High Policy	High Technology	Maximum
Current (2020)	129,309.6 ktCO$_2$	129,309.6 ktCO$_2$	129,309.6 ktCO$_2$	129,309.6 ktCO$_2$
Business as Usual	-17,111.7 ktCO$_2$	-17,111.7 ktCO$_2$	-17,111.7 ktCO$_2$	-17,111.7 ktCO$_2$
Demand Reduction	-3,068.3 ktCO$_2$	-6,727.5 ktCO$_2$	-3,068.3 ktCO$_2$	-6,727.5 ktCO$_2$
Mode Shift	-6,577.9 ktCO$_2$	-13,387.9 ktCO$_2$	-6,577.9 ktCO$_2$	-13,387.9 ktCO$_2$
Electrification	-21,626.0 ktCO$_2$	-16,921.8 ktCO$_2$	-32,431.4 ktCO$_2$	-25,249.0 ktCO$_2$
Total	80,925.7 ktCO$_2$	75,160.7 ktCO$_2$	70,120.3 ktCO$_2$	66,833.5 ktCO$_2$
Decarbonisation	37.4%	41.9%	45.8%	48.3%

Lead Consultant
Richard Adams
Associate Director

AECOM Limited
Belvedere House
Pynes Hill
Exeter EX2 5WS
United Kingdom

T: +44 1392 663200
aecom.com

Appendix C Interventions and Actions

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C.1 Intervention Long-List and Scoring

ID	Intervention	Mean	Rank
31	Improve rail journey connectivity with walking, cycling and other modes of transport	4.80	1
56	Support and encourage modal shift of freight from road to more sustainable alternatives such as rail, cargo bike and inland waterways	4.70	2
66	Spatial planning policy - everyday needs should be accessible within a 20-minute walk, cycle or public transport trip	4.70	2
81	Improve integration between public transport services and as well as active modes for more seamless multi-modal journeys	4.70	2
45	Improving alternatives to domestic flights (ground travel > air travel)	4.60	5
64	Ensuring people can access broadband internet at home	4.60	5
82	Knowledge sharing	4.60	5
34	Market-led development of a charging infrastructure network	4.50	8
52	Freight - Electrification of freight/delivery vehicles	4.50	8
71	Implement low-emission zones/ road user charges and create car-free city centres/zones	4.50	8
16	Increase reliability and frequency of services e.g. by investing in bus priority measures	4.40	11
38	Readying the energy system - demand capacity	4.40	11
78	Shared mobility schemes e.g. bike and e-scooters	4.40	11
83	Encouraging and investing in local innovation projects	4.40	11
28	Increase reliability, frequency and integration of services	4.33	15
1	Develop integrated network of cycle infrastructure to LTN 1/20 (rural & urban)	4.30	16
5	Improved bike parking and cycling facilities	4.30	16
7	Low traffic neighbourhoods (LTNs)	4.30	16
11	Bus - electric bus fleet investment and adoption	4.30	16
14	Develop electric bus charging infrastructure network / strategy	4.30	16
18	Make public transport more accessible and affordable	4.30	16
30	Modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys	4.30	16
15	7 days a week public transport connectivity	4.20	23
29	Increase capacity on the rail network to meet growing passenger and freight demand and support significant shifts from road to rail	4.20	23

ID	Intervention	Mean	Rank
32	Encourage transition from internal combustion to electric (Cars)	4.20	23
33	Promote fleet transformation across business community and public service vehicles	4.20	23
70	Parking management (removal, user charges) in town / city centres and leisure destinations	4.20	23
77	Car sharing incl. car clubs and car sharing apps	4.20	23
80	Develop journey planning, mobility-as-service (Maas) platforms and mobility credit systems	4.20	23
2	Set target for reallocating road space for active travel	4.10	30
26	Make rail more accessible, affordable and easy to use	4.10	30
65	Improving 4G mobile coverage	4.10	30
23	Rail - Electrification of traction and infrastructure	4.00	33
36	Home charging - planning requirement	4.00	33
54	Invest in zero emission HGV technology and trials	4.00	33
67	Flexible mobile / digital provision of a range of local council, health and other services	4.00	33
17	Marketing to re-build confidence in public transport following COVID-19	3.90	37
37	Develop charging infrastructure at tourist destinations	3.90	37
6	School Streets	3.89	39
3	Develop quality walking network incl. pedestrianisation	3.80	40
35	On-street parking charging infrastructure	3.80	40
46	Aviation demand management	3.80	40
50	Shipping - Increase uptake of low carbon and net zero fuels	3.80	40
57	Collaboration and tracking of goods / consolidation centres	3.80	40
60	Efficient supply chain logistics	3.80	40
69	Develop employment opportunities in local centres	3.80	40
79	Demand responsive transport	3.80	40
8	Incentive programme of grants/support to buy new cycles & e-bikes	3.70	48

ID	Intervention	Mean	Rank
10	Behavioural change programmes incl. marketing and communications	3.70	48
19	Mass-transit focus in urban areas	3.70	48
21	Park & Ride sites with integrated EV charging and cycle parking	3.70	48
41	Lead by example by implementing low or zero emission vehicles in local authority fleets	3.70	48
68	Encourage businesses to have a smaller, more localised approach to offices	3.70	48
4	Development of rural active travel corridors	3.60	54
9	Programmes of enabling activities for active mobility e.g. cycle training, targeted personal incentives e.g. GP prescribing	3.60	54
27	Marketing to re-build confidence in rail transport following COVID-19	3.60	54
47	Policy commitment to prevent airport expansion	3.60	54
76	Explore opportunities to diversify ports into renewable energy production	3.60	54
24	Rail - alternative traction technologies: Hybrid, Battery, Hydrogen, etc	3.50	59
48	All new vessels being ordered for use in Peninsula waters are designed with zero emission propulsion capability	3.50	59
51	Monitor and reduce port operation emissions - electric port vehicles, improved logistic efficiency, etc	3.50	59
53	Freight - Alternative motive technologies: Hybrid, biofuels, Hydrogen freight vehicles	3.50	59
63	Develop network of alternative fuel stations and promote existing sites	3.50	59
20	Public Transport Apps [distinct from MaaS apps]	3.40	64
42	Aviation - low carbon / sustainable aviation fuels (SAF) incl. biomass, biogenetic waste, synthetic jet fuel, etc.	3.40	64
49	Develop innovation and infrastructure associated with zero emission propulsion technologies, including bunkering of low or zero emission fuel	3.40	64
22	Bus subsidies	3.30	67
55	Stimulate demand for zero emission trucks through financial and non-financial incentives	3.30	67
59	Real time 3D routing	3.30	67
61	Freight - Use of 'evolutionary' technology solutions to improve existing fuel efficiency / reduce emissions	3.30	67
73	Development/testing alternative fuel technologies e.g. Biomethane	3.30	67
43	Electric powered light aircraft (realistically limited to domestic flights)	3.20	72

ID	Intervention	Mean	Rank
44	Aircraft fleet-efficiency improvements e.g. modernisation, operational optimisation, aircraft improvements	3.20	72
72	Biofuel blends - Government mandated fuel mix - bioethanol (E10) and biodiesel	3.20	72
74	Invest in hydrogen production and utilisation development	3.20	72
13	Bus - Alternative motive technologies: low carbon fuels - biofuel, synthetic, hydrogen, etc.	3.10	76
75	Invest in hydrogen re-fuelling infrastructure	3.10	76
25	Rail -Interim technology fixes to improve/clean diesel trains (until can be removed altogether)	3.00	78
39	Address backlog in traffic signal maintenance to improve traffic flow and reduce emissions	3.00	78
40	Support use of alternative/low carbon fuels (e.g. biofuels) during transition period	2.90	80
58	Autonomous delivery vehicles, esp. for first/last mile	2.80	81
62	Develop business case for coastal feeder services to help remove road vehicles	2.80	81
12	Trolley buses (overhead power)	1.90	83

C.2 Intervention Alignment to Short-Term Actions

Notes

Indicative cost ranges are based around a 'typical' singular action as a means of benchmarking the relative costs of actions, as opposed to providing a cost estimate. It is noted that actual costs may be substantially different and would be developed as part of the next steps, as more detailed scope and geographies are established. The cost ranges have been developed with reference to funding pots, including the DfT's Large Local Major criteria:

Approximate Indicative Cost	Symbol
Less than c. £100,000	£
c. £100,000 to £1m	££
c. £1m to £10m	£££
c. £10m to £50m	££££
c. £50m +	£££££

The 'STB Influence' score has been subjectively assessed depending upon directness of policy and/or funding influence that the STB would have when implementing actions. 'Lead' refers to areas whereby the STB can directly influence interventions; 'Support' corresponds to a less direct role, potentially working alongside other stakeholders to help improve co-ordination and awareness amongst parties.

Mode shift to Public Transport and Active Modes

Intervention	Timescale	Cost range	STB Influence	Next Steps	Next Steps Action Grouping	DfT Theme Alignment
Set targets for reallocating road space to cycling, walking and green space each year	2022 - 2024	£	Support	Stakeholder engagement with Local Authorities to agree cohesive approach	Identification of Strategic Active Travel Opportunities	Increasing walking and cycling
Improved bike parking and cycling facilities	2022 - 2024	£	Support	Identify priority areas for improvements (potential criteria such as key trip attractors), create action plan and implementation fund	Identification of Strategic Active Travel Opportunities	Increasing walking and cycling
Shared mobility schemes e.g. bike and e-scooters	2022 - 2024	£	Support	Stakeholder engagement with Local Authorities and potential providers (consideration around current micromibility trial outcomes and DfT engagement)	Multi-Modal Coordination Plan	Future transport - more choice, better efficiency
Improve integration between public transport services and as well as active modes for more seamless multi-modal journeys	2022 - 2024	£	Support	Create a multi-modal action plan alongside Local Authorities and operators (include items such as mobility hubs); supplement with implementation plan/fund (network connections)	Multi-Modal Coordination Plan	Future transport - more choice, better efficiency
7 days a week public transport connectivity	2022 - 2024	££	Support	Identify gaps in evening/weekend provision; create action and implementation plan for improvement	Public Transport Prioritisation	Delivering zero emission buses and promoting bus use
Parking management (removal, user charges) in town / city centres and leisure destinations	2022 - 2024	0	Support	Stakeholder engagement with LAs / feasibility study to understand potential locations; potential for a Peninsula-wide memorandum of understanding and action plan; engagement with central Government (particularly road-user charging, pavement parking and future Clean Air requirements [WHO reduced limits a lot before Xmas])	Future Funding Focus	Place-based actions
Develop integrated network of cycle lanes and infrastructure to LTN 1/20: covering rural, semi-urban and urban settings	2022 - 2029	££	Support	Identify existing routes and aspirational future network changes (combine LCWIPs and develop strategic links, potentially alongside Sustrans aspirations)	Identification of Strategic Active Travel Opportunities	Increasing walking and cycling
Low traffic neighbourhoods	2022 - 2029	£	Support	Stakeholder engagement with Local Authorities to identify early case study areas, undertake consultation etc., implementation/expansion of an agreed number of areas to build momentum (action plan and implementation fund)	Identification of Spatial Planning Opportunities	Increasing walking and cycling
Increase reliability and frequency of services e.g. by investing in bus priority measures	2022 - 2029	££	Support	Identify gaps in evening/weekend provision and resilience hotspots. Create action plan for improvement; then implementation plan potentially supported by a fund (network connections)	Public Transport Prioritisation	Delivering zero emission buses and promoting bus use
Make public transport more accessible and affordable	2022 - 2029	££	Support	Create a multi-modal action plan alongside Local Authorities and operators; then implementation plan potentially supported by a fund (network connections)	Multi-Modal Coordination Plan	Delivering zero emission buses and promoting bus use
Implement low-emission zones / road user charges and create car-free city centres / zones	2022 - 2029	0	Support	Stakeholder engagement with LAs / feasibility study to understand potential locations; potential for a Peninsula-wide memorandum of understanding and action plan; engagement with central Government (particularly road-user charging, pavement parking and future Clean Air requirements [WHO reduced limits a lot before Xmas])	Future Funding Focus	Place-based actions
Develop Journey planning, mobility-as-service (Maas) platforms and mobility credit systems to link public transport journey stages and increase accessibility	2022 - 2029	££	Support	Create a multi-modal action plan alongside Local Authorities and operators; co-operating/ordinating with central Government; pooled incentive fund across region (if gamified) to benefit from economies of scale; links to digital connectivity strategy/action plan	Multi-Modal Coordination Plan	Future transport - more choice, better efficiency

Decarbonising Transport Modes

Intervention	Timescale	Cost range	STB Influence	Next Steps	Next Steps Action Grouping	DfT Theme Alignment
Invest in zero emission HGV technology and trials	2022 - 2024	£	None	Freight decarbonisation plan (separate work package)	Freight decarbonisation plan (separate work package)	Delivering a zero emission freight and logistics sector
Encouraging and investing in local innovation projects	2022 - 2024	£	Support	Build upon partnerships with LEPs; potentially an innovation fund?	Partnership and engagement activities	Supporting UK research and development as a decarbonisation enabler
Bus - electric bus fleet investment and adoption	2022 - 2029	££	Lead	Develop action and implementation plan in collaboration with Local Authorities and operators	Zero Emission Bus Implementation	Delivering zero emission buses and promoting bus use
Develop electric bus charging infrastructure network/strategy	2022 - 2029	££	None	Develop action and implementation plan in collaboration with Local Authorities and operators	Zero Emission Bus Implementation	Delivering zero emission buses and promoting bus use
Encourage transition from conventional ICE to electric (Cars)	2022 - 2029	£	Support	Develop action plan of supporting measures to accelerate uptake (in combination with Local Authorities and central Government initiatives); promotional marketing across Peninsula to create cost efficiencies/economies of scale	Promotional Activities linking to existing STB Communications Plan	Electrification of road transport (a zero emission fleet of cars, vans, motorcycles and scooters)
Promote fleet transformation across business community and public service vehicles	2022 - 2029	£	Support	Stakeholder engagement with Local Authorities and businesses (in combination with wider public EV initiatives); cohesive promotional marketing across Peninsula to create cost efficiencies/economies of scale	Promotional Activities linking to existing STB Communications Plan	Electrification of road transport (a zero emission fleet of cars, vans, motorcycles and scooters)
Freight - Electrification of freight/delivery vehicles	2022 - 2029	£	None	Freight decarbonisation plan (separate work package)	Freight decarbonisation plan (separate work package)	Delivering a zero emission freight and logistics sector
Support and encourage modal shift of freight from road to more sustainable alternatives such as rail, cargo bike and inland waterways	2022 - 2029	£	Lead	Freight decarbonisation plan (separate work package)	Freight decarbonisation plan (separate work package)	Delivering a zero emission freight and logistics sector
Knowledge sharing	2022 - 2029	£	Support	Build upon partnerships both within the Peninsula and other STBS/central Government/Academia/Modal bodies	Partnership and engagement activities	Supporting UK research and development as a decarbonisation enabler
Rail - Electrification of traction and infrastructure (Shared with WP09)	2025 - 2029	£££££	None	Feasbility study to identify potential routes/services for trials as part of roadmap (Network Rail action plan but regionalised)	Rail action plan (separate work package)	Decarbonising our railways and increasing usage

More Choice, Better Efficiency

Intervention	Timescale	Cost range	STB Influence	Next Steps	Next Steps Action Grouping	DfT Theme Alignment
Improve rail journey connectivity with walking, cycling and other modes of transport	2022 - 2024	£	None	Create a multi-modal action plan alongside Local Authorities and operators (include items such as mobility hubs); supplement with implementation plan/fund (network connections)	Multi-Modal Coordination Plan	Decarbonising our railways and increasing usage
Car sharing incl. car clubs and car sharing apps	2022 - 2024	£	None	Stakeholder engagement with businesses and car club providers (including around decarbonisation of ther fleets); promotion programme and potentially a rural funding grant pot	Promotional Activities linking to existing STB Communications Plan	Future transport - more choice, better efficiency
Increase reliability, frequency and integration of services	2022 - 2024	££	Support	Create a multi-modal action plan alongside Local Authorities and operators	Multi-Modal Coordination Plan	Decarbonising our railways and increasing usage
Make rail more accessible, affordable and easy to use	2022 - 2029	££	Lead	Create a multi-modal action plan alongside Local Authorities and operators, including service integration and physical accessbility assessment (build upon current DfT accessibility work)	Multi-Modal Coordination Plan	Decarbonising our railways and increasing usage
Modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys	2022 - 2029	££	Support	Create a multi-modal action plan alongside Local Authorities and operators	Multi-Modal Coordination Plan	Decarbonising our railways and increasing usage
Improving alternatives to domestic flights (ground travel > air travel)	2022 - 2029	£	Support	Feasibility/stakeholder engagement: Identify current routes and potential action plan for improvement alongside LAs and considerations of Department for Transport funding support); potential alternative promotion in short-term	Promotional Activities linking to existing STB Communications Plan	Aviation decarbonisation
Spatial planning policy - everyday needs should be accessible within a 20-minute walk, cycle or public transport trip	2022 - 2029	£	Support	Stakeholder engagement with Local Authorities to understand feasbility/alignment across area; considerations of developer viability/central Government guidance; potential for a Peninsula-wide memorandum of understanding and/or shared design document	Identification of Spatial Planning Opportunities	Place-based actions
Increase capacity on the rail network to meet growing passenger and freight demand and support significant shifts from road to rail	2025 - 2029	£££	Support	Feasibility study to identify capacity hotspots (Rail work package?)	Rail action plan (separate work package)	Decarbonising our railways and increasing usage

Supporting Infrastructure to Deliver Carbon Reductions

Intervention	Timescale	Cost range	STB Influence	Next Steps	Next Steps Action Grouping	DfT Theme Alignment
Ensuring people can access broadband internet at home	2022 - 2024	0	None	Stakeholder engagement with network providers / feasibilty study as part of digital connectivity strategy/action plan for the Peninsula (target gap identification)	Digital connectivity strategy and action plan	Place-based actions
Improving 4G mobile coverage	2022 - 2024	0	None	Stakeholder engagement with network providers / feasibilty study as part of digital connectivity strategy/action plan for the Peninsula (target gap identification)	Digital connectivity strategy and action plan	Place-based actions
Flexible mobile / digital provision of a range of local council, health and other services	2022 - 2024	0	Support	Stakeholder engagement with service providers; feasibilty study to support a digital connectivity strategy/action plan for the region (focus on gap identification)	Digital connectivity strategy and action plan	Place-based actions
Home charging - planning requirement	2022 - 2029	£	None	Stakeholder engagement with Local Authorities to understand feasbility and alignment across the Peninsula; considerations of developer viability and central Government guidance; potential for a Peninsula-wide memorandum of understanding and/or shared design document	Identification of Spatial Planning Opportunities	Electrification of road transport (a zero emission fleet of cars, vans, motorcycles and scooters)
Market-led development of a charging infrastructure network to meet drivers needs	2022 - 2029	£	None	Stakeholder engagement with industry to understand demand / knowledge share / support; Peninsula inputs into equity/shortfalls (Local Authority funding pot opportunities)	Electric Network of the Future	Electrification of road transport (a zero emission fleet of cars, vans, motorcycles and scooters)
Readying the energy system - demand capacity	2022 - 2029	£	None	Feasibility study / stakeholder engagement with energy providers (tap into National Grid work and liase with charging operators to ensure cohesion)	Electric Network of the Future	Electrification of road transport (a zero emission fleet of cars, vans, motorcycles and scooters)

C.3 Actions Summary

High Priority Actions

Priority Action 1: Electric Network of the Future

This decarbonisation priority involves the commissioning of a study into the creation of an electric network of the future, which would subsequently be used to guide and action plan. This action will directly support central Government's recent call for STBs to co-ordinate the assessment of regional infrastructure demand (Figure C-1), in turn helping electricity network operators to plan their networks and also achieve private sector investment. The study and action plan will support the development of electric vehicle charging infrastructure and will involve stakeholder engagement working alongside Local Authorities, energy network operators, private sector charging providers and network authorities such as National highways to understand potential demand and identify a cohesive electric vehicle network for the peninsula. Central Government funding opportunities may arise from strategic alignment to the commitment to transition to zero emissions cars and vans by 2035[1], in addition to the Decarbonising Transport plan

DTP Priority

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[1] HM Government (2021) Transitioning to zero emission cars and vans: 2035 delivery plan; DfT (2022) Taking charge: the electric vehicle infrastructure strategy

Figure C-1: Electric Vehicle Infrastructure Strategy Sub-National Transport Body Expectations

Sub-national Transport Bodies

We also have made funding available for Sub-national Transport Bodies in 2021-22 to produce regional assessments to support energy system stakeholders and local authorities in planning charging infrastructure provision. We expect these assessments to be in place by the end of 2022. They should:

- Produce scenarios for potential demand for EV infrastructure in the region. These may either build on demand assessments from individual local authorities or provide the basis for more tailored demand scenarios for specific local authorities, depending on the status of existing plans across the region.

- Identify clusters of demand in the region, including bringing together data on current demand and potential future demand from fleets operating in the region (where possible, this should include demand from buses and other heavy vehicles, as well as cars and vans). This should identify charging demand in areas without off-street parking, and at sites such as depots where many vehicles may be charging overnight. This will help electricity network operators to plan their networks to meet this expected demand.

- Identify different levels of engagement and progress within local authorities in the region and locations where additional support is needed to enable planning of local chargepoints.

- Highlight examples of best practices between local authorities and foster partnerships between authorities to ensure charging infrastructure is delivered in an efficient and cohesive manner. Successful charging infrastructure deployment will need committed engagement from across sectors.

Priority Action 2: Zero Emission Bus Implementation

This decarbonisation priority involves the creation of an electric bus action and implementation plan, in support of actions facilitating an all-electric bus fleet in the region. The creation of the plan will involve stakeholder engagement working alongside Local Authorities and bus operators to identify and overcome potential electrification challenges, including potential demand for charging facilities (complementing Priority Action 1). Activities could also include a strategic review of the recent 'Bus Service Improvement Plans'[2]. Central Government funding opportunities may arise from strategic alignment of activities to the 2021 'Bus Back Better' vision for buses, in addition to the Decarbonising Transport plan.

DTP Priority

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[2] Department for Transport (2021) National Bus Strategy: Bus Service Improvement Plans Guidance to local authorities and bus operators

Priority Action 3: Public Transport Prioritisation

This decarbonisation priority involves the creation of a public transport prioritisation action and implementation plan, in support of actions to increase the reliability and frequency of public transport services. The creation of the plan will involve stakeholder engagement working alongside Local Authorities, bus operators and network authorities such as National Highways to strategically build upon recent 'Bus Service Improvement Plans'[3] and net zero commitment actions. Considerations could include ticket interoperability across the peninsula or infrastructure-based requirements, such as strategies for implementing bus priority measures and/or interacting with the Strategic Road Network. Central Government funding opportunities may arise from strategic alignment of activities to the 2021 'Bus Back Better'[4] vision for buses, in addition to the Decarbonising Transport plan.

DTP Priority

Other Actions

Multi-Modal Coordination Plan

This decarbonisation priority involves the creation of a multi-modal action and implementation plan, in support of actions aiming to improve the integration and affordability of different transport modes for door-to-door journeys. The creation of the plan will involve stakeholder engagement working alongside Local Authorities and mobility operators to develop an aspirational multi-modal travel network for the peninsula. Activities could also include the provision of support for mobility hub initiatives, such as those in Plymouth, to understand the potential roll-out across the peninsula area. Central Government funding opportunities may arise from strategic alignment of activities to the 2022 'Levelling Up' White Paper's[5] mission to bring public transport mode quality closer to London standards by 2030, in addition to the Decarbonising Transport plan.

DTP Priority

Future Funding Focus

This decarbonisation priority involves the creation of a future funding action plan, in support of actions including parking management and charging zones that can also be used to fund sustainable transport measures. The creation of the plan will involve stakeholder engagement working alongside Local Authorities, Local Enterprise Partnerships, and central Government to identify a cohesive approach to the application of charging mechanisms the peninsula region. Central Government funding opportunities may arise from potential strategic alignment of activities to the 2020 pavement parking consultation[6], 2022

DTP Priority

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[3] Department for Transport (2021) National Bus Strategy: Bus Service Improvement Plans Guidance to local authorities and bus operators
[4] Department for Transport (2021) Bus Back Better
[5] HM Government (2022) Levelling Up White Paper
[6] Department for Transport (2020) Managing Pavement Parking Consultation

Transport Select Committee report on road pricing[7] and/or any changing of air quality legal limits in response to 2021 World Health Organisation guidelines[8], vision for cycling and walking, in addition to the Decarbonising Transport plan.

Promotional Activities linking to existing STB Communications Plan

This decarbonisation priority involves the creation of a promotional activities action and implementation plan, in support of actions seeking to decarbonise individual's and businesses' travel behaviours. The creation of the plan will involve stakeholder engagement working alongside Local Authorities, the Local Enterprise Partnerships and businesses to potentially develop a cohesive behaviour change programme for the peninsula region. Any programme could build upon existing local initiatives to identify lessons learned and potentially leverage existing buy-in, or alternatively support localised pilot projects (potentially linked to other trial initiatives such as mobility hubs). Central Government funding opportunities may build upon national 'nudge' initiatives including the 2020 introduction of green number plate tags for electric vehicles[9], in addition to the Decarbonising Transport plan.

DTP Priority

Identification of Spatial Planning Opportunities

This decarbonisation priority involves the creation of a spatial planning action and implementation plan, in support of planning-system actions to support neighbourhoods and households decarbonise their travel habits whilst enjoying better places. A pre-cursor to any activities would involve discussion clearly defining Peninsula Transport's desired role in spatial planning matters, including a broad range of topics such as being a co-ordinator for consistency in approach across the area or the potential to act as a stakeholder in plan creation and/or assessment of larger applications. The creation of the plan would involve stakeholder engagement working with Local Authorities, central Government and other statutory stakeholders such as National Highways to create a consistent approach to spatial planning across the region and leverage updates to national guidance when developing Local Plans. Central Government funding opportunities may arise from the desire to promote high-quality placemaking presented in the 2021 'National Model Design Code'[10], in addition to the Decarbonising Transport plan.

DTP Priority

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[7] Transport Select Committee (2022) Road Pricing
[8] World Health Organisation (2021) New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution
[9] Office for Low Emission Vehicles (2020) Green number plates for ultra-low emission vehicles: government response
[10] Ministry of Housing, Communities and Local Government (2021) National Model Design Code Guidance

Identification of Strategic Active Travel Action Opportunities

This decarbonisation priority involves the creation of a high-level active travel action and implementation plan, in support of actions including the development of an integrated network of cycle lanes to LTN 1/20[11] standards. A pre-cursor to any activities would involve discussion clearly defining Peninsula Transport's preferred role in Active Travel provision, including how local delivery can be supported. The creation of any plan could subsequently involve a stakeholder engagement working alongside Local Authorities and national-level organisations such as Active Travel England[12] to bring together the contents of documents such as the existing Local Cycling and Walking Infrastructure Plans[13] and identify a cohesive active travel network for the peninsula. Central Government funding opportunities may arise from strategic alignment of activities to the 2020 'Gear Change'[14] vision for cycling and walking, in addition to the Decarbonising Transport plan itself.

DTP Priority

Partnership and Engagement Activities

This decarbonisation priority involves the continuation and expansion of existing partnership and engagement activities. The area will involve stakeholder engagement working alongside central Government and other STBs to share knowledge and best practice, with potential opportunities to work with the Local Enterprise Partnerships to support investment in transport decarbonisation initiatives and trials. Central Government funding opportunities may arise from strategic alignment of activities to the 2021 'Build Back Greener'[15] vision for a prosperous, low carbon society, in addition to the Decarbonising Transport plan.

DTP Priority

Rail Action Plan and Freight Decarbonisation Plan

This decarbonisation priority involves the creation of rail and freight decarbonisation plans, in alignment with Work Packages 08 and 09, respectively. Whilst the specific contents will follow the recommendations of the individual work packages, the overarching imperative to support and supplement wider decarbonisation must be a central consideration.

DTP Priority

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[11] Department for Transport (2020) Local Transport Note 1/20: Cycle Infrastructure Design
[12] As announced in Department for Transport (2022) Written Statement to Parliament
[13] Adopted by the constituent Local Authorities within the following guidance: Department for Transport (2017) Local Cycling and Walking Infrastructure Plans
[14] Department for Transport (2020) Gear Change: A bold vision for cycling and walking
[15] HM Government (2021) Net Zero Strategy: Build Back Greener

Digital Connectivity Action Plan

This decarbonisation priority involves the creation of a digital connectivity action and implementation plan, in support of actions enabling digital service and opportunity access to supplement and/or replace physical connectivity. The creation of the plan will involve stakeholder engagement working alongside Local Authorities, digital infrastructure providers and key business/local service organisations to support a wider digital roadmap for the peninsula. Central Government funding opportunities may arise from strategic alignment of activities to several 2022 'Levelling Up' White Paper[16] missions, in addition to the Decarbonising Transport plan.

DTP Priority

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[16] HM Government (2022) Levelling Up White Paper

Lead Consultant
Richard Adams
Associate Director
Transportation

Supporting Consultant
Adrian Regueira-Lopez
Principal Consultant

AECOM
Winslade House,
Winslade Park,
Manor Drive,
Clyst St Mary,
EXETER
EX5 1FY
United Kingdom

T: +44 1392 663200
aecom.com

WSP
Kings Orchard
1 Queen Street
Bristol
BS2 0HQ

T: +44 117 930 6200
wsp.com