New Anglia Local Enterprise Partnership, Norfolk County Council and Suffolk County Council

EAST INTEGRATED TRANSPORT STRATEGY: DEVELOPMENT OF LONG-TERM ECONOMIC SCENARIOS

Final Report

001
JULY 2018

CONFIDENTIAL

New Anglia **Local Enterprise Partnership, Norfolk County Council and Suffolk County Council**

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Final Report

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1 INTRODUCTION

1.1 STUDY BACKGROUND AND APPROACH

The New Anglia Local Enterprise Partnership (LEP), Norfolk County Council and Suffolk County Council have jointly commissioned WSP and KPMG to develop a range of economic futures for the East over the next 30 to 40 years with associated scenarios for the development of the region's transport system in order to inform its transport strategy.

The primary objective of the work is to develop a range of future economic scenarios looking 30 to 40 years hence. For each scenario, this commission sets out how transport systems should evolve, be innovatively developed, or change organically, to reflect future economic activity. This work builds on the evolving transport strategy that has been developed by the New Anglia Local Transport Board, and it is noted that this has generally looked at short term timescales.

1.2 DEFINING THE STUDY AREA

This study focuses on Norfolk and Suffolk, which together form the area covered by the New Anglia LEP. The scope of the strategy is the combined are of these two counties in terms of transport connectivity and economic and geographic conditions.

1.3 PURPOSE OF THIS REPORT

This document is the final report and evidence to support the short summary report also produced as part of the commission. The report presents all of the background transport and economic analysis undertaken to develop the strategy, provides the economic futures and transport scenarios and presents the overall strategy itself and its component parts.

1.4 STRUCTURE OF THIS REPORT

Following on from this introduction, the following sections are presented:

- Section 2 – Vision and objectives for the strategy
- Section 3 – presents the economic geography of the New Anglia region
- Section 4 – presents the transportation geography of the region
- Section 5 – a summary of those geographies
- Section 6 – discusses planned change within New Anglia
- Section 7 – discusses global trends and disruptors that will affect the New Anglia economy and transport
- Section 8 – presents the economic futures for New Anglia
- Section 9 – presents the future transport scenarios for the region
- Section 10 – presents the transportation strategy themes and components

2 VISION AND OBJECTIVES

2.1 THE AMBITION

The New Anglia Strategic Economic Plan sets out its ambition for the area as being:

'To harness our distinct sector strengths and our natural assets to deliver more jobs, new businesses and housing'.

This ambition is supported by the detail of delivering 95,000 new jobs, 10,000 new businesses, improved productivity and 117,000 new houses. The ambition is also based on growth in key sectors of advanced manufacturing & engineering, agri-tech, energy, ICT & digital creative, and life sciences.

2.2 OBJECTIVES

When considering objectives for transport, thought needs to be given to serving needs rather than simply providing infrastructure and services. Transport is a means by which needs are served through the provision of access for both people and business. However, access is increasingly being provided without the need for people to physically move from one location to another and this change is likely to become even greater over the coming decades. The objectives for this commission, therefore, need to focus on providing access rather than simply improving transport:

- To provide access to new employment growth opportunities;
- To provide access to support the development of new businesses;
- To improve access to deliver increased productivity;
- To provide access to new housing developments;
- To provide access to the needs of the population to enhance wellbeing.

3 ECONOMIC GEOGRAPHY

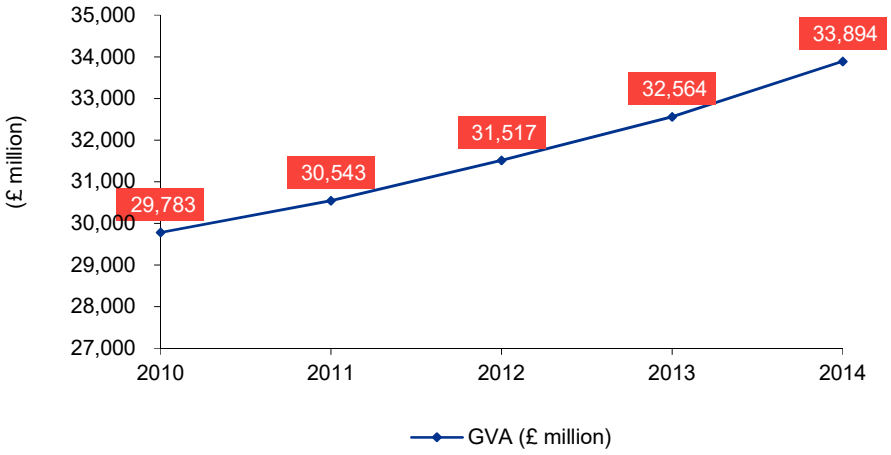
3.1 INTRODUCTION

This section provides an overview of the economy of New Anglia as presented at the stakeholder workshop on 30th November 2016. The purpose of this item was to provide the basis for more detailed discussion on the future of different sectors. The development of economic futures will use a sector led approach which is not presented in this document.

3.2 ECONOMIC OVERVIEW AND GVA

New Anglia had a total (nominal) GVA of £34m in 2014 making it the 13th largest LEP in UK. In 2014 the GVA per head was £21,000 – 85% of the UK average. Between 2010 and 2014 nominal GVA grew on average 2.6% per year (CAGR), while nominal GVA per head grew 2.1% (CAGR). The GVA estimates are on a workplace basis and are presented in current basic prices.

Figure 0-1 – New Anglia – GVA Trend over 5 years



3.3 DEMOGRAPHICS AND SKILLS

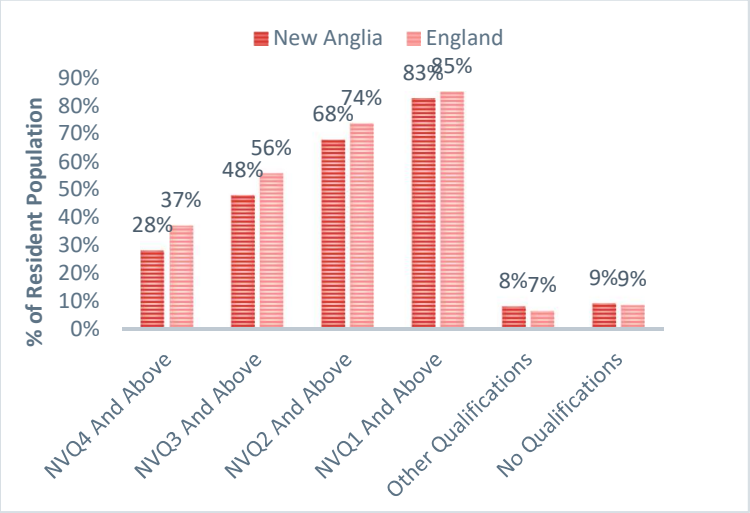
New Anglia's total population of 1.6 million has a notably different demographic mix to the average across England. A higher proportion of the population is aged more than 50 (49% compared to 42%) and lower proportion of the population is aged between 25 and 49 (37% compared to 42%). The table below illustrates this –

Table 0-1 – New Anglia Population for each age group and gender (2016)

	15-19		20-24		25-49		50+	
	New Anglia	England	New Anglia	England	New Anglia	England	New Anglia	England
Male	6.97%	7.50%	7.11%	8.32%	36.60%	41.80%	49.32%	42.38%
Female	6.32%	6.80%	6.27%	7.66%	35.03%	40.38%	52.38%	45.16%

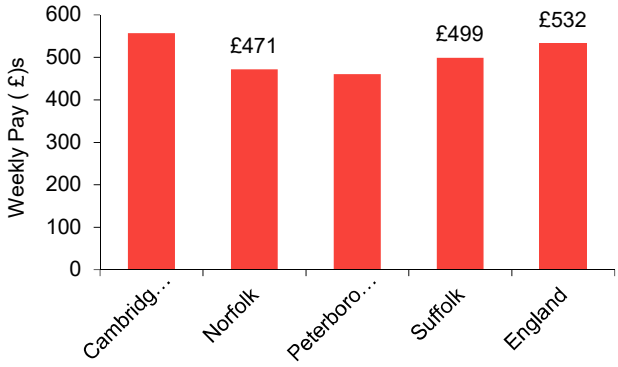
In terms of skills and qualifications, New Anglia has a lower than average level of qualification which is reflected in lower than average weekly pay. This is illustrated in Figure 2 below:

Figure 0-2 – New Anglia Qualifications of those aged (16-64) – 2015



Source: NOMIS

Figure 0-3 – Comparison of Gross Weekly Pay across regions - 2016



Source: NOMIS

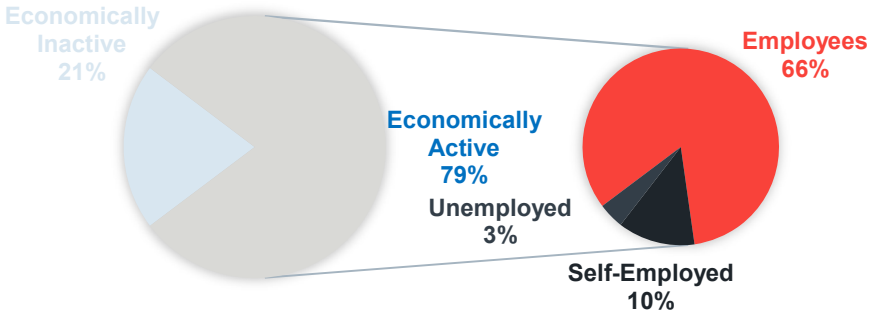
3.4 EMPLOYMENT

New Anglia has an employment rate of 77%, above the average for England (74%). Of the 655,000 employees, 66% are full time compared to 34% part time (showing more part time for England as a whole at 30.5%). The remaining 111,000 are self-employed.

New Anglia has an unemployment rate of 3.4% lower than the average for England of 5.1% (latest ONS figures 2015/16).

The portion of the population that are economically in-active (21%) is similar to average for England (22%), although with a higher portion inactive due to retirement (20% compared to 13%), reflecting the higher portion of residents over 50. The figure below illustrates the New Anglia population breakdown of economically active and inactive people

Figure 0-4 – New Anglia Labour force (2015-16)

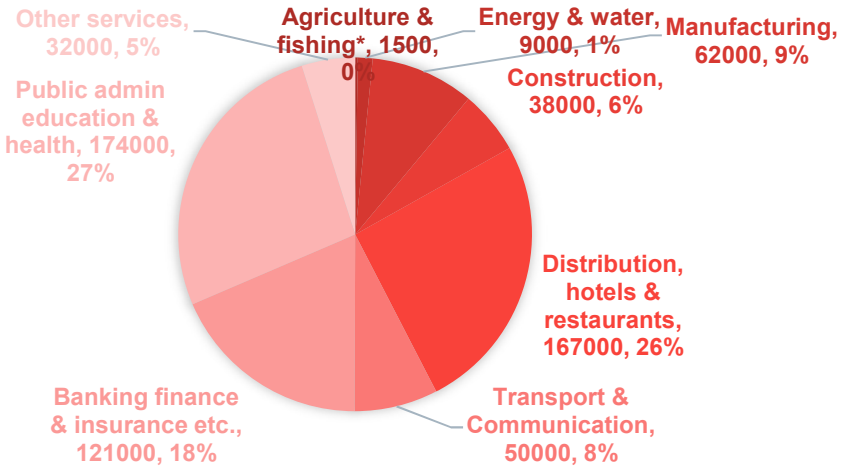


The balance of the economy is similar to other areas and England overall. The largest sectors (by employees) being[1]:

- 27%: Public administration, education (from pre-primary to higher) and health and social work activities including residential care
- 26%: Distribution including wholesale and retail trade of raw materials, goods and equipment in addition to accommodation and food and beverage services such as restaurants and pubs.
- 18%: Financial and insurance services, real estate activities and professional, scientific and technical activities as well as administrative and support services.

The following pie chart shows the breakdown of employees per sector[2] for 2015:

Figure 0-5 – New Anglia Employee Population by Sector (2015)



[1] According to the SIC 2007 Classification.

[2] * For Agriculture and Fishing figures exclude farm agriculture.

3.5 STRATEGIC ECONOMIC PLAN FOR NEW ANGLIA

New Anglia's Strategic Economic Plan (SEP) sets out the vision for the region, to deliver more jobs, businesses houses and improve productivity.

3.5.1 Planned houses and jobs

The SEP targets by 2026:

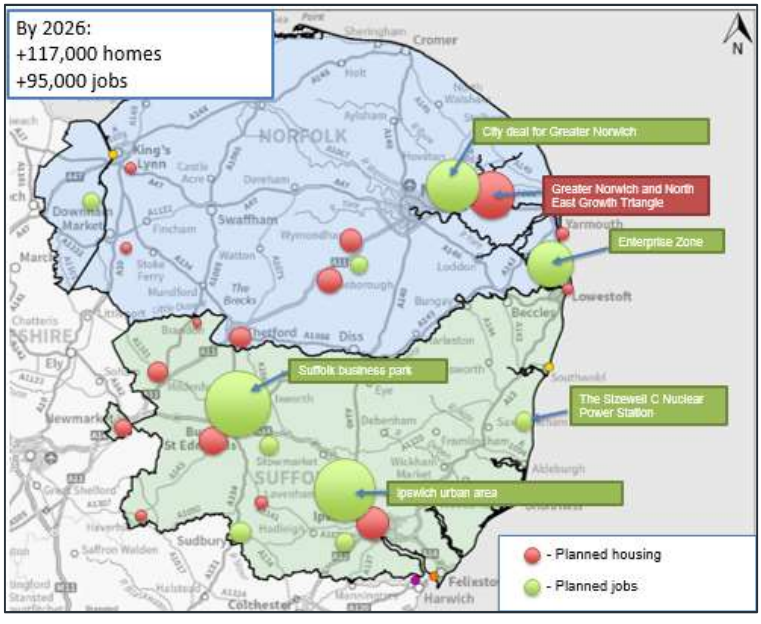
- +117,000 homes
- +95,000 jobs

These will be distributed across the region, though there are a number of key initiatives that will generate a significant number of jobs or homes:

- Growth planned in Norwich city centre is focused on adding at least 100,000m2 of new office space (providing capacity for 8,000 jobs), around 20,000m2 of retail space and 3,300 new dwellings.
- The North East Growth Triangle is the largest single development proposal in the New Anglia area which includes 10,000 new homes and 120ha of employment.
- In the Greater Ipswich area, there are plans for 13,000 new homes and 17,000 new jobs in the period to 2026.
- The Lowestoft-Great Yarmouth Enterprise Zone will receive business rate relief worth up to £275,000 over five years in addition with simplified planning regulations and government support for the provision of super-fast broadband. This zone is estimated to create up to 9,000 direct jobs and 4,500 indirect jobs by 2025. In terms of housing, 2,000 dwellings are estimated in Great Yarmouth and 2,700 in Lowestoft.
- The Sizewell C Nuclear Power Station over its lifetime of construction will create 25,000 new jobs and 5,600 at peak construction.
- The Suffolk Business Park is a 68 hectare master plan extension which could deliver up to 15,000 jobs and 6,000 homes.

These are illustrated on the following figure below:

Figure 0-6 – New Anglia Strategic Economic Plan



3.6 GROWTH AND CORE SECTORS

The SEP identifies five high impact sectors which have the potential to grow rapidly both in absolute terms and productivity. These Growth Sectors are:

- Advanced Manufacturing and Engineering;
- Agri-tech;
- Energy;
- ICT/Digital Culture; and,
- Life Sciences.

The SEP also identifies four underpinning sectors which are the largest employers in the economy. These Core Sectors are:

- Agriculture and food and drink;
- Financial and insurance services;
- Ports and logistics; and,
- Tourism and culture.

3.7 PROGRESS IN THE SEP TO DATE

The progress towards achieving the SEP as of July 2016 can be summarized in the table below which compares the achievements to the set targets:

Table 0-2 – Targets and Progress to date (July 2016)

Jobs	New Businesses	Productivity	Housing
Target: +95 000	Target: +10 000	Target: +7.8% to close gap with national	Target: +117 000
Progress: +32 300	Progress: +4 980	Progress: +0.2%	Progress: +18 850

Source: Strategic Economic Plan Impact Report July 2016

3.8 DEPRIVATION

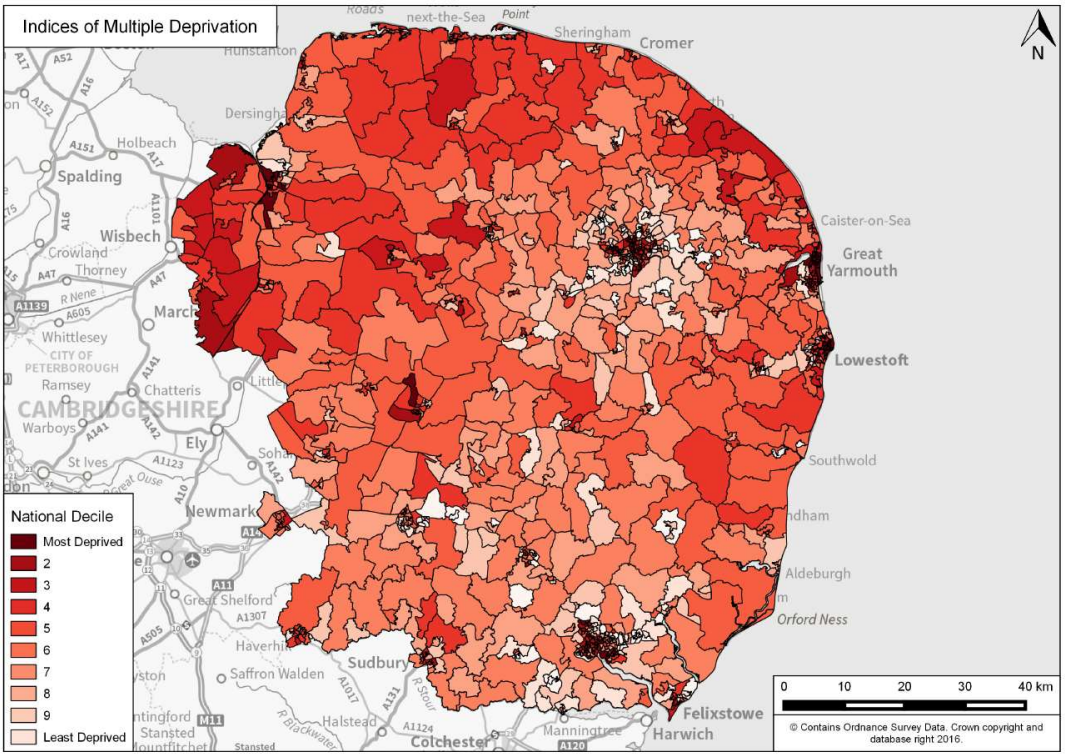
For each of the following deprivation statistics, the deciles are calculated by ranking the 32,844 census Lower Layer Super Output Areas (LSOAs) in England from most deprived to least deprived, and dividing them into 10 equal groups. LSOAs in decile 1 fall within the most deprived 10% of LSOAs nationally and LSOAs in decile 10 fall within the least deprived 10% of LSOAs nationally.

The Index of Multiple Deprivation (IMD) is an overall relative measure of deprivation constructed by combining seven domains of deprivation according to their respective weights. These domains and their weightings include Income Deprivation (22.5%), Employment Deprivation (22.5%), Education Skills and Training Deprivation (13.5%), Heath Deprivation and Disability (13.5%), Crime (9.3%), Barriers to Housing and Services (9.3%) and Living Environment Deprivation (9.3%).

Some 2.7% of the LSOAs in the study area (62 of 981) are in the most deprived decile for IMD in England, while 47.6% (467) are within the most deprived half of LSOAs in the country. At the same time, only 6.4% (63) are in the least deprived national decile. The map below shows a concentration of deprivation in the main urban centres and a generally higher level of deprivation on the coasts, and the areas immediately inland, and the area of western

Norfolk. Lower levels of deprivation cover a broad area surrounding Norwich and spreading south in a wide band into Suffolk. The most deprived areas are likely to have generally lower levels of accessibility as well as lower standards of living.

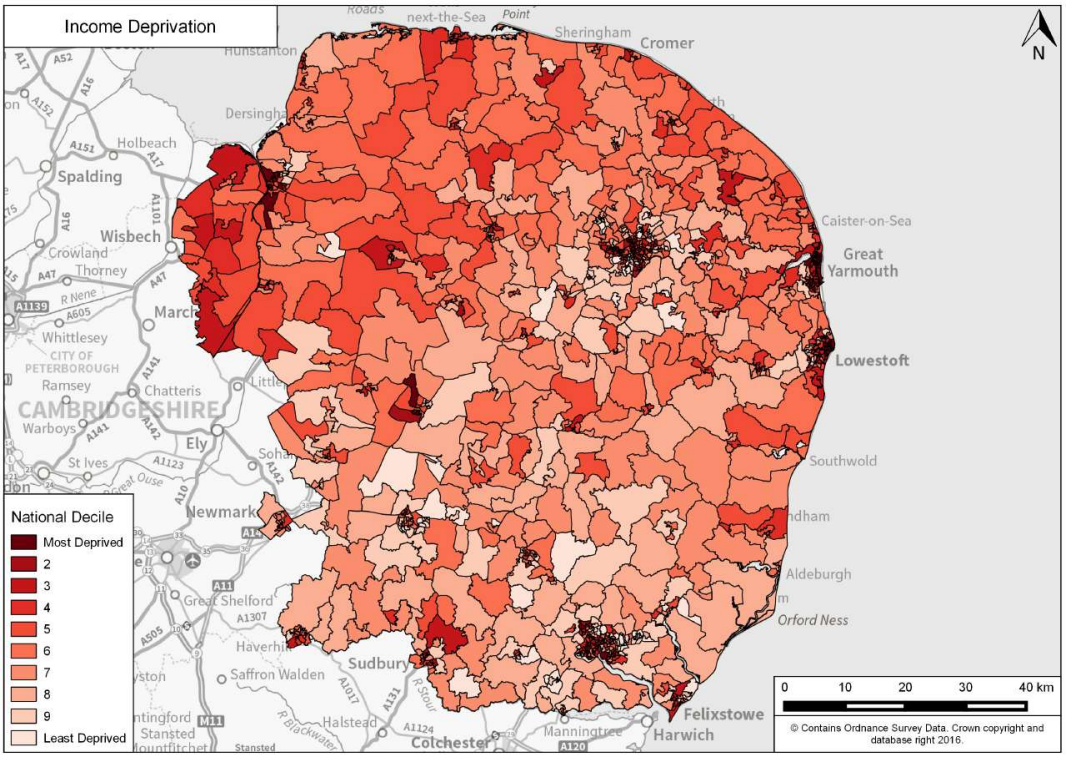
Figure 0-7 – Indices of Multiple Deprivation



The **Income Deprivation** Domain measures the proportion of the population experiencing deprivation relating to low income. The definition of low income used includes both those people that are out-of-work, and those that are in work but who have low earnings (and who satisfy the respective means tests).

5.1% of the LSOAs in the study area (50 of 981) are in the most deprived decile for Income Deprivation in England, while 40.4% (396) are within the most deprived half of LSOAs in the country. At the same time, only 5.5% (54) are in the least deprived national decile. Generally, Suffolk has lower levels of income deprivation than Norfolk with areas of higher deprivation being the main urban areas, and north and west Norfolk.

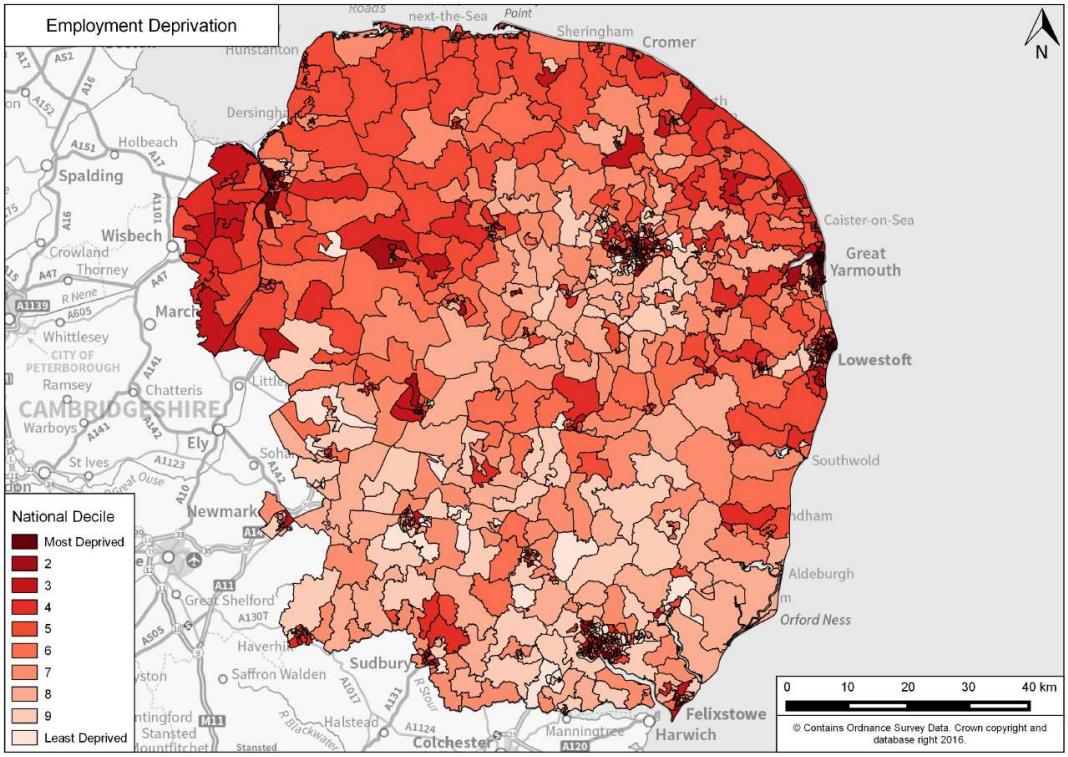
Figure 0-8 – Income Deprivation



The **Employment Deprivation Domain** measures the proportion of the working-age population in an area involuntarily excluded from the labour market. This includes people who would like to work but are unable to do so due to unemployment, sickness or disability, or caring responsibilities.

5.9% of the LSOAs in the study area (58 of 981) are in the most deprived decile for Employment Deprivation in England, while 47.1% (462) are within the most deprived half of LSOAs in the country. At the same time, only 4.9% (48) are in the least deprived national decile. As with income deprivation Generally, Suffolk has lower levels of employment deprivation than Norfolk with areas of higher deprivation being the main urban areas, and north and west Norfolk.

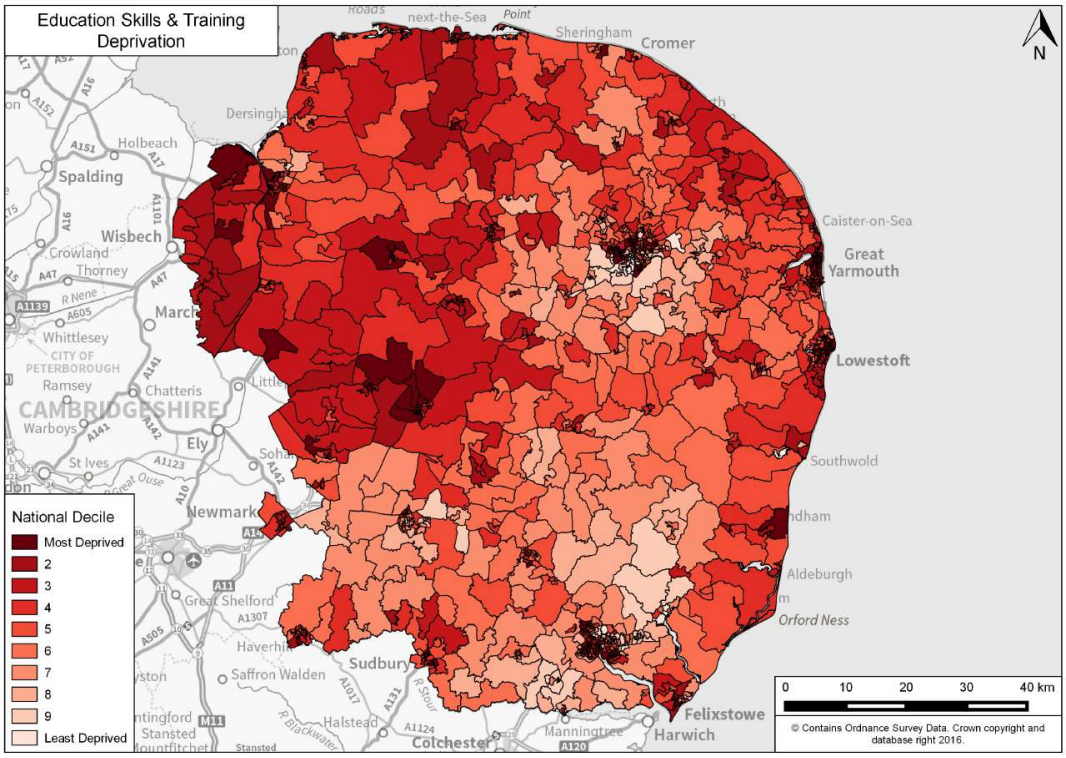
Figure 0-9 – Employment Deprivation



The **Education, Skills and Training Deprivation** Domain measures the lack of attainment and skills in the local population. The indicators fall into two sub-domains: one relating to children and young people and one relating to adult skills.

13.7% of the LSOAs in the study area (134 of 981) are in the most deprived decile for Education, Skills and Training Deprivation in England, while 68.4% (671) are within the most deprived half of LSOAs in the country. At the same time, only 1.8% (18) are in the least deprived national decile. As the following map shows, education, skills and training deprivation are higher in Norfolk, the urban areas and along the coast with Suffolk having generally lower deprivation.

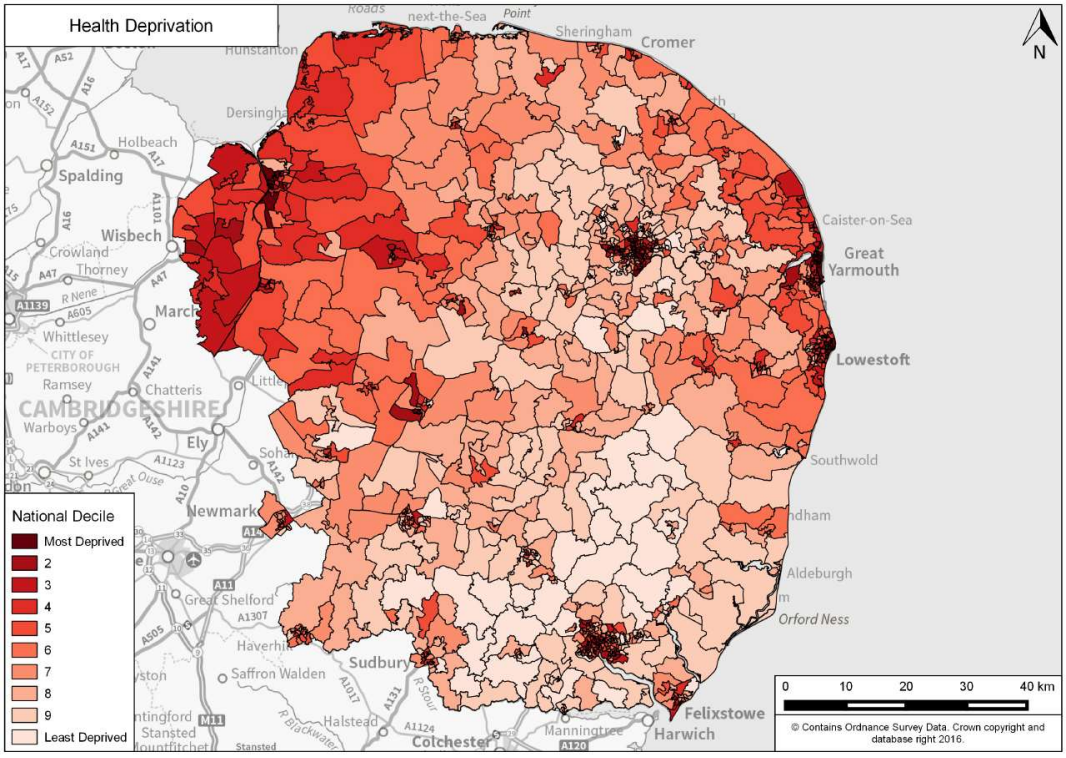
Figure 0-10 – Education, Skills and Training Deprivation



The **Health Deprivation** and Disability Domain measures the risk of premature death and the impairment of quality of life through poor physical or mental health. The domain measures morbidity, disability and premature mortality but not aspects of behaviour or environment that may be predictive of future health deprivation.

4.7% of the LSOAs in the study area (46 of 981) are in the most deprived decile for Health Deprivation and Disability in England, while 40.8% (400) are within the most deprived half of LSOAs in the country. At the same time, only 5.8% (57) are in the least deprived national decile. The map shows a concentration of health deprivation on the Norfolk and north Suffolk coasts and in western Norfolk.

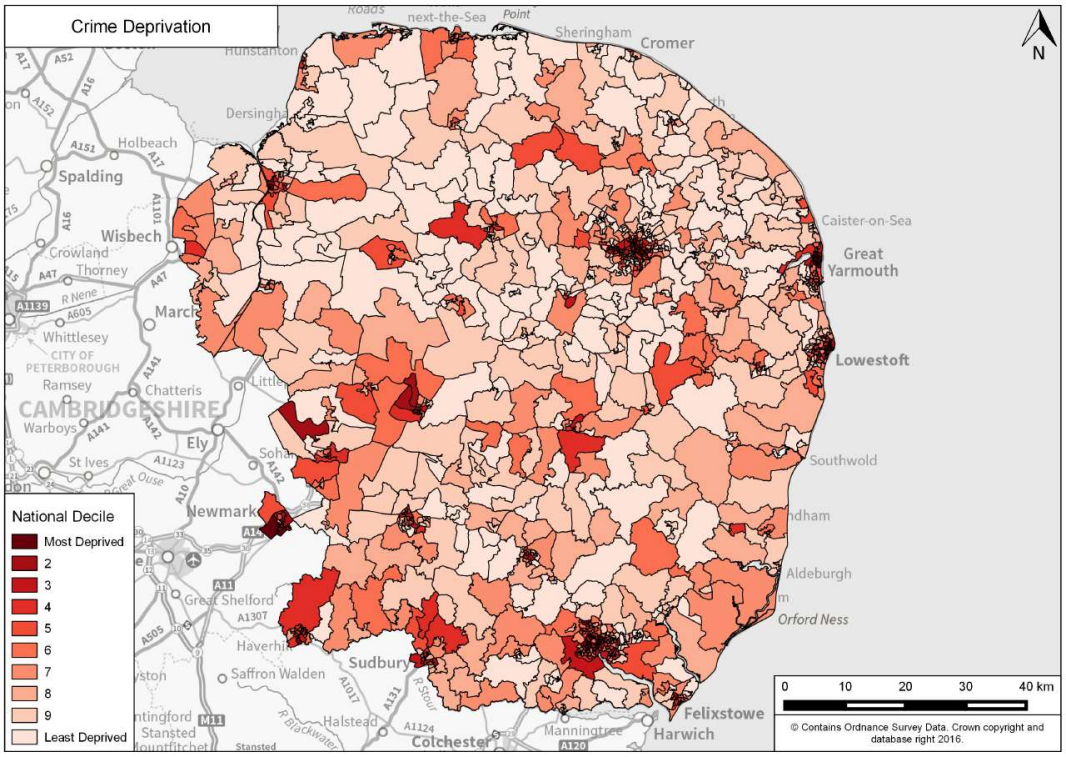
Figure 0-11 – Health Deprivation



The **Crime** Domain measures the risk of personal and material victimisation at local level.

23.5% (231 of 981) of the LSOAs in the study area are in the least deprived national decile. Meanwhile, 3.4% of the LSOAs in the study area (33 of 981) are in the most deprived decile for Crime in England, while 27.8% (273) are within the most deprived half of LSOAs in the country. Crime deprivation is largely focussed on the urban areas.

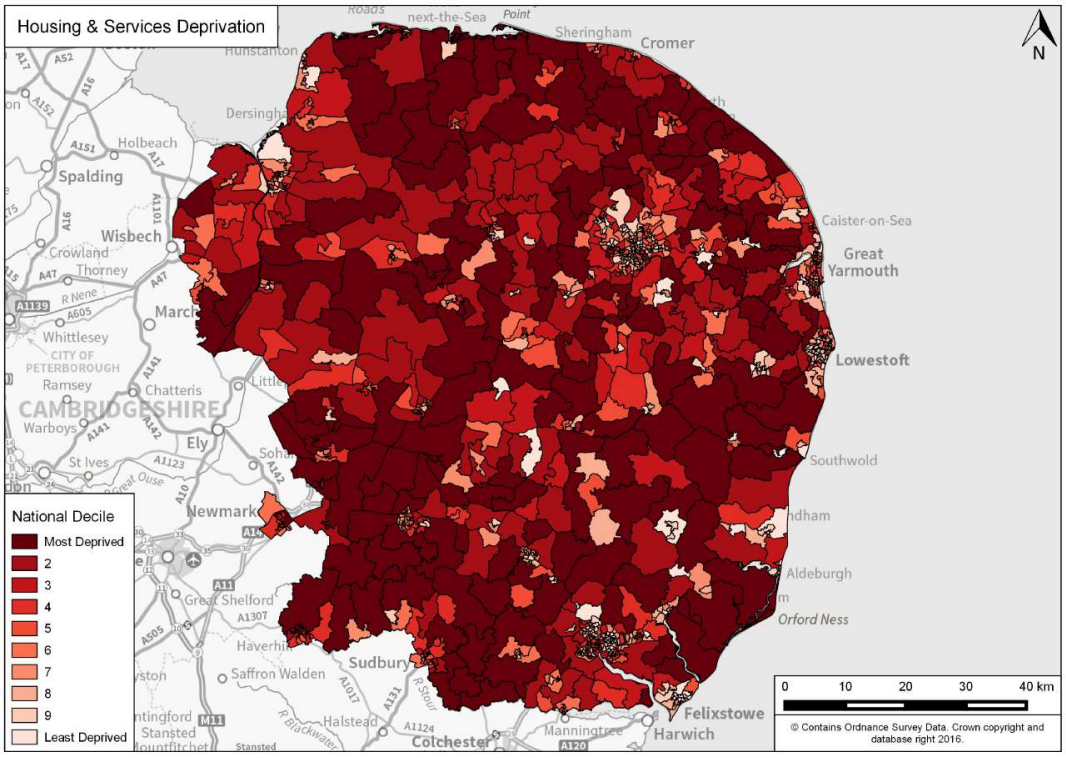
Figure 0-12 – Crime Deprivation



The **Barriers to Housing and Services** Domain measures the physical and financial accessibility of housing and local services. The indicators fall into two sub-domains: 'geographical barriers', which relate to the physical proximity of local services, and 'wider barriers' which includes issues relating to access to housing such as affordability.

15.2% of the LSOAs in the study area (149 of 981) are in the most deprived decile for Barriers to Housing and Services in England, while 56.3% (552) are within the most deprived half of LSOAs in the country. At the same time, only 8.3% (81) are in the least deprived national decile. As would be expected, deprivation related to access to services is largely focussed on the more isolated rural areas.

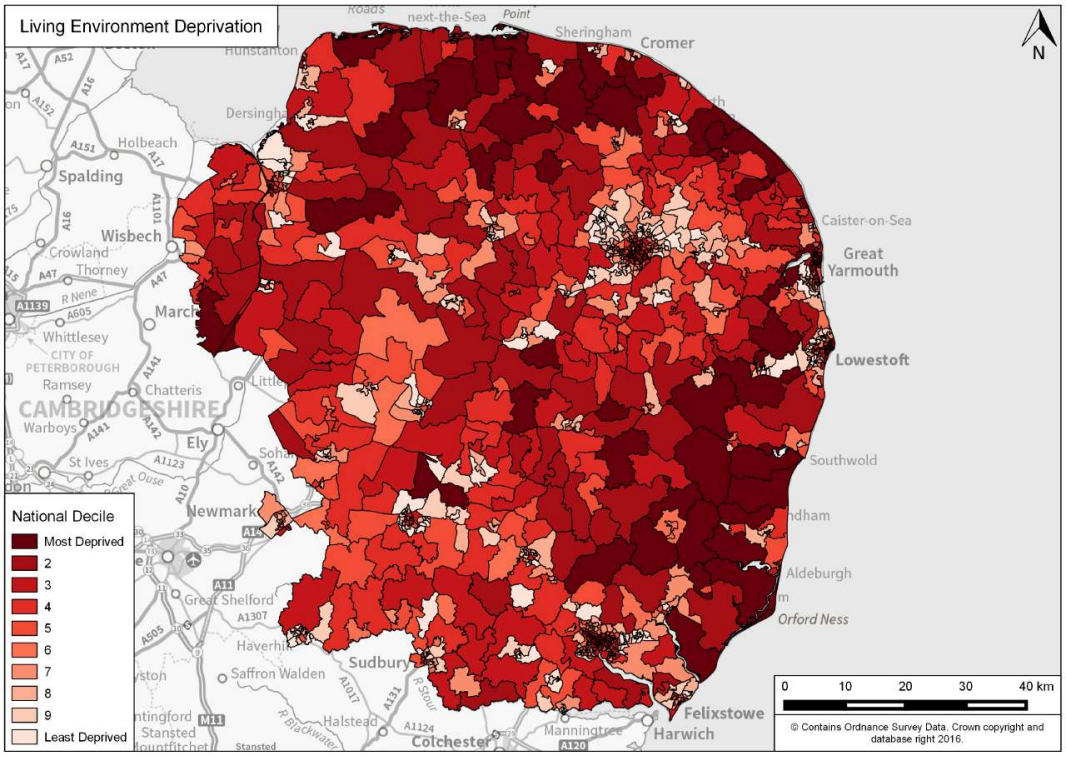
Figure 0-13 – Barriers to Housing and Services Deprivation



The **Living Environment Deprivation** Domain measures the quality of the local environment. The indicators fall into two sub-domains. The 'indoors' living environment measures the quality of housing; while the 'outdoors' living environment contains measures of air quality and road traffic accidents.

8.7% of the LSOAs in the study area (85 of 981) are in the most deprived decile for Living Environment Deprivation in England, while 50.9% (499) are within the most deprived half of LSOAs in the country. At the same time, only 12.8% (126) are in the least deprived national decile. The higher levels of living environment deprivation are concentrated on an arc of LSOAs at and immediately inland of the coasts.

Figure 0-14 – Living Environment Deprivation



Deprivation has two interactions with accessibility and travel; through lower levels of access generating deprivation (e.g. access to services) and lower incomes reducing the ability to afford access to certain types of travel therefore generating further deprivation (e.g. being able to afford a car). The key areas of deprivation identified within the study area are dependant of which measure of deprivation used, however, in general, the coasts and immediately adjacent areas, the poorer urban areas and the west of Norfolk are generally the most deprived. As will be seen in the following section, the coasts and the north and west of Norfolk are also the areas least well served by the transport network.

4 TRANSPORTATION GEOGRAPHY

4.1 OVERVIEW

In order to enable a realistic and deliverable strategy, it is necessary to understand the existing transportation geography across the two counties comprising the study area. Key to the developing the strategy is an understanding of the transport network, its use and the constraints currently present.

4.2 DENSITY

The following information shows a snapshot of the level of human activity across the study area and Figure 0-15 presents the built features (anything from houses and factories to barns and runways, etc). The densest areas of built features in the study area are centred at major settlements, with higher built density also being exhibited in the region's smaller town's centres. But there is also a large amount of relatively dispersed built density that is scattered throughout the area at other smaller settlements and in rural areas. The key areas of activity can be seen as Norwich, Ipswich, King's Lynn, Bury St Edmunds, the A14 arc, the A11, Felixstowe and the coastal area centred on Great Yarmouth and Lowestoft. More broadly, the density of development is lower in the western rural areas of New Anglia.

Figure 0-15 – Built Features

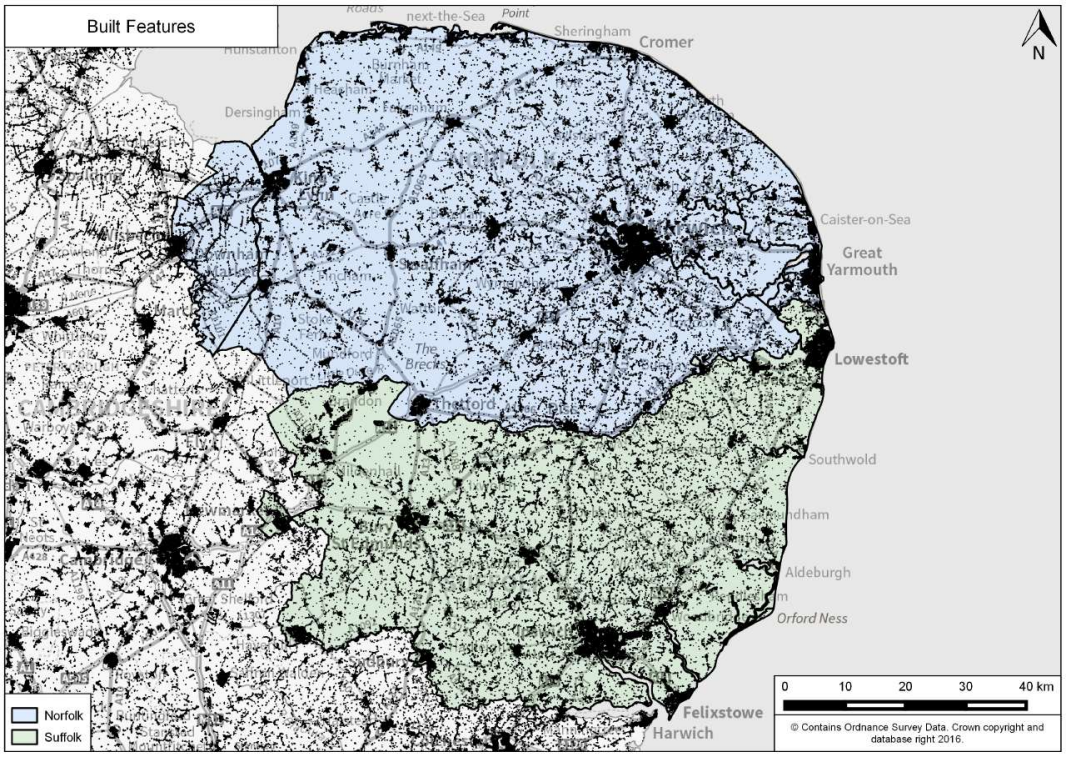


Figure 0-16 and Figure 0-17 present the defined boundaries of large and small urban areas both within and on the periphery of the region.

Figure 0-16 – Urban Areas

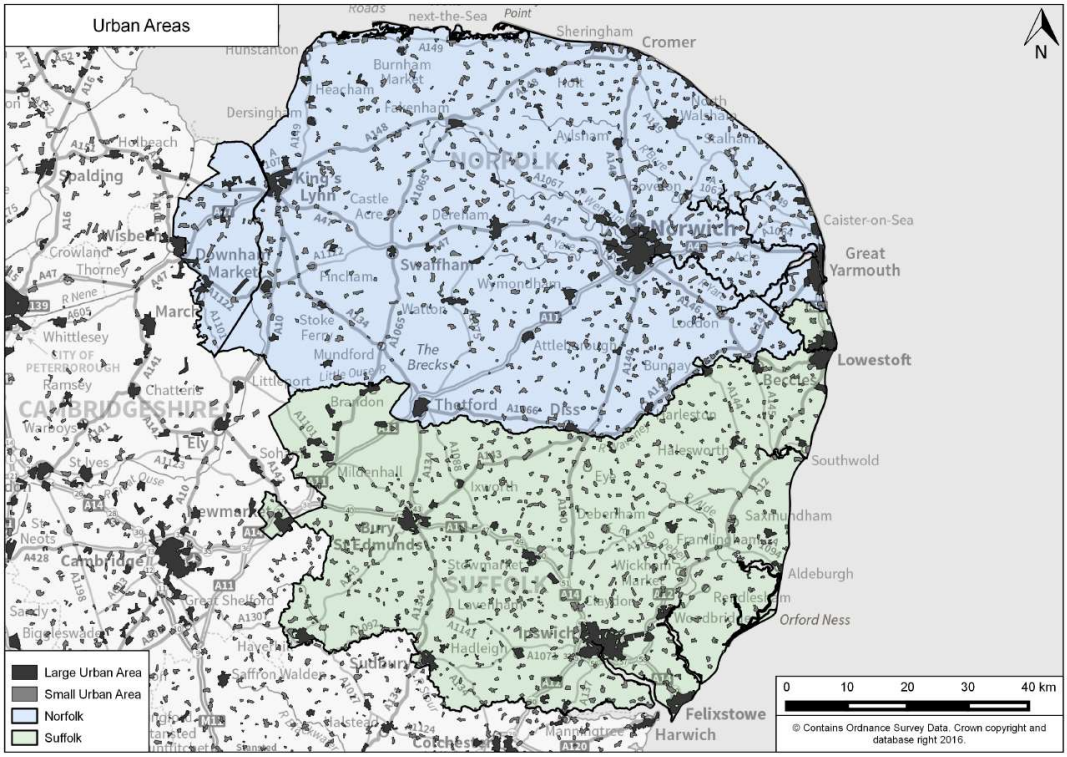
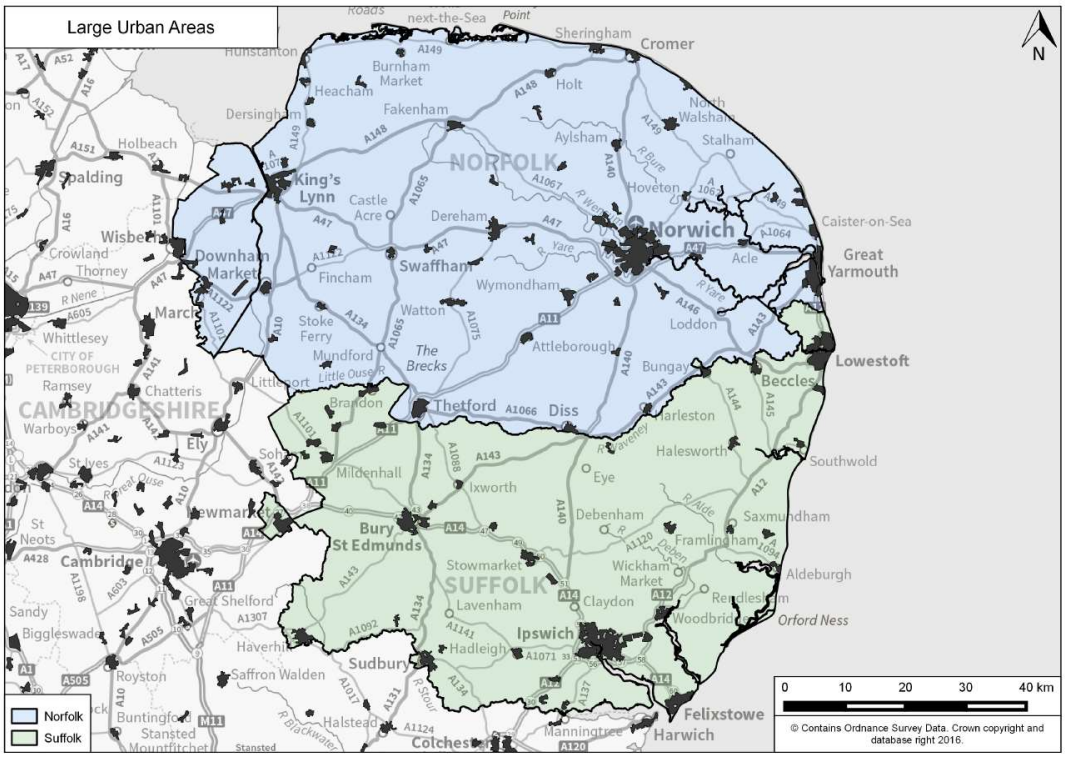


Figure 0-17 – Large Urban Areas

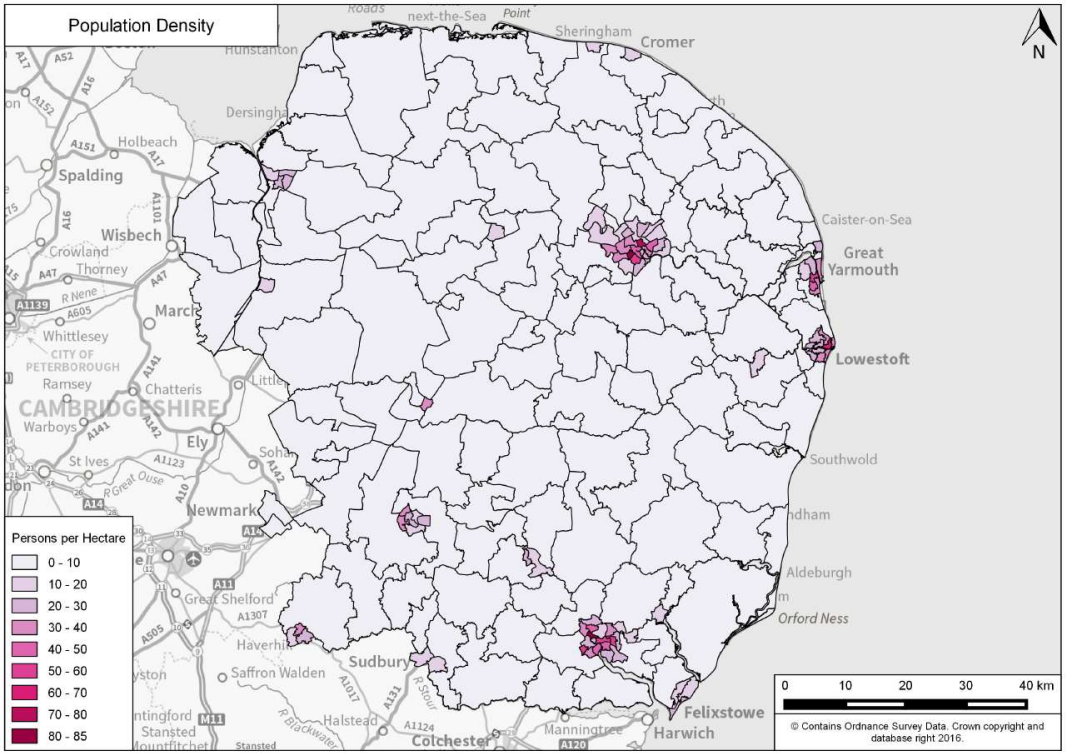


As shown in Figure 0-18, the densest concentrations of population in the study area are located in the census Middle Super Output Areas (MSOAs) that comprise the areas of the

respective county towns; Norwich and Ipswich. Only three of the region's 200 MSOAs have population densities above 80 persons per hectare (pph) – two of them in central Norwich and one in central Ipswich.

Other MSOAs in the region with relatively high population densities are located in Great Yarmouth, Lowestoft, King's Lynn, Bury St Edmunds and Haverhill. Outside of those main centres, the majority of the other MSOAs in the region are more sparsely inhabited by comparison, with population densities of under 10 persons per hectare.

Figure 0-18 – Population Density



4.3 AIRPORTS

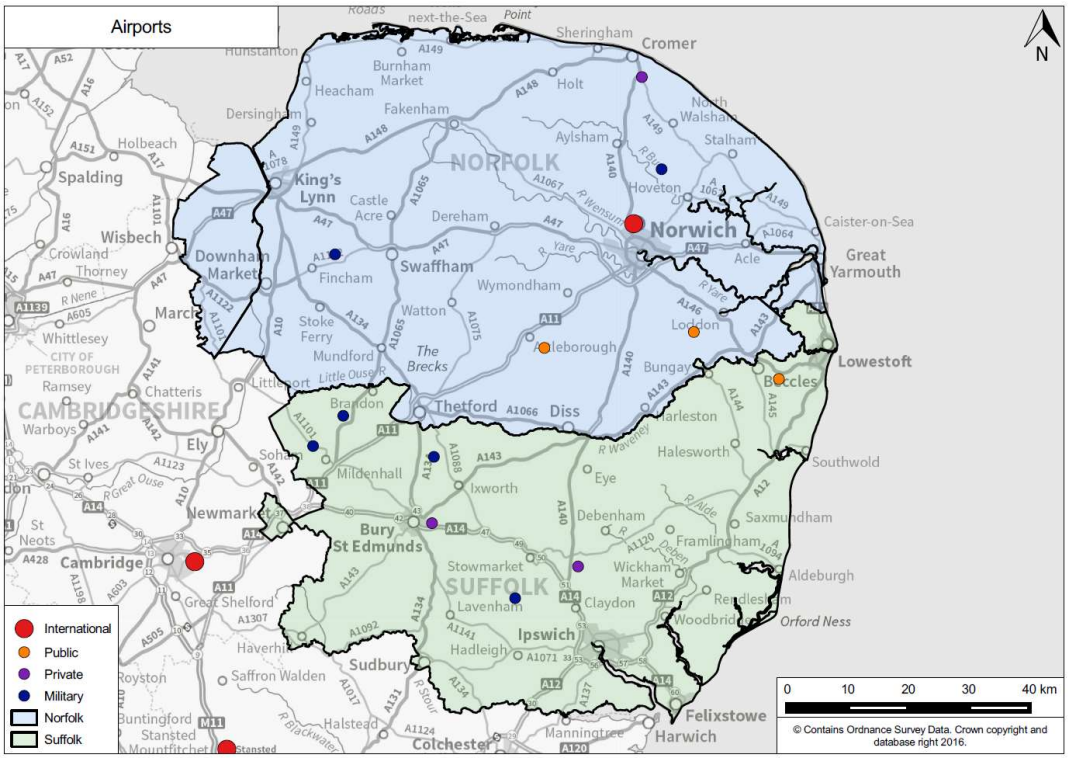
There is one international airport in the study area, which is located in Norwich. Additionally, two other international airports are located on the periphery of the region – London Stansted and Cambridge International – with the former connecting to a wide range of domestic and foreign cities, and the number of destinations served by the latter being relatively limited both domestically and abroad. Additionally, there are three smaller public airports located in the study area, including two with asphalt or concrete runways, and one small private, grass runway airfield.

There are six military airfields in the study area, one of which is currently leased to the US Air Force (RAF Lakenheath). Two of the bases, RAF Mildenhall and RAF Coltishall, are currently disused and present significant opportunities for redevelopment; the latter of which has been purchased by Norfolk County Council. Each of the military airfields feature concrete or asphalt runways with lengths in excess of 8,000 feet.

As can be seen in

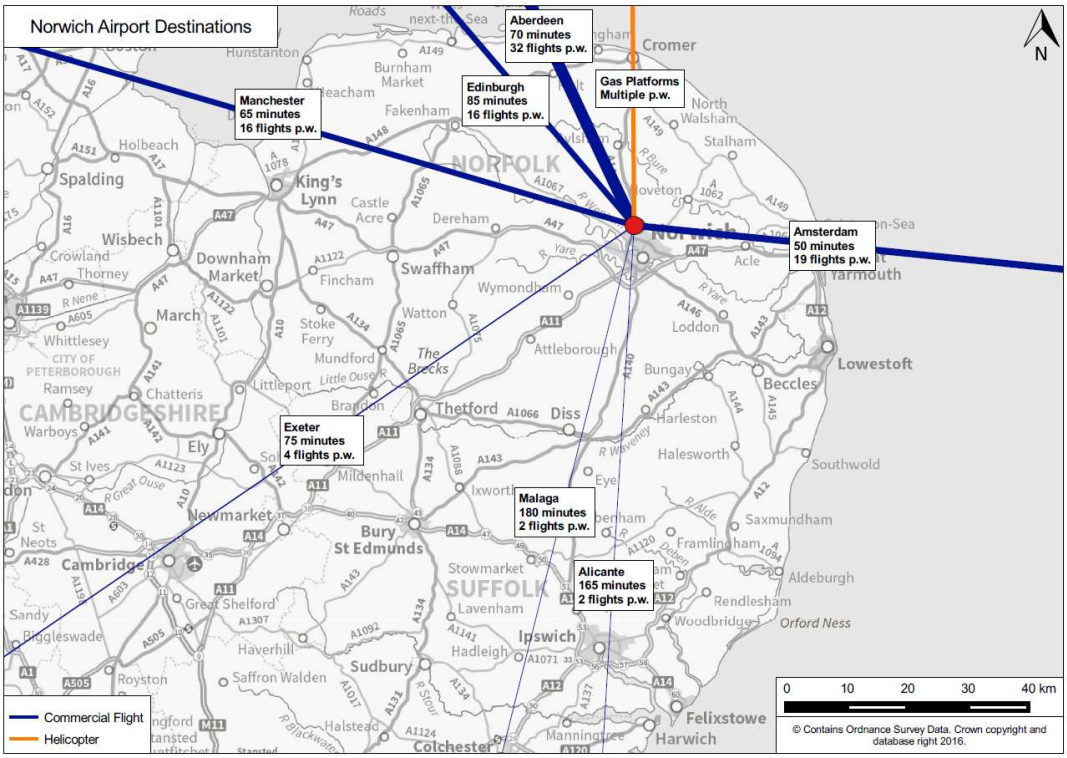
Figure 0-19, Norwich Airport is located to the north of the city which somewhat constrains its access from the south and west. However, the Northern Distributor Road is to be built which will significantly improve highway access.

Figure 0-19 – Airports and Airfields



There are approximately 91 regular scheduled flights departing from Norwich International Airport each week to four domestic and three international destinations, as well as a similar number of weekly arrivals. Additionally, there are varying numbers holiday charter flights, and private charter helicopter flights to the gas platforms in the North Sea (supported by the scheduled flights to Aberdeen). Of particular note are the 19 flights per week from Norwich to Amsterdam Schiphol which enables passengers to transfer flights at one of Europe's major hub airports giving New Anglia easy access to wider markets. In addition, the flights to other UK destinations provide quicker alternatives to rail.

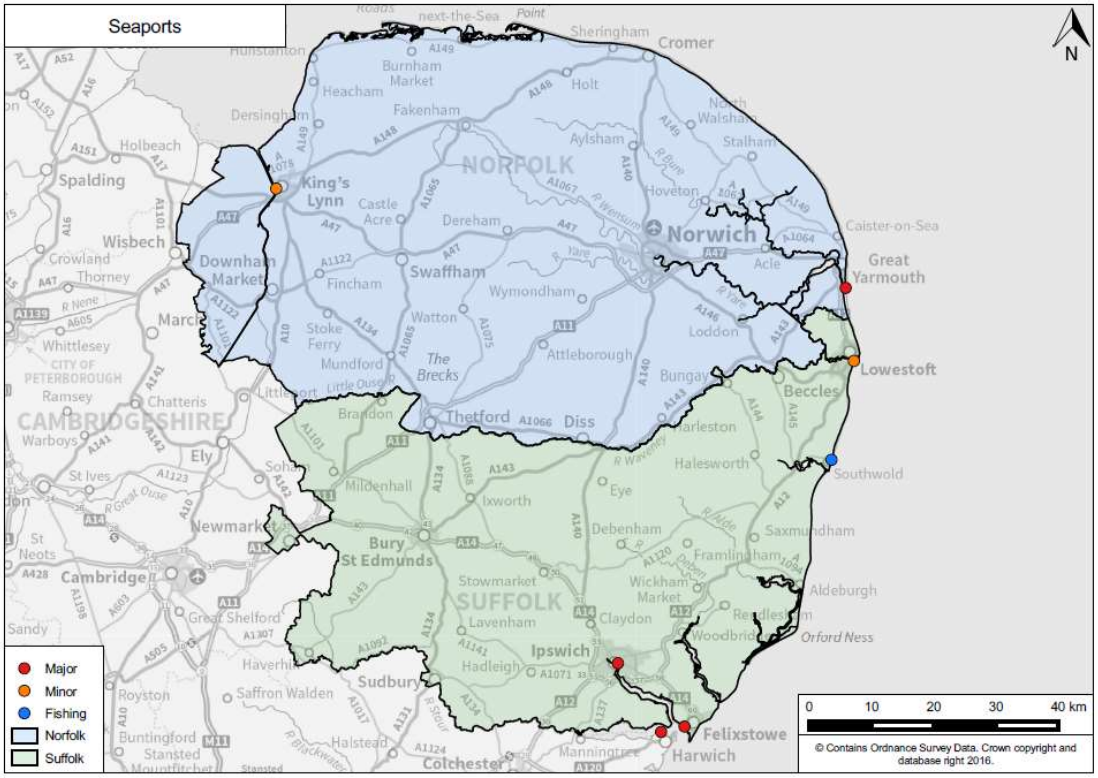
Figure 0-20 – Norwich Airport Destinations



4.4 SEAPORTS AND FREIGHT FLOWS

There are six seaports located within the study area, three of which are classified as major import and export points for freight entering and leaving the country. Those three ports are located at Felixstowe, Ipswich, Great Yarmouth, with the first being one of the largest points in the country in terms of both import and export tonnage of goods. Kings Lynn and Lowestoft are classified as minor ports and Southwold is a fishing port. Additionally, there is another major freight port on the southern periphery of the region, located at Harwich, from which ferry services also operate.

Figure 0-21 – Seaports



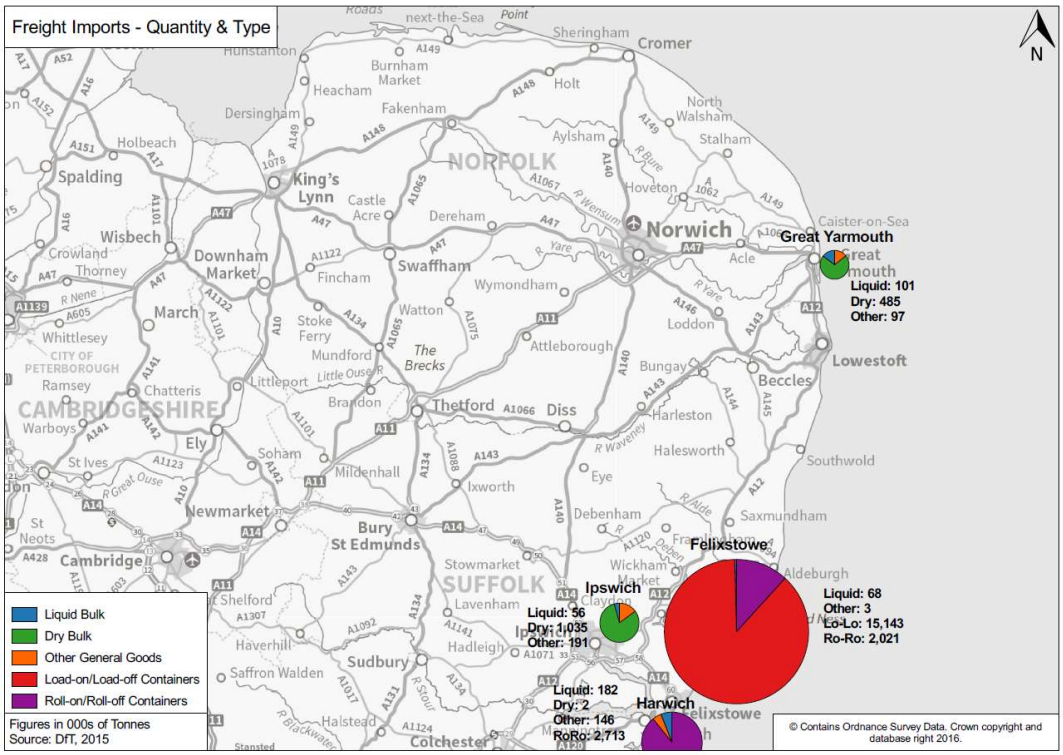
4.5 FREIGHT IMPORTS AND EXPORTS

In terms of the import of goods in the study area, the port of Felixstowe serves as one of the largest in the UK in terms of annual tonnage. The port is the largest containerised freight port in the UK and has almost 2.5 times the amount of containerised freight than the second largest (Southampton). The latest yearly figures available (from 2015), show that there were 17,235,000 tons of goods imported through Felixstowe, over 99% of which was in the form of load-on/load-off and roll-on/roll-off containers.

Imports to the two smaller major ports were also significant in 2015. At Great Yarmouth, 683,000 tonnes were imported, 71% of which was in the form of dry bulk products. Meanwhile at Ipswich, 1,282,000 tonnes were imported, 81% of which was also in the form of dry bulk. The remainder of imports were comprised of liquid bulk and other general goods at both locations.

On the periphery of the region, the port of Harwich served for the point of entry for 3,043,000 tonnes of goods in 2015, 89% of which was in the form of roll-on/roll-off containers and the remainder being comprised of dry bulk and other general goods.

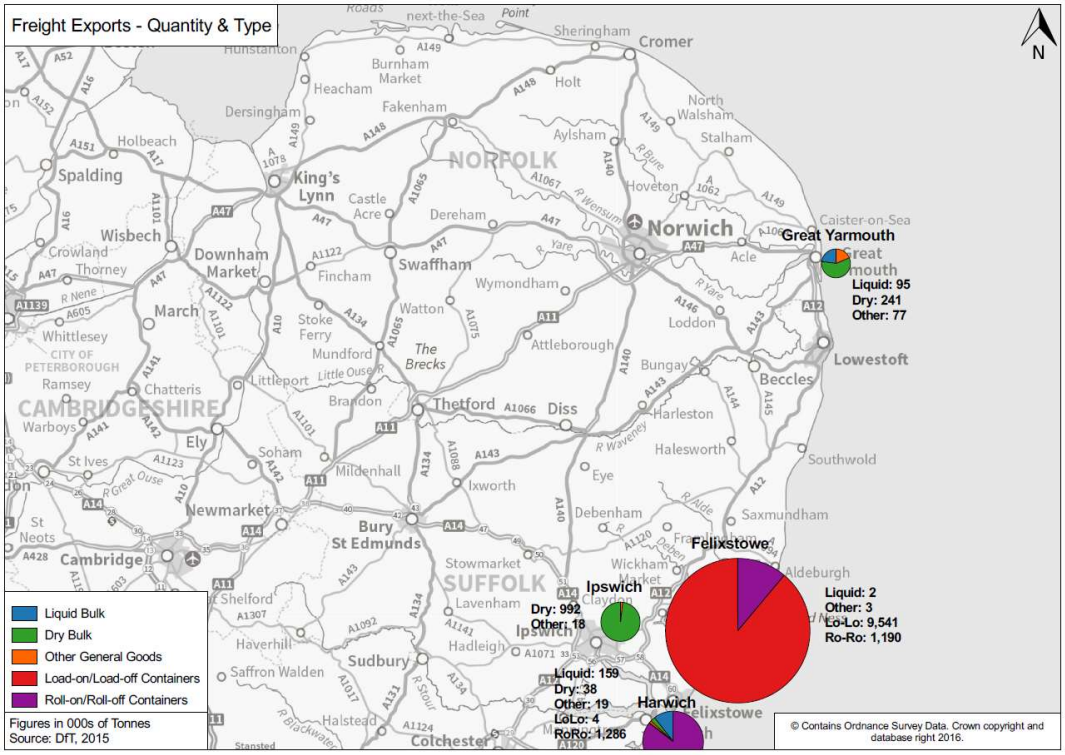
Figure 0-22 – Major Port Freight Imports – Quantity and Type



The same ports serve as export points for goods from the study area, with the port of Felixstowe again serving as one of the largest in the UK in terms of annual tonnage. The latest yearly figures available (from 2015), show that there were 10,736,000 tons of goods exported through Felixstowe, with over 99% again being in the form of load-on/load-off and roll-on/roll-off containers. At Great Yarmouth, 413,000 tonnes were exported, 58% of which was in the form of dry bulk products, while the remainder was made up of liquid bulk and other general goods. At Ipswich, 1,010,000 tonnes were exported, 98% of which was also in the form of dry bulk, whilst the remainder of imports were comprised of other general goods.

From the Port of Harwich, 1,506,000 tonnes of goods were exported in 2015, 86% of which was in the form of roll-on/roll-off and load-on/load-off containers. The remainder was comprised of liquid bulk, dry bulk and other general goods.

Figure 0-23 – Major Port Freight Exports – Quantity and Type



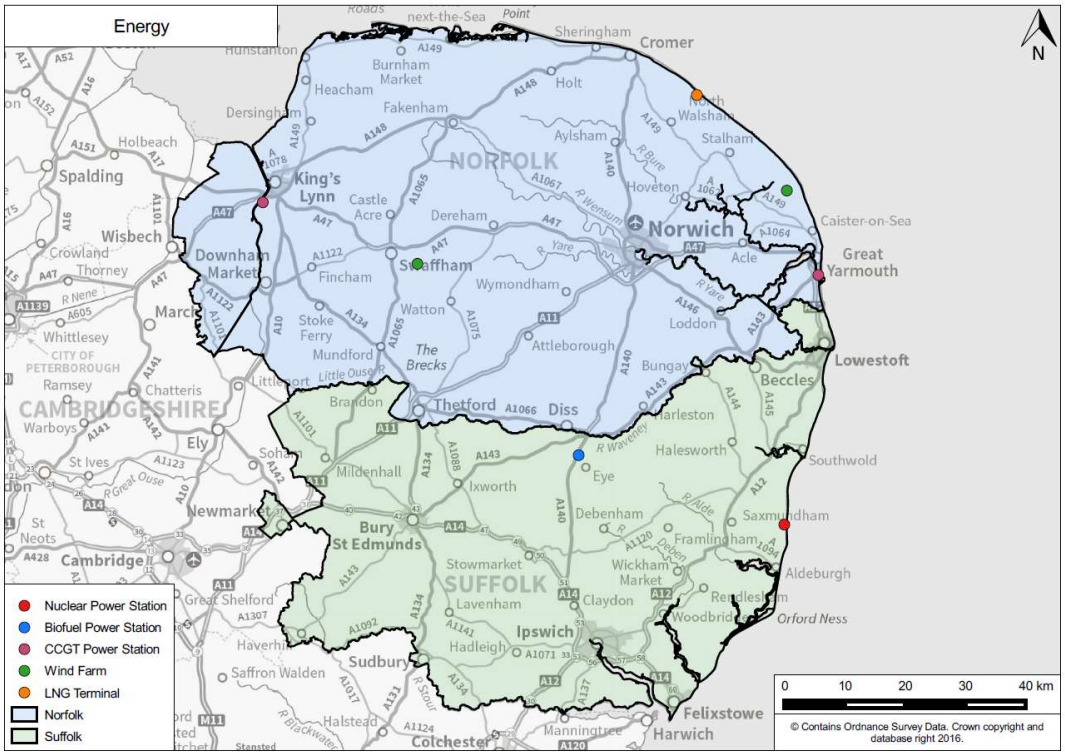
Overall, the six seaports in the study area accounted for 6.4% of the UK's seaborne imports and exports (by tonnage) in 2015.

The main distribution routes from the ports in the south of the area are via the A14 towards the Midlands hubs and the railways via Ely or London. Great Yarmouth has poorer access to distribution via the A11.

4.6 ENERGY

In addition to Sheringham Shoal Off-Shore Wind Farm, located off the north coast of Norfolk, there are also inland wind farms located in the study area at Blood Hill and North Pickenham. The UK's newest nuclear power station is located in Suffolk, at Sizewell, and there are plans to build an additional nuclear power station at the same location. Additionally, there are a number of fossil fuel-based power generating stations in the region, including two closed-cycle gas turbine (CCGT) plants at Great Yarmouth and King's Lynn and a small biofuel power plant near the village of Eye. At Bacton there is a receiving station for off-shore gas.

Figure 0-24 – Energy



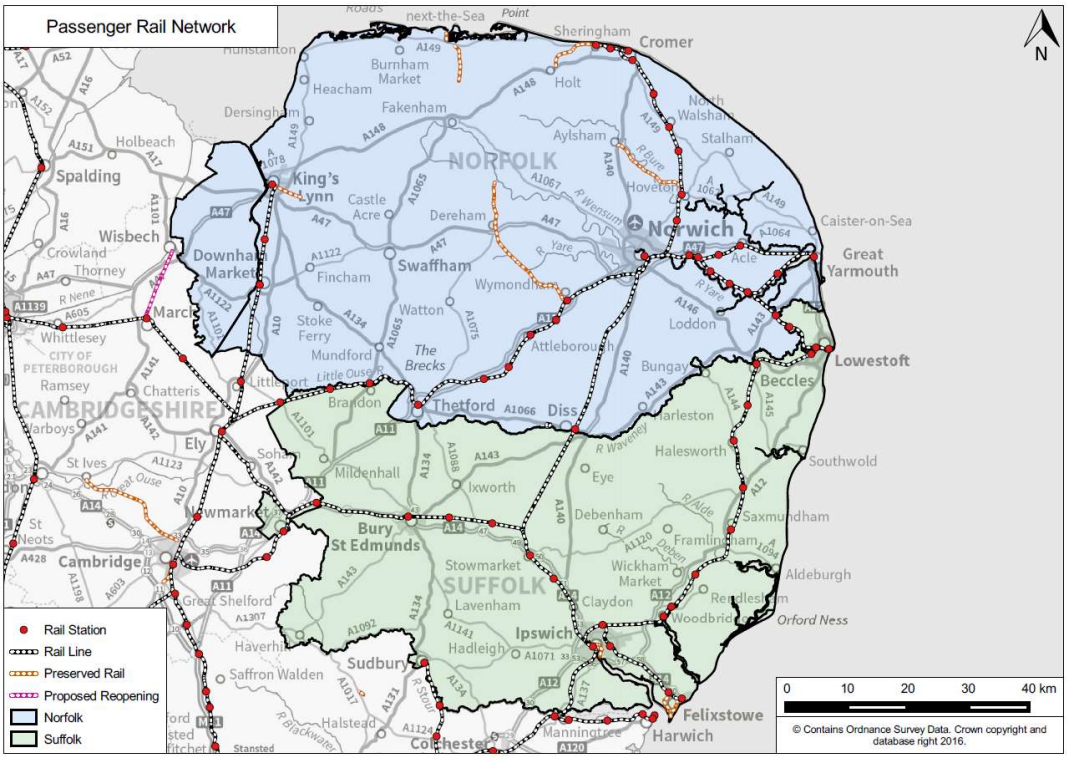
4.7 RAILWAYS

The railway network consists of a number of north-south and east-west lines that connect settlements within Norfolk and Suffolk, as well as other domestic destinations beyond the boundary of the study area. The wider network also offers connections to international destinations throughout Europe and beyond via stations in London that connect to the mainland through the Eurotunnel at Folkestone.

There are railway connections to each of the three major seaports in the study area, located at Ipswich, Great Yarmouth, Felixstowe, as well as nearby Harwich in Essex. They provide a path for the rail movement of goods between these ports and distribution centres throughout the country.

There are also a number of preserved railway lines in the study area, which operate limited, small-scale tourist services, and just to the west of the Norfolk county boundary there is a disused line that is proposed to be reopened to operate services between March and Wisbech.

Figure 0-25 – Railway Network



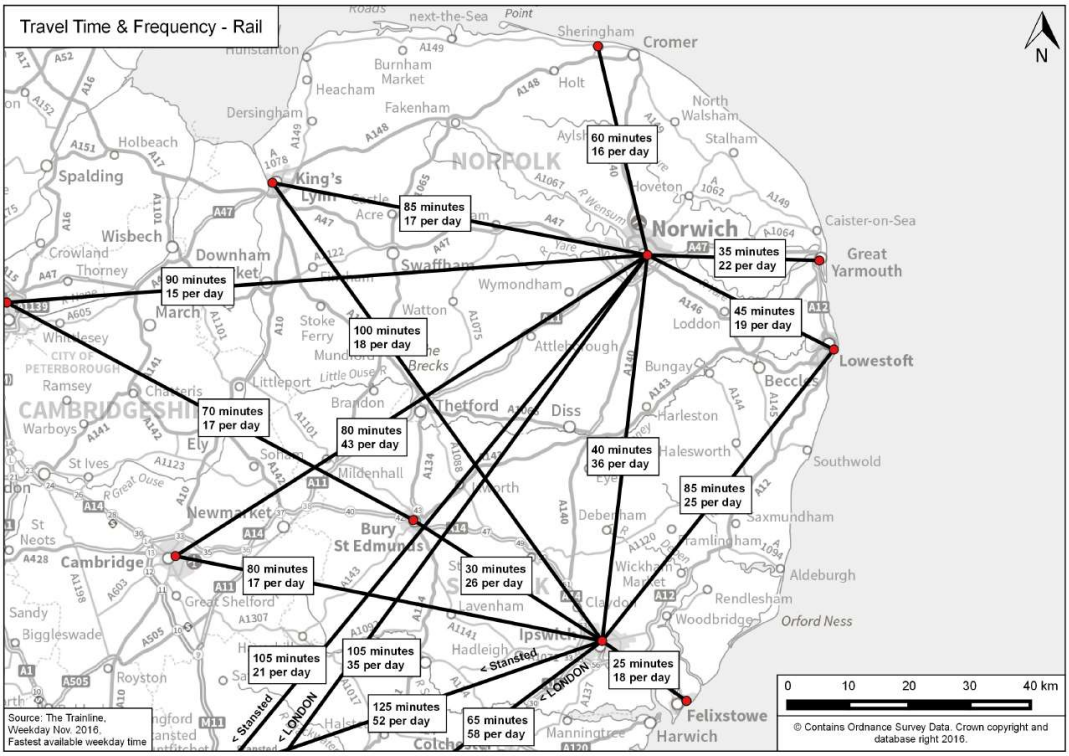
When looking at the rail travel times and frequencies between major settlements within the study area, we see that there are a number of relatively long travel times due to indirect routes between those settlements. The lack of an east-west route in the north of the study area means that interchange is required for journeys, for example, between Norwich and Kings Lynn. The interchange at Ely, for both Kings Lynn and Cambridge presents a constraint to the operation of services.

However, the railway connections between the study area's two major centres, Norwich and Ipswich, are relatively good with journey times of 40 minutes and 36 trains per day; the journey time compares favourably with road travel.

There are external connections from Norwich and Ipswich to both London (Liverpool Street Station), and London Stansted Airport. The fastest travel time to/from Stansted Airport or Central London is 105 minutes from Norwich, but journey times are in excess of two hours from Ipswich to Stansted Airport and in excess of one hour to Central London.

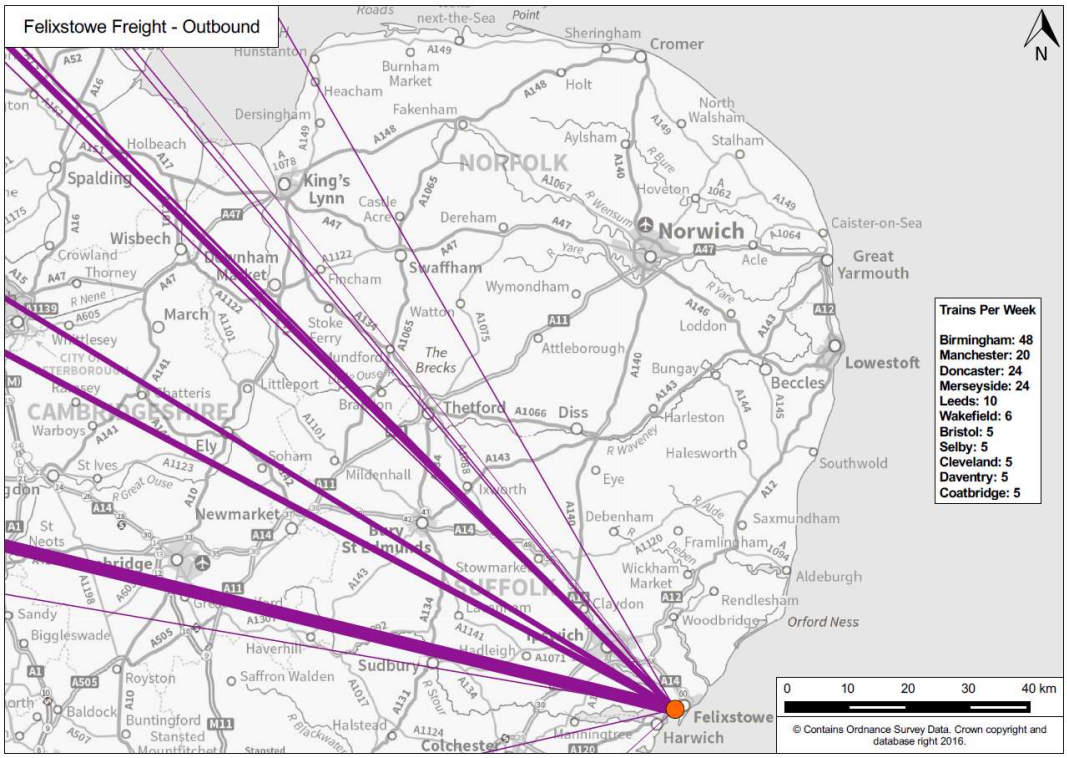
When these travel times are compared to the flight travel times in Figure 0-26, it is evident that travel times to major external destinations, such as Manchester or Amsterdam, by plane are considerably less than travel by rail between settlements of relatively close proximity within the study area (Norwich and King's Lynn, for example).

Figure 0-26 – Travel Time and Frequency – Rail



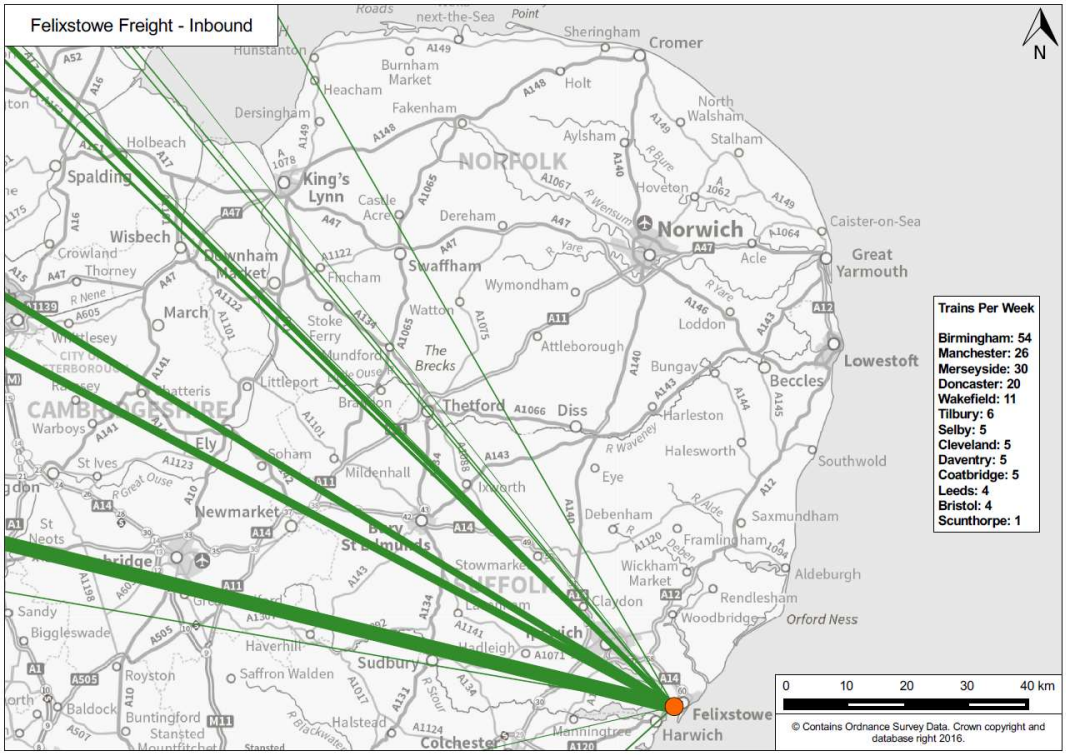
Once freight has arrived at the region's largest port at Felixstowe, much of it is transported by rail to the rest of Great Britain through distribution points at a number of locations. The majority of freight train departures from Felixstowe each week are destined for locations in the Birmingham area (48), with Manchester, Doncaster and Merseyside also being significant freight destinations for goods from Felixstowe (20, 24, and 24 train departures per week, respectively). There are also a number of other destinations comprising a total of 41 departures per week, with the furthest away being in Coatbridge near Glasgow.

Figure 0-27 – Outbound Rail Freight from Felixstowe



A large amount of freight departing from Felixstowe is also transported by rail from other locations in Great Britain. The majority of freight train arrivals at Felixstowe each week again have origins in the Birmingham area (54), with Merseyside, Manchester and Doncaster also being significant freight origins for goods heading to Felixstowe (30, 26, and 20 train departures per week, respectively). There are also a number of other origins comprising a total of 47 departures per week, with the furthest away again being in Coatbridge near Glasgow. It should be noted that due to capacity constraints on the Felixstowe to Nuneaton line some of these rail movements are routed via London and the West Coast Main line.

Figure 0-28 – Inbound Rail Freight from Felixstowe



4.8 ROAD NETWORK

The study area is served by an extensive network of A and B Roads, but lacks any motorways. The nearest motorways are the north-south M11 and A1(M), both located to the west of the region.

The Highways England-manged Strategic Road Network (SRN) includes four A-Roads within the study area, which provide connections between a number of key settlements in Norfolk and Suffolk, as well as facilitating the movement of goods both within and beyond the region. Many parts of the SRN in the study area provide increased vehicle capacity through dual carriageway infrastructure. The A11 and A14 connect to the M11 motorway to the west of Suffolk boundary, providing connections to London and other regions; whilst the A14 connects to the A1(M).

Figure 0-29 – Road Network

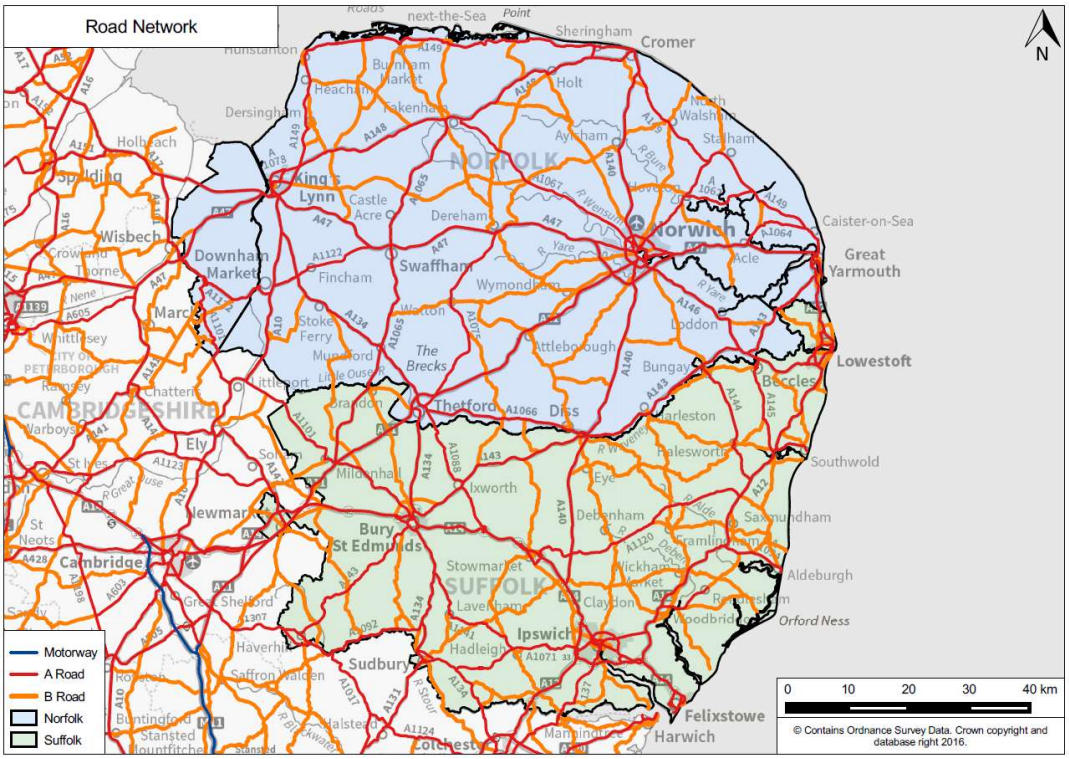
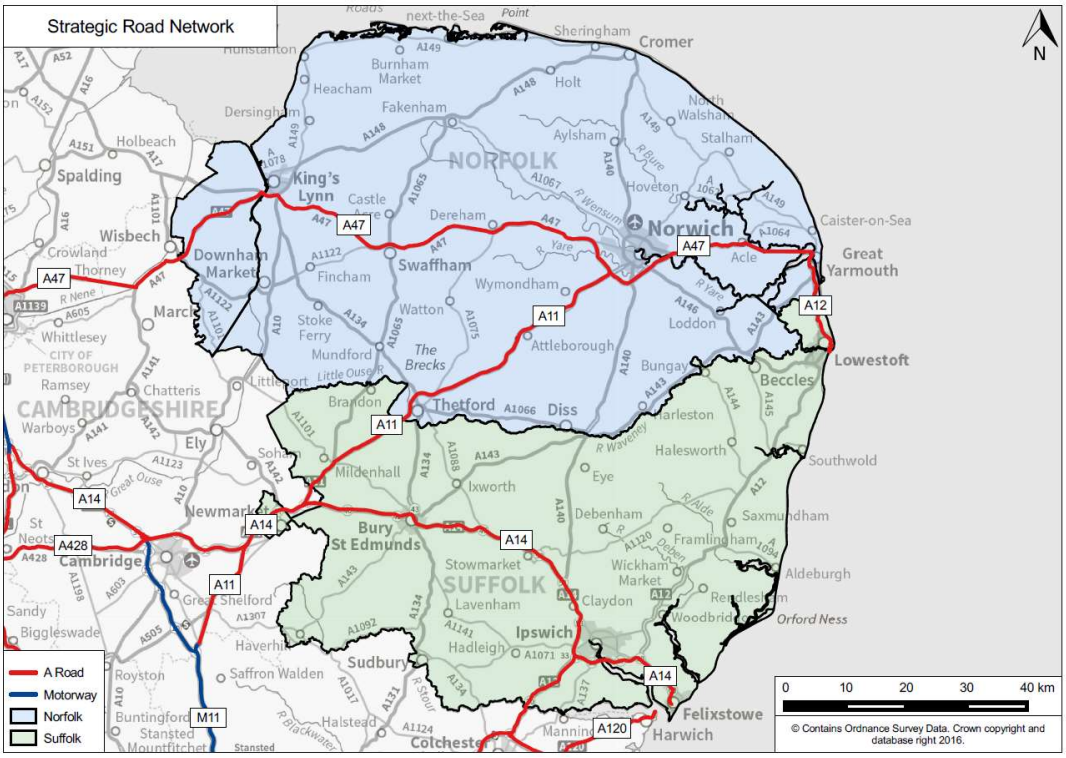
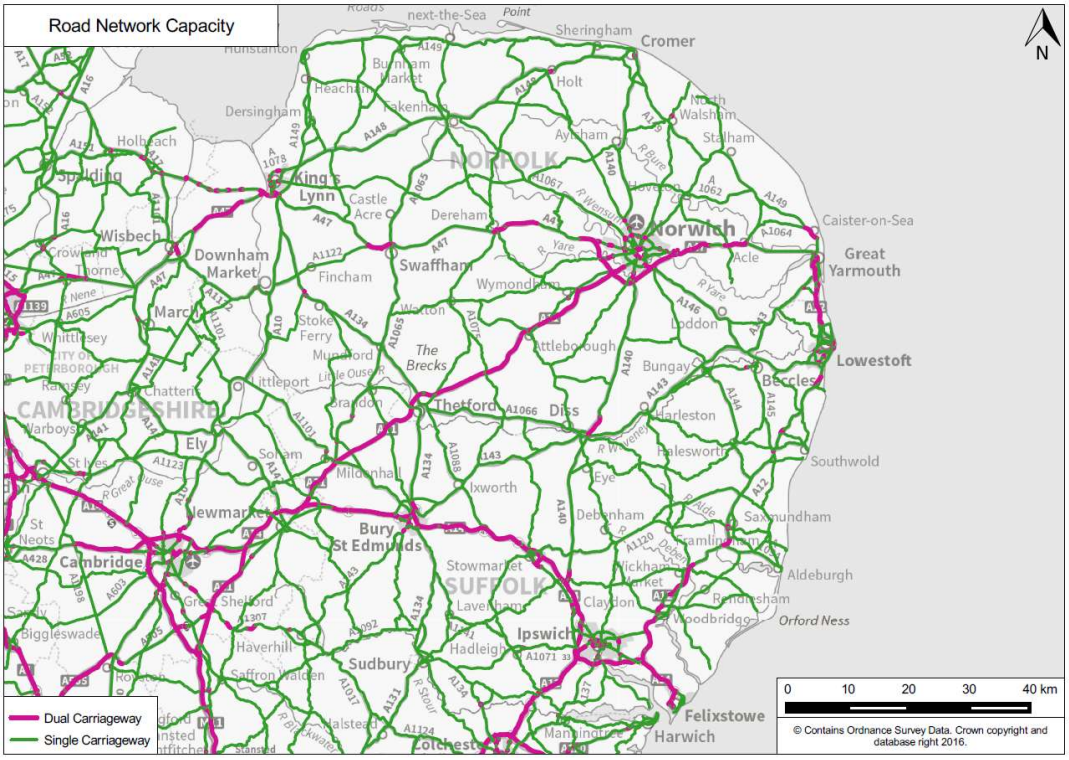


Figure 0-30 – Strategic Road Network



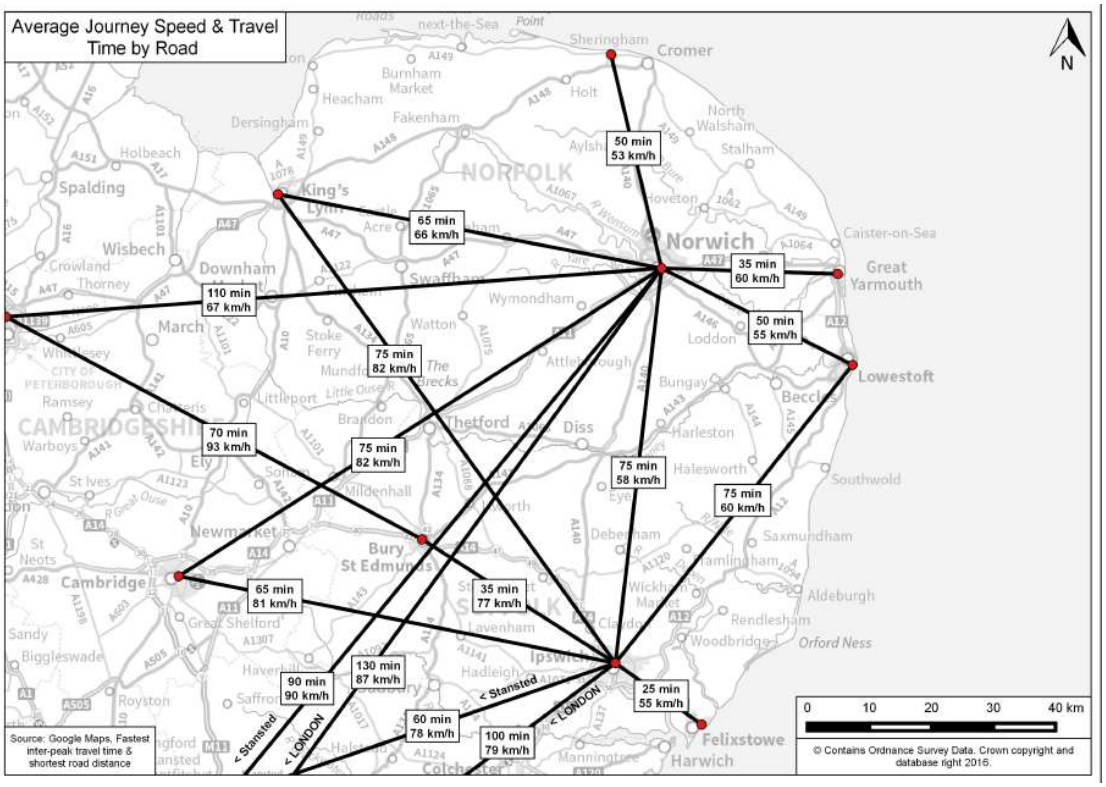
Despite the lack of motorway infrastructure in the study area, there are a number of dual carriageway A Roads within the New Anglia area. Many of these provide higher capacity routes within and around major settlements such as Norwich and Ipswich, as well as connections between them. Additionally, there is dual carriageway infrastructure linking the region's major port (at Felixstowe) to the M11 motorway, thus providing a route for goods to move between the port and the rest of Great Britain. Of particular note is the lack of dual carriageway provision on key north-south routes in general and on east-west routes in the northern part of the study area.

Figure 0-31 – Road Network Capacity



The impact of the lack of higher capacity road infrastructure between some key destinations is highlighted in the following figure, which presents the journey times and average speeds between key origins and destinations within and surrounding the study area. Journey times from Norwich, with the exception of those towards Cambridge using the A11, are particularly slow and of particular note are the speed and journey time between the city and Ipswich. The average speed between the two centres is 58kph compared to 82kph between Norwich and Cambridge; this leads to the two journeys taking a similar length of time despite the route between Norwich and Cambridge being significantly longer by distance. Ipswich itself it significantly better served by higher capacity roads providing quicker speeds on routes towards Bury St. Edmonds, Cambridge, Stansted Airport and London.

Figure 0-32 – Travel Times – Road



Highways England's Route Investment Strategy 2015/16-2019/20 highlights regular or severe congestion on a number of its routes within the New Anglia area including:

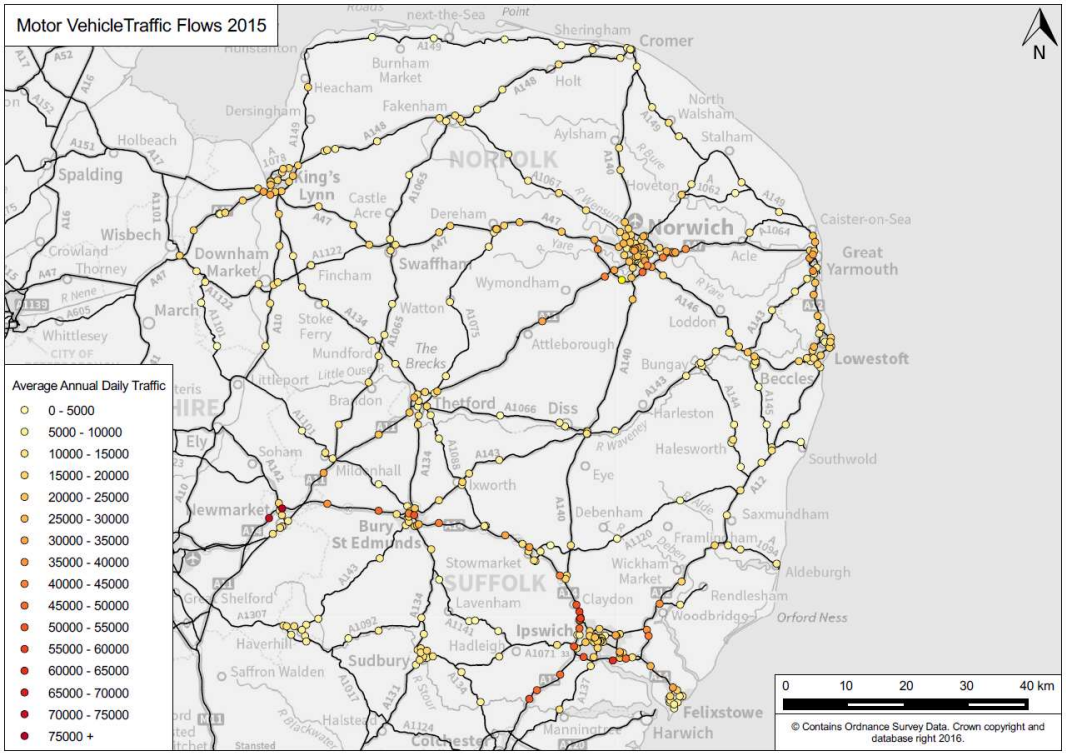
- A14 south of Ipswich (severe)
- A14 west of Bury St Edmund's (severe)
- A11 between Mildenhall and Thetford (regular/severe)
- A47 west of Great Yarmouth (severe)
- A47 west of Norwich (regular)
- A47 at King's Lynn (regular)

There are 426 traffic count points in the study area that are monitored by the Department for Transport (DfT). The data is provided in the form of Average Annual Daily Traffic (AADT) flow for various types of vehicles, and the latest data available is from 2015.

There are just two points which have an AADT above 70,000 motor vehicles, both of which are located on the A14 near Newmarket in Suffolk. Meanwhile, there are a further eight count points which have AADT above 50,000 motor vehicles – seven of them located on the A14 and one located on the A12, all in Suffolk. The count point with the largest AADT in Norfolk is located on the A47 between the A11 and A140, with an AADT of just under 50,000.

The general pattern of flows shown by the figure below is for traffic to be concentrated around the main urban centres and on the higher capacity strategic routes with particular concentrations on routes close to Ipswich, Bury St Edmunds, Norwich, Kings Lynn, Great Yarmouth and Lowestoft. Of particular note are the comparatively low flows on the A140 between Norwich and Ipswich, and generally on north-south routes internal to the study area.

Figure 0-33 – Annual Average Daily Traffic Flows 2015



Despite the lack of dual-carriageways within the New Anglia area, national data shows that journey time reliability on the Strategic Road Network in the area is comparable to the rest country. However, it can be seen in the table below, that motorways are significantly more reliable.

Table 0-3 – Average Journey Time Reliability (%) – 2014

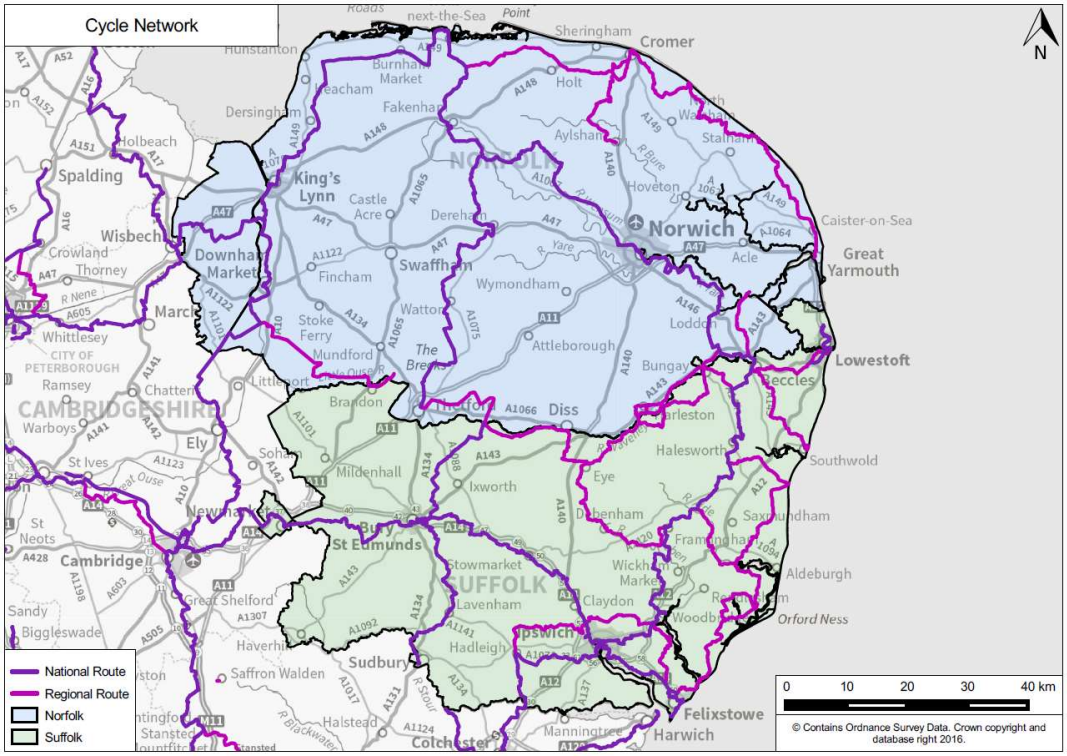
Link Description	Year Ending Dec-14
Entire Strategic Road Network (SRN)	78.6
Motorways on SRN	80.1
A Roads on SRN	75.7
A Roads within Norfolk or Suffolk	76.6

Source: Department for Transport

4.9 CYCLE NETWORK

The cycle network in the study area is comprised of both Sustrans National Cycle Network (NCN) routes and Regional Routes that are maintained by each of the respective boroughs. The total length of NCN routes in the study area is estimated to be 614 km, whilst there is also a total of 509 km of regional cycle routes in the region.

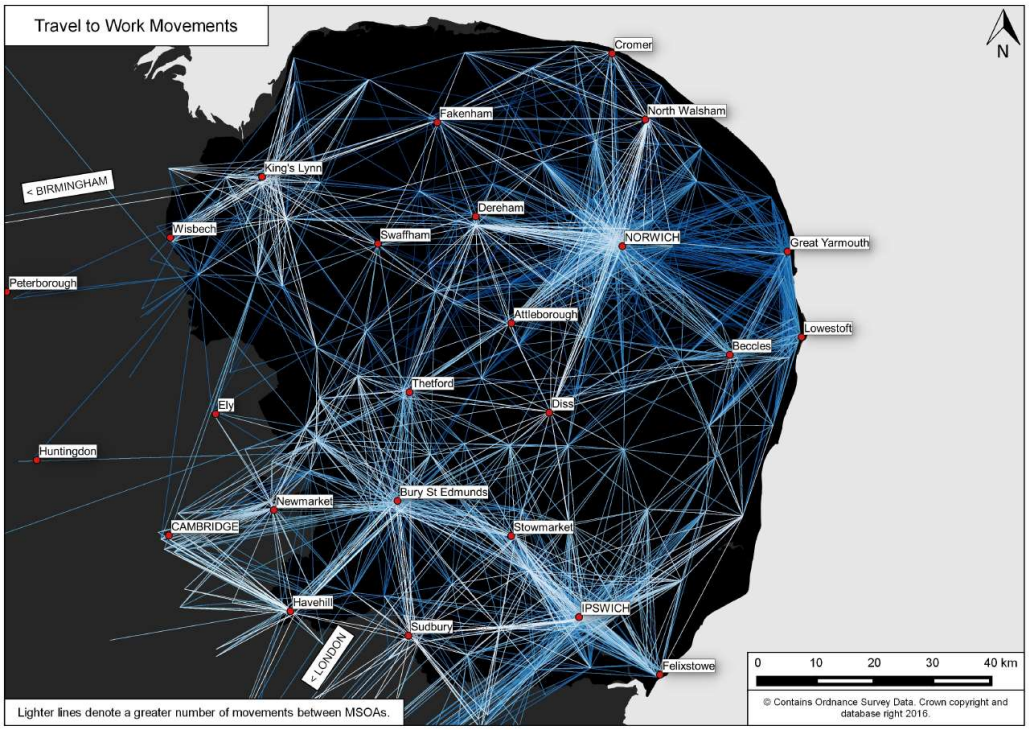
Figure 0-34 – Cycle Network



4.10 TRAVEL TO WORK MOVEMENTS

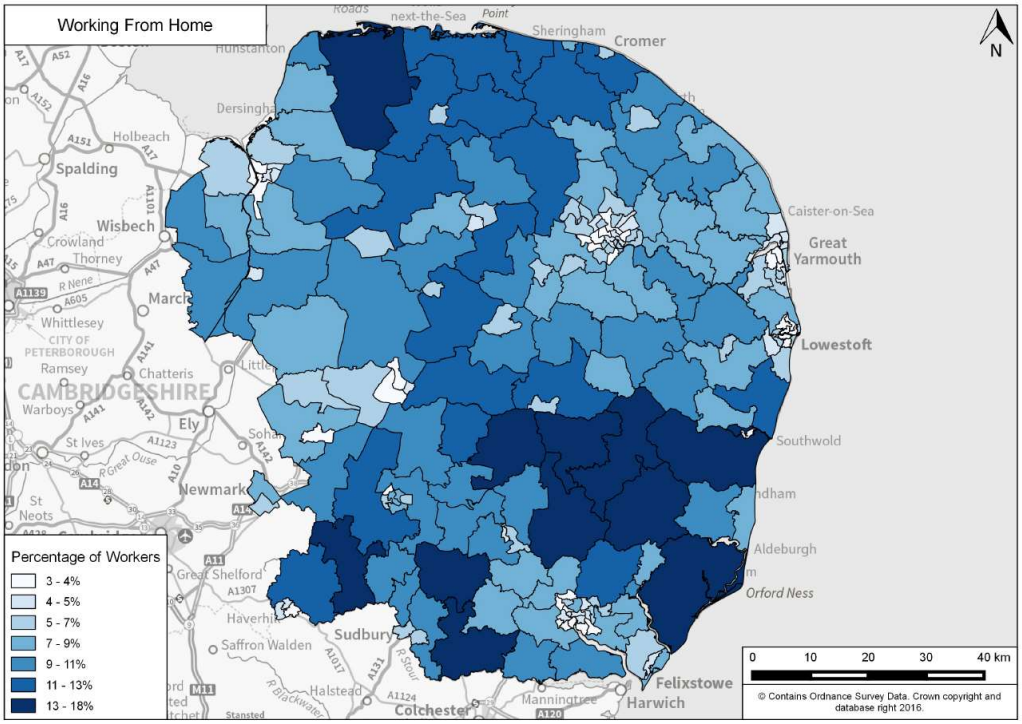
Looking at travel-to-work movements by all transport modes, and from location of residence to location of employment, we see that there are comparatively large commuting movements between Norwich and many of the city's closest towns, including Dereham, North Walsham, Attlebrough, and Diss. Also within Norfolk, there is also a relatively large number of movements between Wisbech and King's Lynn. In Suffolk, meanwhile, we can observe a distinct corridor of commuting movements along the line of the A14. This includes commutes between Ipswich and its nearby towns of Felixstowe, Stowmarket and Sudbury, as well as movements between Stowmarket and Bury St Edmunds, and Bury St Edmunds to Haverhill. To the west of the region there are also a large number of commuting trips between Newmarket and Cambridge, and further afield we see that there are also many journeys that head south toward London from Ipswich, Sudbury, and Haverhill.

Figure 0-35 – Travel to Work Movements



For those in employment who work from home, 28 of the 200 MSOAs in the study area show proportions above 11%. Additionally, 11 of those 28 MSOAs show proportions that are above 13%. We also see that the majority of those 11 areas with the highest proportion are located in the mid and coastal region of Suffolk.

Figure 0-36 – Working from Home



The following table presents the travel to work mode share for the New Anglia area and compares it to the whole of the East of England, non-metropolitan areas and England as a whole. Overall, motorcycle, walking and 'other' are broadly in line with other non-metropolitan areas while bus use is slightly lower, and car use is slightly higher. Proportionately, cycling is significantly higher in the New Anglia area, however, the biggest difference, compared to the non-metropolitan 'norm', is rail use which is 60% lower in New Anglia.

Table 0-4 – Travel to Work Mode Share – 2011 Census

Area	Rail	Bus	Motor-cycle	Car/Van Driver or Passenger	Bicycle	On Foot	Other
New Anglia	1.8%	4.1%	1.0%	74.7%	4.5%	12.6%	1.2%
East of England	8.9%	4.0%	0.8%	70.7%	3.7%	10.7%	1.2%
Non-Metropolitan	4.6%	4.9%	0.9%	73.1%	3.3%	12.1%	1.1%
England	10.0%	7.9%	0.9%	65.6%	3.1%	11.3%	1.2%

Source: Office for National Statistics

Compared to the East of England as whole, which contains larger urban populations and metropolitan fringe areas, New Anglia has similar levels of bus and motorcycle use but car use, cycling and walking are all substantially higher. The low level of train use in New Anglia is particularly notable when compared to the rest of the East of England, however, the wider region will include areas of significant rail-based commuting into London including from south Essex.

4.11 TRANSPORT IMPROVEMENTS

The Strategic Economic Plan sets out its transport priorities for each area in New Anglia with the following being a summary:

- Greater Norwich
  - Northern Distributor Road (Priority)
  - A47 Postwick Junction Improvements (Priority)
  - A47 Thickthorn (A11) and Longwater (A1074) Junction Improvements (Priority)
  - Access to Norwich Research Park (Priority)
  - Wymondham Subway Link (Priority)
  - Hethel/Wymondham Sustainable Transport Package (Priority)
  - Norwich City Centre Initiatives (Priority)
  - South-west and North-east Sustainable Transport Packages (Priority)
- Greater Ipswich
  - Ipswich Radial Corridor Improvements (Priority)
  - Ipswich Garden Suburb Rail Bridge (Priority)
  - A14 Junction Improvements at junctions 55, 57 and 58 (Priority)
  - Ipswich Wet Dock Crossing (Aspiration)

- Lowestoft and Great Yarmouth
    - Beccles Southern Relief Road (Priority)
    - Lowesfoft Third Crossing (Priority)
    - Great Yarmouth Third Crossing (Priority)
    - Railway station and sustainable travel improvements (Medium Term)
    - Denmark Road, Lowestoft, Widening (Aspiration)
    - A47 and A12 Junction Improvements (Aspiration)
- Attleborough
    - Attleborough Town Centre Transport Improvements (Priority)
    - Attleborough A11/B1077 Link Road (Priority)
- Thetford
    - A11 Junction Improvements (Priority)
- Mildenhall
    - A11 Fiveways Improvements (Medium to Long Term)
- Newmarket
    - Public transport links to other towns (Long Term)
    - A14/A142 Junction Improvements (Long Term)
- Brandon
    - Relief Road and rail crossing (Aspiration)
- Felixstowe
    - Rail corridor upgrade to Ipswich (Priority)
- Bury St. Edmunds
    - Eastern Relief Road (Priority)
    - A14 Junction 45 (Rookery Crossroads) Improvement (Priority)
    - A14 Junction 42, 43 and 44 Improvements (Aspiration)
- King's Lynn and Downham Market
    - Lynn Sport Link Road (Priority)
    - A47 Improvements including A47/A10 Junction (Priority)
- A12 and Sizewell
    - A12 Villages Bypass (Priority)
- Haverhill
    - Haverhill North-west Relief Road (Priority)
    - Haverhill A1307 Corridor Improvement (Priority)
- Sudbury
    - Sudbury Chilton Woods Spine Road (Priority)

- Sudbury Western Bypass (Priority)

The Highways England Route Investment Strategy (RIS1) for the period 2015/16 to 2019/20 includes five committed schemes. All are on the A47 through Norfolk, on the sections from Great Yarmouth to just west of Norwich; the schemes include:

- A47 North Tuddenham to Easton
- A47 Blofield to North Burlingham dualling
- A47 Acle Straight
- A47 & A12 junction enhancements
- A47/A11 Thickthorn Junction

Outside of the New Anglia area, there are RIS1 commitments will which improve access to the area including:

- A47 Guyhirn
- A14 Cambridge to Huntingdon
- A12 Colchester Bypass widening
- A12 Chelmsford to A120 widening

Network Rail's Network Specification for the Anglia area for Control Period 5 (2014-2019) states the following plans for the period:

- *"Development work has commenced on an option to examine lengthening services between Kings Lynn and Cambridge from 4-car to 8-car during the peak hours in order to address the existing capacity shortfall. Network Rail is examining options for early implementation, potentially within CP5".*
- *"On the Orbital Routes, the electrification of the Gospel Oak to Barking line is currently underway, due for completion in late 2017, which will allow an electrified diversionary route across London for Thameside freight, as well as providing capacity relief between Forest Gate Junction and Stratford on the Great Eastern route. The electrification will enable the two-car DMUs that operate the current passenger services to be replaced by four-car EMUs, allowing a homogenised fleet for all North London, East London and Gospel Oak to Barking line services as well as providing significant additional passenger carrying capacity. Platform extensions to accommodate the longer trains are linked with the electrification scheme, to be delivered by TfL".*
- *"Potential works being assessed for further development include partial doubling of the Felixstowe branch line, doubling the track between Ely and Soham, Ely area improvements including level crossings and the doubling of Haughley Junction."*

The strategy beyond Control Period 5 may include

- Great Eastern Main Line (GEML)
  - additional platforms at London Liverpool Street;
  - a passing loop north Witham;
  - doubling of Trowse Swing Bridge;
  - improvements at Haughley Junction; and,
  - signalling headway reductions between Chelmsford and London Liverpool Street.

- Cross country corridor via Ely
    - further doubling of the Felixstowe Branch;
    - improved signalling headways on the Bury St Edmunds Line;
    - Ely area improvements including level crossings; and,
    - headway reductions and doubling of single line sections between Ely and Soham.

Abelio, which holds the Greater Anglia franchise up to 2025 also has significant plans for improvements including:

- replacement of all rolling stock on the network with the new vehicles having wifi, plug sockets and air conditioning
- A new timetable will be delivered including
    - 'Norwich in 90', a 90-minute journey time between London and Norwich, will be delivered by two trains each way, heading to London in the morning peak and to Norwich in the evening peak/early evening.
    - 'Ipswich in 60', a 60-minute journey time will be achieved by one train each way per day.
    - Norwich will also benefit from a third train each hour to London in the off-peak.
    - Direct services between Norwich and Stansted Airport.

The Government have recently issued the prospectus for the forthcoming East Midlands franchise competition which covers the services from Norwich to Ely and Peterborough. The current timetable for the re-letting of this franchise envisages contract award in March 2018 with a franchise start date of 22nd July 2018.

5 SUMMARY OF ECONOMIC AND TRANSPORTATION GEOGRAPHIES

The previous sections have reviewed a significant range of data and information to provide a baseline for this study. The following is a summary and snapshot of the key challenges and opportunities

5.1 CHALLENGES

- GVA in New Anglia is 85% of the UK average
- GVA is growing faster than GVA per head showing reducing productivity
- Focus on productivity and skills, with a 7.6% gap remaining with the national average.
- Comparatively older population than the average for England with a lower proportion of those aged 25 to 49.
- Lower average level of qualification than England as a whole which is reflected in lower average weekly pay.
- Limited gains have been made in achieving the SEP target for improved productivity
- Enabling and encourage housing delivery, with ~16% of the SEP target delivered compared to ~34% of the jobs target.
- The challenge of planning and supporting both a rurally dispersed population as well as a growing urban-focussed population.
- The challenge of supporting the reduction in deprivation across the New Anglia area taking account of the differing causes and potential solutions.
- Constrained access to Norwich Airport albeit this being improved through the delivery of the Northern Distributor Road.
- The major ports generate a challenge of freight passing through the region to the Midlands hubs which puts pressures on the transport network.
- Poor east-west rail connectivity in the north of New Anglia with long journey times and poor frequencies.
- Rail network constraints at Ely and on the Felixstowe line generate impacts on east-west freight and passenger movements.
- The lack of motorways and limited dual-carriageways impacts upon journey times, particularly on north-south movements within the New Anglia area, particularly between Norwich and Ipswich, as well as east-west movements in the north of Norfolk. The general perception of the New Anglia area is that it is difficult to access from the west, however, within the region, north-south movements are more difficult.
- The challenge of varying levels of accessibility within the New Anglia area with the south being more accessible than the north.
- Whilst Highways England data suggests otherwise, journey time reliability may be impacted by predominance of single carriageway roads, particularly on the locally managed routes.
- Travel to work movements within New Anglia are particularly low by rail but bus journeys are also low while car journeys are high compared to other non-metropolitan areas.

- Managing New Anglia as one transport network when there are three organisations operating the highway network and separate train operators and railway track operators.

5.2 OPPORTUNITIES

- Higher employment rate than England as a whole but higher proportion of people working part-time.
- The balance of the economy between different sectors is similar to England as a whole.
- To continue and build on strong job growth.
- Opportunity to grow number of businesses further, having already reached close to 50% of the SEP target.
- Leverage private sector investment.
- Norwich Airport provides good access to wider (international) markets via the Amsterdam Schiphol Airport hub and fast links internal to UK where services exist (in competition to rail).
- Good connectivity to London with improved service and journey times under the new franchise, in addition improved connectivity to Stanstead Airport from Norwich.
- New Anglia has six seaports which account for 6.4% of the UK's seaborne imports and exports and includes the UK's largest containerised port.
- Together, walking and cycling are substantially higher in New Anglia than the non-metropolitan norm.
- Commitments to improve the rail services under the Greater Anglia franchise.
- Opportunity to improve east west connectivity through East Midlands franchise process.
- Road Investment Strategy improvements both inside and outside the area.
- Major improvements to infrastructure over the short to medium term through planned investment in road and rail through a combination of Network Rail, Highways England and regional plans.

6 PLANNED CHANGE

6.1 OVERVIEW

This section provides an overview of changes being planned in the New Anglia area including both land use and accessibility. This section summarises those changes and provides a commentary of challenges and opportunities, both current and potential.

This section covers a broad range of matters concerned with how New Anglia is planned to change, in a transport context, over coming years, with the following areas discussed:

- Policy
    - Strategic Economic Plan
    - Land Use and Infrastructure Frameworks
    - Local Plans
    - Local Transport Plans
- Bus Travel
- Active Modes
- Strategic Road Network
- Rail Network
- Airports
- Ports
- Digital communications networks
- Projected growth in journeys
- Accessibility challenges and opportunities
- Challenges and opportunities in 2030

In this section key challenges to accessibility are highlighted with a and opportunities are highlighted with a .

6.2 STRATEGIC ECONOMIC PLAN

The New Anglia Strategic Economic Plan[3] (SEP) was published by the New Anglia Local Economic Partnership (LEP) in 2014. The SEP sets out the LEP's aim to create 95,000 more jobs, 10,000 new businesses and 117,000 more homes in the period 2012-2026. The SEP also targets to increase productivity from £36,000 to £40,000 GVA by 2026 to bring GVA for New Anglia up to that of the national average.

The LEP identifies five high impact sectors which offer the opportunity for rapid growth in absolute terms and in productivity. These are:

[3] New Anglia Local Enterprise Partnership: New Anglia Strategic Economic Plan http://www.newanglia.co.uk/wp-content/uploads/2014/03/New-Anglia-Strategic-Economic-Plan-V2.pdf

- Advanced manufacturing and engineering, which currently employs over 24,500 people and is worth £1.5bn pa in GVA to the New Anglia economy;
- Agri-tech, which has seen growth in recent years far outstripping that of the UK economy in general, and which offers significant opportunities for growth;
- Energy, which currently employs 7,700 people directly in New Anglia and which is worth around £1bn pa to the New Anglian economy, with a GVA per job of £129k;
- ICT/Digital Culture, which currently contains over 1,400 companies in New Anglia employing over 10,000 people, with a GVA of £131k per head pa; and
- Life Sciences, which is worth around £132m pa, employing around 3,000 people, including a world class research cluster in Norwich.

Additionally, the SEP identifies four underpinning sectors:

- Agriculture and food & drink, which currently employs over 10% of the workforce and generates £2.2bn pa;
- Financial and insurance services, which contribute £3.1bn GVA and employ around 21,000 people;
- Ports and logistics, which are worth around £1.3bn pa to New Anglia and employ over 23,500 people, with the port of Felixstowe handling 40% of the country's container traffic; and
- Tourism and culture, which employs around 74,000 people and which is worth around £1.3bn in GVA to the New Anglia economy.

The SEP identifies a number of key growth locations, including:

- Greater Norwich and Greater Ipswich, which are by some way the two largest settlements in new Anglia;
- Lowestoft and Great Yarmouth, which are designated centres for offshore renewables, have an Enterprise Zone and are to be an assisted area;
- Attleborough, Thetford, Mildenhall, Brandon and Newmarket along the A11;
- Felixstowe, Stowmarket and Bury St Edmunds along the A14;
- King's Lynn and Downham Market
- Sizewell (and its nuclear power station)
- Haverhill and Sudbury in South Suffolk, which have over 30% employment in manufacturing; and
- Fakenham and Wells in North Norfolk, which is becoming a service base for North Sea energy.

The SEP stresses the importance not only of growing these places but of connecting them by rail and strategic road networks, both to each other and to the rest of the country.

The SEP identifies that the largest areas for growth will be Greater Norwich and Greater Ipswich with other larger settlements also being the focus for significant growth plans.

Concentrating on Norwich and Ipswich provides the opportunities to build on existing accessibility whilst also, through larger scale development (e.g. urban extensions), enhancing these centres by building in higher levels of accessibility.

However, **the SEP also identifies a wide range of other, smaller locations, including market towns and standalone large sites. Some of these growth locations will be on the periphery of accessibility networks, both infrastructure and services, resulting in greater demand for travel**.

Rail

The SEP sets out the LEP's priorities for rail. These are:

- More capacity, faster journey times and better quality on the Great Eastern Main Line between Norwich, Ipswich and London;
- Improved freight connections with Felixstowe Port to markets in Europe and throughout the UK;
- Better passenger connections between other major economic centres, particularly east-west links; and
- More capacity on the main economic centres of Ipswich and Norwich.

Road

The SEP identifies the A14, the A11, the A47 and the A12 as the most important strategic routes in New Anglia. Congestion on these routes is recognised as creating a significant economic cost to the region, with congestion on the A14 alone estimated to cost the region around £94m per annum. The LEP's particular concern is the impact of congestion at trunk road junctions and other bottlenecks (especially the Orwell Bridge) on economic growth; and seeks to work with the DfT, the Highways Agency (as it was then) and the two county councils on the prioritisation of trunk road improvements.

Transport Priorities

The SEP outlines a number of local transport interventions to support the delivery of growth in key locations. These interventions in most instances can be broadly categorised in one of the following:

- Scheme development of junction and other improvements on the national trunk road and rail networks
- Schemes to unlock employment or housing growth directly
- Urban transport packages which includes sustainable transport, network management and maintenance schemes.

Within Greater Norwich the following transport priorities have been outlined:

- Northern Distributor Road which is anticipated to be open by Christmas 2017
- A47 Postwick junction improvements which opened to traffic in December 2015
- A47 junction improvements in south west quadrant which was announced as part of the Highways England (HE) Road Investment Strategy in Autumn 2014 and will be constructed by 2020/21
- Improve access to the Norwich Research Park
- The Wymondham Subway Link which will be delivered as part of a Section 106 Agreement for Land at South Wymondham. Planning permission was granted February 2014.
- Hethel / Wymondham sustainable transport package
- Accelerated delivery to provide access to Norwich International Airport Aeropark and NE quadrant sites as part of the first phase of development

- City Centre initiatives including improvements to public realm, BRT, ticketing, local rail services, cycling and walking etc.
- South west and North east sustainable transport packages

Within Greater Ipswich the following transport priorities have been outlined:

- Ipswich Radial Corridor Improvements connecting the town centre and three major employment areas. The radial corridor improvements have funding allocation for 2016/17 and 2017/18.
- Ipswich Garden Suburb rail bridge
- Upgrade of three major junctions on the A14 at Ipswich and is due to be complete by 2020
- Cornhill Project which could begin construction in Autumn 2017
- High Street Campus Project which will include enhanced transport connections
- A new crossing of the Wet Dock which was confirmed as a funding commitment (£77 million) within the Chancellor of the Exchequer's March 2016 budget

Within Lowestoft and Great Yarmouth the following transport priorities have been outlined:

- Beccles southern relief road which costs £7m and will be jointly funded by the New Anglia Local Enterprise Partnership and Suffolk County Council
- 3rd river crossings at Lowestoft and Great Yarmouth. Great Yarmouth funding bid is due to be submitted March 2017 and Lowestoft full planning application will be submitted this year with the scheme anticipated to be complete 2022
- Station improvements which are now complete
- Widen Denmark Road
- Improvements to A47 and A12 junctions which are due to be complete in 2022

In addition to the transport priorities mentioned above the following transport intervention have also been highlighted within the SEP:

- Attleborough Town centre transport improvements which has a total of £2.5 million in funding allocated 2017/18
- Attleborough A11/B1077 link road which has a phasing proposal of 2022-2024
- Various junction improvements of A11 to benefit Thetford and Mildenhall
- Improved public transport links and A14/A142 (J37) capacity improvements to benefit Newmarket
- Ambition to create a relief road and new rail crossing to benefit Brandon
- Upgrade rail corridor between Felixstowe and Ipswich
- Eastern Relief Road from Moreton Hall which has secured funding for £15mllion and improvements to A14 junction 45
- Ambition to improve access to the A14 at J47, 43 and 44
- Lynn Sport Link Road which has now opened
- Plan junction improvements of the A47 (particularly Hardwick A47/A10) which will commence 2019/20
- Bypass of Stratford St. Andrew, Farnham, Little Glemham and Marlesford to keep HGV traffic off the A12

- Haverhill NW relief road to unlock development and ease congestion. Consultation of the proposal is planned early 2017
- Haverhill A1307 corridor improvement which went for consultation in 2016
- Develop the Sudbury Chilton Wood spine road to unlock development. The planning application has been submitted and is currently pending a decision.

The Strategic Economic Plan Impact Report
In 2016, the LEP published the Strategic Economic Plan Impact Report (SEPIR)[4], which provided an update on progress against the targets (to 2026) set out in the SEP. The SEPIR noted the following progress:

- 32,300 more jobs since 2012 (34% of the target)
- 4,980 new businesses (50% of the target)
- 18,850 new houses (16% of the target)
- Gap in GVA down from 7.8% to 7.6%
- £208.6m of private sector investment unlocked by LEP schemes (exceeding the £199m target five years ahead of schedule)

Progress is therefore mixed: there has therefore been **very positive news in job and business creation and in private sector finance unlocked**; however, there has been **less progress in delivering housing than had been hoped, and the gap in productivity to the national average has hardly moved at all**.

The SEPIR goes on to discuss progress in campaigning for better transport infrastructure. The report notes the creation of the **New Anglia Local Transport Body**, and discusses **campaigns to reduce the rail journey time from Norwich to London to 90 minutes and from Ipswich to London to 60 minutes**. The report also discusses the Bury St. Edmunds Eastern Relief Road, which is partially funded by the LEP.

A new Strategic Economic Plan for New Anglia is currently under development and will be informed, in part, by this commission.

6.3 LAND USE AND INFRASTRUCTURE FRAMEWORKS

6.3.1 Norfolk Strategic Framework

In early 2015 all Norfolk's Local Authorities, working through its strategic planning member forum, agreed to formally cooperate on a range of strategic cross-boundary planning issues through the preparation of the Norfolk Strategic Framework.

The aim of producing the framework is to:

- Agree shared objectives and strategic priorities to inform the preparation of future local plans;
- Demonstrate compliance with the duty to co-operate;

[4] New Anglia Local Enterprise Partnership: Strategic Economic Plan Impact Report http://www.newanglia.co.uk/wp-content/uploads/2016/09/New-Anglia-Strategic-Economic-Plan-Summary-Update-FINAL.pdf

- Find efficiencies in the planning system through working towards the establishment of a shared evidence base;
- Influence subsequent high level plans (such as the SEP); and
- Maximise the opportunities to secure external funding to delivery against agreed objectives.

Four working groups have been established to pull together a shared evidence base on housing, employment, infrastructure and delivery issues. The working groups consist of local authority staff assisted by other organisations including the Environment Agency, Natural England, Anglian Water, UK Power Networks, Homes and Communities Agency and the New Anglia Local Enterprise Partnership.

A high level vision and objectives for the Framework and an outline structure for the document was discussed at the member forum in October 2016. It is expected that this will be agreed alongside the consultation draft version of the document over the spring period 2017. Public consultation will then start in July 2017 with the final Framework being adopted in autumn 2017.

In addition to commencing the work on draft the framework the following work is being undertaken:

The Housing Group having completed its needs analysis and agreed a common methodology Housing and Economic Land Availability Assessment (HELAA) are now completing the production of HELAAs based on this methodology. The group is also looking in more detail at some cross boundary issues around specialist housing provision for the elderly, student housing, affordable housing, and Gypsy and Traveller sites.

The Infrastructure Group is continuing to produce evidence for all infrastructure areas. The group has been working closely with statutory undertakers to map areas where water disposal and flooding could impact development. Discussions are underway with UK Power Networks to produce details on areas of concern around electricity supply. **A detailed Strategic Green Infrastructure Map is being commissioned externally for the whole of Norfolk whilst studies around Schools, Telecoms, Health and Road, Rail, Public Transport are being written internally from evidence provided by Norfolk County Council.**

The Economic Group has analysed the latest East of England Forecast Model run for 2016 and is now seeking to highlight the impact of new sectors and planned interventions. The group has compiled detailed information on the county's key employment sites and is working on cross boundary strategic economic planning issues including actions and interventions that can be taken to support these.

The Delivery Group has complied and reviewed the progression of all Norfolk housing sites, further analysis is now being undertaken to highlight potential solutions to improving delivery rates on strategic sites. Consideration is also being given to taking forward delivery work done under the devolution workstream.

6.3.2 Suffolk Spatial Planning and Infrastructure Framework (SPIF)

The Spatial Planning and Infrastructure Framework is jointly commissioned project by Suffolk County Council and the district authorities within the county. The Framework will provide a plan for the spatial distribution of development up to 2050. It will take into account the current planned growth in local plans including both the allocated and unallocated growth, and looks ahead for longer term growth beyond the local plan periods for a horizon between 2036 and 2050. The SPIF will look to maintain the uplift of housing delivery up to 2036 that was to be promoted through the devolution agenda.

Three spatial scenarios are being investigated and tested with a resulting preferred option and accompanying infrastructure needs to be defined. The draft content of the SPIF is likely

to be available in spring 2017 and will need to be approved by all commissioning local authorities. Account in the final SPIF will also need to be taken of the imminent Planning White Paper and outputs from work on new local plans.

Together with the SEP, the Norfolk Strategy Framework and the Suffolk Spatial Planning and Infrastructure Framework provide significant opportunities for local authorities to work at a regional level to manage growth, identify key challenges and opportunities and plan for the necessary delivery of associated infrastructure and services.

6.4 LOCAL PLANS

The table below shows the plans amount of new housing development planned in each local planning authority in New Anglia in the LPAs' respective adopted Core Strategies.

Table 0-5 – Planned growth in housing in the current plan period across New Anglia

Local Planning Authority	Adoption Date	Housing Target	Period	Ave. Dwellings per Annum	Notes
North Norfolk	Sep 2008 (minor update 2011)	5,940	2007-2021	424	A target of 8,000 from 2001-2021, of which 2,060 completed between 2001 and 2007
King's Lynn and West Norfolk	Jul 2011	10,654	2009-2026	627	A target of 16,500 from 2001-2026, of which 5,846 completed between 2001-2009
Breckland	Dec 2009	13,865	2009-2026	816	A target of 19,100 from 2001-2026, of which 5,235 completed 2001-2009
Greater Norwich (covering Norwich, Broadland and South Norfolk)	Mar 2011	36,820	2008-2026	2,046	Of these, 33,000 are expected to come forward in the Norwich policy area (this extends slightly beyond the City of Norwich itself).
Great Yarmouth	Dec 2015	7,140	2013-2030	420	
Forest Heath	May 2010	6,800	2011-2031	340	Note that Policy CS7 in the original Core Strategy was subject to a legal appeal and subsequently quashed; this figure represents the replacement figure.
St Edmundsbury	Dec 2010	12,243	2009-2031	710	15,631 dwellings, of which 3,388 complete 2001-2009
Mid Suffolk	Sep 2008	7,268	2007-2025	404	

Local Planning Authority	Adoption Date	Housing Target	Period	Ave. Dwellings per Annum	Notes
Waveney	Jan 2009	4,614	2007-2025	256	Consists of 5,800 2001-2021, of which 2,346 complete 2001-2007, and a further 1,160 2021-2025
Suffolk Coastal	July 2013	7,900	2010-2027	465	
Ipswich	Dec 2011	11,932	2010-2027	702	Note that there will also be concentrations of residential development in the Ipswich fringe areas of the adjacent districts
Babergh	Feb 2014	5,975	2011-2031	299	
Total				7,509	
Note that the period referred to above indicates the period across which the housing target is specified, and does not necessarily correspond to the period of the plan itself.					

It is not straightforward to compare or to draw an overall total from the data compared in these core strategies, since they cover different periods and do not necessarily plan to deliver housing at a consistent rate over time. Nevertheless, in broad terms, it can be seen that the adopted strategies of the **LPAs of New Anglia set out plans for in the region of 7,500 new dwellings per annum across the two counties, or around 105,000 over the fourteen year period of the SEP**. Analysis of these local plans, whilst supporting the SEP in focusing development in major centres, also shows **that even the less populated areas of New Anglia have substantial plans for growth in housing. If employment opportunities are not provided alongside housing growth in less accessible locations, the need to travel will increase.**

The adopted core strategies also set out growth targets for employment, in most cases in the form a specific target for growth in jobs. These targets are set out in the table below.

Table 0-6 – Planned growth in employment in the current plan period across New Anglia

Local Planning Authority	Adoption Date	Jobs Target	Period	Ave. Jobs per Annum	Notes
North Norfolk	Sep 2008 (minor update 2011)	4,000	2001-2021	200	Note that this is not a target set out in the plan but a previous target from the East of England Plan
King's Lynn and West Norfolk	Jul 2011	5,000	2011-2021	500	Includes plans for 66ha of new employment land
Breckland	Dec 2009	6,000	2009-2021	500	

Local Planning Authority	Adoption Date	Jobs Target	Period	Ave. Jobs per Annum	Notes
Greater Norwich (covering Norwich, Broadland and South Norfolk)	Mar 2011	27,000	2008-2026	1,500	Includes plans for 175ha of new employment land
Great Yarmouth	Dec 2015	13,500	2015-2025	1,350	Note that this is not a target, but a forecast of the number of jobs which will be generated by the Enterprise Zone at Great Yarmouth (together with indirect jobs resulting from this).
Forest Heath	May 2010	7,300	2010-2026	456	Includes plans for 16ha of employment land
St Edmundsbury	Dec 2010	13,000	2010-2026	765	Includes plans for at least 80ha of new employment land
Mid Suffolk	Sep 2008	6,000	2001-2021	300	Note that this is not a target but a forecast referred to in the draft Mid Suffolk Employment Land Review (2006)
Waveney	Jan 2009	5,000	2001-2021	250	Includes plans for 71ha of employment land
Suffolk Coastal	July 2013	8,000	2001-2027	307	Includes plans for 8.5ha of new employment land
Ipswich	Dec 2011	18,000	2001-2025	750	
Babergh	Feb 2014	9,700	2011-2031	485	
Total				7,363	
Note that the period referred to above indicates the period across which the employment target is specified, and does not necessarily correspond to the period of the plan itself.					

Again, it should be noted that the data set out in the table above covers inconsistent periods, and also that in some local plans no specific target is stated; where this is the case, the 'jobs target' figure refers to a forecast and a lower level of confidence must therefore be applied to it. Nevertheless, **it can be seen that over the current plan period, over the whole of New Anglia, in the region of 7,000 new jobs per annum are anticipated, equating to around 98,000 over the fourteen-year period of the SEP.**

Plans to focus major employment growth in large major settlements will take advantage of existing higher levels of accessibility while providing some additional

employment opportunities in more remote locations may reduce the need for people to travel long distances for work.

It should not necessarily be expected that the targets set out in the core strategies, and extrapolated by means of an annual figure to a fourteen-year period, should exactly match those set out in the SEP; there are inevitably differences caused by time periods not matching, aging development plan documents, and differing priorities. Nevertheless, it can be seen that the LEP's targets for growth in employment and housing as set out in the SEP are broadly reflected by the development plans in the individual core strategies of New Anglia.

6.5 LOCAL TRANSPORT PLANS

6.5.1 Norfolk

Norfolk's 3rd Local Transport Plan, Connecting Norfolk[5], sets out the strategy and policy framework for transport up to 2026. The document will be used as a guide for transport investment in Norfolk as well as considered by other agencies when determining planning or delivery decisions.

The document sets out six strategic aims:

- Maintaining and managing the highway network;
- Delivering sustainable growth;
- Enhancing strategic connections;
- Reducing emissions;
- Improving road safety; and
- Improving accessibility.

The strategy is accompanied by a series of implementation plans, with the current document setting out the measures to be delivered over 2015 to 2021 period. **This document sets out nine schemes which benefit from Growth Deal funding, reflecting the priorities set out by the LEP. These are as follows:**

- £9.0m Great Yarmouth Sustainable Transport Package 2016/17-20/21;
- £7m Norwich City Centre Transport Package 2016/17-20/21;
- £204.1m for Norwich A11 Corridor package 2015/16-2019;
- £4.6m Attleborough Sustainable Transport Package 2016/17-20/21;
- £2.3m Thetford Sustainable Transport Package 2016/17-20/21;
- £2m Easton / Longwater Junction Norwich 2015/16-17/18;
- £2m Rail Station Interchange Great Yarmouth 2017/18-18/19;
- £2m Third River Crossing Great Yarmouth 2017/18-18/19; and

[5] Norfolk County Council, Connecting Norfolk, Norfolk's Transport Plan for 2026 https://www.norfolk.gov.uk/what-we-do-and-how-we-work/policy-performance-and-partnerships/policies-and-strategies/roads-and-travel-policies/local-transport-plan

- £1m Lynn Sport Access Road King's Lynn 2015/16.

The implementation plan[6] notes that should further funding become available through the Growth Deal, it will lead to a focus on spending toward schemes that support the growth areas.

Other priorities identified in the Implementation Plan include:

- Dualling of the A47;
- Improving speed, quality, capacity and reliability of Norwich-London rail journeys (aiming for a 90-minute journey);
- Improving rail services between Norfolk and the Midlands, and more frequent Norwich to Cambridge services;
- Improving connections to Norfolk's gateways (Norwich airport and Great Yarmouth port) through North Northern Distributor Road (NNDR), for which funding has been secured, and Great Yarmouth Third River Crossing, which is in the scheme development stages;
- Improving connections in Growth Areas including Great Yarmouth, King's Lynn, Norwich, A11 corridor and the Fakenham to Wells corridor (key priorities in Norwich will be NNDR, bus rapid transit, junction improvements and city centre enhancements); and,
- Measures to reduce emissions (e.g. Norwich Park & Ride, Norfolk Car Club, Cycle Delivery Plan), improve road safety and increase accessibility (e.g. carsharing, car clubs and community transport).

The schemes planned to be delivered through the Norfolk Local Transport Plan highlight an existing deficit in transport infrastructure and services across both highway and public transport modes. The need for enhancements to accessibility to overcome existing issues and support future growth is highlighted by the broad range of investment planned.

6.5.2 Suffolk

Suffolk's Local Transport Plan[7] sets out Suffolk County Council's long-term transport strategy for the period from 2011-2031. The key focus of the plan is to support Suffolk's economy in order to support future sustainable economic growth. This will be done by:

- Maintaining (and in the future improving) the transport networks;

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[6] Norfolk County Council, Connecting Norfolk Implementation Plan for 2015-2021 https://www.norfolk.gov.uk/what-we-do-and-how-we-work/policy-performance-and-partnerships/policies-and-strategies/roads-and-travel-policies/local-transport-plan

[7] Suffolk County Council, Suffolk's Local Transport Plan 2011-2031, http://www.suffolk.gov.uk/roads-and-transport/public-transport-bus-pass-and-transport-planning/transport-planning-strategy-and-plans/

- Tackling congestion;
- Improving access to jobs and markets; and
- Encouraging a shift to more sustainable travel patterns.

The plan identifies a number of strategic transport improvements which are a priority for the County Council, which include, inter alia:

- A11 Fiveways to Thetford dualling;
- A14 Copdock improvements;
- Improvements to the rail network, including the Beccles Loop, Ipswich Chord, reinstatement of passenger services to Leiston, and Felixstowe to Nuneaton rail improvements;
- Lowestoft Northern Spine Road phase five;
- Beccles Southern Link Road;
- A12 Four Villages Improvement;
- Felixtsowe Dock Spur roundabout improvement;
- Lowestoft Lake Lothing Southern Access Road;
- Lowestoft 3rd River Crossing;
- Bury St Edmunds Eastern Link Road and development relief roads;
- Haverhill NW Relief Road; and
- Sudbury Western Bypass.

The Suffolk Local Transport Plan, similarly to the Norfolk equivalent, highlights that significant infrastructure investment is needed to remove current constraints and support future development. These constraints occur on both the strategic and local transport network, affecting access to national, regional and local destinations.

6.6 BUS TRAVEL

Funding will remain tight over the period of both the Norfolk Local Transport Plan (LTP) 2015 to 2021 and Suffolk LTP 2011 – 2031, with capital infrastructure schemes more likely than revenue based programmes. This means that revenue funding initiatives such as supporting bus services will be increasingly difficult.

With a reduction in conventional bus services in Norfolk due to that lower revenue funding, the LTP implementation plan proposes active engagement and providing information to the public to ensure a sustainable network is developed. The plan also highlights the need for greater acceptance of shared travel options such as car sharing and car clubs in addition to demand responsive transport.

A result of fewer conventional bus services could be increased rural isolation and the LTP proposes this to be addressed through an emphasis on working with Norfolk's Community Transport providers, to help them make best use of and increase their resources. In addition measures to enhance access to services, particularly by public transport, walking and cycling, will continue to be delivered as part of the capital improvement programme. Measures to enhance connectivity between modes including through ticketing will be delivered where possible. There will also be a focus on keeping traffic moving, particularly public transport in urban centres, where congestion can be an issue.

Particular challenges will be faced in the provision of specialised social transport due to reducing budgets and an aging population and growing complication in care needs.

In Suffolk, sponsored or subsidised bus services have been provided to fill gaps but due to increasing budgetary pressures this has resulted in ever more services being reduced or withdrawn. The pressure on funds has led to priority given to bus services in urban areas and on strategic routes.

To mitigate the loss of rural services, demand responsive transport services are being introduced. Standard timetable services have been replaced with smaller vehicles taking people on request.

Overall, the restrictions on local authority budgets has caused a contraction of the supported bus service network but alternative means of supporting accessibility in the least served areas are being developed. The issues are likely to be greater in rural rather than urban areas due to the lower commercial viability of bus services.

6.7 ACTIVE MODES

Both Norfolk and Suffolk County Councils have significant plans for enhancing active modes, walking and cycling, to improve local accessibility, reduce car travel and deliver health and wellbeing benefits. Improvements take various forms and cover areas across New Anglia and include such programmes and schemes as:

- Cycle Strategies – programmes of improvements to deliver increased cycling across counties, districts and individual urban areas
- Major programmes with DfT funding – including through the Sustainable Travel Transition Fund and Access Fund
- Norwich A to Better – Travel and journey planning programmes for new residential developments
- Active Norfolk and Suffolk Sport – Sports Partnership programmes to increase participation in sport including both cycling and walking
- New major infrastructure incorporating provision for active modes – such as Lake Loathing and the Upper Orwell Crossings
- New active mode-specific infrastructure – such as the Wroxham to Horning Cycle Link and the Golden Ball Lane and Newmarket Road schemes in Norwich.

6.8 ROADS INVESTMENT STRATEGY – HIGHWAYS ENGLAND

Following the reforms that the Government made to the way in which the Strategic Road Network (SRN) is managed and operated there have been a number of key strategies that are significant for East Anglia's transport network.

6.8.1 Road Investment Strategy 1 (2015 to 2020)

Published in December 2014 the first 'Road Investment Strategy' (RIS 1) outlines a long-term programme for the motorways and major roads network (the Strategic Road Network or 'SRN') with associated funding over a five-year period. Through the first RIS the government committed to;

- Providing certainty, with over £15 billion to be invested in the SRN from 2015/16 – 2020/21
- Increasing capacity, with projects that will deliver over 1,300 additional lane miles
- Improving the condition of the network, including resurfacing 80% of the SRN

In 2015, Highways England published the first set of Route Strategies, describing the condition and performance of the SRN, issues affecting them and the investment priorities for the Strategic Road Network for Road Period 1: 2015 to 2020.

The SRN was comprehensively assessed link-by-link and junction by junction meaning that that the first Road Investment Strategy (RIS) was built on a stronger evidence base than previous roads programme.

6.8.2 East of England Route Strategy, April 2015

The East of England Route Strategy[8], published by Highways England in April 2015, informed the Roads Investment Strategy and outlines the key opportunities and challenges for the SRN in the East Anglia region. The strategy covers the SRN roads in the region, namely the A11, A12 and A47 and A120

It also details the nine committed improvement projects and two further schemes anticipated for Road Period 2 (2020 to 2025). **Many of these projects are in Norfolk and Suffolk and all contribute to improving the performance and customer experience of those using the SRN within and to/from the region.**

- **A47 North Tuddenham to Easton** - dualling to provide continuous dual carriageway between Norwich and Dereham, combined with the Blofield to North Burlingham scheme, this will provide full dualling between Dereham and Acle. ***Construction start 2020***
- **A47 Blofield to North Burlingham dualling** - to complete a gap in the dual carriageway between Norwich and Acle; combined with the North Tuddenham to Easton scheme this will provide full dualling between Dereham and Acle. ***Construction start: 2020***
- **A47 Acle Straight** - safety improvements at key hotspots and joint working with Natural England to establish environmental impacts and mitigation measures for the medium and long term which could include installation of safety barriers, junction improvements and road widening or capacity improvements. ***Construction start: 2020***
- **A47/A12 junction enhancements** – junction upgrade improvements, including reconstruction of the Vauxhall roundabout. ***Construction start: 2020***
- **A47/A11 Thickthorn Junction** - Improvement of the interchange to give improved access to Norwich. ***Construction start: 2020***
- **A47 Guyhirn Junction** - Creation of a new larger junction linking the A47 with the A141. ***Construction start: 2020***
- **A47 Wansford to Sutton** - dualling the A47 between the A1 and Peterborough. ***Construction start: 2020***
- **A12 Chelmsford to A120 widening** - Widening to provide three lanes of capacity between Chelmsford and Colchester, improving safety and reducing congestion. ***Construction start: by end 2019/20***
- **A12 whole route technology upgrade** - A12:M25 J28 and Ipswich, Traffic management technology improvements along the whole route, including detection

[8] Highways England Route Strategies: https://www.gov.uk/government/publications/route-strategies-april-2015-march-2020

loops, CCTV cameras and variable message signs to allow better information to drivers and active traffic management of traffic on the route. ***Construction start: by end 2019/20***

- **A12 Colchester bypass** - Widening of the A12 between junctions 25 and 29 to three lanes and improvements to local junction layout, to relieve congestion and improve access between London and Ipswich. ***Construction start: Road Period 2***
- **A12 M25 to Chelmsford** - Widening to three lanes between the M25 and the Chelmsford bypass (junctions 11 to 15), improving a road, which is a patchwork of smaller-scale improvements, to a modern, safe standard. ***Construction start: Road Period 2***

The Route Strategy also highlights proposals to re-trunk the A12 from Ipswich to Lowestoft (to link to the A12) and the A140 Norwich to Needham Market (to link to the A14) thus providing a significantly enhanced SRN in the region.

6.8.3 Felixstowe to Midlands Route Strategy, April 2015

The Felixstowe to Midland Route Strategy, published by Highways England in April 2025, informed the Roads Investment Strategy and outlines the key opportunities and challenges for the SRN in the region focused specifically on the A14 corridor from Felixstowe to Ipswich, Bury St Edmunds and Cambridge and onto the Midlands and M6.

The route strategy does not prioritise further investment during Roads Period 1 in East Anglia but does make substantial commitments to sections east of Cambridge to the M6, which will provide improved resilience, reliability and safety improvements for longer distance movements.

6.8.4 Road Investment Strategy 2 (2020 to 2025)

In March 2016 the DfT published 'Road Investment Strategy post 2020: planning ahead'[9] which presents the government's approach to developing Roads Investment Strategies for period's post 2020. It recognises the role of Sub-national Transport Bodies and the National Infrastructure Commission and that from 2020/21 the Government has guaranteed that all revenue raised from Vehicle Excise Duty (VED) in England will be allocated to a new National Roads Fund and invested directly back into the strategic road network.

Importantly the document recognises that there are a number of future influences on the SRN namely; population growth and changing expectations; growth and productivity; technology; and, energy and environmental shifts. The vision in RIS 2015–20 for a transformed SRN continues to provide the foundation look towards 2040. In preparing RIS2 DfT stated that they want to build on our existing five broad aims;

- **Aim 1: Economy** - The road network needs to support key goals of improving productivity and building a stronger economy.
- **Aim 2: Network Capability** - We need a network that can meet future needs and support growth for the long term.

[9] DfT: Road investment strategy post 2020: planning ahead, March 2016: https://www.gov.uk/government/publications/road-investment-strategy-post-2020-planning-ahead

- **Aim 3: Safety** - England has some of the safest roads in the world and the strategic road network is the safest part of all, per mile driven. However this is no cause for complacency and we remain committed to reducing deaths and injuries on our nation's roads.
- **Aim 4: Integration** - Almost all journeys start or end on a road. We will therefore seek new opportunities for; for; linking the strategic road network with ports, airports and rail; integrating the strategic road network with local road networks; supporting bus and coach services; cyclists and other vulnerable users; and, the next RIS will continue and extend RIS1's practice of investing off of the strategic road network, where this helps the SRN to function better.
- **Aim 5: Environment** - It is vital that we continue to drive the transition to a decarbonised network that is environmentally and locally sensitive. We will continue to tackle the immediate and long-term environmental impacts of the road network.

The approach envisages a number of research activities to inform the development of the RIS, its associated investment plan, the performance specification and the statement of funds. Research includes the 6 strategic studies, of which the Oxford to Cambridge expressway in the most notable with regards to East Anglia and route strategies.

In April 2016 Highways England published their approach to future investment on the SRN[10]. **A further round of 18 route strategies will be one of the key steps of research required for developing the Department for Transport's Road Investment Strategy for Road Period 2 (RIS2). Similar to the work undertaken to inform RIS1 route strategies will be developed for the East of England and the A14.**

The approach states that each strategy will provided a description of the key centres of population and industry, and international gateways served by the route, the type of road, its current performance and constraints. Route strategies will consider options for maintaining, operating or enhancing roads, including on local roads where these may bring about benefits such as alleviating congestion, on the strategic road network. Where appropriate, this could include influencing driver behaviour, or recommend looking further at other modes of travel.

The route strategies for East Anglia will be central to securing further investment in the current, and potentially expanded SRN, to improve connectivity, operational resilience and reliability as well as facilitating growth and economic performance.

The planned investment by Highways England in both the current and next Road Period present significant opportunities to enhance accessibility both within New Anglia and between the area and neighbouring regions. The need for such investment has been highlighted by studies which have revealed significant constraints on the Strategic Road network within the New Anglia area.

6.9 ENHANCEMENTS DELIVERY PLAN – NETWORK RAIL

Network Rail's Enhancements Delivery Plan sets out the outputs, scope and milestones for every project and ring fenced fund that Network Rail is committed to deliver during its current Control Period CP5, which runs to 2019. It is used both by the regulator, to hold Network rail to account, and by customers and funders, to give them visibility of plans. Network Rail publishes an updated version of the EDP every quarter.

[10] Highways England: Route Strategies Approach, April 2016; https://www.gov.uk/government/publications/highways-england-route-strategies

In January 2016 an update to the Enhancements Delivery Plan covering England and Wales was published in draft to support the Hendy review of Network Rail's enhancements programme for CP5. The review confirmed that Network Rail will continue to deliver a very significant enhancement programme during the period to 2019.

Of particular note and relevance to East Anglia are the following:

Ely North Junction capacity improvements – junction improvements to deliver capacity in the area by developing an operationally flexible junction to allow for simultaneous multiple train moves. ***To be delivered during the next Control Period CP6 (post 2019).***

Anglia Traction Power Supply Upgrade - provide enhancements to the existing traction power infrastructure required to support the forecast increase in electrically operated rolling stock. ***Work ongoing.***

Ely to Soham doubling - The Ely to Bury St Edmunds line has been identified as part of the strategic cross country freight route. This project will develop a scheme to improve capacity for up to 48 freight train paths per day, with provision for the future capability to allow up to 56 freight train paths per day by 2030. ***To be delivered during the next Control Period CP6 (post 2019).***

6.9.1 Anglia Level Crossing Proposals

Network Rail has been undertaking a series of consultation events to examine 130 locations where private rights of way crossings could be closed by providing alternative means of access or diversion to other routes. **The closure of such crossings would improve safety, improve network reliability and reduce delays. It should be noted that none of the crossings proposed are A or B roads.**

6.9.2 Felixstowe Branch Line Improvements

On the 28th September 2016 Network Rail submitted a Transport and Works Act Order application to transfer previously granted powers to allow improvements to the Felixstowe Dock branch. **If granted the Order would allow for the construction of additional track and the removal of a number of level crossings, measures which would provide for enhanced capacity on the branch, essential for rail freight movements from the Port of Felixstowe.**

6.9.3 Anglia Route Study

In March 2016 Network Rail published the Anglia Route Study[11] as part of their long term planning process (LTPP) which replaces the Route Utilisation Strategy (RUS) process.

It states *"The railway in Anglia plays a vital role in the region's economy, providing links between communities and employment, industry and markets, and conveying nationally important freight flows from ports where container traffic arrives in the UK" and adds "Over the next 30 years more and more people are expected to travel by train, and more freight traffic is forecast to come off the road and onto the railway. This presents significant challenges which are explored and options to address them presented in the Anglia Route Study."*

The LTPP identifies as number of potential capacity constraints in the future in the East Anglia region. On the Great Eastern Main line (GEML) from Norwich to London, morning

[11] Network Rail, long term planning: https://www.networkrail.co.uk/running-the-railway/long-term-planning/

peak passenger demand increasing by 32% to 2023 and 83% to 2043 (both from 2013 figures). It also anticipates significant increase in port related intermodal freight with a doubling in volumes to 2023 and a further doubling to 2043 and a significant rise in the domestic intermodal market, in both cases the majority of movement being containerised.

With such increases in both passenger and freight movements it is anticipated that there will need to be improvements made to infrastructure at a number of locations.

On the Great Eastern Main Line, to deliver more and faster trains;

- Improvements at London Liverpool Street station including more passenger space and additional platform(s)
- Improvements to signalling to allow more trains to run between Chelmsford and Stratford (through Digital Railway)
- Passing loop north of Witham
- Doubling of Trowse Swing Bridge
- Level crossing closures or improved safety mitigations

In addition the Anglia Route Study anticipates that further capacity enhancements on the GEML may be needed in the proposal for a second Crossrail route in London comes to fruition.

On the cross country corridor via Ely, to deliver more freight trains and better connectivity;

- Felixstowe Branch capacity enhancements
- Ely area improvements, including signalling improvements to allow more trains to run, Ely North Junction and level crossings
- Partial doubling of the Ely to Soham single line
- Improvements to signalling to allow more trains to run at Ely and Bury St Edmunds
- Haughley Junction doubling
- Level crossing closures or improved safety mitigations

In addition, the Route Study suggests three core areas where further improvements will be required;

- **Improving safety** – level crossings removal to address the 800 level crossings within the Anglia Route study area
- **A more resilient railway** – anticipating the effects of weather in terms of network resilience, building upon the Weather Resilience and Climate Change Adaptation Plan for the Anglia Route which sets out a management plan.
- **The digital railway** – capitalising on new signalling systems where new technology can support more trains and faster journeys. The study states that there are clear opportunities on the Great Eastern Main Line and Cross country corridor via Ely where the European Train Control System (ETCS), combined with changes to the network, can be used to improve the train service, providing vital new capacity on the lines.

The outcome from the LTPP will have a significant bearing on the connectivity and performance of the rail network in East Anglia.

6.9.4 East West Rail

On 6th December 2016, the Secretary of State for Transport, The Rt Hon Chris Grayling MP, announced a new approach to deliver East West Rail which will link Oxford and Cambridge

via Bedford with new and re-opened railways[12]. The new East West Rail organisation will deliver the design, construction and operation of the missing railway link between Oxford and Cambridge.

The East West Rail Consortium (whose membership includes Norfolk and Suffolk County Councils) awarded a contract to Atkins Consultants on 31 October 2015 to deliver a Conditional Output Statement (COS)[13] regarding the potential enhancements to the Eastern Section, comprising, existing rail links between Cambridge, Norwich and Ipswich.

The potential for the Eastern Section (from Cambridge to Ipswich and Norwich) would be to upgrade the section from Cambridge through Dullingham to Newmarket from the existing single track, to double track thus increasing capacity and reducing an operational pinch-point.

The final conclusions from the study into the Eastern Section are expected to be completed by May 2017.

6.10 GREATER ANGLIA FRANCHISE – 2016 TO 2025

On the 16th October 2016 the new Greater Anglia franchise began operation. This 'transformative' franchise will see operator Abellio deliver substantial commitments over the 9 year franchise period, commitments secured through collaborative working between the public and private sector partners.

Over the period to 2025 the franchise will deliver a major package of improvements for rail services in the region, including[14]:

- Replacement of the entire fleet of trains with 1,043 brand new carriages, built by Bombardier in Derby (660 carriages) and Stadler in Switzerland (383 carriages). These will all be in service by the end of 2020.
- Investment of £60 million in stations, including the redevelopment of five stations: Broxbourne, Cambridge, Cheshunt, Harlow and Southend Victoria.
- More services and faster journeys across the network, including two 'Norwich in 90' trains each way per day and average journey times to Ipswich falling from 73 to 64 minutes.
- Better connections, with Lowestoft linked directly to London by four trains each way per day, and Norwich to Cambridge services extended to Stansted Airport every hour.
- Faster services between Cambridge and London.
- Doubling the Peterborough to Ipswich service to hourly.

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[12] DfT press release 6th December 2016: https://www.gov.uk/government/news/transport-secretary-puts-passengers-at-the-heart-of-the-railway

[13] East West Rail: http://www.eastwestrail.org.uk/eastern-section-overview/

[14] Abellio press release 2016: https://www.abellio.com/news/abellio-confirmed-new-east-anglia-franchise-operator-department-transport

- Working with Network Rail to implement specific schemes to drive up performance and reliability throughout the franchise.
- 55% more seats into London in the morning peak period, and 1,144 extra services per week on the network.
- A better ticketing system for customers, including extension of smartcards, the introduction of flexible 'carnet' tickets, lower fares on the Stansted Express and automatic Delay-Repay for seasons and advance purchase ticket holders.

Network Rail have also provided commitments to improve infrastructure to support these investments in rolling stock to improve service performance and reliability.

On 17th January 2017 Abellio stated that it had signed an agreement to sell 40% of its Greater Anglia business to the Japanese trading group Mitsui & Co[15] to partner in the delivery of the transformation programme.

Once delivered the rolling stock and service improvements will significantly improve the rail network with improved customer experience, improved connectivity and improved service frequencies.

In February 2017[16] identified key East Anglian rail infrastructure upgrade priorities which it believes need to be delivered over the next decade. These priorities were identified as follows:

Felixstowe – Peterborough (and Nuneaton)

- Haughley Junction upgrade (to enable more frequent and reliable services)
- Ely area upgrades (including Ely North Junction, Queen Adelaide level crossings, re-signalling and bridge strengthening, to enable more frequent and reliable services)
- Ely – Soham double tracking project (to enable more frequent freight and passenger services)

Great Eastern Main Line (Norwich – Ipswich – Colchester – Chelmsford – London)

- Haughley Junction upgrade (to enable more frequent and reliable services)
- Trowse Swing Bridge replacement (with a fixed double track bridge, instead of the current single track swing bridge to enable more frequent and reliable services)
- Long loops between Colchester and Witham (to allow fast trains to overtake slower full length freight or passenger trains, helping to improve reliability and journey times)
- Digital re-signalling Colchester to London (to enable more frequent services)

West Anglia Main Line

- Capacity upgrades to enable 4 trains an hour between Angel Road and Tottenham/Stratford

[15] Abellio press release: https://www.abellio.com/news/abellio-sells-40-share-greater-anglia-mitsui

[16] https://www.greateranglia.co.uk/about-us/latest-news/news-articles/greater-anglia-highlights-key-east-anglia-rail-infrastructure

- Four-tracking of the West Anglia route from Copper Mill Junction to Broxbourne as the first stage of the Crossrail 2 scheme (to enable more frequent services, quicker journey times and better reliability)
- Other key projects
- Wider level crossing upgrade programme (to improve reliability and journey times)
- London Liverpool Street capacity increases (platform and concourse upgrades to accommodate increasing passenger numbers)

6.11 EAST MIDLANDS FRANCHISE RENEWAL

The East Midlands franchise is due for renewal in 2018. The Government issued its Franchise Prospectus in November 2016[17] which outlines the Government's aspiration for the franchise over the next period of operation from July 2018. With regards to East Anglia the main objectives are as follows;

"to invest in the East Midlands train fleet to bring this up to world class standard of on-train passenger facilities and improve fleet capacity, operating performance and reliability"

"to develop fully aligned incentives between management in the TOC and Network Rail to secure the investment and improvement in the route's infrastructure, including the services to Corby, and infrastructure improvement where most needed, to reduce journey times on long distances and achieve a high level of service resilience and reliability"

"to develop coastal, leisure and high value tourist services, including working collaboratively with heritage railways"

Expressions of interest have been invited and the tender period is expected to commence in May 2017 with contact award in May 2018.

The existing franchise provides long distance connectivity to the West, Midlands and the North West through the hourly Liverpool to Norwich service providing connections at Peterborough, Nottingham, Sheffield and Manchester.

6.12 COMMUNITY RAIL PARTNERSHIPS

Within New Anglia, there are four Community Rail Partnerships promoting improvements to local railway lines. The lines in Suffolk and Norfolk covered by these partnerships include:

- East Suffolk Lines – Ipswich to Lowestoft, Ipswich to Felixstowe
- Essex and South Suffolk Lines – The Gainsborough Line between Marks Tey and Sudbury
- Bittern Line – Norwich to Cromer and Sheringham
- Wherry Line – Norwich to Lowestoft and Great Yarmouth

All rail services on these lines are operated by Abellio Greater Anglia.

The East Suffolk Line from Ipswich to Lowestoft is a mixture of single and double-tracked sections and is not electrified. The route is served by a mixture of diesel multiple units. The line has been improved and experienced significant growth in passenger since an hourly

[17] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/569286/east-midlands-rail-franchise-competition-prospectus.pdf

service on the Ipswich to Lowestoft route was introduced in 2012. Over recent years, new ticket machines have been installed, a bus–rail interchange and revised car park have been completed at Lowestoft and two others stations have had car parks improved, and secure cycle parking and cycle hire have been installed at Ipswich and Lowestoft. Rolling stock has been refurbished with £3m spent on the Class 156s up to 2014. In addition the £59m Ipswich Chord opened in March 2014 serving freight traffic between the Port of Felixstowe and the East Midlands.

The Essex and South Suffolk Lines include five lines in total with one that passes into the New Anglia at Sudbury; all other lines are in Essex only. The line is not electrified and is single tracked throughout its length. Services are operated using older Class 153 and 156 Diesel Multiple Units. Between 2005 and 2007, the line was improved, replacing jointed track with new continuous welded rail.

The Bittern Line, between Norwich, Cromer and Sheringham is a mixture of single and double track and is not electrified. Services use a mixture of older and newer classes of diesel multiple units. Investment in the Bittern Line infrastructure by Network Rail has exceeded £17 million pounds over recent years and has included replacing the signalling system and upgrading and repair of stations and track. Previous franchise holders improved services by arranging for trains to stop at additional stations to attract local patronage, improved the station environments and add additional train services to the timetable. Future aspirations include longer trains and a new station at Sheringham or connection to the North Norfolk Railway.

The Wherry Lines, running from Norwich to Great Yarmouth and Lowestoft, are a mixture of double and single-tracked sections and they are not electrified. The services have a mixture of older and newer diesel multiple unit rolling stock which are supplemented at summer peaks with longer loco-hauled services from London Liverpool Street.

6.13 AIRPORTS

Norwich Airport has a single terminal and runway and has approximately 260 employees. The following table shows traffic figures for 2016 and 2015.

Table 0-7 – Norwich Airport Traffic

	2014/15	2015/16	Change
Scheduled traffic	258,918	252,129	-2.7%
Charter traffic	100,859	107,273	+6%
Gas platform & domestic charter	106,354	114,082	+6.8%
Total passengers	466,131	473,484	+1.6%

The airport is adjacent to a large industrial estate, jointly owned and managed by the city and county councils. The need for 30 hectares of new business park land for airport related employment has been outlined within the Joint Core Strategy (JCS).
Currently the there is an aviation cluster around the airport which includes key businesses such as KLM UK Engineering and Air Livery with the support of the University of East Anglia and Norwich University Technical College. The Greater Norwich City Deal (2013) forecasts a growth of 2,133 jobs in this area.

At present, strategic access to the airport is poor. The JCS proposes access enhancements through the Northern Distributor Road (NDR) and public transport improvements on the A140 corridor to the city centre. This would require a public transport interchange at the airport and may include the relocation and expansion of the present airport Park & Ride to a site to the north, adjacent to the NDR.

Stanstead Airport is the fourth largest airport in the UK and has a single terminal and runway. The Airport was acquired by Manchester Airports Group (MAG) for £1.5bn in February 2013. The table below shows traffic figures for 2016 and 2015.

Table 0-8 – Stanstead Airport Traffic

	2015	2016	Change
Total Passenger	22,566,793	24,317,100	7.8%
Plane Movements	157,248	166,152	5.7%
Cargo Tonnage	237,029	252,618	6.6%

The airport serves around 160 destinations across 30 countries. The Sustainable Development Plan (2013) states that by 2025 the airport will be approaching its current planning cap of 35 million passengers per annum (mppa) (worth £1.7 billion to the UK economy). Beyond that the airport could grow to handle in the region of 40-45 mppa by 2030 within the current boundaries and physical constraints which is estimated to be worth £46 Billion to the UK economy and an extra 10,000 jobs. There is also potential to double the volume of cargo goods to around 400,000 per annum.

Key constraints identified include increasing levels of congestion on the strategic road network around the airport and the need to enhance rail access to the airport, both of which have been highlighted as key areas to focus on.

6.14 PORTS

There are six seaports located within the New Anglia area, three of which are classified as major import and export points for freight entering and leaving the country. Those three ports are located at Felixstowe, Ipswich, Great Yarmouth, with the first being one of the largest points in the country in terms of both import and export tonnage of goods. Kings Lynn and Lowestoft are classified as minor ports and Southwold is a fishing port. Additionally, there is another major freight port on the southern periphery of the region, located at Harwich, from which ferry services also operate.

6.14.1 Felixstowe

Felixstowe is strategically located to serve import/export and is the largest container port by volume in the UK. It is the port of choice for more than 30 major shipping lines, offering more than 90 services and covering nearly 400 ports around the world. The port is on target to deliver a container handling capacity of 6 million twenty foot equivalent units (TEUs) per annum by 2020. The port has the ability to accommodate a wide range of goods as well as being designed to allow the docking and processing of multiple Mega Vessels simultaneously. DfT statistics show that in 2015 the port handled nearly 28 million tonnes of traffic, the vast majority of which (nearly 27.5 tonnes) was foreign traffic.

Recent investment has included the construction and reconfiguration of the Felixstowe South Terminal creating 1,300 m of quay served by 13 new ship-to-shore gantry cranes. This new terminal will have a clearance of 16m and gantries suited for extra large box carriers

As a major UK port, Felixstowe is a major focus for the improvements to road and rail links identified earlier in this section, including schemes for the A14 and Ipswich to Felixstowe

railway line. To support the South Terminal project, the Felixstowe and Nuneaton freight capacity scheme has upgraded a significant length of track to support the movement of 'Hi-Cube' containers from the port to the West Coast Main Line at Nuneaton. The Copdock Roundabout, at the junction of the A12 and A14, was also improved to support the South Terminal project.

6.14.2 Ipswich

The Port of Ipswich is situated at the head of the River Orwell and is within a short sailing time from North Sea shipping lanes. The port also had active rail line at its West Bank. The port handles dry bulks, forest products, general cargo and roro. DfT statistics show that in 2015 the port handled 2.2 million tonnes of traffic of which 583,000 was domestic and 1.7 million foreign traffic.

Investment in the Port of Ipswich in 2016 has been up to £2.2 million. This ensured procurement of grabs which will increase the capabilities of the current bulk handling equipment. It is anticipated that continued investment will increase the capacity of the port of Ipswich to handle traffic.

6.14.3 Great Yarmouth

Great Yarmouth is strategically located to serve the oil and gas fields of the southern North Sea and the existing and planned Offshore Wind development off the UK East Coast. ScottishPower Renewables selected Peel Ports Great Yarmouth as its port of choice for the construction and installation activities for its £2.5 billion East Anglia ONE offshore wind farm. Construction will start in 2017, with the first turbines installed by 2019.

The port handles a wide range of cargoes including aggregates, cement, grain, fertilisers, forest products, dry and liquid bulks, pipeline and onshore wind farm equipment. In 2015 the port of Great Yarmouth handled approximately 1 million tonnes of which 404,000 tonnes was domestic and 692,000 foreign traffic.

Construction work on the Great Yarmouth Outer Harbour, a deep-water harbour on the North Sea, began in June 2007 and was completed by 2009. Originally there were plans for a ro-ro ferry link with IJmuiden. Similarly, despite the installation of two large cranes in 2009, and since removed, plans for a container terminal have also been scrapped.

6.14.4 King's Lynn

King's Lynn is the fourth largest port in the New Anglia area and handled almost 500,000 tonnes in 2015. The port handles dry bulk, forest products and steel and other metal cargoes.

6.14.5 Lowestoft

The Port of Lowestoft is a focus for dry bulks, general cargo and offshore energy and handled 126,000 tonnes of cargo in 2015. The port supports offshore and standby vessels and us the home of the operation and maintenance base for the Greater Gibbard Offshore Windfarm. The port provides facilities for construction of equipment for the offshore oil and gas fields and windfarms.

As gateways to and from the New Anglia area, the UK as a whole and world markets, the ports rely on good physical transport links (rail, strategic road and local distribution) between the dockside, immediate hinterlands and the surrounding regions beyond.

6.15 DIGITAL COMMUNICATION NETWORKS

Access to digital communications has become an essential part of the accessibility landscape whether customers are accessing service information before or during trips, commuters are working on the move or as many people now do, working from home rather than travelling at all.

Broadband and mobile coverage is provided by a large number of commercial companies however the speed and reliability of access varies considerably depending upon means of access, network provider, geographic location and mode of travel. Access and reliability problems are particularly acute in rural areas whether via mobile or fixed means.

6.15.1 Ofcom: Connected Nations Report

Under the Communications Act 2003 ('the Act') Ofcom is required to submit a report to the Secretary of State every three years, describing the state of the electronic communications networks and services in the UK. In December 2016 Ofcom published its 'Connected Nations' report[18] which provides its most recent 'state of the nation' report.

Ofcom currently defines fixed broadband speeds as follows: broadband (up to 30Mbit/s download), superfast (up to 300Mbit/s) and ultrafast (over 300Mbit/s) and mobile access by communications network 4G services, voice (2G, 3G and 4G) and data services (3G and 4G). Whilst the report doesn't provide data on a region by region basis, it does provide some useful insight.

- **"The availability of superfast broadband has improved**, but a significant number of homes and businesses are still at risk of digital exclusion. In 2015 around 8% of UK premises (2.4 million) were unable to receive broadband speeds faster than 10Mbit/s. Although this figure has since fallen to 5% of UK premises, this still means 1.4 million premises are being poorly served and may fall within a broadband universal service obligation".
- **"Superfast coverage has improved**, though SMEs still see poorer availability than residential consumers. 89% of UK homes and small and medium-sized businesses (25.5 million) are now able to receive superfast download speeds of 30Mbit/s or higher. This is up from 83% (24 million), in 2015. There is also an improving picture in rural areas, where more consumers are now better connected superfast coverage is reaching 59% of homes and businesses (2.3 million) up from 44% in 2015.However, although superfast coverage has improved in Scotland, Wales and Northern Ireland, they still lag behind the UK as a whole".
- **"Ultrafast Fibre to the Premises (FTTP) services**. Approximately 1.7% of UK premises (498,000) have access to "full fibre" FTTP services, which offer download speeds of between 250Mbit/s and 1Gbit/s. Around 450,000 of these premises are in England. A number of providers, of varying scale and reach, are committed to deploying full fibre services and we would expect to see coverage increase over the coming 12 months".
- **"Increased take-up of superfast services** is driving greater consumption. Around 31% of UK premises (9 million) now subscribe to superfast broadband services. Although this is up from 27% in 2015, it remains relatively low, given that superfast is an option for 89% of UK premises. The percentage of premises not taking up a fixed broadband service at all is 22%".

With regards to mobile communications the report notes that Indoor coverage has increased but there is still some way to go with geographic coverage. It states that there have been rapid strides in 4G roll-out but mainly in urban areas and that 4G is driving data usage.

[18] Ofcom: Connected Nations 2016: https://www.ofcom.org.uk/research-and-data/infrastructure-research/connected-nations-2016

There are a number of areas, rural or otherwise, in East Anglia where digital connectivity is lagging behind the rest of the UK. Major network providers are rolling out infrastructure improvements and developing new technologies to increase speeds over existing infrastructure. In addition local initiatives have been developed to provide wireless transmission systems removing the dependency on fixed apparatus including an initiative from free Wi-Fi in Norwich city centre.

6.15.2 National Infrastructure Commission: Connected Future

The National Infrastructure Commission recently published (December 2016)[19] its 'Connected Future' report into 5G and communications technology. The commission stated the following;

"The Commission's central finding is that mobile connectivity has become a necessity. The market has driven great advances since the advent of the mobile phone but government must now play an active role to ensure that basic services are available wherever we live, work and travel, and our roads, railways and city centres must be made 5G ready as quickly as possible."

It also states that Government and Ofcom must ensure that essential outdoor mobile services – such as basic talk, text and data - are available wherever we live, work and travel:

- Britain is 54th in the world for 4G (the typical user can only access 4G 53% of the time), there are too many digital deserts and partial not spots, even within our city centres.
- Government and Ofcom should develop a meaningful set of metrics that represent the coverage people actually receive and use these to determine a mobile Universal Service Obligation so that consumers can access essential services where they are needed.
- Government and Ofcom should deliver this as a soon as is practical but no later than 2025.

Government must ensure the UK is 5G ready:

- **Key Rail Routes:** The railway network must rapidly improve connectivity. This is best delivered by a trackside network. Government should provide a plan by 2017, and the infrastructure should be in place on key routes by 2025.
- **Major Roads:** Our motorways must have mobile networks fit for the future. The infrastructure should be in place by 2025.
- **Towns and Cities:** Local Authorities and LEPs should work with network providers to develop approaches that enable the deployment of the tens of thousands of small cells we expect to need in our urban centres.

The report makes a series of recommendations of particular relevance to East Anglia and the future of transportation;

- **Recommendation 2:** Our motorways must have mobile telecommunication networks fit for the future. It is vital that our motorways are able to meet both the long term

[19] National Infrastructure Commission: December 2016: https://www.gov.uk/government/news/government-must-take-action-now-to-secure-our-connected-future-so-we-are-ready-for-5g-and-essential-services-are-genuinely-available-where-they-are-n

operational needs of connected vehicles and the connectivity needs of the passengers. This will necessitate the timely installation of an open and accessible mobile telecommunication and backhaul network that is fit for the future.

- **Recommendation 3:** Rail passengers should have high capacity wireless connectivity. This should be achieved through a delivery model that utilises trackside infrastructure to provide an open and accessible mobile telecommunication and backhaul network that is fit for the future.
- **Recommendation 4:** Local government should actively facilitate the deployment of mobile telecoms infrastructure: a) Local authorities should work together and with Local Enterprise Partnerships (LEPs) to develop coordinated local mobile connectivity delivery plans.

There are significant implications for future connectivity and its role in facilitating not only improved connectivity but to enable underlying changes in mobility technology. These will need to be considered in future transport strategies.

6.16 PROJECTED GROWTH IN JOURNEYS

To highlight the potential level of growth in travel predicted in the New Anglia area over the coming decades, the National Trip End Model has been interrogated to provide supporting information on trends. This is not an output from this commission but the current forecasts produced by the Government based on the current understanding and patterns of economic growth, adopted local development projections and travel choices.

The table below shows projected growth in the number of journeys made by people to or from locations in New Anglia (Norfolk and Suffolk).

Overall, total journeys in New Anglia are predicted to increase by 12% by 2030, 19% by 2040 and almost 25% by 2050, with growth in journeys by car substantially exceeding those rates. Walking is also predicted to increase significantly with lower increases for rail and cycling. Bus travel is predicted to have only a modest increase over the next few decades.

Table 0-9 – Percentage increases in journeys forecast for New Anglia – 2030, '40 and '50

Mode	2030	2040	2050
Walk	9.2%	13.4%	16.1%
Cycle	6.4%	9.3%	10.7%
Car Driver	13.6%	22.6%	30.9%
Car Passenger	12.9%	19.8%	25.7%
Bus/Coach	5.2%	6.2%	4.4%
Rail	6.2%	9.4%	11.3%
Combined	12.0%	18.9%	24.8%

6.17 ACCESSIBILITY CHALLENGES AND OPPORTUNITIES

The commentary on planned changes set out above, coupled with information within the Stage 1 report[20] for this commission, provide an understanding of key challenges faced by New Anglia and opportunities that may be open for exploiting.

6.17.1 International access

New Anglia has a number of international access points, both within and immediately adjacent to the area. The key airports serving New Anglia are Norwich and London Stansted both of which will have accessibility enhanced through improvements in either road or rail provision. In addition, access to wider international markets will be enhanced via improved connectivity with London Heathrow via Crossrail. Norwich Airport, the only international airport within the New Anglia area itself, provides direct connections to the major European hub at Amsterdam Schiphol, which brings the continent closer to New Anglia, in travel time, than many major British cities. However, despite the proposed Northern Distributor Road enhancing road access, the road journey times, and reliability of those journeys, are hampered by constraints at pinchpoints and a lack of higher capacity routes within New Anglia. The airport is also remote from the rail network.

New Anglia is home to one of the major UK ports, Felixstowe, which is the country's largest gateway for containerised freight. In addition, the area is served by two further large ports, at Ipswich and Great Yarmouth. Felixstowe is served by both the national rail network and the Strategic Road Network, providing connectivity to both London and the major distribution centres in the Midlands. However, access from this major international port is constrained by restrictions on both road and rail, which increase journey times and reduce reliability. Whilst these restrictions are being met with plans for improvements by Network Rail and Highways England, constraints may remain in place which put other major or developing ports at an advantage in accessing some major markets.

6.17.2 National access

Access from New Anglia into neighbouring regions, for both passengers and freight, is constrained by existing road and rail networks. The Strategic Road Network within New Anglia is relatively sparse although it does connect to all of the major urban centres and connections from the south of the area into Essex and London are better than in other directions. SRN connectivity north of Ipswich is poor towards the coast and to Norwich. Journeys are particularly constrained by a lack of dual carriageway provision across the north of the area into the Midlands which impacts both journey time reliability and resilience. The level of demand, particularly on the A11 and A14, both within and outside New Anglia generates pinchpoints, both in terms of junction and link capacity.

The railway network into neighbouring regions is also constrained by line capacity and pinchpoints at a number of key junctions sections which severely reduce the potential to increase service levels. In particular, line capacity on the Felixstowe route and limited paths through Ely hamper rail movements from New Anglia to the rest of the country. Line speeds and the limited number of passenger services reduces accessibility to key centres outside of New Anglia. Whilst connectivity to London and Cambridge is in need of enhancement, journeys to the west to Peterborough, the North and Midlands are particularly long.

Overall, the strategic transport network presents challenges to New Anglia in terms of connectivity, reliability and journey times. Constraints on the networks are likely to be

[20] 161214 EITS Stage 1 Report v1.0

exacerbated by increasing demand for both road and rail journeys over the current plan period.

However, both Highways England and Network Rail have live projects, committed plans and potential schemes that will enhance links from New Anglia to the wider country. These are supported by plans within the new Greater Anglia rail franchise which will enhance service levels. The combination of all these schemes would substantially enhance strategic accessibility, plugging gaps in capacity and removing significant constraints, providing New Anglia with a level of provision closer to matching that of other regions.

6.17.3 Regional access

This report, alongside the Stage 1 Report, highlights an existing deficit in infrastructure and services and this is most clear at the regional level, i.e. within the New Anglia area. The non-SRN highway network is very limited in dual-carriageway provision, leading to long journey times and poorer reliability. In particular, the network between Norwich and Ipswich, the two major centres of New Anglia, is nearly all single carriageway leading to relatively poor connectivity. The key centres in south of the New Anglia area are better served by the SRN and, therefore have less reliance on the local network for key movements. However, in the north, the SRN is less developed and as a result, the lower capacity local network acts as a constraint and in particular linking to the south of New Anglia.

Both the Norfolk and Suffolk Local Transport Plans identify significant highway improvements on their respective local road networks and these, coupled with plans for the SRN, could substantially improve accessibility by road including the length and reliability of journeys within the New Anglia area.

In contrast with the road network, the rail link between Norwich and Ipswich is comparatively good and provides quicker journey times, however, in general, the rail network replicates journey times of the road network. Whilst journey times may be more reliable by train, the limitations of the infrastructure means that service frequency is relatively poor in many locations.

The development proposals for the New Anglia area focus growth predominantly within the main urban centres and along existing major access corridors. This will help to deliver development in the most accessible locations in terms of both hard infrastructure, service provision and the speed and capacity of digital telecoms. However, there will also be concentrations of development in smaller settlements and standalone sites which will generate demand for access to locations which are less well served by traditional transport modes. This may put additional pressure on networks and require supporting infrastructure and service enhancements, some of which are identified earlier in this section.

Together with the SEP, the Norfolk Strategy Framework and the Suffolk Spatial Planning and Infrastructure Framework provide significant opportunities for local authorities to work together at a regional level to manage growth, identify key challenges and opportunities and plan for the necessary delivery of associated infrastructure and services.

6.17.4 Local access

The local access networks within New Anglia are not untypical for the range of areas found in the region. New Anglia has populations concentrated in two largest urban centres, a number of smaller towns, a large number of villages, very rural areas and poorly connected coastal areas. However, a remoteness is added to New Anglia by being bounded by the sea on two sides and the relatively long distances and travel times to neighbouring large urban centres.

Growth at the district level is set out in a number of local plans and typically these will focus development on more easily developed and commercially viable land rather than where development is most appropriate in accessibility terms. Local Plans may lack the agility to react to new trends and limit the ability to meet emerging challenges and opportunities due to the period that local plans cover and the time it takes them to be developed or reviewed,

The constraints on local authority revenue budgets has, like elsewhere, led to a reduction in the level of financial support for bus services and a resulting loss of services, particularly in rural areas. Some solutions to gaps in provision are being found in the form of more flexible public transport service types.

New Anglia is typical of more remote rural shire county areas with major centres being relatively well served by digital communications but with surrounding areas being significantly disconnected. Whilst digital connectivity, to varying degrees of speed and capacity, is provided locally, it affects accessibility at all geographical levels as it influences how, when and if people have to make journeys to gain access to personal or business needs. In providing access, digital connectivity should, therefore, be seen as an access mode in its own right, alongside traditional transport modes.

Wider impacts of transport are also generally felt at local levels with the New Anglia area being similar to others where transport contributes to issues concerning safety, air quality and noise, severance and social isolation.

6.18 CHALLENGES AND OPPORTUNITIES

Earlier in this section, the planned changes in East Anglia were discussed and the challenges and opportunities in developing a future transport strategy were highlighted. These are summarised are now summarised as follows:

Challenges

- **Local accessibility:** there is inequality in access with larger urban areas being better served by transport and communication networks and the rural and coastal areas being relatively disconnected.
- **Regional accessibility:** there is relatively poor connectivity and reliability of journeys within the New Anglia area due to limitations of existing infrastructure, particularly between the two major centres and across the north.
- **National accessibility:** New Anglia is geographically peripheral to England and the strength of links into surrounding areas varies across the region. Some areas relatively better served, but with congestion leading to lower reliability, while other areas suffer from the impacts lower capacity infrastructure and pinchpoints.
- **International accessibility:** New Anglia has a number of access points to international markets including the nationally important port at Felixstowe, however, access to these gateways is subject to constraints within both the road and rail networks. Through Norwich and Stansted Airports, New Anglia has good connectivity to European markets but transport links need to be improved to these gateways.
- **Ambitious growth:** the SEP and Local Plans identify significant growth in New Anglia. Economic growth will lead to increased demand for travel across all modes of transport.
- **Productivity Gap:** there is a significant gap between New Anglia performance and that of the rest of the country and the gap is presently only slowly closing.
- **Limited housing growth:** there are ambitious plans for delivering new housing whilst currently missing targets.
- **Rural and coastal accessibility:** there is poor accessibility away from major centres and corridors including for some significant growth areas. Housing and employment need to be matched to reduce the need to travel. The growth of Ports relies on physical connectivity to move goods to markets.
- **Infrastructure deficit:** there is poorer existing strategic and local infrastructure provision compared to other regions. Major improvements in to the strategic road network in New Anglia are not planned for the current Road Period.

- **Journey times:** the relative peripherality of the New Anglia area combined with lower capacity infrastructure delivers longer journey times both within the area and to neighbouring centres. Journeys times between Norwich and Ipswich are similar to those to Cambridge.
- **Reliability:** the major highway and rail routes are generally of low capacity and this combined with significant pinchpoints reduces the reliability of travel for both people and freight and impacts on economic activity
- **Resilience:** there is a lack of network capacity and alternative strategic routes to cope with peaks in traffic and incidents
- **Digital connectivity:** due to the peripheral, rural and coastal nature of much of New Anglia, digital connectivity lags behind more central and urbanised areas.
- **Ageing population:** there are challenges to provide for the elderly due to higher older population and more complicated needs
- **Restrictions on local authority budgets:** budgetary constraints have reduced support for a range of services, including the subsidised bus network, reducing accessibility and limiting local authorities' ability to bring change

Opportunities

- **Ambitious growth:** there are significant plans for growth provide opportunities to deliver improvements in accessibility and build in higher levels of access.
- **Growing jobs market and businesses:** success is being delivered in the creation of new jobs and businesses in both established and new industries.
- **Building on existing accessibility:** focusing major growth in larger centres will build on existing higher levels of accessibility while larger scale developments provide opportunities to 'lock in' greater accessibility.
- **New strategic transport infrastructure and services:** new road and rail projects are and will continue to deliver improved infrastructure and services for New Anglia, removing existing constraints and supporting growth. The new Greater Anglia rail franchise will substantially improve rail services and major schemes to be delivered by Highways England and the County Councils will bring substantial benefits.
- **New rail franchise:** the new rail franchise presents opportunities to significantly improve connectivity and the number and quality of rail services within the region.
- **Collaboration:** ongoing and closer working within and between the public and private sectors can improve planning and delivery of accessibility enhancements to support a growing economy. The LEP and joint working between local authorities provide a basis for stronger integration and more informed decision-making.
- **Performance:** The New Anglia area can build on recent success including strong performance against SEP targets and the significant improvements secured through the new Greater Anglia rail franchise.

In order to inform the development of a transport strategy to 2030 it is important that those challenges are considered so that they can be addressed in order to unlock future benefits.

7 GLOBAL TRENDS AND DISRUPTORS

7.1 OVERVIEW

In considering economic futures and how they inform future transport strategies we have taken a 'top-down' approach firstly examining the global trends and disruptors that are impacting economic performance and movement.

These trends and disruptors have influenced our work in both developing economic futures in Section 4 and considering the scenarios to inform future transport strategies in Section 5.

7.2 GLOBAL TRENDS

There are a number of global trends, some of which are long term and others more recent, which are impacting the way in which our societies are living, working, learning, playing and trading. These trends will all impact the economic landscape over the coming years which in turn influence the shape and form of our transportation networks and services.

7.2.1 Demographic challenges

Many regions are experiencing a growing and ageing population which will present significant social challenges in caring for the elderly and citizens remaining fulfilled and economically active in increasing longer later life. Net migration continues from some regions driving up populations in others and there is an ongoing trend of urbanisation with populations returning to towns and cities.

With regard to the population over 65, in 2014 the Office for National Statistics (ONS) showed that 17.6% of the population of England were over the age of 65. That proportion in England is expected to grow to 18.7% of the population by 2020, to 21.8% by 2030, and to 24% by 2039. Extrapolating growth linearly using the final two forecast years available, it can be assumed that 24.1% of the population will be over 65 in 2040, and that proportion will grow to 25% by 2050.

In East Anglia, 22.8% of the population were over the age of 65 in 2014. That proportion is expected to grow in East Anglia to 24.5% of the population by 2020, to 28.2% by 2030, and to 30.9% by 2039. Again extrapolating growth linearly using the final two forecast years available, we can assume that 31% of the population of East Anglia will be over 65 in 2040, and that proportion will grow to 32% by 2050.

Table 0-10 – Population 65+ (000s)

Year	England	% of Pop.	Change	East Anglia	% of Pop.	Change
2014	9,538	17.6%	-	368	22.8%	-
2020	10,609	18.7%	+1.1%	410	24.3%	+1.5%
2030	13,167	21.8%	+3.1%	488	28.2%	+3.9%
2040	15,313	24.1%	+2.3%	572	31.0%	+2.8%
2050	16,667	25.0%	+0.9%	614	32.0%	+1.0%

Source: Office for National Statistics

From this, we see that trend of ageing population is greater for East Anglia than for that of England overall in both the short term and longer term forecasts. Furthermore, we can see that a larger proportion of the overall population is over 65 in East Anglia than in England overall at all time periods, current and forecast.

7.2.2 Technology change

The role of technology in society and the economy is becoming ever more prevalent. The automation of many tasks traditionally undertaken by humans continues and developments are delivering the need to undertake many 'mundane' tasks. Digitisation of commerce, manufacturing and many other sectors continues and 3D printing is starting to become commercially viable. Virtualisation allows from remote working or control and artificial intelligence is starting to be deployed undertaking decision making either once undertaken by humans or providing enhanced decision make hitherto not possible. The acceptance of e-payment systems and the development of 'blockchain' type payment and ledger systems make for a new financial landscape.

7.2.3 Social change

Within numerous societies there is a rise of the 'sharing' economy where people are prepared to share assets and services either at a personal level or via specific tailored services. Such sharing avoids the need to 'own' certain assets which users may not need to access to all or some of the time, thus reducing costs and reducing storage needs. Right across the globe there has been a growth in 'immediacy' with people having greater expectations about the products and services they use and the desire to access, purchase or partake immediately or as soon as possible.

7.2.4 Environmental focus

Concerns continue with regards to climate change and the impact that fossil derived fuels are having upon the environment, quality of health and living standards. Some commodities will become increasing scarcity of resource requiring a strategy of divesting from traditional sources. The role of renewable energy is being more prevalent in both consumer and industrial applications.

7.2.5 Economic shift

In many regions society has seen the rise of rise of the 'gig' economy with individuals being paid for the individual 'gigs' (tasks) they undertake rather than being traditionally employed on an hourly or salaried basis. Whilst this leads to personal flexibility it can also lead to reduced security and a rise in individuals needing to maintain multiple jobs. In numerous sectors 'new' business models are emerging with the monetising of services and access being ever more creative. The pre-fabrication of components, sub-systems and whole products is disrupting established supply chains particularly in the construction and manufacturing sectors.

7.2.6 Political landscape

In many regions we are seeing a devolution of decision making with local governments making decisions and changing taxation. Increasing we are experiencing the globalisation of products and services but conversely seeing the rise of protectionism of local markets.

7.3 TRANSPORTATION TRENDS AND DISRUPTORS

Within the transportation realm there are a number of global trends that are impacting traditional models of transportation delivery and operation. Some of these trends are driving social and economic change which is impacting transportation's response and others are disrupting transport directly.

7.3.1 Digital connectivity

Digital connectivity is becoming a foundation to much of our daily landscape. The movement of information between people, other people and assets is fundamental to the way in which much of what we consume is now produced and fundamental to most of our activities. The connectivity of assets (machines and other devices) will allow for the automation of many functions and processes in the future. Digital connectivity provides for seamless mobile

communication, the optimisation of transport networks and ultimately the automation of cars, buses and trains.

7.3.2 Artificial Intelligence and cognitive thinking

Underpinning many of the systems and processes we engage with on a day to day basis is artificial intelligence or cognitive thinking. Whether it's the personal assistant on our mobile phone or sat-nav providing estimates of travel times or 'speaking' with automated call centres, AI is becoming a part of all of our lives. Cognitive thinking is being used in many sectors to reduce mundane decision making or make better than human decisions for complex processes and is already being used in transportation to manage supply / demand and to predict future conditions.

7.3.3 Automation and robotics

The convergence of digital connectivity and artificial intelligence allow for the development of autonomous systems to undertake the 'dirty, dull and dangerous' tasks that humans may not need to or choose to undertake. From the removal of humans from hazardous environments in the nuclear sector to the automation of driving on the highways and railways, automation and robotics will provide new ways of undertaking activities such as driving, inspecting, cleaning or servicing. Autonomous vehicles will provide for new service models for the movement of both people and goods and provide independent mobility for those who may not presently have it such as the elderly.

7.3.4 Propulsion and energy

There have been rapid developments in the energy sector with hybrid, hydrogen and electric propulsion being used for cars, buses, trains and even aircraft. With concerns over climate change and the availability of fossil fuels the decarbonisation of energy consumption will continue which will deliver benefits at the point of use / consumption. Within the home and industry the use of renewables and energy storage techniques will alter the way in which energy is generated, distributed, stored and consumed.

7.3.5 Materials science

The development of new materials and approaches to production and manufacturing will lead to new and varied industrial applications. Cheaper lighter materials will reduce energy consumption in transportation and logistics and self-diagnostic / self-healing technologies will improve asset life, reduce human intervention and improve system and network reliability.

7.3.6 Additive / on-demand manufacturing (inc. 3D printing)

The development of new manufacturing techniques such as on-demand production and 3d-printing will result in the dis-integration of traditional production supply chains. With the ability to produce mundane, consumable items closer to the point of consumption will result in changes to distribution networks with more raw materials being distributed to more locations. The production of items on demand reduces storage requirements but impacts distribution networks especially with an expectation of 'immediate' access or use.

7.3.7 Collaborative consumption

The sharing of services and assets is gaining traction in many places with people choosing to pay for access to services or assets rather than engaging in traditional 'ownership' models. Shared mobility solutions are already in commercial service in a number of locations including cycle hire, car clubs, car sharing and hybrid bus/taxi services. The willingness of individuals to share services or assets will present a major challenge to existing public transport models.

8 ECONOMIC FUTURES

8.1 INTRODUCTION

The primary objective of this part of the commission is to understand how the region's economy may develop over the long term to provide a backdrop against which to shape the development of a long term transport strategy

Making economic predictions, even qualitative predictions, is inherently difficult and the process is subject to a good degree of uncertainty. For that reason we have developed three economic scenarios to illustrate possible growth paths for the region. The scenarios are high level in nature, based on 43 global trends and market disruptors, all of which are already occurring to some degree and all of which have the potential to accelerate or abate over the next few decades.

We have, therefore, necessarily grouped impacts according to their expected directional impact on economic patterns of growth, with a particular focus on value-addition, job creation (or destruction) and geographic clustering, but also factoring in impacts on productivity, inward investment and markets served.

At a macroeconomic level, long term economic futures will be determined by supply-side factors as well as the global trends and market disruptors identified, including the availability of labour and capital and growth in productivity. Growth prospects together with the ability to attract inward investment are likely to be influenced by the availability of a skilled workforce, openness to innovation and trade, quality of infrastructure, quality of public institutions, demographic profile and clustering effects, as well as more immediate influences of exchange rates and local taxes.

At a high level the scenarios can be characterised as:

- **Scenario 1 (status quo)**. A balanced growth path where recent patterns of development continue into the foreseeable future, with no single global trend disrupting that pattern. This can be considered a continuation of the status quo.
- **Scenario 2 (high productivity growth)**. Rapid technological advanced lead to automation of many low skilled and medium skilled jobs, particularly in manufacturing but also in the service sector.
- **Scenario 3 (inclusive growth)**. Job creation keeps pace with jobs lost to technology and a balanced and inclusive pattern of faster growth emerges.

No scenario is necessarily better or more likely to occur than another: different patterns of growth may occur at different rates. In some respects, they are similar, and in other respects the differences have been exaggerated to highlight the potential risks and opportunities that different patterns of growth, supported by different transport infrastructure, can bring. Scenario 1, however, does serve as a reference point or 'baseline' scenario.

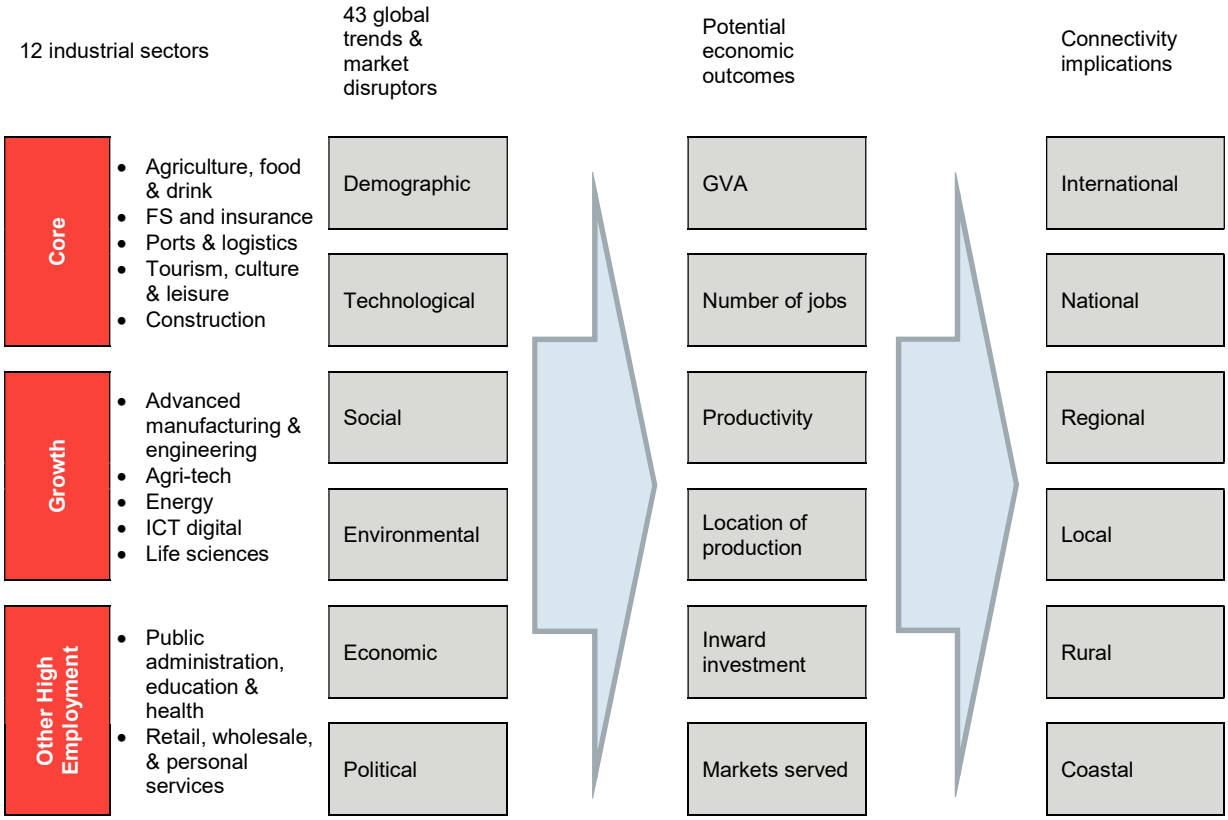
The three scenarios each have a common theme, highlighting global trends that share common features (such as rapid technological improvements or significant demographic disruption) or that drive similar results (automation of low skilled jobs or increased dislocation of jobs from physical locations).

The scenarios are illustrative and selected based on their divergent socio-economic impacts and transport implications. They are neither exhaustive (i.e. they do not cover the full range of potential outcomes), mutually exclusive (i.e. some elements are similar between them), nor are they necessarily the most likely. They are designed to highlight the choices which New Anglia faces in supporting different patterns of growth, including investment in different transport requirements, as well as highlighting the risks and opportunities that these investments and patterns of growth entail.

8.2 APPROACH

Figure 8-1 provides an overview of the approach to the development of the economic scenarios. It is structured in three stages.

Figure 0-37 – Overview of approach to economic scenarios



In **Stage 1** we disaggregate the economy into 12 industrial sectors aligned to the New Anglia Strategic Economic Plan. The industrial sectors include five 'growth' sectors, five 'core' sectors, and two high employment sectors: retail and the public sector.

In **Stage 2** we consider how the global trends and market disruptors identified in Section 3 could influence economic activity in terms of the value of economic output, the number and skill requirements of jobs, the productivity of labour, the location of production (and in particular whether that economic activity is geographically concentrated in clusters), whether or not the sector would attract inward investment, and where the goods and services are sold (access to markets).

Finally, in **Stage 3**, we consider the implications that changes to the scale, type and location of economic activity could have on the demand for transport services and infrastructure. At this stage the analysis of the transport implications is strategic, focussing on demand and connectivity for broad types of movements – international, national, regional, local, rural and coastal.

It is important to note that whilst the analysis is structured, the scenarios are relatively subjective and need to be interpreted as such.

8.3 NEW ANGLIA ECONOMIC FUTURES

In this section of the report we provide a description of the economic geography, sectoral trends, potential economic future and implications for transport demand for each of the industrial sectors identified in the SEP together with retail and the public sector.

The sector analysis is based on a review of material produced by New Anglia LEP, trade associations and central government departments, augmented by local insight gathered by a short questionnaire survey of industrial sector leads identified by New Anglia LEP. The survey identified the global trends and market disruptors and asked respondents to think about their impact on the New Anglia economy.

The relationship between the industrial sectors defined by the SEP and data included in the ONS's Standard Industrial Classification is shown in Table 4-1 below. The two sets of sector classifications do not map exactly and there are material differences in the estimates of employment across sectors.

ONS data shows total employment in the region at 645,500, of which the SEP notes 45,500 (7%) in 'Growth' sectors and 241,500 (37%) in 'Core' sectors. Employment in retail and the public sector as a whole present the biggest differences between the classifications, and both need to be taken into account in the transport strategy.

Table 0-11 – Comparison of SEP sectors and ONS SIC sectors

		Core					Growth					Other		
		C1	C2	C3	C4	C5	G1	G2	G3	G4	G5	O1	O2	O3
		Agriculture, food & drink	Financial services & insurance	Port & logistics	Tourism & culture	Construc-tion	Adv. man. & eng	Agri-tech	Energy	ICT/digital	Life sciences	Retail	Public	Other
ONS Standard Industrial Classification	Employment	85,000	21,000	23,500	74,000	38,000	24,500	(inc. in C1)	7,700	10,300	3,000	367,000 - to balance with SIC		
A Agriculture & fishing	1,500													
B, D, E Energy & water	9,000													
C Manufacturing	62,000													
F Construction	38,000													
G, J Distribution, hotels & restaurants	167,000													
H, I Transport & communication	50,000													
K-N Finance, insurance, professional, scientific	121,000													
O-Q Public admin, education & health	174,000													
R-U Other services	32,000													

8.3.1 Agriculture, Food and Drink

Economic geography: This is among the largest employment sectors in New Anglia, employing over 15% of the workforce and generating £3.9bn pa GVA, equivalent to 14% of total GVA[21]. This sector is well represented in all districts of New Anglia, comprising distinct groups including: farms, food manufacturing (large scale processing companies and niche, local food and drink producers) and restaurants and cafes. New Anglia is reputed for its food and drink festivals as well as for the quality of its local produce. The agricultural land in Norfolk and Suffolk produce 12% of all England's cereal production and 20% of its vegetables. There is a growing interest in producing crops for renewable energy, like biomass.

Table 0-12 – Agriculture, Food and Drink Sector[22]

Employment 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
111,136	7,837	12,755	770	3,935	35,409

Source: New Anglia LEP (2017)

Sector trends: The Government is looking to make the most of export opportunities that result from New Anglia's reputation as producer of excellent quality food and drink. **To enable the local producers to sell more overseas and increase their productivity, the necessary technology, information, innovation, finance and skills need to be made available.** The sector is expected to see continued growth, despite concerns over Brexit, assuming it retains access to migrant workers. Loss of market access from increased trade barriers may limit export markets, although these may be compensated for by greater domestic market opportunities. **As the future of farming leans more towards technology there may be job losses** but at the same time the **sector may favourably receive investments in staff training, restructuring and from joint ventures**. Table 4-3 below highlights possible impacts of various global trends and market disruptors which may impact the sector.

Table 0-13 – Possible Impact of Global Trends and Market Disruptors - Agriculture, Food and Drink Sector

Global Trend and Market Disruptor	Impact
Automation/Robotics	Increased value of economic output and speed of growth as a result of higher labour productivity. Increase in processing at source, causing manufacturing locations to become more dispersed. Automation may reduce employment as robots become smarter and more precise. For instance soft fruit picking is currently done predominantly by hand but may in the future be automated.23 Shift in employment within the food system with fewer people working in

[21] New Anglia LEP, 2017

[22] New Anglia LEP, 2017

[23] http://www.bbsrc.ac.uk/news/food-security/2016/160223-f-farms-of-the-future/

Global Trend and Market Disruptor	Impact
	agriculture and more working in transport, wholesaling, retailing, food processing and retail. Unmanned aerial vehicles could help with crop management and help coordinate crop harvesting. Precision farming, using developments in engineering and technology, will open-up new opportunities not only in the established disciplines of arable and livestock farming but also in the emergent areas of urban and integrated farming.
Digitisation	Increased use of e-commerce with the Government is helping businesses reach new markets through its E-exporting Programme. Digital technology could help farmers better manage chemical input, watering, and machinery and geospatial technologies and drones will help farmers monitor and increase productivity and production.
Immediacy	Greater emphasis on local produce could affect markets served and lead to dispersion in manufacturing and retail.
Urbanisation	Growing share of urban food demand. Migration and mobility could also be a form of income diversification that can support farming innovation and intensification.
Gig Economy	There could be a positive impact of the gig economy if flexible working becomes more of the norm causing a possible dispersion of the workforce. The sector however has traditionally relied on seasonal labour.
Globalisation / Protectionism	Increased globalisation could lead to new opportunities in international markets but will also expose the sector to increased competition from abroad. Migrant labour will continue to be important to the sector as a whole. The immediate impact of Brexit could be material, potentially providing protection to UK producers.

Source: WSP/KPMG Analysis

Economic futures: As technology begins to drive this sector more strongly, higher labour productivity will help the sector GVA grow steadily but may have implications for job security – there may be drop in agricultural employment owing to automation. Production locations may become more concentrated as a result of increased capital intensity with other parts of the sector becoming more dispersed owing to environmental, immediacy and gig economy effects. **As Government begins to focus more on enabling local producers to sell overseas, more international markets are expected to be served by New Anglia's Food and Drinks producers subject to securing trade deals. Inward capital investment is also expected to rise. Low skilled service jobs in restaurants and cafes may be vulnerable to automation, and new technologies such as Uber Eats and Deliveroo may shift consumption patterns**.

Table 0-14 – Economic Futures - Agriculture, Food and Drink Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Higher	Higher
Number of jobs	Fewer	Neutral
Labour productivity	Much higher	Higher
Production location	More concentrated	Neutral
Inward Investment	Higher	Higher
Markets served	More external to region	More external to region

Source: WSP/ KPMG Analysis

The *High Productivity* scenario sees the future of agriculture food and drink being much more technology focussed with an even greater reliance on capital as opposed to labour. As a result processing locations could be more spatially concentrated, unit costs could be lower and output levels higher than under Business as Usual assumptions. Increased levels of global urbanisation could further open up export markets subject to trade deals. Weaker consumer demand reduces demand for lower-end restaurants and automation replaces many of the remaining jobs in many establishments, although demand remains strong in the top end.

Under the *Inclusive Growth* scenario, capital investment still occurs but potential job losses are offset by diversification, investment in staff training and restructuring to serve specialist markets with higher value products. On balance, labour productivity is neutral relative to the Business as Usual scenario with production location including more diverse locations such as urban farming to counterbalance concentration of high technology capital.

Implications for transport demand: The agriculture, food and drinks is expected to grow driven by increases in productivity and increased levels of demand for high quality produce locally, nationally and internationally. The high productivity scenario could see fewer but higher value jobs and a subsequent push to urbanisation (rural depopulation), although many low skilled jobs in cafes and restaurants may be lost. **Access to markets will remain important, especially via the strategic roads network to other parts of the UK and international gateways**. More inclusive growth could provide a counter to job migration to urban areas.

Table 0-15 – Implications for transport demand - Agriculture, Food and Drink Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	Marginal increase in freight Marginal increase in passenger B2B	Marginal increase in freight Marginal increase in passenger B2B
National	Marginal increase in freight Marginal increase in passenger B2B	Marginal increase in freight Marginal increase in passenger B2B
Regional	Marginal increase in freight	Marginal increase in freight

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Local/Urban	More passenger movements due to urbanisation Decrease in journeys from restaurant and café staff.	Marginal increase in freight
Rural	Marginal increase in freight Fewer passenger movements due to lower employment and rural depopulation	Marginal increase in freight
Coastal	Marginal increase in freight	Marginal increase in freight

Source: WSP/ KPMG Analysis

8.3.2 Financial and Insurance Services

Economic geography: The sector makes the largest contribution to GVA of £2.1bn or 7% of total GVA. It employs almost 29,000 people in the area, representing 4% of total employment. It is a well-established sector with over 200 years of history and two distinct, globally competitive hubs based in Norwich and Ipswich with additional strengths across the counties. There are notable employers in Kings Lynn, Great Yarmouth and other districts such as Forest Heath where there are aspirations to growth the insurance sector. Small and medium sized businesses are thriving, particularly in the Greater Norwich area, and are supporting the growth of niche, innovative, technology driven enterprises in support of the wider sector.

Table 0-16 Financial and Insurance Services Sector

Employmnt 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
29,295	(1,093)	2,210	65	2,124	72,496

Source: New Anglia LEP (2017)

Sector trends: Maintaining competitiveness is the primary goal using technological innovation and attracting mobile investment opportunities from home and overseas. Whilst overall employment is expected to remain static, there will be shifts in employment levels in different sub-sectors. Larger companies are in consolidation mode, driven by cost saving directives from headquarters. In contrast, SMEs are expected to continue growing and developing niche, technology driven specialisms around the sector. Technological developments will continue to drive the sector, particularly around customer engagement, online interfaces and mobile phone enabled payment methods. There is a strong link between the creative, ICT, digital sectors and future developments for financial services. Continued access to global markets and further liberalisation of trade in services are high on the Government's agenda.

Table 0-17 – Possible Impact of Global Trends and Market Disruptors - Financial and Insurance Services Sector

Global Trend and Market Disruptor	Impact
Automation / Robotics	Using basic process automation (BPA) to carry out repetitive tasks can reduce business processing costs by between 30 and 40 percent. Enhanced process automation (EPA) will eventually allow

Global Trend and Market Disruptor	Impact
	insurance companies to approve and reject customer claims by robotics.
Digitalisation	Transactions are migrating online and technology is replacing many roles. This could potentially result in job losses but alternatively resources could be redeployed to provide more innovative and bespoke services.
Virtualisation and Mobile Working	Dispersion of people who can now work at home or in local smart hubs, while connecting remotely to colleagues or end users. As an example, Nationwide have centralised experts such as mortgage advisers and deploy them remotely to branches across the country through virtual technology. In the future we may expect many more services to be delivered in this way.
Artificial Intelligence	Statistical algorithms could model the relationships between data – such as location or claim frequency –to maintain optimum pricing or service levels. Improvements in AI could result in a transfer of capital for labour in the production process leading to fewer employment opportunities.
Blockchain	Insurers could build a "Know Your Customer" blockchain with records of client addresses, employment details and qualifications Through its cryptographic audit trail, blockchain will help insurers to detect and prevent fraud, and also speed up insurance claims handling. Statistical algorithms could model the relationships between data – such as location or claim frequency – to maintain optimum pricing or service levels.
Sharing economy	Increase in crowdfunding and peer-to-peer lending and insurance, low cost online only banks and do-it-yourself portfolio management companies could all challenge traditional financial systems, although these still represent only a small share of the sector.
Globalisation	Impacts may vary depending the outcome of trade negotiations and more general trends in globalisation of services, although in the short term some barriers to EU trade are expected.

Source: WSP/ KPMG Analysis

Economic futures: Automation, digitalisation and artificial intelligence may all have material implications on productivity and cost across the sector. **Where endogenous efficiencies are passed-on to customers in the form of lower charges or reinvested to provide a better quality of service, overall demand for financial and insurance services could grow. Jobs lost to technology could be offset by new jobs in growth markets.**

The impact of exogenous disruptors are more difficult to predict, especially with regard to insurance for connected and autonomous vehicles which are likely to have very different safety risk profiles and different patterns of ownership.

With strong headwinds and tailwinds impacting on the sector, there are considerable uncertainties ahead. Whatever happens, the sector will need to innovate and drive efficiencies to be competitive in a global economy. This will be heavily dependent on access to highly skilled and specialist labour markets and focussed capital investment.

Table 0-18 – Economic Futures – Finance and Insurance Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Higher	Higher
Number of jobs	Neutral	Higher
Labour productivity	Much higher	Higher
Production location	More dispersed	Neutral
Inward Investment	Higher	Higher
Markets served	More external	Neutral

Source: WSP/ KPMG Analysis

In the *High Productivity* scenario jobs may be lost to technology and production concentrated in fewer urban clusters, but the general influx of skills is likely to improve the competitiveness of the region, whilst new technologies will allow a greater decentralisation of activities away from London. The increase in technology will require higher levels of inward capital investment. If access to international markets continues, the use of technology could reduce costs and increase competitiveness by enabling firms to offer more agile and customer-focussed products. The *Inclusive Growth* scenario will see proliferation of fragmentation of the sector will new firms providing innovative products based on alternative business models.

Implications for transport demand: The financial and insurance sector is a material part of the region's economy, employing large volumes of highly productive workers in Norwich, Ipswich and other areas. **The sector relies on good B2B transport links to London and other metropolitan areas, with efficient local networks improving the regions attractiveness as a place to live and work.** These patterns of transport demand are likely to continue under both High Productivity and Inclusive Growth scenarios although there is likely to be a less demand for traditional 9-5 commuting as employment levels fall and remote/ flexible working increase. **The sector is set to benefit from improved transport connectivity to London and Cambridge and to international gateways**.

Table 0-19 – Implications for transport demand – Finance and Insurance Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	Increase in passenger B2B	Increase in passenger B2B
National	Increase in passenger B2B	Increase in passenger B2B
Regional	Neutral	Neutral
Local/Urban	Reduced 9-5 commuting	Reduced 9-5 commuting but potentially less so that under the High productivity scenario
Rural	Neutral	Neutral
Coastal	Neutral	Neutral

Source: WSP/ KPMG Analysis

8.3.3 Ports and Logistics

Economic geography: The sector has some 4,440 companies in Norfolk and Suffolk, employing more than 47,000 people. The sector is worth £2.2 billion to the East Anglian economy.

The sector comprises road and water freight and transport services, cargo storage and warehousing. It has a large proportion of full-time employees in operative trades: drivers, loaders, dock workers and logistics personnel. The northern Haven Gateway ports include Felixstowe and Ipswich, and further north Lowestoft and Great Yarmouth. They generate substantial freight activity along road and rail corridors to major distribution centres and other hubs. The ports are closely linked to other sectors including: energy products and offshore installation and maintenance; agricultural goods and supermarkets port-based logistics operations; business and professional services from accountancy to transport engineering; tourism, marine and coastal leisure activities including: marina developments; tourism from business (international energy companies); and cruise and ferry passengers.

Table 0-20 Ports and Logistics Sector

Employmnt 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
47,364	472	4,440	400	2,279	48,114

Source: New Anglia LEP (2017)

Sector trends: The volume of trade passing through the region's ports and across the region's transport networks is strongly dependent on the strength of the UK economy and trends in world trade. It also depends on the strength of competition from other ports such as Rotterdam and the new London Gateway where surplus capacity exists.

Growth in world trade has not returned back to pre-financial crisis levels when volumes typically grew at around double the rate of world GDP growth. Since then, movements to liberalise trade and build international supply chains, which spread production and assembly of goods across borders, has eased and trade protectionism as risen up the political agenda.

Perhaps a more substantial explanation why trade growth may never rise as high again is the possible shift is global supply chains. Countries like China may be at the forefront of this new trend. The share of the country's imports of parts and components in total exports fell from a peak of 60 percent in the mid-1990s to around 35 per cent more recently, thanks perhaps to greater integration of some of the interior Chinese regions into the country's supply chain. Data is too patchy to corroborate, but if correct, it would have significant implications for a number of industries.

The logistics and distribution sector has grown quickly, especially growth in Light Goods Vehicles (LGVs), with Department for Transport statistics showing a 61% growth in LGV vehicle miles between 1997 and 2016. The latest forecasts by the DfT show that this growth is expected to continue, with forecast increases in HGV and LGV mileage between 2010 and 2040 at 22% and 78% respectively. These forecasts are, however, highly dependent of continued GDP growth and fuel efficiency savings.

In recent years there also has been a growing demand for progressively larger distribution centres built to high specifications, with consumer demand created by e-commerce

transforming the commercial property market and main distribution centres are increasingly supported by a network of local distribution units enabling superfast delivery to customers[24].

Table 0-21 – Possible Impact of Global Trends and Market Disruptors - Ports and Logistics Sector

Global Trend and Market Disruptor	Impact
Automation/Robotics	Automation and robotics have the potential to cause significant job losses as low cost robots begin to enable dispersed logistics hubs and autonomous delivery vehicles, boosted by the trend for immediacy.
3D Printing	This may change the nature of shipments from finished goods to raw materials and may reduce the need for shipping as local manufacturing become more possible causing production locations to disperse.
Artificial Intelligence	With advances in artificial intelligence, the supply chain could be completely autonomous, being leaner, more agile and self-regulating, working with automated fleets and distribution centres, drones and mobile robots.
Digitalisation	Data is increasingly important to the sector, and with the right processing and better predictive analytics it will become increasingly important in driving efficiencies and competitiveness. This could involve less asset intensive supply chains, and in some instances reduce the need for fleets and warehousing through e-brokerage.
Immediacy	This may cause national dispersion or regional clusters/dispersions (as more warehouses start using low-cost robots). Rapid automated distribution networks may be more cost efficient based in a regional cluster or may be sufficiently scalable for a dispersed model to be low costs as well as better meeting consumer needs. Amazon chief executive Jeff Bezos, following the recent drone delivery trial tweeted: “first ever #AmazonPrimeAir customer delivery is in the books. 13 min—click to delivery.”25 A speed of service even close to this would require a more dispersed model of distribution with local hubs.
Blockchain	Blockchain technology could lead to innovative and smarter logistics models that self-regulate, with smarter contractual arrangements, payment and incentive mechanisms.
Sharing economy	Less asset intensive supply chains reducing the need to own fleets and warehousing, using e-brokerage in much the same way as Uber has for passenger transport.
Globalisation	If international trade increases, the sector growth may increase, pushing for the Felixstowe cluster. Alternatively increased trade protectionism could suppress demand.

[24] Highways England, The Road to Growth discussion paper, November 2016

[25] https://twitter.com/JeffBezos/status/809034847121350657

Source: WSP/ KPMG Analysis

Economic futures: The Ports and Logistics sector is dependent on economic prosperity and trends in global trade. **Increased levels of automation could increase productivity which could also result in a reduction in sector employment if trade volumes do not increase. Increased demand for rapid automated distribution and growth in 3D printing could also potentially lead to reduced levels of employment in the sector in the longer term.** Smaller hubs and distribution centres may be located closer to customers, most activities will involve some level of automation and the intelligent use of data will better manage the process from the customer order (either passive or active) to fulfilment. High productivity and Inclusive Growth scenarios are likely to be relatively similar in demand for freight, with the gains in B2B freight in the High Productivity offset by lower consumer demand thanks to decrease employment in low skilled jobs, with Inclusive Growth seeing fewer job losses.

Table 0-22 – Economic Futures – Ports and Logistics Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Higher	Higher
Number of jobs	Fewer	Neutral
Labour productivity	Much higher	Higher
Production location	More dispersed	More dispersed
Inward Investment	Higher	Higher
Markets served	More external	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: **Increased demand for rapid distribution of goods could see the continued rise in LGV vehicle mileage, whether automated or manned.** This increase in demand for road space could be tempered by use of drones and local 3D printing. **Good surface access to and from the region's ports will continue to be an important part of global supply chains and the competitiveness of the ports themselves.**

Table 0-23 – Implications for transport demand – Finance and Insurance Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	▪ Marginal increase in HGV and LGV traffic	▪ Marginal increase in HGV and LGV traffic
National		
Regional		
Local/Urban		
Rural		
Coastal		

Source: WSP/ KPMG Analysis

The potential reduction in costs as a result of automation and digitisation will stimulate demand across the ports and logistics sector, subject to supply-side constraints and network capacity. Evidence published by Highways England suggest the cost of congestion to the freight industry will be £14 billion in 2040[26]. The sector provides 9% of UK Gross Value Added (GVA) directly, and provides essential services to other activities. Estimates suggest a 1% increase in freight costs reduces trade by 1.3% to 3.5%. Infrastructure accounts for 40-60% of the variation in these costs[27].

8.3.4 Tourism, Culture and Leisure

Economic geography: Tourism, Culture and Leisure together employ around 88,000 people and contribute £3.0bn in GVA. Culture on its own has over 1,000 businesses, directly employing 5,800 people and has a direct GVA of £83.6m[28]. In 2014, there were 73 million tourist trips to Norfolk and Suffolk.[29]

Table 0-24 – Tourism, Culture and Leisure Sector

Employment 2015	Change in Employment 2009-15	Number of Businesses 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
88,208	8,754	8,995	460	2,983	33,819

Source: New Anglia LEP (2017)

Sector trends: The Tourism, Culture and Leisure sector is likely to be a source of economic growth for New Anglia, both directly in terms of employment and as a source of innovation and collaboration with other growth sectors. The sector is relatively fragmented, largely consisting of dispersed SMEs and sole traders.

Inbound tourism to the UK and visitor spending is increasing, although it is dependent on the global macroeconomic outlook and the strength of the pound. Visitor numbers are also influenced by events relating to security, health scares and natural disasters. At a more local and regional level, the rise of the 'day-cation' rather than the 'stay-cation' has been a notable part of changing behaviours in recent years. This trend is expected to grow.

Table 0-25 – Possible Impact of Global Trends and Market Disruptors - Tourism, Culture and Leisure Sector

Global Trend and Market Disruptor	Impact
Automation/ Robotics	Increased automation across the economy as a whole could increase labour productivity, induced shorter working hours and increase the proportion of time available for non-work related activities – a demand-side impact

[26] DfT (2013) Action for Roads: A network for the 21st century

[27] Behar, A. and A.J. Venables, A.J. (2010) Transport Costs and International Trade. University of Oxford Department of Economics Discussion Paper Series.

[28] Culture Drives Growth – The East's Cultural Strategy 2016-2022, http://www.newanglia.co.uk/wp-content/uploads/2013/10/Culture-Drives-Growth-FINAL.pdf

29 Larking Gowen Tourism Business Survey – 2016 Results, http://www.tourismsurveys.co.uk/2016-results/

Global Trend and Market Disruptor	Impact
Sharing Economy	The forefronts of 'Sharing Economy' – Airbnb – can help people in making extra income by renting out resources e.g. rooms to visitors for 'day-cations' and 'stay-cations'. However, more replacement of jobs rather than addition to jobs, hence production location to become more dispersed.
Gig Economy	"Gig economy" characteristics such as short term flexile employment are already commonplace within tourism, leisure and culture. This is unlikely to change substantially, but may support growth of the sharing economy.
Demographics	Those over the age of 65 spend significantly more on average on hospitality and leisure than any other age group. For this in traditional retirement age groups (65-74) recreation is the biggest expense. Prima facie, an aging population is likely to drive an increase in demand in the sector and thus employment, as well as shaping the types of goods and services, however today's "Golden Age of Retirement" may not be sustainable. Increased life expectancy, higher housing costs, increased care costs and pressure on pension funding may mean that extrapolating the behaviours of today's pensioners forward may not be correct. A growing global middle class, up to 4.9 billion in 2030 will see travel and tourism grow, with the UK likely to continue to be an attractive destination.
Digitalisation	Virtual reality – aerial images, high-quality, clean-cut photography and 360 degree virtual tours – combined with the ease of booking could change the face of tourism - especially tourism marketing. Mobile apps are becoming the norm in tourism market creating a demand for tech-savvy tourism enterprises who can reach out to potential customers in the mobile environment. The rising demand from an aging population may offset this trend in the short term.

Source: WSP/ KPMG Analysis

Economic futures: In the coming years and longer term, New Anglia's Tourism, Culture and Leisure sector is expected to grow, with a change in sector GVA driven by wider changes to the structure of the economy, changing demographics, new business models and social behaviours, together with technological innovations.

The sector is dependent on local, national and international macroeconomic performance. In the short term the global economic outlook is expected to be relatively stable, supporting recent trends in the sector. In the longer term global economic activity is not expected to decline from historical trends although activity is expected to continue to move east to Asia.

The number of jobs in the sector is likely to increase in line with growth in output, although technology may cause job losses in the High Productivity scenario with automatic check in and replacement of manual jobs. Digitalisation, virtualisation and the sharing economy effect is expected to marginally increase the productivity of the sector, whilst changing the skills requirements and make the production locations more dispersed.

High productivity and Inclusive Growth scenarios lead to similar economic outcomes.

Table 0-26 – Economic Futures – Tourism, Culture and Leisure Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Higher	Higher
Number of jobs	Lower	Higher
Labour productivity	Higher	Neutral/ Slight increase
Production location	More dispersed	More dispersed
Inward Investment	Higher	Higher
Markets served	Neutral	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: **The Tourism, Culture and Leisure sector in New Anglia is a high employment sector, with dispersed activity across the region. Transport is an integral part of tourism and culture and can impact on the quality of experience. Good transport links to national networks and international gateways, together with reductions in the negative impacts of congestion, over-crowding and transport related environmental degradation are all likely to contribute to the economic success of the sector.** Leisure and recreational activities are often social and more locally focused. They are therefore often clustered in urban areas and accessible to large parts of the population.

Table 0-27 – Implications for transport demand – Tourism, Culture and Leisure Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	▪ Increase in tourist traffic accessing the region from national networks and international gateways ▪ General increase in leisure activity across all of the network with focus on urban areas and "destinations"	▪ Increase in tourist traffic accessing the region from national networks and international gateways ▪ General increase in leisure activity across all of the network with focus on urban areas and "destinations"
National		
Regional		
Local/Urban		
Rural		
Coastal		

Source: WSP/ KPMG Analysis

8.3.5 Construction

Economic geography: Construction is a key part of the infrastructure needed to support employment growth. This includes construction of economic and social infrastructure as well as construction of housing which is particularly labour intensive.

Table 0-28 – Construction Sector

Employmnt 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
69,882	(1,164)	10,280	270	2,952	42,249

Source: New Anglia LEP (2017)

Sector trends: **In the short term Britain has one of the most ambitious infrastructure programmes in Europe. Between now and 2026 the UK needs to build an additional 225,000 to 275,000 homes per year in order to keep pace with growing and ageing population, with the East of England region sitting towards the top of the league table of where additional homes are needed.** The government has recently set out ways that it plans to do this in the White Paper 'Fixing our Broken Housing Market' including: simplifying the planning process, increased levels of funding and access to finance, and proposals to support utility companies and infrastructure providers.

Each new home built in the New Anglia area is equivalent to £36,700 more (in GVA) to the economy. Approximately 5,200 firms in the New Anglia area build new or improve the existing housing stock. There are around 740,000 dwellings; around 85% are in private ownership; slightly higher than the England average (82%). House building is a powerful stimulus for growth and supports around 1.5 jobs directly and 2.4 additional jobs in the wider economy for every home built.

Some of the newer trends in the sector will cut costs and increase productivity including increased use of off-site construction with more ICT-intensive buildings. **Modern methods of Construction (MMC) are unlikely to have a great impact on trades involved in repair and maintenance (R&M), but appear likely to make inroads into new-build work.** The extensive use of robotics in construction processes on-site by 2020 appears unlikely but is likely to grow over the longer term. There will be increased focus on CO2 emission reduction and energy conservation in buildings.

The UK's National Infrastructure and Construction Pipeline contains over 700 projects and programmes across 15 sectors and 14 regions, with a total value of £502 billion. Of the 15 sectors, 84% of the pipeline value comprises projects in

- Energy (£206.3 billion),
- Transport (£138.3 billion)
- Utilities (£74.8 billion)

A further 14% consists of

- Education (£22.5 billion)
- Communications (£15.5 billion)
- Housing and Regeneration (£12.9 billion)
- Ministry of Defence (MoD) (£8.4 billion)
- Science and Research (£6.2 billion)
- Flood (£4.1 billion)
- Health (£2.9 billion)

Planned expenditure in the Midlands and East represents the fourth biggest spend in the pipeline at £27.5 billion. Energy represents £8.8 billion (32%) of investment in the Midlands and East, £8.4 billion of which come from Offshore and Onshore Wind projects.

Similar demands for new infrastructure are evident globally with UK firms competing for these contracts.

Table 0-29 – Possible Impact of Global Trends and Market Disruptors - Construction Sector

Global Trend and Market Disruptor	Impact
Automation/ Robotics	Drones, automated vehicles (bull dozers, excavators, dumper trucks) and robotics all working together will play an increasing large part in the 'smart' construction sector. This will reduce costs and improve productivity. Growth in demand however will likely require a bigger, more skilled workforce
3D Printing	3D printing is likely to be a common process in construction, with those at the forefront of this technology already making huge progress in industrial scale applications. The changes could reduce costs, increase productivity and demand for traditional construction sector labour. The sector will require new skills to drive productivity and value, providing a bespoke service to final customers.
Digitalisation	Digital technologies can improve the design, quality and cost efficiency of infrastructure projects, for better surveying, improved building information modelling, the internet of things and better operations planning.
Pre-fabrication	Mass-manufacturing and pre-fabrication which when coupled with smart construction and 3D printing will provide low cost, bespoke options for commercial and residential construction.

Source: WSP/ KPMG Analysis

Economic futures: The outlook for the construction sector is positive, with global trends and market disruptors stimulating demand, improving productivity and reducing the cost of supply. However it is important to note that over the last 20 years, labour productivity in construction has been relatively static and has not kept pace with overall economic productivity and the sector is notoriously slow in responding to innovation. Where taken up, technology will improve the design and manufacture of infrastructure, how it is maintained and operated, improving its whole life value. In the short to medium term there is likely to continue to be a shortage of both skilled and unskilled labour, creating upward pressure on wages and negating some of the benefits of technological advances.

The High Productivity scenario will see wholesale adoption of technology and innovation, including automation of construction activities, pre-fabrication, 3D printing and digitisation, but without investment in supporting sectors such as energy, and without replacement of low skilled jobs lost to automation in other sectors, demand may be limited. The Inclusive Growth scenario we see less take-up of innovation and greater reliance on traditional labour intensive construction methods at the expense of productivity gains.

Table 0-30 – Economic Futures – Construction Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Neutral	Higher
Number of jobs	Much lower	Higher
Labour productivity	Higher	Neutral
Production location	Neutral	Clustered around growing areas
Inward Investment	Much higher	Higher
Markets served	More external	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: Progress in the construction of commercial and residential properties will depend in part on spatial planning policy, the availability of land and the enhancement of transport infrastructure to provide the necessary access. Taken together, the development or redevelopment of sites to support economic activity will form a central part of the economic plan for the region. In addition, access to ports for the import and export of construction materials and access to large scale construction sites in the energy sector will likely be an enabler of growth. Under the High Productivity scenario there will be a marginal increase in HGV and LGV traffic, local traffic impacts around major construction sites and greater access needed to ports for raw and pre-fabricated materials.

Table 0-31 – Implications for transport demand – Construction Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	▪ Access to ports for innovative construction materials and processes	▪ Neutral
National	▪ Marginal increase in HGV and LGV traffic	▪ Marginal increase in HGV and LGV traffic
Regional		
Local/Urban	▪ Local impacts around large scale construction sites	▪ Local impacts around large scale construction sites
Rural	▪ Neutral	▪ Neutral
Coastal	▪ Neutral	▪ Neutral

Source: WSP/ KPMG Analysis

8.3.6 Advanced Manufacturing and Engineering

Economic geography: This 'growth' sector employs over 39,500 people in more than 4,000 businesses and is worth £2.1bn in GVA to New Anglia. The sector is made up of companies that use high-level designs or scientific skills to produce innovative and technologically complex (high-value) products and processes. New Anglia has significant clusters of activity – offshore energy, engineering, electronic businesses in East and West Suffolk and marine, auto, electronics and manufacturing engineering in Norfolk. There are businesses in rural settings including redundant airfields and along the A11 automotive corridor. There are a number of aerospace businesses around Norwich Airport and military facilities across both counties. It has strong synergies with other sectors including food and drink producers and biotech companies manufacturing chemicals and chemical products.

Table 0-32 – Advanced Manufacturing and Engineering Sector

Employmnt 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
39,394	(1,668)	4,330	535	2,123	53,900

Source: New Anglia LEP (2017)

Sector trends: Additive manufacturing, ICT, sensors, advanced materials, nanomaterials and robotics will integrate into future products and networks facilitating fundamental shifts in how products are designed, offered and ultimately used by consumers. There is likely to be increased demand for mass personalisation of low-cost products with shorter cycle-times. Technological advances will be the source of innovation across sectors and will improve UK competitiveness in the global market by improving productivity, spearheading trade deals and incentivising privately funded R&D.

There may be a change in the production landscape itself which will include capital-intensive super-factories producing complex products. **Digitised manufacturing may transform value chains, improving customer relationship management, process control, product verification, logistics, product traceability and safety systems.** They will enable greater design freedom through the uses of simulation, and they will create new ways to bring customers into design and suppliers into complex production processes. When change occurs, it could occur quickly and the sector needs to be agile to respond to new opportunities.

Table 0-33 – Possible Impact of Global Trends and Market Disruptors – Advanced Manufacturing and Engineering Sector

Global Trend and Market Disruptor	Impact
Automation/ Robotics	The sector is both a user and producer of advanced technology to reduce costs, improve quality and improve productivity. The sector as a whole benefits from physical clustering although this could be reduced with advances technologies to support virtual clustering. The high value sector required highly skilled worked, is capital intensive and thrives on creativity and innovation. Strong competition exists across international markets for market share of resources and sales.
Digitalisation	Use of digital technologies and data to improve the efficiency of relatively fragmented value chains, build stronger relationships with customers, improve quality management and safety, as well as provide greater flexibility in design through simulation.

Global Trend and Market Disruptor	Impact
Artificial Intelligence	AI could automate design and testing. Over time design, testing and product adaption and fault fixing could all take place with little human intervention, through the use of self-diagnosing systems.
Globalisation	Increased globalisation presents an opportunity to for UK businesses to be part of multi-national supply chains and to compete in international markets for high value contracts, generating specialist clusters and agglomeration economies. Growth in the global middle-class will stimulate demand for higher quality products, tailored to individual customer's requirements.

Source: WSP/ KPMG Analysis

Economic futures: Like most other sectors, Advanced Manufacturing and Engineering is also set to be significantly impacted by technological change, notably trends around digitisation, artificial intelligence and automation. In the near future, the GVA change in the sector could be transformational, with strong jobs growth and increased productivity. Production locations are on balance expected to be clustered, driven by traditional agglomeration economies although improvements in ITC and virtualisation technologies may reduce the advantages of close physical location. If successful, investments are expected to come in from international markets and the local manufacturers also expect to sell more in international markets.

In the High Productivity scenario the sector embraces new technology and pioneers opportunities for growth by investing in technology. Some lower paid jobs will be lost to automation but sector growth will create new, higher value employment. Labour productivity will be higher and production locations more concentrated. The sector as a whole will need to take a global outlook. In the Inclusive Growth scenario the sector is less pro-active in embracing R&D, holding on to labour intensive activities. The sector as a whole will not be as productive as under the High Productivity scenario and will rely less on the benefits of clustering.

Table 0-34 – Economic Futures – Advanced Manufacturing and Engineering Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Much higher	Higher
Number of jobs	Neutral	Higher
Labour productivity	Much higher	Higher
Production location	More concentrated	Neutral
Inward Investment	Much higher	Higher
Markets served	More external	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: The sector is a high value, relatively low volume sector earmarked for growth. The Advanced Manufacturing and Engineering growth corridor is on the A11 between Thetford and Norwich with small clusters, especially Kings Lynn, Ipswich and Great Yarmouth. **B2B connectivity is likely to be important for the growth of this sector. Ports likely to become important as many businesses rely on the ports for imported materials for production and to ship out end products. Better connectivity to**

skills in the Golden Triangle between Oxford, Cambridge and London, to national networks as well as airports is expected to positively impact the sector. The sector may be more reliant on B2B connectivity to international and national markets in the High Productivity scenario than in the Inclusive Growth scenario.

Table 0-35 – Implications for transport demand – Advanced Manufacturing and Engineering Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	Increase in passenger B2B	Neutral
National	Increase in passenger B2B	Neutral
Regional	Neutral	Neutral
Local/Urban	Technology clusters may need generate local transport requirements, especially where they are located on greenfield sites.	Neutral
Rural	Neutral	Neutral
Coastal	Neutral	Neutral

Source: WSP/ KPMG Analysis

8.3.7 Agri-tech

Economic geography: The sector focuses on adding value to agriculture through the use of technology to expand production, improve quality and reduce adverse impacts on the environment. The sector comprises a number of sub-sectors including plant, animal, environmental, engineering and precision farming, ITC systems, advisory services and infrastructure. The sector is therefore complementary to the agricultural, food and drink sector described above. It relates to the research and development phase of the agricultural supply chain, and the output from this sector are new agricultural processes and technologies rather than crops

Together with Greater Cambridge Greater Peterborough LEP (the lead partner), New Anglia has set up the Eastern England Agri-tech Growth Initiative. This programme uses £3.2m of Regional Growth Fund to support agri-tech business start-ups and to bring new products to market. The money will also go to build a new translation centre where scientists and farmers can work together on new projects. The programme will create and safeguard over 500 jobs, create 25 new businesses and up to £30m in net GVA per year.

Table 0-36 – Agri-Tech Sector

Employmnt 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
19,970	304	6,508	507	1,231	61,632

Source: New Anglia LEP (2017)

Sector trends: Some of the emerging technologies in agri-tech include unmanned aerial systems (e.g. drones and satellites), diagnostic tools and using big data to help farmers work out what and where to plant. For instance, data can be used to enable the growers to optimise yield and quality across fields. Global population is expected to increase from 7.3 billion to 9.7 billion between now and 2050 creating demand for more and better quality

agricultural output. In turn this will increase demand for technologies that improve productivity and increase output in the agriculture sector, making farms more like factories with tightly controlled processes and precision farming to manage the transition from inputs and outputs.

Table 0-37 – Possible Impact of Global Trends and Market Disruptors - Agri-tech Sector

Global Trend and Market Disruptor	Impact
Automation/ Robotics, digitisation	Improved automation and robotics, digitisation and advanced manufacturing technologies will increase the quantity and improve the quality of agri-tech products to meet the needs of the agriculture sector.
Globalisation	Increased demand for high quality agricultural outputs arising from growing population and increased global GDP will increase demand for outputs from specialist agri-tech businesses. Agglomeration economies are likely to remain important to the sector driving clustering of economic activity.

Source: WSP/ KPMG Analysis

Economic futures: Increased demand for agricultural output, together with the need to increase farming productivity will increase demand for agri-tech globally and nationally. The very specialist nature of the sector means that it will benefit from some clustering to generate agglomeration economies in agricultural areas. New Anglia has a strong and established agricultural sector and is therefore well positioned to benefit from the emergence of agri-tech clusters. As the sector is largely a start-up, it will not be susceptible to hollowing out of employment markets through a shift from labour to capital intensive processes.

Aside from benefiting from local demand in the agricultural sector, the sector depends on an availability of highly skilled labour. The High Productivity scenario is characterised by an inflow of such skills and under this scenario the agri-tech sector is expected to expand rapidly, driving up productivity in the agricultural sector in the process but also job losses through automation. Multiple agri-tech clusters emerge. In the Inclusive Growth scenario, growth in this sector is less transformative, with less of a knock on to jobs in the agricultural sector. Both scenarios will involve inward investment, with innovations in the sector ultimately serving national and international markets.

Table 0-38 - Economic Futures – Agri-tech sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Much higher	Higher
Number of jobs	Higher	Slightly higher
Labour productivity	Neutral	Neutral
Production location	More dispersed	Neutral
Inward Investment	Much higher	Higher
Markets served	More external	More external

Source: WSP/ KPMG Analysis

Implications for transport demand: The sector activity is clustered in and around Norwich with strong links to technology clusters in Cambridge. **B2B connectivity will be important**

as agri-tech is an intermediate input into the agricultural sector rather than producing goods for household consumption directly. The importance of attracting highly skilled workers and facilitating knowledge transfer means that links between New Anglia and the Golden Triangle will be important, as will connectivity to international gateways.

Table 0-39 – Implications for transport demand – Agri-tech Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	▪ Much higher B2B passenger travel. ▪ Much higher freight.	▪ Neutral
National		
Regional	▪ Neutral.	▪ Neutral
Local/Urban	▪ Many more commuter journeys. ▪ Neutral	▪ Neutral
Rural	▪ Neutral	▪ Neutral
Coastal	▪ Neutral	▪ Neutral

Source: WSP/ KPMG Analysis

8.3.8 Energy

Economic geography: Energy, a 'growth' sector for New Anglia, employs 19,000 people directly and thousands more indirectly. It is worth £1.5bn in GVA and has a high GVA per employee at £81,397. Norfolk and Suffolk is at the centre of the world's largest market for offshore wind energy and the UK's most dense offshore development. Great Yarmouth and Lowestoft are the closest ports to the 1200-1800 turbine East Anglia Array wind farm, 25km off the coast. With two new power stations proposed at Sizewell in Suffolk, nuclear power is witnessing substantial investment too. This will result in significant employment prospects in construction, engineering and maintenance and 900 jobs once operational. Sizewell C will supply 6% of the nation's electricity and generate enough power for 5 million homes. The region has the UK's largest gas landfall and plays a continuing role in supporting North Sea oil and gas exploration, extraction and eventually decommissioning.

As well as creating jobs directly, growth within the energy sector creates additional demand for the construction sector (e.g. the construction of the new nuclear power stations) and the advanced manufacturing and engineering sector (e.g. parts for offshore wind).

Table 0-40 – Energy Sector

Employmnt 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
19,041	601	3,290	920	1,550	81,397

Source: New Anglia LEP (2017)

Sector trends: The energy industry across the east of England is witnessing rapidly developing technologies in renewable and low carbon sectors coupled with major investment in offshore wind and civil nuclear power generation. There is an urgent need to make the best of UK oil and gas reserves and have secure energy supply chains for UK imports and for this, the Southern North Sea gas reserves place Norfolk and Suffolk well. The decommissioning of offshore gas platform is a major growing business opportunity too. The companies that installed, operated and maintained gas platforms and pipelines are now turning to the fast new markets of off-shore wind and wave and nuclear clean-up and new build. The area has

to position itself to capitalise on this growth whilst ensuring a sustainable, prosperous future based on secure and balanced energy supplies, transmission and distribution. Local companies need to be made aware of, and able to plan for, the immediate growth around off-shore wind, oil and gas and nuclear facilities. This scale of investment involves building on existing capabilities, diversification and inward investment. The industry also urgently requires the provision of a skilled workforce to meet its changing needs.

Overall energy consumption across the UK has remained relatively stable since the 1970s, reflecting increases in energy use and improvements in energy efficiency. Total energy production has declined since the late 1990s, becoming increasingly reliant on energy imports. The need for enhanced energy security coupled with binding carbon targets will increase demand for primary electricity including nuclear, wind and hydro. Changes to automotive sector with improvements in battery technology will shift demand from petrol and diesel technologies to electric drive train technologies.

Table 0-41 – Possible Impact of Global Trends and Market Disruptors - Energy Sector

Global Trend and Market Disruptor	Impact
Automation / Robotics / Artificial Intelligence	Automation and robotics could reduce the costs of energy production and replace some jobs in the sector. Although most manual jobs have already been automated, better monitoring systems and AI could further reduce requirement for human intervention.
Digitalisation	Creation of intelligent grids to balance supply and demand using batteries and grid-embedded generation technologies may constraint overall increases in energy production requirements despite growing consumption.
Renewable Energy	Transition towards more renewable energy and diversified supplies for environmental and well as energy security reasons will likely continue. Renewables will gain market share, potentially doubling output in the next 10 years. For this to happen the cost differential between renewables and non-renewables will need to close and the policy framework to support the decarbonisation agenda will need to incentivise changes through subsidies, taxation and regulation. While the electricity generation sector is on the required trajectory, significant progress is still needed in the heating and transport sectors if the UK is to meet the 2020 renewable target and 2050 carbon renewable target on time.
Energy storage	There is heightened interest in electricity storage due to the falling cost of new storage technologies and increased system flexibility needs arising from greater levels of renewable generation

Source: WSP/ KPMG Analysis

Economic futures: The economic landscape in energy markets is changing. The decarbonisation agenda is driving significant changes in energy supply, with traditional sources of supply giving way to an ever-divergent mix: the roll-out of some types of renewable capacity and prominence of small-scale generation. This agenda requires international coordination and there are signs that support in the UK and USA may be wavering.

Demand for energy is forecast to remain stable over the foreseeable term but there are some short term variations. DECC notes that the UK primary energy demand is projected to fall

11% over the next 10 years reflecting an underlying energy efficiency trend and energy saving policies that step up the pace of gains in energy efficiency. Primary energy demand is then projected to rise 10% from 2025 as energy saving policies come to an end and energy use gradually reverts towards its underlying trend in the absence of further policies. By the end of the projection period in 2035, primary energy demand has fallen 3% below current levels. Oil and natural gas consumption is expected to remain relatively stable, solid fuel consumption is expected to fall and nuclear, renewables and other consumption expected to rise.

The Inclusive Growth scenario sees high capital investment in nuclear and renewables making use of new digital and advanced manufacturing and engineering technologies to drive productivity in the sector to drive down costs. This creates additional demand in key supply sectors such as construction and engineering, with multiple economic clusters forming around nuclear power stations and off-shore wind. Clusters in New Anglia are able to serve both national and international energy markets, thanks for further integration of the European markets with new interconnectors. Without this investment into new energy sources in New Anglia, the High Productivity scenario looks similar to Business as Usual, with some jobs being replaced by automation but the sector growing at a similar rate.

Table 0-42 – Economic Futures – Energy Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Neutral	Neutral
Number of jobs	Lower	Neutral
Labour productivity	Much Higher	Neutral
Production location	More concentrated	Neutral
Inward Investment	Much higher	Neutral
Markets served	Higher	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: The sector is a high value, high growth sector with clusters in Great Yarmouth and Lowestoft, with Sizewell, Norwich and Bacton are also being important. **Much of activity in the sector is located in peripheral coastal parts of the region presenting transportation challenges in moving people and goods from more accessible locations**.

The growth of the sector in the Inclusive Growth Scenario sees an increase in shipments of industrial machinery required in the sector, especially in coastal areas to serve off-shore wind. Higher employment results in more commutes relative to Business as Usual.

Table 0-43 – Implications for transport demand – Energy Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	Increases in inwards shipments of industrial machinery. Support to engineering cluster increases exports.	Neutral

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
National	Increases in inwards shipments of industrial machinery. Support to engineering cluster increases exports.	Neutral
Regional	Neutral.	Neutral.
Local/Urban	Lower number of commuters thanks to virtual working and automation of jobs.	Neutral
Rural	Neutral.	Neutral.
Coastal	Neutral.	Neutral

Source: WSP/ KPMG Analysis

8.3.9 Information and Communications Technology (ICT) Digital

Economic geography: The ICT sector is worth £1.8bn to New Anglia, with over 5,400 companies employing 33,700 people and GVA of £53k per head pa. BT's global research centre based at Martlesham, has a cluster of other businesses around it, as do our universities – including digital cultural expertise at Norwich University of the Arts.

Table 0-44 – ICT Digital Sector

Employment 2015	Change in Employment 2009-15	Number of Businesses 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
33,766	(1,127)	5,405	340	1,783	52,797

Source: New Anglia LEP (2017)

Sector trends: The ICT sector has important links to other sectors. In one respect, all businesses now rely on internet access and/or bespoke software to remain competitive, but, in New Anglia, there are very specific links to businesses in the creative industries, energy, financial services and health and life sciences sectors. In the future, this sector will require increasing processing power, data storage and connectivity. Digital skills are needed to maximise the benefits of ICT, but the European Commission forecasts that the UK workforce will have the largest digital skills deficit in the EU by 2020. As ICT use increases there is going to be increased focus on privacy and security legislation. A range of new business models and technologies have emerged, which some argue have the potential to 'democratize' business like 'crowdsourcing' and 'sharing economy'.

Table 0-45 – Possible Impact of Global Trend and Market Disruptor - ICT Digital Sector

Global Trend and Market Disruptor	Impact
Digitalisation / Virtualisation / Mobile working	Digitalisation is both a driver and a consequence of growth in the sector. With more services moving online, on to mobile and the internet of things comes greater demand for the sector. In turn, innovations within the sector are likely to create new services, many of which are yet to be conceived.

Global Trend and Market Disruptor	Impact
	As one of the most 'tech ready' sectors, the relevance of geographic location is likely to diminish in the ICT sector first. Provided fast and reliable connectivity is available, regions will compete as places to live rather than as large employment hubs. However, the importance of clustering is still very apparent, for example London's 'silicon roundabout' at Old Street.
3D Printing	Will create new opportunities in the ICT sector although is a complementary rather than erosive technology, as little output of the ICT sector is physical.
Artificial Intelligence / Sharing economy / Immediacy / Gig Economy	These global trends all create new opportunities for the ICT sector, ultimately driving demand for ICT services, although likely to have a limited direct impact on the supply side.
Globalisation	As a sector which often lack a physical presence, it will be hard to erect protectionist barriers against export of ICT services, and globalisation is likely to continue, bringing both opportunities and increased competitive threats. New Anglia may offer a more competitive opportunity for clusters than higher rental areas such as London, provided it can attract the skills.

Source: WSP/ KPMG Analysis

Economic futures: The ICT sector is already experiencing transformational growth which is likely to continue. **Although changes in patterns of working are likely to evolve with improved telecommunications, virtual offices and greater remote working, innovations in the sector will continue to be driven by highly skilled employees.** Developments in the sector are global, and so New Anglia's investment in the sector is unlikely to significantly accelerate or hamper the knock on effects into other sectors, which will experience significant disruption due to advances in technology.

The proximity of business and consumer demand will still play a part. In the High Productivity scenario, the growth of sectors such as advanced manufacturing, engineering, life sciences and financial services will create a strong regional demand that is likely to attract the workers needed for the ICT sector to flourish. In the Inclusive Growth scenario ICT is still likely to be a key enabler of diversified growth, and jobs created through new ICT services may help to replace others lost due to automation. As such, the two growth scenarios look fairly similar, with production more clustered in the Inclusive Growth scenario as technology developments do not facilitate remote working to the same extent, and large employment opportunities are created in urban centres with strong digital connectivity.

Table 0-46 – Economic Futures - ICT Digital Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Much higher	Much higher
Number of jobs	Much higher	Higher
Labour productivity	Higher	Neutral
Production location	Dispersed	Neutral
Inward Investment	Much higher	Higher
Markets served	More external	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: Growth in the sector will be driven by the ability to attract highly skilled individuals into the area. Although clusters have been shown to be significant in this respect, in the future the exchange of ideas and knowledge spill-overs may take place through virtual networks rather than physical location. **Places will compete on their ability to attract remote and home workers, although connectivity to major financial and innovative sectors in London and Cambridge will be vital**.

The Martlesham cluster will likely continue to be significant for the sector. **Increase in B2B connectivity and dispersed production locations will benefit from transport enhancements to London and Cambridge and national network connectivity.**

Table 0-47 – Implications for transport demand – ICT Digital Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	Neutral	Neutral
National	Higher B2B passenger.	Higher B2B passenger.
Regional	Neutral	Neutral
Local/Urban	Slightly higher with some employment occurring in urban clusters.	Higher levels of commuting to urban clusters.
Rural	Higher, with more remote workers making social and personal trips from places of work.	Somewhat higher thanks to remote working.
Coastal	Higher, with more remote workers making social and personal trips from places of work.	Somewhat higher thanks to remote working.

Source: WSP/ KPMG Analysis

8.3.10 Life Sciences

Economic geography: Life sciences is currently a relatively small sector in New Anglia, worth £1bn pa. Nonetheless, New Anglia has identified it as a key growth sector in its strategy. The

sector currently employs over 16,000 people in 1,000 businesses, with GVA of £64k per head. The Norwich Research Park, located between South Norfolk and Norwich, is Europe's largest single-site concentration of research into Health, Food and Environmental Sciences. The park employs over 2,400 scientists, with over 8,500 support staff, and has an annual research budget of over £100 million (Norwich Research Park website, November 2012). Activity in this sector is clearly focused around three distinct points of a 'Life Sciences Triangle' located across LEP boundaries – in Norwich (Norwich Research Park), Ipswich (University Campus Suffolk) and Cambridge and containing important life science 'hubs' including those located in Newmarket (equine/bloodstock cluster), Mildenhall and Haverhill. The sector's strong links with advanced manufacturing and the food and drink industry is another key strength.

Perhaps the most important driver of this sector, as with other strategic growth sectors, is ensuring that New Anglia nurtures and/or attracts the necessary skills in the area.

Table 0-48 – Life Sciences and Biotechnology Sector

Employment 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Business 2010-16	GVA, £m 2015	GVA per Employee 2015
16,052	5,354	1,050	275	1,033	64,342

Source: New Anglia LEP (2017)

Sector trends: Growth in the life sciences hinges crucially on New Anglia being able to attract the skills base the sector requires. Life sciences and biotechnology face a long-term challenge both in terms of inward investment and the way drugs are regulated once the UK exits the EU, and access to major markets in the EU, as well as protectionist policies in the USA, represent a threat to the sector nationally. Technological advancements like precision medicine, advanced diagnostics, devices and robotics may reduce drug errors and improve efficiency. In order to support commercial development plans in New Anglia, there should be a focus on speeding up commercialisation through provision of start-up facilities and support services for small businesses.

Table 0-49 – Possible Impacts of Global Trends and Market Disruptors - Life Sciences Sector

Global Trend and Market Disruptor	Impact
Automation/Robotics	May replace some jobs (and reduce need for others in quality assurance) but as a low employment, high skill sector impact is likely to be negligible.
Mobile Working	Improvements in connectivity and telecommunications will facilitate greater remote working, with less emphasis on colocation of jobs. This may help or hinder New Anglia. Employees based in London or Cambridge who are not required to commute so often may choose to live in New Anglia, with a boost to the regional economy through multiplier effects, whilst there may be greater dispersion of the sector nationally.
Protectionism	Represents a threat to the sector, with protectionist policies mooted in USA (a major market) and continued access to the European market uncertain.

Source: WSP/ KPMG Analysis

Economic futures: The sector is already one of high productivity and technological improvements and new research and development is likely to improve productivity in

proportion with other sectors of the economy. Skills requirements are already high and that is likely to remain the case. **The near term outlook is uncertain for the sector nationally, and hinges upon whether the UK continues to invest in R&D, builds and attracts the skills necessary for the sector, and retains access to major markets in the EU and USA.** Whether New Anglia can benefit from growth in the sector will depend on its attractiveness as a place to work and live for highly skilled, highly paid individuals, and will be linked to transport connections to the Golden Triangle of Oxford, Cambridge and London.

The Inclusive Growth and High Productivity scenarios are similar. Both assume increased levels of investment, although in the High Productivity scenario this is particularly concentrated in Life Sciences. Despite higher productivity, these high levels of investment attract skilled workers and employment increases significantly.

Table 0-50 – Economic Futures – Life Sciences Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Much higher	Higher
Number of jobs	Much higher	Higher
Labour productivity	Higher	Neutral
Production location	More dispersed	Neutral
Inward Investment	Much higher	Higher
Markets served	More external	More external

Source: WSP/ KPMG Analysis

Implications for transport demand: As attracting skills and ensuring connections to the Golden Triangle are likely to be the key determinants of growth in this sector, access to London and Cambridge and to national networks and airports is the priority. Growth in this sector is expected along the A11 corridor from Cambridge to Norwich, including Newmarket, Mildenhall, Bury St Edmunds and Thetford, along with Ipswich and Lowestoft.

Transport requirements are similar in pattern between the High Productivity and Inclusive Growth scenarios, with the only real difference arising from the increased scale of the sector (in terms of movements of raw materials, finished products and workers) in the High Productivity scenario.

Table 0-51 – Implications for transport demand – Life Sciences Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	Much higher	Higher
National	Much higher	Higher
Regional	Higher	Neutral
Local/Urban	Much higher	Higher
Rural	Neutral	Neutral
Coastal	Neutral	Neutral

8.3.11 Public Administration, Education and Health

Economic geography: The public sector is an important source of employment in the New Anglia economy, with 166,000 jobs in the sector. It accounts for £5.1bn of GVA New Anglia, which is 17% of its total GVA. Aside from its direct economic contribution, particularly in employment, it provides vital services to the local population such as education and health. Employment in the public sector is typically for skilled individuals. Employment is regionally dispersed with concentrations in urban areas.

Table 0-52 – Public Administration, Education and Health Sector

Employment 2015	Change in Employmnt 2009-15	Number of Business 2015	Change in Business 2010-16	GVA, £m 2015	GVA per Employee 2015
166,538	19,620	5,795	510	5,101	30,632

Source: New Anglia LEP (2017)

Sector trends: **The public sector has faced continued budgetary pressures in the last decade and these are likely to be compounded in the future by an aging population.** This will create an added burden in the healthcare sector and increased demand for medium skilled workers, particularly in New Anglia that has a higher share of older people than in other parts of the UK. Growth in jobs such as home care, residential care and NHS bands 1-4 are projected to substantially outstrip growth in demand for higher skill levels such as medical and dental professionals. New models for provision of healthcare will need to be developed, which may combine a greater emphasis on care in the home to release (costly) hospital beds, and centralisation in 'super-hospitals', with local, distributed services reducing. **There is also going to be an increase in the use of mobile technologies in healthcare to enable remote monitoring and care.** Cost pressures may lead to integration of out-of-hospital health care breaking down barriers between primary and secondary care, physical and mental care, and health and social care.

In education, new models are also likely to emerge. A greater emphasis on distance and remote learning, particularly in the tertiary sector, is likely. Virtual classrooms in schools may still be distant, although are a possibility within the time horizon of this study.

Devolution and decentralisation of public administration may create increased employment opportunities in the region, as the dominance of Whitehall and London are addressed as part of a wider economic rebalancing.

Table 0-53 – Possible Impact of Global Trends and Market Disruptors - Public Administration, Education and Health Sector

Global Trend and Market Disruptor	Impact
Automation	Some care positions and manual jobs in public sector may be automated in the future, although scope is limited.
Virtualisation	Some services, particularly learning and diagnostic, may be made virtual, with a decreased emphasis on location and (in education) allowing for greater student: teacher ratios.
Artificial Intelligence	May reduce some diagnostic and care jobs although not likely in the near term.
Demographics	Aging population is likely to drive major changes in the provision of healthcare, both by substantially increasing demand, but also increasing the dependency ratio (of old people to working age

Global Trend and Market Disruptor	Impact
	population) and therefore requiring new, more cost effective modes of delivery. These may include a greater emphasis on care in the home, and a centralisation of services in 'super-hospitals'. Likely to have knock on effects on budgets for other public services.
Devolution	May create more employment in regional public administration and an emphasis on local delivery models designed to meet needs of region, but also may squeeze funding available in areas with high shares of elderly and lower economic activity.

Source: WSP/ KPMG Analysis

Economic futures: GVA change is expected to remain neutral. Employment is expected to become increase based on rising demand for healthcare from aging population in the Business as Usual scenario, although in the High Productivity scenario more of these jobs are automated or carried out remotely. Location of jobs will depend on new delivery models, but could combine greater centralisation and care in the home, both of which are likely to increase transport demand.

Table 0-54 – Economic Futures – Public Administration, Education and Health Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Neutral	Higher
Number of jobs	Much Lower	Higher
Labour productivity	Much higher	Higher
Production location	Clustered, with remote, automated care in the home or super hospitals	Polarised, with increased home visits but agglomeration of hospital services
Inward Investment	Much Higher	Higher
Markets served	Neutral	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: **a greater demand is likely to arise between homes and healthcare centres, as health care professionals are required to provide a greater proportion of care in the home and an older population increase demand for healthcare services.**

Business as Usual seems unsustainable, with centralisation of services in larger hospitals to achieve economies of scale requiring greater regional travel by patients. In the High Productivity scenario, more care is provided remotely, virtually, digitally and automatically in the home, reducing urban and rural travel requirements. More care is also provided in the home in the Inclusive Growth Scenario, but with less emphasis on machines and more human interventions, increasing local and rural transport requirements.

Table 0-55 – Implications for transport demand – Public Administration, Education and Health Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	▪ Neutral	▪ Neutral
National	▪ Neutral	▪ Neutral
Regional	▪ Higher	▪ Higher
Local/Urban	▪ Lower, with more care in the home but undertaken remotely.	▪ Higher, with more care in the home requiring human presence.
Rural		
Coastal	▪ Neutral	▪ Neutral

Source: WSP/ KPMG Analysis

8.3.12 Retail, Wholesale and Personal Services

Economic geography: Although it is often overlooked in economic development strategies and is neither identified as a core or strategic growth sector in New Anglia, the retail, wholesale and personal services are nonetheless an important economic sector in terms of GVA and employment.

The sector is labour intensive, with lower skills, pay and productivity than other sectors. Retail is concentrated in urban centres, with some specific retail parks, serving local markets.

Table 0-56 – Retail, Wholesale and Personal Services Sector

Employment 2015	Change in Employment 2009-15	Number of Businesses 2015	Change in Businesses 2010-16	GVA, £m 2015	GVA per Employee 2015
82,133	2,827	7,330	(15)	2,066	25,153

Source: New Anglia LEP (2017)

Sector trends: The retail sector is already going through a large, technology driven transformation. An increasing share of retail occurs online, with almost 17% of retail trade occurring online in 2016.[30] This is reducing the role of the high street and other physical retailers. Furthermore, automation is changing the retail business model, with many national retail chains replacing check out staff with automatic check outs. This poses a risk to employment in the sector. Further advances in automation in areas such as warehouse management and stocking are possible in the future.

This is likely to change the nature of retail jobs. Losses due to automation may be replaced with roles enhancing the customer experience. Changing consumer preferences are also likely to shape the future of the sector, and trends such as an increased emphasis on quality, personalisation and locally sourced products may all impact the sector. Expectations for

[30] Centre for Retail Research, http://www.retailresearch.org/onlineretailing.php

quicker delivery of online orders may also have impacts for the distribution sector, with a higher volume of lighter loads from regional depots.

Table 0-57 – Possible Impact of Global Trends and Market Disruptors – Retail Wholesale and Personal Services Sector

Global Trend and Market Disruptor	Impact
Automation/Robotics	Already starting to replace jobs in the sector with major, national retailers switching to automatic tellers. Other jobs in warehouses and 'shelf-stacking' also vulnerable to automation.
Digitalisation	Retail moving online, with 17% of UK sales now online and growing. Faster, more efficient delivery services will be demanded in distribution and support further migration online.
3D Printing	Prospect for certain items to be printed at home rather than collected or delivered, although only likely to impact certain subsections of retail market whilst others unlikely to be affected (e.g. groceries).
Artificial Intelligence	Speed at which AI can replace customer service roles remains to be seen, but could lead to further job losses in the sector.
Virtualisation	May encourage a further dislocation between place of work, place of sale and place of purchase, with virtual consumers 'visiting' shops from their home and virtual assistant services customers remotely from centralised centres or home.
Immediacy	More demanding customers expecting faster delivery will increase demand for distribution services in more frequent, lighter loads from regional hubs. May also encourage dispersion of retail locations closer to residential areas.
Globalisation / Protectionism	Increasing or dissipating barriers to trade are likely to affect the ability of foreign online retailers to compete in local markets. This will affect both competition for local retailers in New Anglia, as well as the ability for UK based retailers to sell abroad.

Source: WSP/ KPMG Analysis

Economic futures: In the High Productivity scenario, GVA is likely to grow with the local economy, regional employment and population but is significantly offset by lower consumer demand caused by job losses in large tranches of the labour market. However, the labour intensity of the sector will continue to fall, increasing productivity but reducing employment opportunities. An alternative scenario is presented as Inclusive Growth in which new retail, wholesale and personal services emerge to redeploy labour resource lost to automation and digitisation.

Table 0-58 – Economic Futures – Retail, Wholesale and Personal Services Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Gross Value Added	Neutral	Much Higher
Number of jobs	Much lower	Neutral
Labour productivity	Much higher	Higher

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
Production location	More clustered	More dispersed
Inward Investment	Higher	Higher
Markets served	Neutral	Neutral

Source: WSP/ KPMG Analysis

Implications for transport demand: Retail is typically facilitated by effective local transport networks, which facilitate clustering and economies of scale. **The shift towards online retail will have particular implications for distribution sector.** The speed at which retail moves online will be determined by the competitiveness of location based retail, both in terms of price and customer service.

Table 0-59 – Implications for transport demand – Retail, Wholesale and Personal Services Sector

Change relative to Business as Usual	High Productivity Scenario	Inclusive Growth Scenario
International	Neutral	Neutral
National	Neutral	Neutral
Regional	Lower passenger, but more LGV required for regional distribution centres.	More LGV for regional distribution centres.
Local/Urban	Much higher volume of very LGV vehicles transporting lower loads. Much lower shopper movements.	Neutral for employees. Lower volume of shoppers making more selective trips.
Rural	Low shopper movements and lower demand for retail in general caused by lower employment.	Neutral passenger journeys but much higher frequency deliveries of light loads.
Coastal	Neutral	Neutral.

Source: WSP/ KPMG Analysis

8.3.13 New Anglia economic scenarios

In the preceding section we considered the potential impacts of global trends and potential market disruptors on each of the 12 market sectors. In this section we combine the sector analysis to produce three scenarios for the economy as a whole.

The analysis considers how each individual sector works with the economy as a whole:

- Key sectors which have direct knock on impacts to other sectors
- Correlated sectors that move with skills level of regional economy
- Reactive sectors that are determined by the scenario itself

No scenario is necessarily better than another: different patterns of growth may occur at different rates. In some respects, they are similar, and in other respects the differences have been exaggerated to highlight the potential risks and opportunities that different patterns of growth, supported by different transport infrastructure, can bring. Scenario 1, however, does serve as a reference point or 'baseline' scenario.

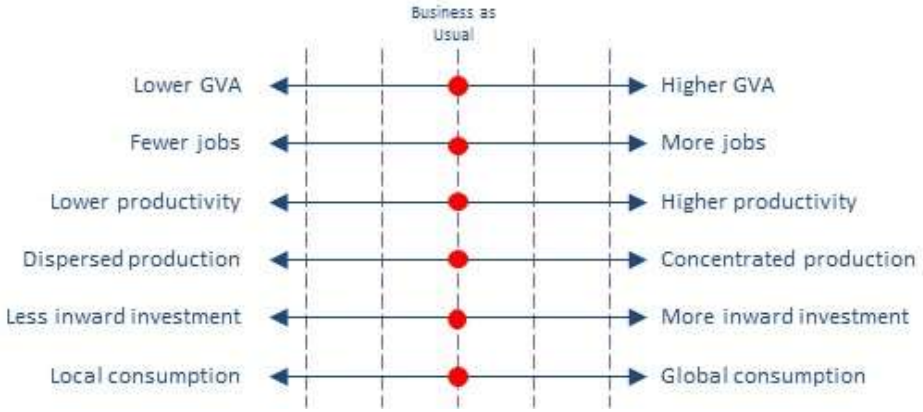
Please note: the scenarios are still in draft form and may evolve following further analysis and discussion.

8.3.14 Scenario 1 – Status quo

Under the status quo scenario, no individual or set of global trends is assumed to have a significant impact to disrupt current patterns of growth. Demographic, technological, social, environmental, economic and political trends continue to evolve at their current rates.

Technology continues to act as a disruptive force and automation in particular continues to replace manufacturing and retail jobs. A continued shift to digital and online services reduces the emphasis on physical location, although this neither accelerates nor is it offset by large increases in new 'experience' location based services.

Table 0-60 – Status quo scenario – Scenario outcomes



As in recent years, growth is expected to be driven primarily by the finance and insurance sector, the tourism, culture and leisure sector, and the retail, wholesale and distribution sectors. Felixstowe protects its share of UK shipping in a world that sees a cooling of growth in international trade.

Table 0-61 – Status quo scenario – Sectors driving scenario employment

The public sector, tourism, culture and leisure sector, and the retail, wholesale and distribution sector remain the biggest sources of employment. Inward migration continues to increase the workforce and counteract the aging of the native population (which continues to drive up the demand for public services – particularly health and social care). The devolution of public administration brings some benefits in terms of greater local control of economic policy, but against this the demands of an aging population place a burden on the region's public finances, with the impact felt in particular between 2020 and 2030.

Without any significant supply side interventions in the housing market, construction continues to fall short of the ambitions set out in the Strategic Economic Growth plan.

High value, strategic growth sectors in advanced manufacturing, agri-tech, energy, ICT and life sciences continue to contribute some growth but not the transformational growth envisaged in the SEGP. Productivity and skills remain behind UK averages.

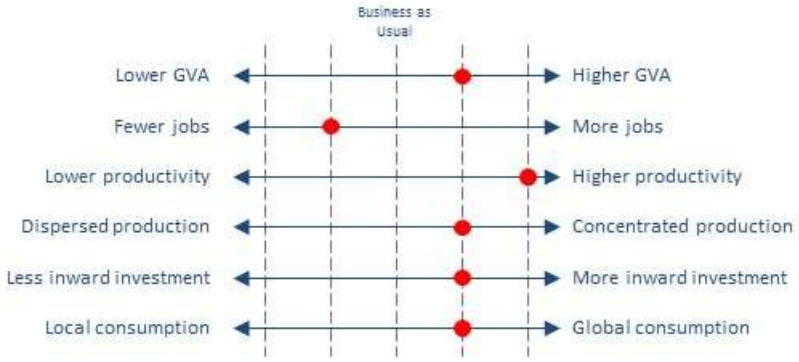
Table 0-62 – Status quo scenario – Global trends and disruptors driving scenario employment

Demographic	Technological	Social
Growing population	Automation / robotics	Sharing economy
Ageing population	Digitalisation	Immediacy
Net migration reduction	3D printing	
Urbanisation	Virtualisation	
	Artificial Intelligence	
Environment	**Economic**	**Political**
Climate change	Gig economy	Devolution
Scarce resources	Pre-fabrication	Globalisation
Renewable energy	New business models	Protectionism

8.3.15 Scenario 2 – High productivity growth

In our second scenario, rapid improvements in technology act as a significant disruptor.

Table 0-63 – High productivity scenario – Scenario outcomes



An increase of skills leads to growth in the high value, technology driven strategic sectors of advanced manufacturing, agri-tech, ICT and life sciences. These sectors lead to fast growth in the economic output but create fewer jobs than traditional sectors. The jobs which are created are highly skilled, well paid jobs, driving up productivity of the region.

Table 0-64 – High productivity scenario – Sectors driving scenario employment

These sectors grow thanks to significant inward investment into the region, focused around specialised clusters. These clusters can be expected to gravitate around key transport hubs linking business and workers to areas of research and innovation (in particular Cambridge and London).

Output from the high growth sectors meets the demands of global markets, although new manufacturing techniques and materials and increasing focus on digital products mean that shipments tend to be higher frequency, lighter weight, suggesting a greater emphasis on air freight than Felixstowe. A rise of protectionism in international trade contributes to lower shipping volumes through the sea port.

These advances in technology are accompanied with a rapid increase in the rate at which jobs are lost to automation, with most low skilled jobs in manufacturing, retail and distribution replaced by automated machines. These trends are reinforced by increased digitalisation (with less emphasis on the high street) and the widespread adoption of connected and autonomous vehicles.

Some medium skilled jobs in finance and insurance are replaced by algorithms or artificial intelligence, although the strong transport links to areas of innovation and education mean that these sectors continue to grow in output and employment in the region.

These trends encourage further inward investment, with an overall pattern of fast economic growth driven by fewer workers. Productivity consequently rises significantly, but a large

proportion of lower skilled workforce struggle to find jobs. A lack of lower skilled jobs reducing the pull factors for inward migration. These trends, together, suppresses regional demand, with higher income households increasingly supplied by online national and international markets, with a multiplier effect, further reducing local consumption and demand for houses.

As in the status quo scenario, there is no significant change to the supply of houses and construction languishes, reinforced by slower income growth for large sections of the workforce.

The aging population, as in the baseline, acts as a serious drag to growth and creates a burden on local government, although technological advances and increased centralisation (facilitated by automated transport) in the provision of health and social care ease the burden to some degree and create less of a demand for workers.

Table 0-65 – High productivity scenario – Global trends and disruptors driving scenario employment

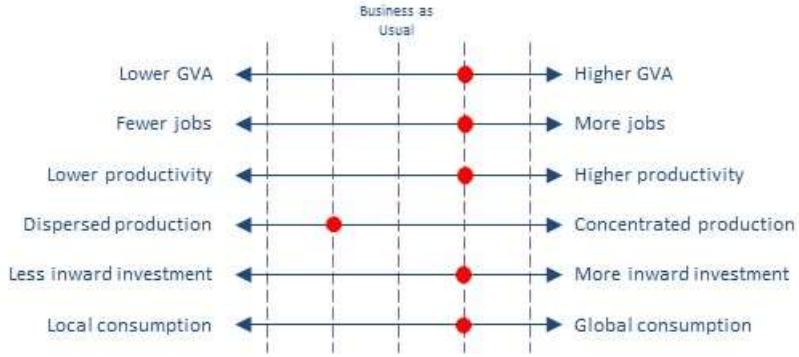
Demographic	Technological	Social
Growing population	Automation / robotics	Sharing economy
Ageing population	Digitalisation	Immediacy
Net migration reduction	3D printing	
Urbanisation	Virtualisation	
	Artificial Intelligence	

Environment	Economic	Political
Climate change	Gig economy	Devolution
Scarce resources	Pre-fabrication	Globalisation
Renewable energy	New business models	Protectionism

8.3.16 Scenario 3 – Inclusive growth

Under our third scenario, many of the technological advances outlined in the high productivity scenario still arise but without such a transformative and disruptive impact. The major difference is that a more balanced growth path is supported and new jobs are created to keep pace with the jobs lost to technology.

Table 0-66 – Inclusive growth scenario – Scenario outcomes



In particular, significant supply side constraints are addressed in the housing sector with housebuilding accelerating to levels set out in the SEGP. Growth in renewable (offshore)

energy also creates significant numbers of low and medium skilled engineering jobs, met by retraining of industry workers displaced by automation.

Table 0-67 – Inclusive growth scenario – Sectors driving scenario employment

The more balanced growth path, coupled with strong regional demand and greater emphasis on local supply in areas such as retail and leisure services creates a significant number of service sector jobs. Fewer distribution jobs are lost to autonomous vehicles compared to Scenario 2 and the demand for distribution increases with customer expectations of same day delivery.

Continued globalisation and integration of international supply chains means a growing demand for shipping services through Felixstowe, which requires good links to national distribution networks. These support growth in tourism and new service sector jobs in hospitality, culture and leisure, supported by the strength of the gig economy. The burden of an aging population is offset by a growing population.

Table 0-68 – Inclusive growth scenario – Global trends and disruptors driving scenario employment

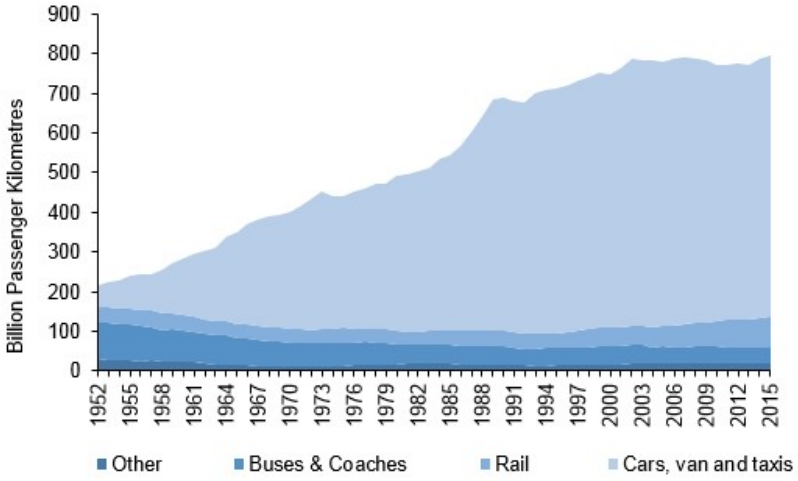
Demographic	Technological	Social
Growing population	Automation / robotics	Sharing economy
Ageing population	Digitalisation	Immediacy
Net migration reduction	3D printing	
Urbanisation	Virtualisation	
	Artificial Intelligence	

Environment	Economic	Political
Climate change	Gig economy	Devolution
Scarce resources	Pre-fabrication	Globalisation
Renewable energy	New business models	Protectionism

8.4 IMPLICATIONS FOR TRANSPORT DEMAND AND CONNECTIVITY

Good transport networks enable participation in geographically dispersed economic and social activities. Changes to the economy of New Anglia together with changes to the price and quality of transport services are likely to impact on transport demand.

Figure 0-38 – Passenger transport in Great Britain 1952-2014



Source: Transport Statistics Great Britain, 2016

The figure above shows that total transport demand in Great Britain has, by and large, plateaued at a little under 800 billion passenger kilometres per year. There is however considerable debate over future levels of demand. Significant changes to demographics, economic activity and transport technology all have the potential to materially influence future demand:

- Higher population levels will naturally increase travel demand, with the ageing population and lower levels of driving licence holding amongst the young changing traditional mode choices.
- Increased automation and digitisation in the workplace could lead to lower levels of employment in traditional employment sectors, with growth in higher value sectors creating greater demand for B2B connectivity, potentially involving longer distance travel.
- Automation and asset sharing will dramatically reduce the cost of travel, potentially stimulating an increase in demand. Government policy on tax and incentives could however offset the cost reduction.
- New business models and the rise of the gig economy could lead to a reduction in traditional '9-to-5' commuting, resulting in less peaked demand to a greater variety of geographical locations.

The relative strengths of alternative economic futures and their implications for transport are varied, with different implications for different parts of the network:

- Connectivity to London and Cambridge: High value growth sectors require strong B2B connectivity to London and Cambridge in order to attract skills. These links are also important for bringing business and leisure visitors to the region. Network capacity, reliability and resilience are likely to be important in both the short and longer term under the three scenarios developed above.
- Urban connectivity: Potential reductions to employment as a result of technological change could reduce demand for traditional 9-to-5 tidal flow commuting. Geographical dispersal of healthcare, wholesale and retail activities, together with potential reduction in cost of travel driven by new transport business models. New housing developments, especially in Greater Norwich, will need new transport infrastructure in the short term. Traditional radial networks may become relatively less important in the longer term.

- Rural connectivity: Under all three scenarios, the focus on rural networks will be on maintenance and renewals, with some enhancements at pinch-points and where new micro-clusters are developed.
- Connectivity to strategic national transport networks: Growth sectors will require access to national markets and will need to be connected to national networks. The A11 and A14 corridors will likely continue to be important for high value sectors, with a focus on capacity and reliability.
- International connectivity: Growth sectors will also need access to international markets, accessing the right talent and resources, and accessing global supply chains. Much of this will depend on national policy but it will also be influenced by transport connectivity to international gateways for passengers and freight.

Overall, population growth and potentially much lower transport costs as a result of changing asset ownership models could increase demand for transport, although this could be offset by new charges, taxes and incentives. Reductions in traditional 9-to-5 employment could diffuse and disperse demand in urban areas. Growth sectors of the economy will need strong connectivity to national and international markets, with strong focus on connections to London and Cambridge.

In the short term, before technology changes drive changes in the economy and transport systems, agglomeration benefits in Norwich and Ipswich, supported by links to London, Cambridge and national networks will be relatively more important. In the longer term peak capacity could be less important in urban areas with the emphasis on transport operations rather than infrastructure.

At the risk of simplifying too much, the transport strategy needs to find a balance between enhancements to national and international B2B connectivity and enhancements to urban and rural networks. Empirical evidence clearly shows the importance of transport connectivity to economic prosperity and the positive relationship between transport and the economy will likely continue into the future, although advances in technology may reduce the need for physical connectivity.

Most markets are more efficient when supported by good transport networks, with most transport improvements showing good economic returns on investment. In the short term, relatively small transport enhancements typically produce greater economic returns than larger schemes, however that may not be the case in the longer term as land-use patterns change.

In selecting the right investment strategy there may also be a trade-off between economic efficiency and equity, with Scenarios 2 and 3 highlighting important differences in this regard. Nevertheless, it has been useful to consider the differences between the scenarios when developing the transport strategy. In summary:

- The world is getting ‘smaller’ and competition in global markets more intense meaning that businesses that rely on international trade will need excellent connections to international gateways to remain competitive. Surface access to ports and airports for both passenger and freight traffic will likely remain a strategic priority for the foreseeable future.
- Businesses that focus on national markets will continue to need easy access to customers and supply chains across the across the UK. The anticipated growth of the Golden Triangle bounded by London, Oxford and Cambridge as a centre for commerce and technology amplifies the need for the region to be well connected to this markets, with growth initiatives aligned with the Midlands Engine and Northern Powerhouse strengthening the strategic case for better east-west connections.

- Improved transport and digital connectivity between and within urban areas in the region will support the growth of relatively specialist clusters of economic activity (including the growth areas identified in the Strategic Economic Plan) increasing the overall 'economic mass' of the region.
- The potential dispersal of economic activity between areas and across times of the day and days of the week arising as a result of automation and digitalisation may mean that peak capacity on urban radial routes may become relatively less important over time. Investment in traffic management technology as well as infrastructure capacity will be needed to deliver the benefits available from greater connectivity between vehicles.
- The growth of new economic clusters and new housing developments, as well as a general change in travel patterns arising from changing demographics and employment patterns could result in bottlenecks requiring a more agile approach to investment in capacity and/or traffic management.

It is unlikely that the physical landscape of the East of England will look very different to what it does today. The majority of people will live where they live now, they will need to access employment locations, attend to personal business, go to school and college, visit friends and relative, and take care of their heath. Tourists will still visit the region and goods will still make their way to and from the region's ports. Transport networks will need to be maintained and renewed, and enhancements will be required to remove local pinch-points and release local land for development or re-development.

That said, the changes brought about by the trends and disruptors identified above are expected to be material. Competition is growing with productivity gains taking place in many markets around the world. The region needs to embrace change by investing in skills and infrastructure and as part of this strategy it needs transport networks that reduce the costs of bringing resources together at the point of production and make it easier to get finished goods to market. At one level this suggests prioritising investment in 'strategic' networks but this needs to be balanced against the reality that digital technology will play a much bigger part in how customers pay for and experience transport services and how we manage network capacity, and the fact that quality of life is an important determinant of household and business location. Places need to 'work' in a holistic sense to make sure that they are able to attract the right talent.

Considering the future economic performance of the East of England it is imperative that access needs are met for residents, businesses, employees, investors, wider users and customers alike. Whilst many of the external factors, many of which are out of our control, will inevitably change, remaining agile to global trends will be the key to success, as is recognising the intrinsic and fundamental link between change, the economy and transport.

9 DEVELOPING TRANSPORT SCENARIOS

9.1 OVERVIEW

In order to develop future transport scenarios for New Anglia (to subsequently inform strategy development), we have taken a top down approach informed by global trends, transportation and socio-economic trends and disruptors, changes in the region including committed schemes, planned projects and aspirations, the challenges and opportunities these present and the potential impacts of economic change as a result of economic scenarios 2 and 3, a blend of which most likely represents what is expected to happen in the future.

To consider these matters in the fullest way we have developed a 'glidepath' approach to presenting the future of transportation in New Anglia to 2030 and 2040. The glidepath considers the qualitative impact of future changes upon existing networks and users (including the movement of people and freight), likely benefits and estimates their likely influence. There are a number of themes which emerge from the glidepaths which, when considered with the underlying challenges and opportunities identified earlier, shape the future scenarios for transport.

9.1.1 Implications for transport from economic scenarios

The transport implications of economic scenarios considered in Section 8 highlights a number of key factors that future transport strategies will need to consider to ensure that accessibility plays a central role in facilitating economic aspirations. These can be summarised as follows and have informed the development of both scenarios and the strategy itself;

- The importance of international freight gateways
- The role of trunk-haul and international freight in providing access to raw materials and export markets
- Meeting the needs of first mile and last mile freight
- The importance of B2B connectivity especially to international markets and the 'Golden Triangle', A11 and A14 corridors
- The need for strategic and local access to coastal areas to support development of energy sectors
- The need for international, national and local accessibility to support tourism across the region
- The role of accessibility and transport in supporting agglomeration benefits of improved access between the main regional centres
- The importance of accessibility within urban centres to support growing populations
- The need for accessible networks within rural areas to meet the challenges of reducing low wage employees
- The need for infrastructure to facilitate and support new development
- Delivering health and care services in major centres whilst also supporting delivery in local communities and people's homes
- Facilitating new ways to provide education
- Encouraging a longer term move away from increasing peak period capacity to providing access a broader time period
- Supporting the digitisation, automation and sharing of access to reduce costs whilst also managing the negative impacts of increasing demand
- Encouraging and facilitating hub and home working

- Increasing agility to meet changes in demand for access brought about by changes in population and new ways to access transport

9.2 DEVELOPING THE TRANSPORTATION GLIDEPATH TO 2030

The glidepaths include an assessment of the transportation trends (as discussed in and associated transport and socio-economic disruptors, the potential impact on movement by existing modes and the estimated state of readiness of any given disrupter by given year. Importantly they also include a commentary on the risks and dependencies associated with each potential disruptor and helps inform the themes discussed later in this section.

The following table provides an overview of the transportation glidepath to 2030 for New Anglia which is included in full in Appendix A and includes references to research and various real-life applications.

Transport Trends	Transport / socio-economic disruptors	Overview to 2030
Digital connectivity	'Wireless' digital connectivity Fixed "Super fast" 30Mbps / "Ultra fast" 300Mpbs connectivity 'Wireless' digital connectivity Digital connectivity, facilitating the monitoring of wellbeing / health	The digital connectivity of people, places and fixed and moving assets is already significantly impacting transportation in its widest sense. Improved connectivity with increased speeds and reliability will provide the foundation for many new technologies in transportation which will pave the way for new forms of mobility, improved network and service performance, improved digital access for business and provide realistic opportunities for home working. It is expected that improvements won't significantly reduce trip making but will make trips more productive and more efficient.
Artificial Intelligence (AI) and cognitive thinking	Optimising customer travel planning Optimisation / management of transport supply and demand Enhancement of network resilience, safety and environment Personal prediction / monitoring of wellbeing and healthcare	Artificial intelligence is already in some consumer applications and services and it is expected that such 'machine' or cognitive thinking will develop applications in transport in particular in manging and predicting supply, demand and the use of assets. It is expected that improved reliability and network / service performance will lead to increased trip making as predictability increases. AI will also gain traction in the healthcare sector potentially reducing the numbers of human interventions through predictive caring. It expected that AI will the norm in some applications and in others wide scale.
Automation and robotics	Autonomous personal vehicles (road based modes) single occupancy Autonomous personal vehicles (air based modes) single occupancy Autonomous shared vehicles (road based	In the transportation realm the automation of vehicles probably presents the biggest change since the mass availability of the car. The arrival of autonomous vehicles will disrupt traditional models of ownership, access and the customer experience potentially unlocking new service models and allowing different patterns of trip making as well as providing independent access for excluded groups such as the elderly. It is expected that autonomous technologies

Transport Trends	Transport / socio-economic disruptors	Overview to 2030
	modes) 'car' type solutions Autonomous shared vehicles (road based modes) multiple occupancy solutions Autonomous vehicles (rail based modes) Autonomous shared vehicles (air based modes) Autonomous trunk haul freight (road based modes) Autonomous delivery vehicles (road based modes) Autonomous delivery vehicles (air based modes) 'drones' Robotic maintenance of assets Automation of agricultural processes	will be viable and visible by 2030 but not at mass levels of market penetration. Automation of haulage and deliver will have started to gain traction in certain use cases in specific area. On the railways automation may have started to impact certain flows such as long distance trunk haul. Automation may have a role to play in the agricultural sector but this will be dependent upon the commercial case and benefits. The use of robotic technologies in transportation will help remove humans from hazardous environments, provide for continual and preventative maintenance this leading to improved network reliability and performance.
Propulsion and energy	Petrol / diesel / hybrid propulsion (all modes) Hydrogen propulsion (all modes) Electric propulsion (all modes) Inert propulsion (all modes)	Concerns over the impacts of oil derived fuels in transportation continue and it is expected that the electrification of cars will continue as well as wider scale uptake of hydrogen propulsion. It is expected that public transport will move away from oil derived fuels with electric and hydrogen fuels become more prevalent. On the railways it is expected that electrification will continue through a mix of wired routes and hybrid or battery electric solutions to increase range or reduce impacts. It is not expected that beyond railway electrification that such changes will materially change trip patterns but they will improve the customer experience.
Materials science	Self-healing technologies Use of lightweight technologies	Self-healing technologies could reduce the need for unplanned maintenance interventions. The development of new, stronger, lighter materials will trickle down into transportation applications by 2030. It is not expected that these applications will significantly impact trip making but they will deliver operational benefits which in turn lead to improved reliability and resilience.
Additive / on-demand	Home printing / production of products	Changes to the manufacturing process will lead to associated changes in the distribution of raw

Transport Trends	Transport / socio-economic disruptors	Overview to 2030
manufacturing (inc. 3D printing)	Community printing / production of components and products Industrial printing / production of components and products 3D printed food production	materials, components and finished goods. The dis-integration of traditional supply and production chains will lead to changes to where products are produced with a move, in some cases to more local production for some commodities. This could lead to changes in the way in which consumables are produced including in some cases food manufacturing. It is expected that these technologies will still be developing in 2030 and therefore be making only a marginal impact.
Collaborative consumption	Sole / family use transport Flexible sole use (flexible access to sole use vehicles) Shared access (community or restricted group access) Lift sharing (sharing of sole use vehicle) Ride sharing (shared use of fleet vehicles) Mobility as a Service Freight aggregation Shared 'last mile' delivery 'Hub' working / 'hot' offices, sharing of space	The collaborative use of assets and services has the potential to significantly disrupt traditional models of transport access, vehicle ownership and patterns of trip making. New services models both in terms of ownership and access will emerge and it is expected that will be a blurring between some public transport modes as ride sharing and demand responsive services become more prevalent. By 2030 it is expected that some of these changes may have started to impact urban areas but it will be more challenging to develop commercial models for rural communities. It is expected that further changes will occur in freight and goods distribution, particularly for first mile / last mile deliveries. Finally, the sharing of office space will become more wide-scale with hub type working supplementing traditional location based work locations and home working, thus changing traditional work related trip making.

It should be noted that the glidepath in Appendix A for 2040 is an iteration from the 2030 position and recognises further developments of technologies, their likely increasing uptake within the marketplace and their associated impacts on existing modes. We consider that extrapolating beyond 2040 is not practical given the rapid rate of change of technology in its widest sense and the uncertainty of cumulative impacts over the coming years.

9.2.1 Risk and dependencies

There are number of risks and dependencies associated with the majority of the interventions identified within existing programmes, future aspirations and within the glidepaths. Many of these are beyond the control of the New Anglia LEP, Norfolk CC and Suffolk CC and their partners but could potentially influence, delay or reduce the potential for delivery and the realisation of benefits. They can be summarised as follows;

Risks	Dependencies
Personal, societal and wider acceptance of disruptions to transportation and uptake of emerging technology and new service models	Development of commercial cases and business models for emerging technology applications and new service implementations, these may vary between

Risks	Dependencies
	national, regional, urban and rural deployments.
Consistency of application, affordability and applicability of new and emerging solutions and services in particular to rural areas	Rate of technological change, its uptake and applicability to New Anglia networks, service providers and customers.
Safety of new technologies to both users and non-users	Underlying digital connectivity providing the foundations for new mobility across the whole of East Anglia.
Personal and data security concerns	Public and private sector infrastructure provider priorities at a national, regional, urban and rural level.
Exclusion of certain sectors within society, particularly the elderly and those with low / no income.	Willingness of customers and users to pay for services
Need to continue to solve transportation pressures of today within a shifting landscape.	Ease of access and use of the transportation network.
	Legislative framework associated with new transportation technologies, particularly autonomous vehicles.

Understanding these risks and dependencies is key to future changes in accessibility becoming a reality both in terms of commercial realisation but also applicability to the specific needs of communities in New Anglia.

9.2.2 Drivers and enablers

There are also a number of high level drivers and enablers which will facilitate changes to the transportation network thus delivering wider transport and other benefits.

Drivers	Enablers
Economic development and competitiveness (sectoral, geographic, commercial scale)	Evolving legislative policy framework
Increased and varied demand for mobility for all journey purposes	Policy makers aspirations and priorities
Increased movement due to intensification and diversification of land use	Prevalence of 'big' data and increasing digital connectivity
Increasing customer expectations from the transportation network	'e-payment', 'smart' ticketing and other new payment methods to streamline the customer experience
Transport disruption from non-traditional companies and new market entrants	New operating models which may push at traditional norms and legislative boundaries
	Partnership working between public and private sectors to realise aspirations and deliver improved outcomes
	Innovative funding and commercial models

These drivers and enablers are also important considerations in shaping the transport strategy.

9.3 DEVELOPING A TRANSPORT SCENARIO FOR 2030 – PREPARING FOR A CHANGING ACCESSIBILITY MARKET

The glidepath presents a transport scenario for 2030 through the identification of change and disruption to transport and the associated impacts on different modes specifically within East Anglia. It also includes risks, dependencies, drivers and enablers for the various anticipated technology disruptors.

By condensing the glidepath findings, the associated risks, dependencies, drivers and enablers, as well as the challenges and opportunities identified in developing our evidence base, we have drawn together a scenario for transport in New Anglia at 2030, which allows us to consider the trajectory from now to subsequently inform the development of strategy components.

We consider that by 2030 the development of a digitally connected transport network facilitating accessibility will be underway with improvements to reliability and resilience on the key corridors between key centres. Network reliability and resilience will have improved significantly on both the rail and the road networks through the removal of pinch points, provision of increased capacity and improvements to operational regimes. The emerging network will be agile to ongoing technological disruptors, particularly on the road network and new more agile public transport service models will be emerging in urban centres to meet ever changing demands.

Customers will have significantly improved access to information to allow them to plan their journeys with increased certainty. Many people will be able to make more informed and dynamic choices with regards to when and how they travel and when they can access needs and opportunities without leaving home, including home working.

The transport network in New Anglia will be evolving to provide the certainty, reliability and resilience to meet evolving economic change, industrial needs and societal expectations. Whilst autonomous vehicles will be available it is expected that these will be a small proportion of the overall fleet.

The following sections illustrates the 2030 transport scenario.

9.3.1 Society and users / customers

It is imperative that any future transport network and associated services provide access for people to their needs and opportunities, allow raw materials to be delivered efficiently to industry and provide access to markets for finished goods. In 2030 it is conceivable that;

- An integrated, transport network provides for equitable access to opportunities for rural, coastal and urban communities.
- Crops, raw materials and goods are moved efficiently, locally and within the region as well as to national and international markets
- Personal, “always-on” connectivity is the norm with an expectation of immediate access to travel information, services and payment
- Personal connectivity is helping to provide more flexibility in making decisions on whether, when and how to travel, resulting in the dispersal of traditional peak period travel and enabling service operators to balance pressures of supply and demand
- People are making more productive use of their journey time through improved connectivity

- Personal connectivity and AI are helping people plan their journeys with live, accurate and trusted information
- Home and hub working is becoming much more prevalent for certain groups enabling more flexibility in considering if and when people need to travel, reducing the number of journeys, their length and reducing the impact of peak period travel
- Improved communications systems provide realistic opportunities for people to reduce the need to travel for some traditionally face to face interactions.
- Walking and cycling continue to feature as a key part of some people's active lifestyle in part encouraged / enabled by appropriate infrastructure, digital connectivity and the trend of the 'quantified self'.
- Whilst not yet available to many, the growing use of private and shared autonomous vehicles allows users to be more productive whilst they are travelling and potentially improve road safety
- The significant reduction in the use of vehicles producing pollution at the point of use is leading to air quality improvements, particularly in urban centres
- The use of robotic systems removes some workers from potentially hazardous or undesirable environments improving working conditions, reducing accidents and fatalities
- 3D printing allows for the production of many consumables at home or close to home for many people
- Shared, on-demand transport provides people with responsive, flexible services providing for enhanced mobility, particularly in urban areas
- People have the ability to pay for and access transport electronically allowing for a blended approach to use and consumption
- Elderly users and those with impaired mobility have more travel opportunities whether they are living independently or in the care of others, helping them to remain economically active and engaged with their communities
- Reductions in personal travel costs due to greater automation, shared use patterns and greater utilisation of vehicles, increases demand for certain types of travel

9.3.2 Infrastructure

- In order for New Anglia's transport networks to effectively serve a changing economy which combines the clustering into urban centres for some functions and communities and dispersal for others it will need to both meet today's challenges and be agile in terms of the changes anticipated in the near future. In 2030 it is conceivable that;
- An integrated network links communities, commerce and activities, is reliable, resilient and adapts to changing needs
- New land use developments are brought forward using sustainable principles, reducing the need to travel and prioritising non-motorised transport, whilst also connecting into and enhancing strategic networks where appropriate
- Wireless connectivity provides for vehicle and infrastructure connectivity in urban areas and on some strategic roads is delivering operational efficiencies, improved safety and customer benefits
- Super-fast, fixed 'broadband' connectivity is the norm for homes, hubs and businesses, and in some places 'ultra-fast' is available

- The Strategic Road Network links all key centres of population within the region and external to it (particularly to the 'golden triangle') including where required re-trunking to provide north/south links
- Pinch points on the Strategic Road Network have been eliminated providing for reliable, replicable journeys between key centres and communities
- Pinch points on the rail network have been eliminated and sections of single line have been doubled to improve capacity
- Planning is underway for signalling improvements to significantly increase capacity on main line rail routes
- Detailed planning is underway to connect the region into East West rail
- Improvements have made to improve journey times and reliability between coastal and rural communities and key centres
- Urban road networks allow for shared, on-demand, responsive and flexible public transport services providing for a 'mesh' of mobility
- Data collection, processing and dissemination will be a key part of the transportation network optimising capacity and demand on strategic and urban networks
- Data led monitoring of infrastructure condition enables continual and preventative maintenance and improves reliability and performance
- New technologies emerging from materials science developments may lead to construction efficiencies, performance improvements and the reduction of unplanned maintenance
- The design construction and maintenance of infrastructure will be changing to capitalise the replacement of people by robotics particularly for activities in hazardous environments
- Whilst emerging technology changes may not have impacted rural infrastructure, planning will be underway to facilitate change
- Facilities for much more widespread cycling and walking for leisure and commercial activities will be influencing the design and provision of infrastructure
- Freight aggregation and distribution centres in urban areas will provide for 'immediate' delivery of some items and facilitate improvements in 'last mile' deliveries, including to rural communities

9.3.3 Services

It is expected that transportation services will undergo significant change between now and 2030 driven by changing economic and land uses as well as the impact of technology and data-led services. In 2030 it is conceivable that;

- Multi-modal transport services provide opportunities to link people to activities irrespective of location
- In urban centres and on key routes, ubiquitous digital connectivity will seamlessly link customers, services and network operators allowing for streamlined travel
- Private and shared autonomous vehicles are available for some groups, operating autonomously in some areas, and shared services may be provided by new operators, such operations may be starting to deliver network efficiencies in some areas in terms of safety and performance but will still be a minor part of the overall 'fleet'

- Rail network reliability and resilience has been improved following the introduction of new rolling stock in the Greater Anglia franchise area and improvements through the East Midlands franchise.
- At least half hourly services link all key centres on population and activity including to London, Cambridge and Peterborough
- Traditional bus services are merging with on-demand (including taxi and private hire) services in urban centres
- On-demand, flexible services are starting to provide new mobility solutions for some rural communities.
- New mobility services will be available to provide access for elderly and mobility impaired people
- New 'access' based service models are developing and traditional car ownership is reducing in urban centres including lift and ride share solutions
- Local goods distribution is in part being provided through new service models and new technologies in some locations
- Dis-integration of manufacturing is occurring through changes in technology and production in some sectors with resultant changes to transportation needs

9.4 DEVELOPING A TRANSPORT SCENARIO FOR 2040 – CAPITALISING ON TECHNOLOGY AND NEW SERVICE MODELS

The glidepath from 2030 to 2040 builds upon the changes anticipated over the next decade and assumes a consolidation of technological solutions to permit new service models to emerge.

We consider that by 2040 digital connectively will be ubiquitous in all but a few remote locations. Connectivity speed and bandwidth is sufficient to support the majority of home, business and industrial needs with certainly of service. High speed wireless communications will be in place on primary road and rail corridors as well as in key centres providing the foundations for the next generation of vehicles and services to operate safely. Connected vehicles will be the norm improving safety and contributing to the smooth running of the network. Highly automated and autonomous vehicles will be operating in a variety of personal, shared and private applications. The move away from fossil fuels will be well underway for most applications with communities benefitting from associated air quality improvements. Home and hub working will be viable for many due to advances in virtualisation supported by associated communications improvements.

The transport network in New Anglia will have evolved to provide the certainty, reliability and resilience to meet evolving economic aspirations, changing industrial need and connected societal expectations.

The following sections illustrates the 2040 transport scenario.

9.4.1 Society and users / customers

It is crucial that the transport network in 2040 is meeting the needs of future East Anglia that will have developed significantly from now. Building upon change experienced to 2030, by 2040 it is conceivable that;

- Seamless digital connectivity is an essential part of most people's lives helping them to manage their time, movements and activities.

- People have the ability to be more productive on the move, enabled by autonomous vehicles and reliable digital connectivity
- Home and hub working is a genuine option for many people in many occupations with employer's realising productivity, staff retention and other benefits and employees experience better health and well-being.
- Remote healthcare provides enhanced and predictive healthcare of the most vulnerable in our communities and remote, digital learning will help those in rural and coastal communities realise their educational aspirations.
- Technology provides a viable alternative to travelling for some traditionally face to face interactions and meetings across all sectors.
- Personal connectivity and AI help people manage their day and plan their journeys with live, accurate and trusted information
- Walking and cycling continue to feature as a key part of some people's active lifestyle in part encouraged / enabled by digital connectivity and the 'quantified self', and e-bikes are affordable for many.
- Private and shared autonomous vehicles allow users in some areas to be more productive whilst they are travelling and potentially improve road safety for all users
- Fossil fuels have been largely eliminated with zero pollution at the point of use for many vehicles leading to significant air quality improvements, particularly in urban centres with a step change in health benefits
- Humans are largely removed from many hazardous transportation environments reducing accidents and fatalities
- Additive manufacturing will be a major part of the production chain resulting in new models of production, distribution and consumption.
- Shared, on-demand transport provides most people with access to responsive, flexible services providing for enhanced mobility, particularly in urban areas thus reducing dependency on the 'private car'
- Elderly and mobility impaired users have significantly more travel opportunities whether they are independently living or in the care of others, helping them to remain economically active and engaged with their communities
- Further reductions in personal travel costs are being realised due to automation, sharing of assets and balancing supply and demand.

9.4.2 Infrastructure

In order for New Anglia's transport networks to effectively serve a changing economy with clustered urban centres as well as other dispersed activities infrastructure will need to be agile to change. In 2040 it is conceivable that;

- An integrated network links communities, commerce and activities, is reliable, resilient and is adapting to changing technological possibility and need
- All new land use developments are brought forward using sustainable principals, integrating digital and transport connectivity, appropriate service solutions within an integrated live, work, play built environment.
- Ultra-fast, fixed 'broadband' connectivity is the norm for homes, hubs and businesses in all but the most remote areas
- Vehicle and infrastructure connectivity within urban areas and on all primary corridors is delivering operational efficiencies, improved safety and customer benefits

- The Strategic Road Network reliably links all key centres of population within the region and external to it (particularly to the 'golden triangle') providing for reliable, replicable journeys between key centres and communities
- Digital signalling improvements are significantly increasing capacity on main line rail routes including the GEML
- East West rail now links Norwich and Ipswich with Cambridge, Milton Keynes and Oxford significantly increasing access to business, employment and education opportunities
- Data analytics are central to the management, operation and maintenance of transportation networks optimising capacity and demand on key corridors and in urban centres
- Autonomous vehicles are starting to deliver network efficiencies in urban areas in terms of safety and performance and will be an increasing portion of the overall 'fleet'
- Robotics are reducing the need for operatives undertaking maintenance activities improving safety and reducing journey-reliability issues caused by safety-related traffic management
- Emerging technologies are starting to benefit rural networks, with delivery underway to provide similar levels of benefits
- Freight aggregation and distribution centres in urban areas are providing for 'immediate' delivery of some items facilitate 'last mile' deliveries, some of which are via autonomous road and air vehicles.

9.4.3 Services

It is expected that transportation services will have undergone significant disruption in some quarters between 2030 and 2040 due primarily to automation. It is conceivable in 2040 that;

- Digital connectivity seamlessly links the majority of customers, services and network operators allowing for streamlined travel
- Multi-modal, including demand responsive, transport services provide opportunities to link people to activities irrespective of location, some of these services may be automated
- Private and shared autonomous vehicles are available for many people in many areas, services are being provided by new operators
- Flexible, on demand, shared public transport and other services provide for a 'mesh' of mobility in urban centres
- New on-demand, flexible services and solutions provide viable mobility solutions for rural communities.
- New mobility services provide access for elderly and mobility impaired people
- Rail network reliability and resilience has been improved and digital signalling is starting to enable enhancements in capacity and service levels.
- At least half hourly services link all key centres of population and activity including to London, Oxford, Milton Keynes, Cambridge and Peterborough
- Traditional bus, taxi and private hire services have been replaced with on-demand services in urban centres
- 'Access' based service models, including lift and ride share solutions, are widely available and traditional car ownership is uncommon in urban centres

- Local goods distribution is provided through new service models and with autonomous and shared technologies
- The dis-integration of manufacturing has led to more production in local areas with resultant changes to where people work and how and where raw materials and goods are produced and distributed

9.5 CONSIDERING TRANSPORTATION IN BEYOND 2040 – A TRANSFORMED NETWORK

Given the significant changes anticipated in transportation over the coming years it is extremely difficult to predict with any certainty what the longer term could look like. In this period it is also conceivable that the next generation of technological developments may well be starting to impact, many of which aren't yet envisaged.

The strategy measures proposed in the next section will provide the framework to anticipate subsequent change and be positively agile to it, thus providing for further, future improvement of the transportation network.

Looking ahead beyond 2040 the transportation landscape could be quite different from what we see today. The digital landscape will have continued to develop providing the majority of people with access to services and opportunities as well as it helping them to be more productive on the move, it will also help play a role in caring for an ageing population as well as providing new models of access to education and skills. Autonomous vehicles will provide services for freight, passenger, personal and shared movement. Propulsion technology will have developed greatly with electric and hydrogen being the norm, improving the environment especially in urban areas. The railway will play a key role in providing direct access between key centres with faster journey times and higher capacity, and local lines will have benefitted from more reliable rolling stock and improved customer experience. New service models, unlocked via automation will provide opportunities to reduce operation costs and provide new service provisions for remote and hard to reach communities. Finally the link between customers and services will pave the way for on-account, seamless, barrier-less payment technologies facilitating MaaS solutions where users are able to use any mode, at any time with payment on account via electronic means.

There are numerous challenges to these visions of the future becoming a reality in particular the availability, applicability and uptake of some new technologies and their social acceptance. In addition market forces will have a major impact on transportation over the coming years particularly through the autonomous vehicle agenda and in some cases legislation may have to adapt to permit change. There are many factors that will be outside our direct control but we need to be aware of these developments, engage in dialogue with partners both familiar and unfamiliar to us to help shape and influence to meet our needs and, importantly, remain agile to change.

10 TRANSPORTATION STRATEGY THEMES AND COMPONENTS

10.1 UNLOCKING IMPROVED ACCESSIBILITY

Transportation in the East has largely been developed on a mode by mode basis with integration only considered where those modes physically interact. Arguably the link with land uses, new developments and transport has not been strong enough and many strategic plans have done little to consider the emerging role of digital technologies in realising accessibility needs at both a business and personal level.

Over recent years digital technologies have started to provide alternatives to travelling, allowing remote working, learning and collaboration, and some parts of the East already have high levels of such activities but are completely dependent upon fast and reliable broadband. Fundamentally, there is a human need for people to come together to socialise, share, learn, work and care; this is especially important given our geographically dispersed communities.

Over the coming years some aspects of the transport market will undergo significant change with a blurring of traditional ownership models and transport modes, autonomous vehicles will provide access for hard to reach groups such as the young and elderly, and there will be an emphasis in some places on the sharing of assets to reduce costs and improve access. There will an increasing focus on the customer experience with easy, instant access to travel information and payment being imperatives.

Given these changes, the economic needs discussed earlier, and the growth and development aspirations in the East, it is considered important to plan transport at a spatial, rather than the traditional modal level. This provides the foundations for a new approach to accessibility for our businesses and communities fusing digital access with both traditional and emerging solutions to provide increased access to opportunity irrespective of circumstance. The use of digital data will also help balance supply and demand across all transport networks delivering significant operator and user benefits.

This spatial approach recognises the variety of movement needs and opportunities in the East – international, national, regional, local, rural and coastal – thus providing a framework for transport change and allowing for the integration of land use, digital, transport and other core agendas. Seven multi-modal themes have also been adopted for the development of strategy components:

- **Connectivity** – improving the links to and within road, rail and air networks;
- **Capacity** – providing for existing and future demands across the East;
- **Reliability** – improving journey times and predictability to world class levels;
- **Resilience** – improving network availability during times of bad weather or disruption;
- **Agility** – anticipating and planning for future technology change in transport;
- **Mobility** – providing movement solutions for existing and new;
- **Policy** – facilitating the above in a pro-active manner.

This approach has been developed in order to satisfy the strategy principles and to facilitate productivity, growth, health, well-being, education, environmental, safety and economic benefits.

For this strategy to be successful it will require true partnership working both within and outside the East. These new and existing partnerships, in and beyond the traditional transport realm, will be key with the public, private and voluntary sectors working together to realise

joint aspirations, overcome legislative challenges, secure funding from both existing and new sources, realise innovation, achieve behavioural change and deliver improvements.

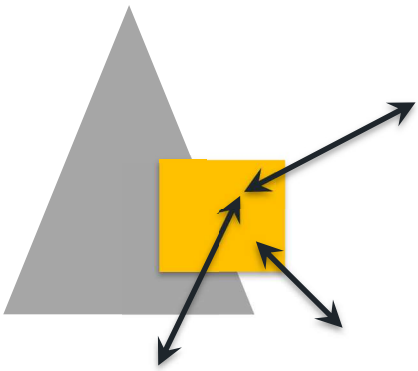
10.2 ANTICIPATING THE FUTURE AND BEING AGILE TO CHANGE

The following pages summarise the strategy on a spatial basis with sections covering international, national, regional, local, rural and coastal needs. Individual components are illustrated more fully (categorised by connectivity, capacity, reliability, resilience, agility, mobility and policy) in the following appendices.

Many of the components contained with this strategy are applicable across a number of spatial levels given the interlinkages and commonalities between regional and more localised networks including the need to put the customer first and the need to drive cost efficiencies and deliver value for money. The strategy is also mindful of national policy and regulations as they relate to the ownership, regulation and operation of transport networks and services.

Appendix B presents these strategy components in full.

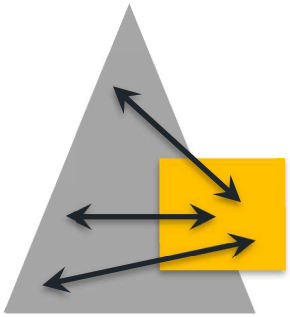
10.2.1 International – accessing the world from the East



International access is a key strength and significant opportunity for the East. We need to maximise our connectivity with international markets and opportunities to facilitate the flow of imports and exports through our international gateways, to support trade in the East and wider UK, and encourage tourism. To capitalise on our position we will work with our partners in the ports and airports sectors to;

- Encourage the development of international services from Norwich Airport to improve direct connectivity to international markets and opportunities from the East.
- Support the role of the Port of Felixstowe and Port of Ipswich in facilitating import / export opportunities for the East and the wider UK.
- Consider connectivity to international hubs outside the region including Stansted and Southend Airports and Harwich International Port.
- Determine future capacity, reliability and resilience constraints, future requirements and associated infrastructure for our ports and airports.
- Promote regional and national accessibility and associated competitiveness in changing and fast moving international markets.

10.2.2 National – accessing the rest of the UK from the East



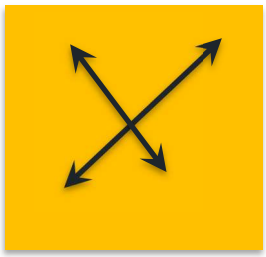
Accessibility between the East and the rest of the UK is essential in enabling future economic performance and competitiveness. Fast and reliable links between our major centres to airports and to London, Cambridge and Oxford are key to business to business connectivity and realising new opportunities. Strong national links are also crucial for access to the energy sector and in particular our unique tourism offer, therefore we will work with our partners to;

- Encourage the development of regional air services to/from Norwich to improve direct, fast connectivity with other parts of the UK.

- Develop East West rail proposals and associated services to improve connectivity of the East to the Oxford Cambridge corridor.
- Develop connectivity to Stansted Airport through improved direct rail services from Norwich, Ipswich and other key centres and to Heathrow through Crossrail interchange from GEML.
- Ensure that the A11, A12 (south of Ipswich), A14 and A47 feature prominently in future Roads Investment Strategies to improve overall capacity and performance within the national Strategic Road Network (SRN) and identify capacity constraints outside of the East which impact network performance of the SRN within the region (such as the A120).
- Ensure that the North to Felixstowe rail route remains a high priority for investment in improvement plans to improve accessibility to the Midlands and the North.
- Ensure that rail capacity constraints and journey time improvements are a high priority within programmes into London on the GEML and routes to Cambridge.
- Ensure that next generation rail digital signalling is actively planned and developed for the GEML so as to not restrict future growth, capacity, operational and customer benefits.
- Identify road and rail network reliability and resilience issues outside the East which impact performance within the region.
- Promote the East as being 'open' to future transport innovation and technology to deliver economic and societal improvements, particularly where change could facilitate growth in other sectors, for example in agri-tech.
- Increase the frequency and capacity of rail services to Cambridge, the Midlands and the North.
- Monitor Great Eastern Main Line (GEML) usage to plan for increased frequency and / or capacity improvements to London.
- Promote priorities in digital, transport and technology improvements to benefit economic performance, facilitate inward investment, improve the customer experience and encourage sustainability.

10.2.3 Regional – enabling easier accessibility across the region

Improving accessibility between our major centres within the region is essential to our future aspirations. Improved accessibility provides access to jobs, education and healthcare, it will encourage clustering of activities and associated developments and help attract investment. A strong transport network across the East will link businesses and suppliers to markets and provide the backbone for the East to thrive. Therefore we will work with our regional partners to:



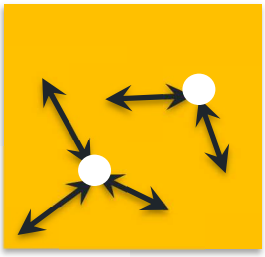
- Prioritise and deliver reliable super-fast and ultra-fast broadband speeds for all new and existing business and residential properties.
- Make sure that digital network capacity / rate of roll-out and reliability meets the region's needs, particularly for new generation technologies such as 5G.
- Ensure that key SRN routes in the region are included in early 'connected highway' programmes to facilitate future capacity, operational and customer improvements.
- Prioritise and deliver pinch point improvements on the SRN including dual carriageway improvements to the A47 corridor.

- Develop a Key Route Network (KRN) for the East to supplement the SRN in terms of 'primary' route connectivity for the region and identify capacity, reliability and resilience constraints and develop an integrated delivery programme.
- Facilitate underlying digital communications to enable emerging autonomous technologies, including freight functionality, on the SRN to deliver operational and customer benefits.
- Deliver rail key infrastructure upgrade priorities across the region to improve capacity and reliability - including Trowse Bridge, Ely Area Enhancements and Haughley junction – as well as key single track sections in the regional network.
- Enhance capacity and frequency of trains to London on the GEML and to Cambridge.
- Develop regional 'metro' style rail services with regularised service frequencies and hours of operation to connect key centres in and around the East.
- Consider benefits of electrifying the Felixstowe branch and Stowmarket, Ely to Peterborough route to improve freight movements.
- Encourage the development of digital travel planning and 'e' ticketing solutions to help customers plan, pay for and undertake trips with confidence, e.g. a Mobility as a Service (MaaS).
- Consider both the digital and transport connectivity when planning new settlements or major developments to build-in sustainable mobility options.
- Influence peak demand network requirements through social and behavioural change programmes.
- Encourage provision of 'open' data to facilitate the use by industry and others to enable innovative uses to deliver operational and customer benefits.
- Promote the adoption of connected, self-monitoring technologies for roadside infrastructure on the SRN and KRN to improve reliability.
- Prioritise network locations which are a resilience risk, particularly from weather, and develop and prioritise improvements.
- Investigate and promote the use of new materials and technologies to improve road and rail network resilience.
- Encourage network operators to identify robotic applications to help remove human operatives from dangerous working environments.
- Consider the link between economic performance, spatial needs, societal trends and transportation when considering future policies, plans and major investments.
- Develop and adopt aligned 'period' based economic, land use and accessibility (transport) policies and plans to enable joined up decision making and the setting of investment priorities.
- Develop relationships with partners in the wider emerging transport innovation, 'smart' data and communications sectors to actively share and disseminate contemporary and future thinking and associated challenges for the benefit of accessibility and transportation in the East.
- Actively monitor the wider 'connected, autonomous and robotics' agenda (across all modes and sectors) within the context of capitalising on specific opportunities and develop policies to meet the East's future needs, particularly in relation to transportation impacts, infrastructure investment requirements, priorities and decision points.

- Promote the East as being 'open' to transport service innovation particularly where such transport innovations could benefit hard to reach communities.
- Encourage the development of work 'hubs' at key locations within the region to encourage part time remote working, to supplement home working options, and business to business connectivity.
- Develop sustainable, applicable freight aggregation solutions to serve retail and business to business needs.
- Develop integrated economic, land use and accessibility policies and an integrated infrastructure connectivity plan with associated periodic review process for the East including land use, digital and transportation.
- Promote the adoption of digital communications into wider accessibility ('transport') policies rather than just considering digital as a utility.
- Develop policies to encourage local manufacturing using new technologies to reduce transport impacts.
- Promote early adoption of transport / technology change within the public sector given its wider influence, importance and scale.
- Develop greater policy links between healthcare, education, digital and transport sectors to actively plan and care for ageing populations and to improve educational attainment particularly for rural and coastal communities.
- Many of the measures described above are also applicable to our local, rural and coastal communities as described below.

10.2.4 Local – improving access to and within the major centres in the East

Our local transport networks are the lifeblood of our communities and improving access to, from and within them is essential so our existing towns and cities, as well as those growing, can capitalise upon their strengths to serve those that live, work, trade and play there. Our local transport networks need to be able to serve growing and changing populations and they need to be agile to the changing shape of private, public and shared transport to link people, place and activity. Recognising this we will work with our partners to:



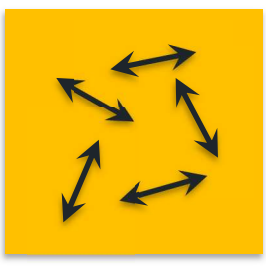
- Prioritise, deliver and market mobile / wireless (including 5G) digital connectivity to a wide subscriber base.
- Develop local digital and transport connectivity plans to provide business and residents with the widest accessibility offer and ensure this is promoted to encourage awareness.
- Develop cycling (including e-bikes) and walking networks for all key centres of population integrating with regional networks as well as all key activities and needs to encourage and promote an active lifestyle.
- Consider local connectivity needs when planning for essential key services including healthcare and education.
- Develop a flexible and/or remote digital education offer to increase levels of attainment particularly for those in remote communities.
- Develop and promote local freight aggregation centres to reduce the impact of local deliveries and where feasible pilot new, autonomous car and other technologies.

- Develop an integrated approach to multi modal interchange across the region at rail stations, on key bus routes and for key centres, and facilitate this through the development of associated commercial models and land uses.
- Consider the wider network impacts of new developments on the KRN (residential and business) to encourage long-term sustainable solutions.
- Monitor market developments and consider alternative 'fuelling' networks including electric (for both at and away from the home) and hydrogen.
- Consider opportunities to influence peak demand network requirements through social and behavioural change programmes.
- Identify and prioritise local roads capacity, reliability and resilience constraints and develop integrated delivery programme.
- Encourage network operators and transport operators to provide 'open' data to facilitate the use by industry and others to enable innovative uses to deliver operational and customer benefits.
- Ensure resilience of local energy networks to facilitate a shift to electric propulsion for road vehicles.
- Establish the East as a model for remote home and hub working as an alternative to travelling, with the public sector leading the way.
- Encourage new and existing public transport service providers to provide both linear and on-demand 'mesh' type services in key centres to meet population and business needs.
- Encourage the development and promotion of new public transport service models providing for emerging autonomous, demand responsive and other service models to address social care and education travel needs.
- Promote and encourage car sharing / car hire / shared access networks / solutions in key centres with local employers and to / from key hubs and destinations.
- Encourage the development of commercial bike share (including e-bike) within key centres.
- Develop land use policy for hubs/shared/flexible facilities.
- Develop policies and strategies to encourage emission free (at point of use) bus and public sector fleets.
- Develop specific transport policies for an ageing population and young people to encourage social and economic activity and to improve educational attainment and associated transport impacts, remote learning, core hours etc.

The majority of the measures described above are also applicable to our rural and coastal communities as described below.

10.2.5 Rural – ensuring the rural communities of the East are accessible

Our rural communities are a vital part of the economy of the East providing some of the UKs most attractive places to live and work. Transport has a key role to play in providing access to jobs, enabling educational attainment and providing access to healthcare. Many of our rural communities also need strong networks to encourage tourism in particular to our market towns. Rural networks have particular challenges with regards to their remote nature, sparsity and cost of services recognising these particular challenges therefore we



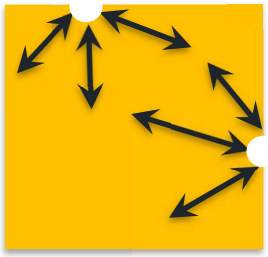
will work with our partners and specifically in our rural communities to:

- Encourage innovative, demand response and shared public transport networks.
- Consider local connectivity needs when planning for essential key services including healthcare and education.
- Identify and remove pinch points on key rural routes to the SRN and centres as part of wider KRN development.
- Work with telecommunications partners to improve network reliability and resilience for both fixed and wireless networks.
- Encourage the development of solutions using crowd sourced / 3rd party data to improve network monitoring, reliability and resilience in traditionally 'hard to reach' areas.
- Encourage the adoption of connected, self-monitoring technologies for roadside infrastructure in rural areas to improve reliability and enhance performance.
- Encourage new and existing public transport service providers to provide on-demand type services to meet rural / coastal needs using autonomous vehicles where possible to deliver commercial services.
- Continue to develop community rail partnerships for rural and coastal branch lines to differentiate individual offers, promote to a wide audience and encourage use.
- Promote opportunities in the East for a research & development centre into autonomous agriculture solutions – including a focus on reducing transport network impacts and improving productivity.

It should be noted that some of these strategy measures also apply to our Coastal communities.

10.2.6 Coastal – ensuring the East's coastal communities are accessible

Our coastal communities are some our most remote settlements but play a vital part of the East's unique tourism and cultural offer and provide access to the energy sector. Diverse in nature, offer and in size these communities have similar particular challenges to many local and rural communities but in addition suffer with reliable and resilient connectivity, access and service levels. In addition to the measures outlined above we will work with our partners to:



- Support local ports in developing niche freight opportunities to continue to directly serve the East and to access other regions.
- Identify capacity improvements on rail lines to coastal communities to permit service expansion.
- Identify and remove pinch points on key coastal links as part of wider KRN development.
- Consider the challenges of coastal environments, particularly in relation to weather effects, and the distances of parts of those networks from key centres.

10.3 ACTION PLAN

We recognise that in order to realise the ambitious aims of this strategy an action plan in needed for partners to prioritise interventions, develop the necessary business case for the programme of work as a whole as well as individual projects within the programme and to secure funding.

With this in mind the following supporting tasks need to be undertaken over the next few months to bring this strategy to life and to develop the momentum necessary for delivery:

- Ensure alignment with the revised Strategic Economic Plan when complete.
- Similarly ensure alignment with the emerging Suffolk Planning Infrastructure Framework and the Norfolk Strategic Framework.
- Consider the development of Norfolk and Suffolk Local Transport Plan revisions to be aligned with this strategy.
- Consider linkages with national planning policies.
- Ensure alignment with local plans including market towns strategies.
- Identify opportunities with other land use, public health, social care and education plans including potential cross sector funding streams.
- Engage with the Department for Transport and Government to highlight the transport aspirations of the East.
- Establish short and medium term infrastructure priorities with key partners including Norfolk CC, Suffolk CC, Highways England and Network Rail, Norwich Airport, Hutchinson Ports, Port of Felixstowe, Network Rail, Highways England, Abellio and, the new East Midlands franchise operator once awarded.
- Identify new partners particularly in digital realm to develop digital delivery plans.
- Develop business cases for infrastructure and other improvements.
- Identifying funding sources including innovative funding streams across all modes.
- Identify any legislative barriers and opportunities.
- Consider and cultural and behavioural challenges to delivery.
- Develop a short (5 year), medium and long term delivery plan.

APPENDIX A – GLIDEPATHS

EITS Transportation glide path to 2030
– preparing for a changing landscape

Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
Digital connectivity – *movement of information between people, other people places and assets*	'Wireless' digital connectivity between vehicles, people and infrastructure to facilitate 'always on' connectivity. **Example(s):** Connected car developments worldwide[31] Train wi-fi upgrade on GEML in Anglia[32]	Improves fleet performance and safety, improves security. Greater reliability and certainty of delivery times – enables just in time delivery, improving productivity. Enables higher load factoring and fewer empty trips. Emerging connected technology available now. **2030: Norm**	Improves fleet performance and safety, improves security. Enables consolidated deliveries and pick-ups and fewer empty trips. Emerging connected technology available now. **2030: Norm**	Digital signalling improves capacity, network management and reliability. Improves network operations, management and reliability. Enables better connections with reduced waiting/dwell times at road/rail interfaces. **2030: Emerging**	Digital signalling improves capacity, network management and reliability. In-train connectivity Improves productivity and personal security on the move and customer experience. Wireless connectivity available now on some services, performance dependent upon underlying network coverage. **2030: Emerging**	Data sharing between cars and networks to improve safety, network management and user experience. Connectivity available for new vehicles, performance dependent upon network coverage. **2030: Wide scale**	Vehicle connectivity improves productivity and personal security on the move and customer experience. Improves fleet performance, asset utilisation and safety. Wireless connectivity available on some services, performance dependent upon network coverage. **2030: Wide scale**	Improves fleet performance, asset utilisation and safety. Enables on-demand and responsive services. Available now, in part, via Uber. **2030: Emerging**	Optimises fleet use and reduces cost - balancing changing demands. Improves user experience and security from in-vehicle services. Enables greater "peace of mind" for carers and users due to connectivity. **2030: Emerging**	Provides new data sources for 'slow modes' for network operators and customer uses. Provides for safety improvements for all road users. Available now via Garmin, Fitbit etc. devices. **2030: Norm**	**R:** Connected capabilities of existing transportation assets **R:** Reliability of systems for safety critical applications. **R:** Rate of roll-out of subsequent generations of connectivity 4G, 5G etc. particularly in rural locations. **D:** Telecom provider's priorities **D:** Applicability / availability of public sector support for more remote areas **D:** Rate of technological change and adoption. **D:** Business case for investment in digital signalling.

[31] KPMG Global Automotive Executive Survey 2017, https://home.kpmg.com/xx/en/home/insights/2017/01/global-automotive-executive-survey-2017.html

[32] Abellio Greater Anglia franchise improvements, https://www.abellio.com/news/abellio-confirmed-new-east-anglia-franchise-operator-department-transport

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Fixed "Super fast" 30Mbps / "Ultra fast" 300Mpbs connectivity between homes, business and centres of activity to provide 'digital utility'. **Example(s):** BT, Virgin and other service provider 'broadband' roll-outs[33]	N/a	N/a	N/a	Improved connectivity at home may facilitate more home or hub working. Speed and capacity currently variable especially in rural areas. **2030: Norm**	Improved connectivity at home may facilitate more home or hub working. Speed and capacity currently variable especially in rural areas. Further expansion of online shopping – change travel habits from retail to other leisure. **2030: Norm**	Improved connectivity at home may facilitate more home or hub working. Speed and capacity currently variable especially in rural areas. **2030: Norm**	Improved connectivity at home may facilitate more home or hub working. Speed and capacity currently variable especially in rural areas. **2030: Norm**	N/a	N/a	**R:** Rate of roll-out of ever faster connectivity, particularly in rural areas. **D:** Provision of fixed fibre optic broadband and / or high speed wireless connectivity **D:** Investment priorities particularly in rural areas **D:** Availability of public sector support for more remote areas
	'Wireless' digital connectivity of assets to networks, Internet of Things (IoT) to improve performance of systems and networks. **Example(s):** Internet of Things, Smart Transportation[34]	Improves network resilience and reduces need for unplanned maintenance. Delivers network efficiencies and improved customer experience. Emerging technology being implemented in highway networks. **2030: Emerging**	Improves network resilience and reduces need for unplanned maintenance. Delivers network efficiencies and improved customer experience. Emerging technology being implemented in highway networks. **2030: Emerging**	Improves network resilience and reduces need for unplanned maintenance. Delivers network efficiencies and improved customer experience. Emerging technology being implemented in rail networks. **2030: Emerging**	Improves network resilience and reduces need for unplanned maintenance. Delivers network efficiencies and improved customer experience. Emerging technology being implemented in rail networks. **2030: Emerging**	Improves network resilience and reduces need for unplanned maintenance. Delivers network efficiencies and improved customer experience. Emerging technology being implemented in highway networks. **2030: Emerging**	Improves network resilience and reduces need for unplanned maintenance. Delivers network efficiencies and improved customer experience. Emerging technology being implemented in highway networks. **2030: Emerging**	Improves network resilience and reduces need for unplanned maintenance. Delivers network efficiencies and improved customer experience. Emerging technology being implemented in highway networks. **2030: Emerging**	N/a	N/a	**R:** Cyber security risk to personal information and physical security of assets. **D:** Dependent upon underlying communications networks. **D:** Function of product development and the miniaturisation of devices.

[33] Ofcom, 'Connected Nations 2016': https://www.ofcom.org.uk/research-and-data/infrastructure-research/connected-nations-2016

[34] Intel, 'Internet of Things (IoT), Smart Transportation': http://www.intel.co.uk/content/www/uk/en/internet-of-things/smart-transportation-solutions.html

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Digital connectivity, facilitating the monitoring of wellbeing / health at a personal and social level. **Example(s):** Technology enabled care services[35]	N/a	Potential increase in local "service" trips for healthcare, e.g. reduced visits to GP for repeat prescriptions could result in increased number of home deliveries. **2030: Wide scale**	N/a	N/a	Improved connectivity may reduce non-essential healthcare journeys via pre-emptive monitoring. **2030: Wide scale**	Improved connectivity may reduce non-essential healthcare journeys via pre-emptive monitoring. **2030: Wide scale**	Improved connectivity may reduce non-essential healthcare journeys via pre-emptive monitoring. **2030: Wide scale**	Improved connectivity may reduce non-essential healthcare journeys via pre-emptive monitoring. **2030: Wide scale**	Digital healthcare may increase cycling and walking trips for some groups as part of an active lifestyle **2030: Wide scale**	**R:** Personal security and wellbeing **D:** Dependent upon underlying communications networks.
Artificial Intelligence (AI) and cognitive thinking – *the application of self-learning systems*	Optimising customer travel planning (need, time, cost, quality) through the aggregation, processing and dissemination of data. **Example(s):** National Rail enquiries[36] Traveline[37]	N/a	N/a	N/a	Provides for improved customer experience for travel planning purposes and at times of disruption. Solutions in development **2030: Wide scale**	Provides for network load balancing and informed travel choices. development **2030: Wide scale**	Provides for improved customer experience for travel planning purposes and at times of disruption. Solutions in development **2030: Wide scale**	Optimises fleet performance. Emerging, disruptive services available in part now via Uber, Lyft and similar. New models for shared transport **2030: Emerging**	Optimises customer / user needs and fleet optimisation. New models for shared transport **2030: Emerging**	N/a	**R:** Personal security and wellbeing **R:** Willingness of customers / users to share movement and habitual data. **R:** Optimisation of algorithms and underlying assumptions **D:** Dependent upon underlying communications networks.

[35] Deloitte, 'Connected Health 2015': https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/life-sciences-health-care/deloitte-uk-connected-health.pdf

[36] National Rail enquiries: http://www.nationalrail.co.uk/

[37] Traveline: http://www.traveline.info/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Optimisation / management of transport supply and demand (networks, fleets and services) through the use and application of movement and network data. **Example(s):** Haulage Exchange in the UK[38]	Enables just in time distribution, optimisation of customer needs and network conditions. **2030: Norm**	Enables efficiencies in first mile / last mile distribution. Improves customer experience. **2030: Norm**	Improves service and network reliability and customer expectations. **2030: Norm**	Improves service and network reliability and customer expectations. **2030: Norm**	Improves travel planning decisions, reduces congestion and improves overall resilience. **2030: Wide scale**	Enables demand responsive, meshed public transport solutions to supplement traditional linear routes. Balances customer demand with fleet availability and network conditions. New models for shared transport **2030: Emerging**	Enables demand responsive, meshed public transport solutions to supplement traditional linear routes. Balances customer demand with fleet availability and network conditions. New models for shared transport **2030: Emerging**	Enables demand responsive applications for social transport reacting to customer needs. New models for shared transport **2030: Emerging**	N/a	**R:** Reliability and resilience of underlying data. **R:** Optimisation of algorithms and underlying assumptions **R:** Willingness of customers / users to share movement and habitual data. **D:** Dependent upon underlying communications networks. **D:** Availability of fleet and network performance data. **D:** Commercial models particularly for rural networks
	Enhancement of network resilience, safety and environment through active network management using predictive and real-time monitoring. **Example(s):** National Traffic Information System, England[39]	Improves customer experience (hauliers) and their customer outcomes. Improves network resilience, recovery after incident, particular on the SRN / KRN and the local environment. **2030: Wide scale**	Improves customer experience (distributors) and their customer outcomes. Improves network resilience, recovery on after incident and the local environment. **2030: Emerging**	Enables further performance enhancements through digital signalling. **2030: Emerging**	Enables further performance enhancements through digital signalling. **2030: Emerging**	Improves network resilience and recovery after incident. **2030: Wide scale**	Improves network resilience and recovery after incident. **2030: Emerging**	Improves network resilience and recovery after incident. **2030: Emerging**	Improves network resilience and recovery after incident. **2030: Emerging**	Improves environment for encouraging slow modes. **2030: Emerging**	**R:** Data security **D:** Dependent upon underlying communications networks. **D:** Availability of network performance, incident data. **D:** Commercial models particularly for rural networks

[38] Haulage Exchange: https://haulageexchange.co.uk/

[39] National Traffic Information Service, Mouchel Ltd. case study: http://www.mouchel.com/sectors-and-services/managing-national-traffic

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Personal prediction / monitoring of wellbeing and healthcare at a personal and social level. **Example(s):** Technology enabled care services[40] Availability of 'quantified self' fitness and other products[41]	N/a	N/a	N/a	N/a	Application of personal healthcare technology may reduce some short distance trips that could be taken by slow modes as part of a more active lifestyle. **2030: Wide scale**	Application of personal healthcare technology may reduce some short distance trips that could be taken by slow modes as part of a more active lifestyle. **2030: Wide scale**	Application of personal healthcare technology may reduce some short distance trips that could be taken by slow modes as part of a more active lifestyle. **2030: Wide scale**	Monitoring of personal healthcare may prevent unnecessary planned / emergency trips through other interventions. **2030: Wide scale**	Encourages use of active modes through active, connected lifestyle. **2030: Wide scale**	**R:** Willingness of users to share healthcare data with 3rd parties **D:** Development and application of scalable technology **D:** Dependent upon underlying communications networks.
Automation and robotics – *the replacement of human decision making and control with technology*	Autonomous personal vehicles (road based modes) single occupancy **Example(s):** Self-driving pods in Milton Keynes[42]	N/a	N/a	N/a	Impact is n/a but technology could potentially impact rail passenger trips through shift to new mode. **2030: Emerging**	Private car may develop into the personal car and result in increased trips if vehicles aren't shared. **2030: Emerging**	Personal AVs will impact traditional, linear bus use. **2030: Emerging**	Personal AVs will impact taxi sector in some geographies. New service models may emerge. **2030: Emerging**	Access to personal AVs could impact traditional social needs transport uses. New service models may emerge. **2030: Emerging**	Access to personal AVs may impact local walking / cycling commuting / utility trips. **2030: Emerging**	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality

[40] Deloitte, 'Connected Health 2015': https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/life-sciences-health-care/deloitte-uk-connected-health.pdf

[41] Wikipedia, 'Quantified Self': https://en.wikipedia.org/wiki/Quantified_Self

[42] Transport Systems Catapult, Self driving pods, Milton Keynes: https://ts.catapult.org.uk/current-projects/self-driving-pods/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous personal vehicles (air based modes) single occupancy **Example(s):** Personal autonomous drone development[43]	N/a	N/a	N/a	May impact some rail trips in certain circumstances. **2030: Developing**	Personal air based AV could impact some private car trips. **2030: Developing**	Personal AVs may impact traditional, linear bus use. **2030: Developing**	Personal AVs may impact taxi sector in some geographies. **2030: Developing**	N/a	Access to personal AVs may impact local walking / cycling commuting / utility trips **2030: Developing**	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality **D:** Applicability to rural networks
	Autonomous shared vehicles (road based modes) 'car' type solutions **Example(s):** Development of autonomous cars technology around the world[44]	N/a	N/a	N/a	Shared 'car' type AVs may impact rail travel for some users. **2030: Emerging**	'Car' type AVs may marginally increase trips due to shift from 'public' modes. **2030: Emerging**	'Car' type AVs may marginally decrease trips due to shift from 'public' modes. **2030: Emerging**	'Car' type AVs may marginally decrease trips due to shift from 'public' modes. **2030: Emerging**	N/a	Access to shared AVs may impact local walking / cycling commuting / utility trips **2030: Developing**	**R:** Safety and security **R:** Public perception **D:** Development and availability and technology uptake **D:** Dependent upon underlying communications networks **D:** Applicability to rural networks **D:** Cost to consumers

[43] PC World, 'Ehang 184 personal drone is ready to fly': http://www.pcworld.com/article/3155344/consumer-electronics/the-ehang-184-personal-drone-is-ready-to-fly.html

[44] SMMT, 'Connected and Autonomous Vehicles: the UK Opportunity 2015': https://www.smmt.co.uk/wp-content/uploads/sites/2/Connected-and-Autonomous-Vehicles-%E2%80%93-The-UK-Economic-Opportu....pdf

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous shared vehicles (road based modes) multiple occupancy solutions **Example(s):** Self-driving taxis in Singapore[45]	N/a	N/a	N/a	Shared AVs may impact rail use for short distance, urban trios **2030: Emerging through new service providers**	Shared AVs may impact uptake and use of 2+ cars, may impact some single occupancy trips. May lead to new service models. **2030: Emerging**	Shared AVs will disrupt traditional, linear bus services enabling on demand, flexible solutions. May lead to new service models. **2030: Emerging**	Shared AVs will disrupt the taxi sector and see a blurring between bus / taxi. May lead to new service models. **2030: Emerging**	Shared AVs will disrupt the taxi sector and see a blurring between bus / taxi which may impact social transport sector to deliver improved services **2030: Emerging**	Access to personal AVs may impact local walking / cycling commuting / utility trips **2030: Developing**	**R:** Safety and security **R:** Public perception **D:** Development and availability and technology uptake **D:** Dependent upon underlying communications networks. **D:** Development of commercial models **D:** Applicability to rural networks **D:** Cost to consumers **D:** Legislative framework for autonomous vehicles

[45] Guardian, 'Self-driving taxis roll-out in Singapore', Aug 2016: https://www.theguardian.com/technology/2016/aug/24/self-driving-taxis-roll-out-in-singapore-beating-uber-to-it

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous vehicles (rail based modes) **Example(s):** Development of driverless trains in Germany[46]	Autonomous trains may impact long distance road market through service and operator efficiencies. **2030: Developing**	N/a	Autonomous trains could result in service / performance efficiencies and result in more traffic if commercial solutions are attractive. **2030: Developing**	Autonomous trains could result in service / performance efficiencies and result in more traffic if commercial solutions are attractive. **2030: Developing**	N/a	N/a	N/a	N/a	`N/a	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality **D:** Industry acceptance **D:** Legislative framework for autonomous vehicles
	Autonomous shared vehicles (air based modes) **Example(s):** Multiple occupancy, high payload, autonomous aircraft development in Israel[47]	N/a	N/a	N/a	May impact some rail trips in certain circumstances. **2030: Developing**	Shared air based AV could impact some private car trips. **2030: Developing**	Shared AVs may impact traditional, linear bus use. **2030: Developing**	Shared AVs may impact taxi sector in some geographies. **2030: Developing**	Shared AVs could deliver significant improvements for emergency services. **2030: Developing**	N/a	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality **D:** Legislative framework for autonomous vehicles

[46] Popular Science, 'Germany may have driverless trains by 2023', June 2016: http://www.popsci.com/germany-may-have-driverless-trains-by-2023

[47] Reuters, 'Autonomous aircraft that goes where no helicopter dares', Jan 2017: http://www.reuters.com/video/2017/01/03/autonomous-aircraft-that-goes-where-no-h?videoId=370843747

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous trunk haul freight (road based modes) **Example(s):** Self-driving truck deliveries in the USA[48]	Platooning and other autonomous solutions could deliver efficiencies for trunk haul road freight and result in shifting of trip patterns. **2030; Emerging**	N/a	AV technology to develop 'road train' type solutions could impact longer distance rail use in some cases. **2030: Emerging**	N/a	N/a	N/a	N/a	N/a	N/a	**R:** Safety and security **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Industry acceptance **D:** Commercial business case **D:** Legislative framework for autonomous vehicles
	Autonomous delivery vehicles (road based modes) **Example(s):** Local delivery robots for last mile deliveries in London[49]	N/a	AV first mile / last mile deliveries could significantly impact the use of LGV and private car/van for local distribution. **2030: Emerging**	N/a	N/a	AV first mile / last mile deliveries could significantly impact the use of LGV and private car/van for local distribution. **2030: Emerging**	AV delivery solutions may be integrated with on-demand shared services. **2030: Emerging**	AV delivery solutions may be integrated with on-demand shared services. **2030: Emerging**	N/a	N/a	**R:** Safety and security including deliveries **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Commercial business case **D:** Legislative framework for autonomous vehicles

[48] Wired, 'Uber's self-driving truck makes its first delivery', Oct. 2016: https://www.wired.com/2016/10/ubers-self-driving-truck-makes-first-delivery-50000-beers/

[49] The Engineer, 'Autonomous delivery robots hit London', July 2016: https://www.theengineer.co.uk/autonomous-delivery-robots-hit-london/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous delivery vehicles (air based modes) 'drones' **Example(s):** Unmanned aerial vehicle test delivery in Cambridgeshire[50]	N/a	Drone based deliveries could impact first mile / last mile distribution for certain consumables / products in certain areas **2030: Emerging**	N/a	N/a	Drone based first mile / last mile deliveries could significantly impact the use of LGV and private car/van for local distribution. **2030: Emerging**	N/a	N/a	N/a	N/a	**R:** Safety and security including deliveries **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Commercial business case **D:** Legislative framework for autonomous vehicles
	Robotic maintenance of assets **Example(s):** National Centre for Robotics, UK is examining applications[51]	Reduces need for humans from hazardous, undesirable environments and facilitates improved road network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved road network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved rail network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved rail network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved road network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved road network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved road network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved road network resilience. **2030: Developing**	Reduces need for humans from hazardous, undesirable environments and facilitates improved road network resilience. **2030: Developing**	**R:** Security of assets **D:** Development and availability of technology in transportation sector **D:** Commercial business case

[50] The Telegraph, 'Amazon makes first drone delivery to house in Cambridge', Dec 2016: http://www.telegraph.co.uk/technology/2016/12/14/amazon-makes-first-drone-delivery-house-cambridge/

[51] Leeds University, 'National facility for innovative robotics opens', Oct 2015: https://www.leeds.ac.uk/news/article/3611/national_facility_for_innovative_robotics_opens

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Automation of agricultural processes **Example(s):** Autonomous tractor development and trial in the UK[52]	May impact methods of agricultural production and subsequent distribution chains in certain areas, for certain crops. **2030: Emerging**	May impact methods of agricultural production and subsequent distribution chains in certain areas, for certain crops. **2030: Emerging**	N/a	N/a	May impact methods of agricultural production and subsequent use of human resource in certain areas, for certain crops. therefore less travel to site. **2030: Emerging**	N/a	N/a	N/a	N/a	**R:** Safety and security including deliveries **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Commercial business case **D:** Legislative framework for autonomous vehicles
Propulsion and energy – *the decarbonisation of energy consumption*	Petrol / diesel / hybrid propulsion (all modes) **- m**ove away from oil derived fuels for vehicle propulsion to hybrid solutions **Example(s):** Developments in vehicle propulsion around the world[53]	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	Move from petrol / oil underway, positive environmental impacts **2030: Wide scale**	N/a	**D:** Cost of technology and consumer uptake

[52] BBC, 'In the future, will farming be fully automated?', Nov 2016: http://www.bbc.co.uk/news/business-38089984

[53] KPMG Global Automotive Executive Survey 2017: https://home.kpmg.com/xx/en/home/insights/2017/01/global-automotive-executive-survey-2017.html

EITS Transportation glide path to 2030
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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Hydrogen propulsion (all modes) move from oil derived fuels to hydrogen propulsion. **Example(s):** Developments in hydrogen fuel cell technology[54]	Hydrogen propulsion may be applicable for some service solutions **2030: Emerging**	Hydrogen propulsion may be applicable for some service solutions **2030: Emerging**	Hydrogen propulsion may be applicable for some service solutions **2030: Emerging**	Hydrogen propulsion may be applicable for some service solutions **2030: Emerging**	Hydrogen propulsion may be available for some vehicle types. **2030: Wide scale**	Hydrogen propulsion may be available for some vehicles **2030: Wide scale**	Hydrogen propulsion may be available for some vehicles **2030: Wide scale**	Hydrogen propulsion may be available for some vehicles **2030: Wide scale**	Hydrogen powered bikes may be part of cycle hire solutions. **2030; Emerging**	**R:** Safety and security of distribution / storage chains **D:** Cost of technology and consumer uptake **D:** Changing in service infrastructure from petrol/diesel to hydrogen **D:** Distribution and storage solutions
	Electric propulsion (all modes) **–** application of electric propulsion systems in all modes, battery electric or electrified systems. **Example(s):** Longer range electric cars[55] Independent electric multiple units (trains) in Essex[56]	Electric propulsion may be applicable for some service solutions **2030: Emerging**	Electric propulsion may be applicable for some service solutions **2030: Emerging**	Electrification of the railway will continue (wired or battery) and cover more lines **2030: Norm**	Electrification of the railway will continue (wired or battery) and cover more lines **2030: Norm**	Electric propulsion will be well developed and the norm for new vehicles. May reduce fuel costs and increase trips. **2030: Norm**	Electric propulsion will be well developed and the norm for new vehicles. **2030: Norm**	Electric propulsion will be well developed and the norm for new vehicles. **2030: Norm**	Electric propulsion will be well developed and the norm for new vehicles. **2030: Norm**	**E-bikes will be common and enable wider cycling usage for shorter trips** **2030: Norm**	**D:** Development and applicability of technology **D:** Commercial case

[54] Toyota Mirai, hydrogen car: https://www.toyota.co.uk/new-cars/new-mirai/landing#

[55] Tesla cars: https://www.tesla.com/

[56] RalwayTechnology.com, 'Independently Powered Electric Multiple-Unit (IPEMU), Essex': http://www.railway-technology.com/projects/independently-powered-electric-multiple-unit-ipemu-essex/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Inert propulsion (all modes) - development of inert propulsion systems (such as compressed air) to provide alternative drive train solutions. **Example(s):** Development of air powered cars in the USA[57]	N/a	N/a	N/a	N/a	May have applications for low, load personal travel. **2030: Developing**	N/a	May have applications for low, load personal travel. **2030: Developing**	N/a	N/a	**D:** Technology in early infancy and yet to be proven
Materials science and technology – *Use of new materials and systems to manage develop and make best use of assets.*	Self-healing technologies - within transportation and other infrastructure to reduce the need for unplanned maintenance interventions. **Example(s):** Self-healing pavements (highways)[58]	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. May reduce trips associated with maintenance of assets. **2030: Emerging**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. May reduce trips associated with maintenance of assets. **2030: Emerging**	N/a	N/a	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. **2030: Emerging**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. **2030: Emerging**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. **2030: Emerging**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. **2030: Emerging**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. **2030: Emerging**	**D:** Rate of development of technology **D:** Commercial application and business case

[57] AIRPod 2.0 Compressed Air-Powered Car: http://zeropollutionmotors.us/

[58] 'Self-Healing Technology for Asphalt Pavements', Amir Tabakovic & Erik Schlangen, Nov 2015: https://www.researchgate.net/publication/292986082_Self-Healing_Technology_for_Asphalt_Pavements

EITS Transportation glide path to 2030

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Use of lightweight technologies in industry and transportation applications. **Example(s):** Development of nano technology applications in transportation[59]	Reduces axle weights or increases load density, thus delivering logistics chain efficiencies. Lighter vehicles reduce impact on highway infrastructure and delivers fuel efficiency. **2030: Emerging**	Reduces axle weights or increases load density, thus delivering logistics chain efficiencies. Lighter vehicles reduce impact on highway infrastructure and delivers fuel efficiency. **2030: Emerging**	Reduces axle weights or increases load density, thus delivering logistics chain efficiencies. Lighter vehicles reduce impact on rail infrastructure and delivers fuel efficiency. **2030: Emerging**	Lighter vehicles reduce impact on rail infrastructure and delivers fuel efficiency. **2030: Emerging**	Reduces axle weights or increases load density, thus delivering logistics chain efficiencies. Lighter vehicles reduce impact on highway infrastructure and delivers fuel efficiency. **2030: Emerging**	Reduces axle weights or increases load density, thus delivering logistics chain efficiencies. Lighter vehicles reduce impact on highway infrastructure and delivers fuel efficiency. **2030: Emerging**	Reduces axle weights or increases load density, thus delivering logistics chain efficiencies. Lighter vehicles reduce impact on highway infrastructure and delivers fuel efficiency. **2030: Emerging**	Reduces axle weights or increases load density, thus delivering logistics chain efficiencies. Lighter vehicles reduce impact on highway infrastructure and delivers fuel efficiency. **2030: Emerging**	N/a	**R:** Rate of adoption in transportation industry and wider industrial application **D:** Industrial development and cost effectiveness
Additive / on demand manufacturing (inc. 3D printing) – on-demand *production of products or components and dis-integration of traditional production using advanced printed manufacturing techniques*	Home printing / production of products - to produce mundane, small scale consumables for use around the home. **Example(s):** 3D printers are becoming cheaper and more readily available for home users[60]	Reduces the need to transport small utility items that can be produced closer to the point of use / consumption **2030: Emerging**	Reduces the need to transport small utility items that can be produced closer to the point of use / consumption **2030: Emerging**	Reduces the need to transport small utility items that can be produced closer to the point of use / consumption **2030: Emerging**	N/a	Reduces the need to transport small utility items that can be produced closer to the point of use / consumption **2030: Emerging**	Reduces the need to transport small utility items that can be produced closer to the point of use / consumption **2030: Emerging**	Reduces the need to transport small utility items that can be produced closer to the point of use / consumption **2030: Emerging**	N/a	Reduces the need to transport small utility items that can be produced closer to the point of use / consumption **2030: Emerging**	**D:** Affordability of technology **D:** Ease of use for all **D:** Underlying communications networks for data files

[59] 'Nanotechnology in Transportation', Jeanne Nye, Andrew Greenberg, Ph.D. and Angela Jones, Ph.D., University of Wisconsin: http://ice.chem.wisc.edu/NanoDecisions/PDF/Transportation.pdf

[60] PC Mag, 'The Best 3D Printers of 2017': http://uk.pcmag.com/printer-reviews/36506/guide/the-best-3d-printers-of-2017

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Community printing / production of components and products - use of 3D printing / production to produce scale consumables in greater quantities / sizes using shared, approaching industrial machines. **Example(s):** Commercial 3D printing services are becoming available worldwide[61]	Reduces the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. **2030: Emerging**	Reduces the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. **2030: Emerging**	Reduces the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. **2030: Emerging**	N/a	Reduces the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2030: Emerging**	Reduces the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2030: Emerging**	Reduces the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2030: Emerging**	N/a	Reduces the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2030: Emerging**	**D:** Availability of local hubs **D:** Cost and scalability of technology **D:** Ease of use for consumers **D:** Underlying communications networks for data files
	Industrial printing / production of components and products **-** to produce components and finished products on demand, closer to markets. **Example(s):** Commercial large scale 3D printers are becoming available[62]	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. May however result in changes to raw material distribution. **2030: Emerging**	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. May however result in changes to raw material distribution. **2030: Emerging**	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. **2030: Emerging**	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. **2030: Emerging**	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. **2030: Emerging**	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. **2030: Emerging**	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. **2030: Emerging**	N/a	Reduces the need to transport many items, produced close to the point of consumption. May dis-integrate manufacturing chain and re-distribute jobs. **2030: Emerging**	**D:** Commercialisation and scalability of technology **D:** Printing capabilities / complexity of outputs **D:** Availability of appropriate industrial scale premises **D:** Underlying communications networks for data files

[61] Wired, 'Bram de Zwart is ushering in a new historical era with mass 3D printing', Nov 2015: http://www.wired.co.uk/article/3d-hubs-bram-de-zwart

[62] HP, 'The 3D printer revolution starts now': http://www8.hp.com/uk/en/printers/3d-printers.html

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	3D printed food production - 'consumable' foods at the point of consumption. For example within the care sector, remote workers in hazardous environments. Allows for the conversion of bulk ingredients into food by small scale machine process. **Example(s):** 3D printing of food is in its infancy, but applications are being developed[63]	May impact the distribution of easily produced, non-artisan, consumption and fast-foods. Provides for localised food production and reduction of associated distribution trips. **2030: Developing**	May impact the distribution of easily produced, non-artisan, consumption and fast-foods. Provides for localised food production and reduction of associated distribution trips. **2030: Developing**	N/a	N/a	N/a	N/a	**N/a**	May impact the distribution of easily produced, non-artisan, consumption and fast-foods. Provides for localised food production I care homes and reduction of associated distribution trips. **2030: Developing**	N/a	**R:** Food safety and security **D:** Public acceptability **D:** Commercial case **D:** Availability of technology
Collaborative consumption – *the sharing of services and assets*	Sole / family use transport **- e**xisting model of solely 'owned' / leased cars **Example(s):** Most vehicle manufacturers now offer lease options, some have no option to own[64]	N/a	N/a	N/a	N/a	Existing traditional model of private car use declining. **2030: Emerging**	N/a	N/a	N/a	N/a	**R:** Global financial performance **D:** Continued social models and perceptions of car access

[63] Popular Mechanics, 'Do We Really Want 3D-Printed Food?', Dec 2016: http://www.popularmechanics.com/home/food-drink/a24493/3d-printed-food/

[64] Auto Express, 'Personal leasing: is this the car rental revolution?', Jan 2016: http://www.autoexpress.co.uk/car-news/94171/personal-leasing-is-this-the-car-rental-revolution

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Flexible sole use (flexible access to sole use vehicles) – fractional sharing of sole use vehicles with other users. **Example(s):** New commercial models have been launched in the UK, Hiya Car[65]	N/a	N/a	N/a	May impact some rail trips if those who don't have access to a vehicle or need a car 100% of the time switch to having access. **2030: Norm**	May result in more / varied trips as new, previous public transport dependent users have access to vehicles. **2030: Norm**	May result in more / varied trips as new, previous public transport dependent users have access to vehicles. **2030: Norm**	N/a	N/a	May impact cycle usage as new options to access vehicles for occasional use. **2030: Norm**	**R:** Personal safety and security **D:** Wide scale commercialisation from exiting pilots **D:** Social need / acceptance **D:** Underlying communications networks
	Shared access (community or restricted group access) - to a fleet of vehicles for flexible use through group membership at corporate, club or community level. **Example(s):** Micro sharing model, Audi Unite in Sweden[66]	N/a	N/a	N/a	May impact some rail trips if those who don't have access to a vehicle or need a car 100% of the time switch to having access. **2030: Wide scale**	May impact some trips if those who presently don't have access to a vehicle or need a car 100% of the time switch to having access. **2030: Wide scale**	May impact some trips if those who don't have access to a vehicle or need a car 100% of the time switch to having access. **2030: Wide scale**	May impact some trips if those who don't have access to a vehicle or need a car 100% of the time switch to having access. **2030: Wide scale**	N/a	May impact cycle usage as new options to access vehicles for occasional use. **2030: Wide scale**	**R:** Personal safety and security **R:** Applicability to low density populations **D:** Commercialisation of operational models

[65] Hiya Car 'Rent a car from someone local': https://www.hiyacar.co.uk/

[66] Audi Unite, 'Join a circle. Share an Audi': https://www.audiunite.com/se/service/en_unite.html

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– preparing for a changing landscape

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Lift sharing (sharing of sole use vehicle) - **m**atching of available rides and potential users across modes. **Example(s):** Numerous commercial lift sharing platforms exist, Lift Share UK[67]	N/a	N/a	N/a	May impact some rail trips if those who don't have access to a vehicle or need a car 100% of the time switch to having access. **2030: Norm**	May reduce overall trips to certain destinations / key centres **2030: Norm**	May impact traditional bus operations if widespread sharing is available. New service models may emerge. **2030: Norm**	May impact traditional taxi operations if widespread sharing is available. New service models may emerge. **2030: Norm**	Could benefit education and social care transport for some customers and reduce single trips. **2030: Norm**	May impact some cycle commuter trips. **2030: Norm**	**R:** Personal safety and security **R:** Applicability to low density populations **D:** Social need / acceptance
	Ride sharing (shared use of fleet vehicles) - **o**n demand vehicles which respond to planned and real time customer demand. **Example(s):** A number of ride sharing platforms are in service, Slide, Bristol[68]	N/a	N/a	N/a	Potential impact on short distance rail trips in urban areas. **2030 Emerging**	May be a major disruptor to private car use in urban areas. **2030: Emerging**	May be a major disruptor to traditional bus use in urban areas but could be the evolution of urban bus / taxi travel. Could result in more buses / trips. **2030: Emerging**	May be a major disruptor to traditional bus use in urban areas but could be the evolution of urban bus / taxi travel. Could result in more buses / trips. **2030: Emerging**	May provide significant benefits for social transport delivering improved user experience. May increase overall number of trips. **2030: Emerging**	May impact some cycle commuter trips. **2030: Norm**	**R:** Personal safety and security **R:** Applicability to low density populations **D:** Commercialisation of operations **D:** Business case **D:** Underlying communications networks

[67] Lift Share, 'Let's travel together': https://liftshare.com/uk

[68] Slide, 'A better ride to work': http://www.slidebristol.com/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Mobility as a Service - on account payment for transport services irrespective of mode, provision of real and predictive travel information to manage supply and demand, seamless integration between all modes, cash, ticket free. **Example(s):** MaaS models and applications are in development, Finland[69] Whim app West Midlands, UK[70]	N/a	N/a	N/a	Seamless travel information, choice, ticketing and payment may increase public transport usage. **2030: Emerging in urban areas**	Seamless travel information, choice, ticketing and payment may increase public transport usage thus reducing private car use. **2030: Emerging in urban areas**	Seamless travel information, choice, ticketing and payment may increase public transport usage. **2030: Emerging in urban areas**	Seamless travel information, choice, ticketing and payment may increase public transport usage. **2030: Emerging in urban areas**	N/a	Seamless travel information, choice, ticketing and payment may encourage cycle hire scheme use where they exist. **2030: Emerging in urban areas**	**R:** Perceptions around use of personal data **D:** Behavioural change of existing users **D:** Co-operation of all operators / service providers / data providers **D:** Underlying communications networks

[69] ITS Finland, 'Mobility as a Service': http://www.its-finland.fi/index.php/en/palvelut/mobility-as-a-service.html

[70] 'Whim app is live, West Midlands UK': http://maas.global/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Freight aggregation – of movements, particularly last mile / first. **Example(s):** The LiMoLo project illustrated different last mile delivery models in the UK and Europe[71] Ongoing changes in the express logistics market are changing traditional distribution models[72]	Load aggregation already occurring in trunk haulage. **2030: Norm**	Local aggregation of trips from centres, and aggregation of drop offs to hubs may significantly reduce numbers local trips. **2030: Emerging**	Load aggregation already occurring in trunk haulage. **2030: Norm**	N/a	N/a	N/a	N/a	N/a	N/a	**R:** Security in transit **D:** Change to existing commercial distribution networks **D:** Construction of aggregation facilities

[71] 'UK cities can adopt viable last-mile delivery schemes for no cost by tapping into existing research': http://freightinthecity.com/2015/07/uk-cities-can-adopt-viable-last-mile-delivery-schemes-for-no-cost-by-tapping-into-existing-research/#JwtzA7pWQkuQAAH2.99

[72] KPMG, Transport Tracker, Feb/Mar 2016, : https://assets.kpmg.com/content/dam/kpmg/pdf/2016/03/kpmg-transport-tracker.pdf

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Shared 'last mile' delivery - development of multi-purpose public transport / delivery vehicles which undertake similar last mile / first mile functions. **Example(s):** Academic work has considered the opportunities for shared last mile[73]	N/a	May disrupt traditional 'van' based delivery systems with new shared (inc. autonomous) delivery solutions **2030: Emerging in urban areas**	N/a	N/a	N/a	May disrupt traditional bus solutions with new shared (inc. autonomous) solutions **2030: Emerging in urban areas**	May disrupt traditional taxi solutions with new shared (inc. autonomous) solutions **2030: Emerging in urban areas**	N/a	N/a	**R:** Public acceptance **R:** Safety and security **D:** Development of technology **D:** Commercialisation of operational models **D:** Underlying communications networks
	'Hub' working / 'hot' offices, sharing of space - creation and use of shared office / working facilities in accessible locations. **Example(s):** There are increasing trends in homeworking in the UK[74]	N/a	N/a	N/a	May reduce commuting into traditional centres. **2030: Emerging**	May reduce commuting into traditional centres. **2030: Emerging**	May reduce commuting into traditional centres. **2030: Emerging**	May reduce commuting into traditional centres. **2030: Emerging**	N/a	May reduce commuting into traditional centres but encourage shorter trips to new centres **2030: Emerging**	**D:** Commercial case **D:** Availability of appropriately sited land **D:** Connectivity, digital and transport

[73] 'Exploring Last Mile Synergies in Passenger and Freight Transport', Niklas Arvidsson, Moshe Givoni & Johan Woxenius, Univeristy of Gothenberg, 2016: http://www.gu.se/english/research/publication/?publicationId=248299

[74] People management: 'Number of staff working from home passes 1.5 million', May 2016: http://www2.cipd.co.uk/pm/peoplemanagement/b/weblog/archive/2016/05/20/number-of-staff-working-from-home-passes-1-5-million.aspx

EITS Transportation glide path from 2030 to 2040

– capitalising on technology and new service models

Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
Digital connectivity – *movement of information between people, other people places and assets*	'Wireless' digital connectivity between vehicles, people and infrastructure to facilitate 'always on' connectivity. **Example(s):** Connected car developments worldwide[75] Train wi-fi upgrade on GEML in Anglia[76]	Most HGV fleets expected to be fully connected. HGV platooning on key corridors may be a commercial reality subject to business needs and benefits. **2040: Norm**	Local distribution models expected to be disrupted through digital connectivity with advances in trip consolidation. Consumer demand may continue to rise but some trips could be automated. **2040: Norm**	Digital signalling expected to be implemented on a few key routes. If this included the GEML there would be benefits in available capacity to allow an enhancement of available paths for freight digital routes. **2040: Wide scale**	Digital signalling expected to be implemented on a few key routes. If this include the GEML there would be significant benefits in available capacity to allow an enhancement of service frequency. Wireless connectivity for passengers expected to be the norm. **2040: Wide scale**	Data sharing between cars and networks to improve safety, network management and user experience will be commonplace on key corridors. **2040: Wide scale**	Digital connectivity of vehicles will be commonplace delivering service, security and management benefits. Wireless connectivity for customers will be commonplace where underlying networks permit. Connectivity of vehicles and customers will provide basis of demand responsive service options. **2040: Norm**	Taxi industry will have evolved to capitalise on digital technology to match rides and customers, including ride sharing options. Easier access by customers may lead to increased use in urban areas. **2040: Norm**	Digital connectivity will be delivering benefits to social transport as part of the wider evolution and blurring of bus and taxi based solutions. Supply and demand will be able to be balanced more efficiently using a blend of solutions to deliver improved services. **2040: Wide scale**	'Quantified self' type solutions (data and health tracking) will be the norm as part of an active lifestyle. Additional improvements may be realised for vulnerable road users due to the sharing of connected vehicle data. **2040: Norm**	**R:** Connected capabilities of existing transportation assets **R:** Reliability of systems for safety critical applications. **R:** Rate of roll-out of subsequent generations of connectivity in rural locations. **D:** Telecom provider's priorities **D:** Applicability / availability of public sector support for more remote areas **D:** Rate of technological change and adoption. **D:** Business case for investment in digital signalling.

[75] KPMG Global Automotive Executive Survey 2017, https://home.kpmg.com/xx/en/home/insights/2017/01/global-automotive-executive-survey-2017.html

[76] Abellio Greater Anglia franchise improvements, https://www.abellio.com/news/abellio-confirmed-new-east-anglia-franchise-operator-department-transport

EITS Transportation glide path from 2030 to 2040

– capitalising on technology and new service models

Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Fixed “Super fast” 30Mbps / “Ultra fast” 300Mpbs connectivity between homes, business and centres of activity to provide ‘digital utility’. **Example(s):** BT, Virgin and other service provider ‘broadband’ roll-outs[77]	N/a	N/a	N/a	Hub and home working will be a realistic option for most people. **2040: Norm**	Reliable high speed internet will provide for more immersive online retail experiences. However retail experience still expected to be important. Home and hub working may reduce some private car trips. **2040: Norm**	Hub and home working will be a realistic option for most people. **2040: Norm**	Hub and home working will be a realistic option for most people. **2040: Norm**	N/a	N/a	**R:** Rate of roll-out of ever faster connectivity, particularly in rural areas. **D:** Provision of fixed fibre optic broadband and / or high speed wireless connectivity **D:** Investment priorities particularly in rural areas **D:** Availability of public sector support for more remote areas
	‘Wireless’ digital connectivity of assets to networks, Internet of Things (IoT) to improve performance of systems and networks. **Example(s):** Internet of Things, Smart Transportation[78]	Connected asset solutions expected to be the norm on key corridors where upgraded infrastructure has been implemented delivering network resilience, operational and customer benefits. **2040: Wide scale**	Connected asset solutions expected to be the norm on key corridors and in urban centres where upgraded infrastructure has been implemented delivering network resilience, operational and customer benefits. **2040: Wide scale**	Digital signalling and wider connectivity of assets is expected to improve network resilience and reliability resulting in reduce delays in improved journey time certainty. **2040: Wide scale**	Digital signalling and wider connectivity of assets is expected to improve network resilience and reliability resulting in reduce delays in improved journey time certainty. **2040: Wide scale**	Connected asset solutions expected to be the norm on key corridors and in urban centres where upgraded infrastructure has been implemented delivering network resilience, operational and customer benefits. **2040: Wide scale**	Connected asset solutions expected to be the norm on key corridors and in urban centres where upgraded infrastructure has been implemented delivering network resilience, operational and customer benefits. **2040: Wide scale**	Connected asset solutions expected to be the norm on key corridors and in urban centres where upgraded infrastructure has been implemented delivering network resilience, operational and customer benefits. **2040: Wide scale**	Connected asset solutions expected to be the norm on key corridors and in urban centres where upgraded infrastructure has been implemented delivering network resilience, operational and customer benefits. **2040: Wide scale**	Connected asset solution may improve safety for vulnerable road users depending upon development of appropriate solutions. **2040 Emerging**	**R:** Cyber security risk to personal information and physical security of assets. **D:** Dependent upon underlying communications networks. **D:** Function of product development and the miniaturisation of devices.

[77] Ofcom, ‘Connected Nations 2016’: https://www.ofcom.org.uk/research-and-data/infrastructure-research/connected-nations-2016

[78] Intel, ‘Internet of Things (IoT), Smart Transportation’: http://www.intel.co.uk/content/www/uk/en/internet-of-things/smart-transportation-solutions.html

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Digital connectivity, facilitating the monitoring of wellbeing / health at a personal and social level. **Example(s):** Technology enabled care services[79]	N/a	Digitalisation of the healthcare supply chain may reduce the need for patient trips, optimise consumables and associated deliveries. This may result in a dispersal of delivery trips. **2040: Wide scale**	N/a	N/a	Digital connectivity expected to be contributing to a reduction non-essential healthcare journeys via pre-emptive monitoring. **2040: Wide scale**	Digital connectivity expected to be contributing to a reduction non-essential healthcare journeys via pre-emptive monitoring. **2040: Wide scale**	Digital connectivity expected to be contributing to a reduction non-essential healthcare journeys via pre-emptive monitoring. **2040: Wide scale**	Digital connectivity expected to be contributing to a reduction non-essential healthcare journeys via pre-emptive monitoring. **2040: Wide scale**	Digital healthcare may increase cycling and walking trips for some groups as part of an active lifestyle **2040: Wide scale**	**R:** Personal security and wellbeing **D:** Dependent upon underlying communications networks.
Artificial Intelligence (AI) and cognitive thinking – *the application of self-learning systems*	Optimising customer travel planning (need, time, cost, quality) through the aggregation, processing and dissemination of data. **Example(s):** National Rail enquiries[80] Traveline[81]	N/a	N/a	N/a	Data driven services for rail passengers will be the norm with the ability to plan journeys, purchase tickets and get travel information on the move will be the norm. It will help network operators balance supply and demand. **2040: Norm**	Personal travel planning solutions will be the norm allowing private car users to optimise their trip making decisions with some handled by AI. **2040: Norm**	Data driven services for bus passengers will be the norm with the ability to plan journeys, purchase tickets and get travel information on the move will be the norm. It will help network operators balance supply and demand. **2040: Norm**	Data solutions of shared transport solutions will be the norm matching available vehicles to passenger trips either shared or sole use. **2040: Norm**	Data will provide for improvements in the management of supply and demand for services resulting in new service models and customer solutions **2040: Wide scale**	Data driven travel planning solutions may help cyclists in particular to plan their journeys to use less congested routes or to avoid accident hot spots. **2040: Emerging**	**R:** Personal security and wellbeing **R:** Willingness of customers / users to share movement and habitual data. **R:** Optimisation of algorithms and underlying assumptions **D:** Dependent upon underlying communications networks.

[79] Deloitte, 'Connected Health 2015': https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/life-sciences-health-care/deloitte-uk-connected-health.pdf

[80] National Rail enquiries: http://www.nationalrail.co.uk/

[81] Traveline: http://www.traveline.info/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Optimisation / management of transport supply and demand (networks, fleets and services) through the use and application of movement and network data. **Example(s):** Haulage Exchange in the UK[82]	Optimisation of fleet availability, trip needs and customer expectations will provide for just in time delivery for most freight movements. **2040: Norm**	Significant rationalisation of last mile deliveries (and first mile pick-ups) will have occurred through data, algorithms and technology resulting in better customer experience with wider range of solutions. **2040: Norm**	Improves service and network reliability and customer expectations. **2040: Norm**	Improves service and network reliability and customer expectations. **2040: Norm**	Real and predictive management of network capacity will provide for improved trip planning, in journey experience resulting in improved journey time reliability. **2040: Norm**	Demand responsive, meshed, shared transport solutions supplementing traditional linear bus routes will be the norm in key centres. **2040: Wide scale**	Demand responsive, meshed, shared transport solutions will be the norm in key centres. **2040: Wide scale**	Improved demand responsive solutions for social transport will deliver operational benefits and improved customer experience. **2040: Emerging**	In urban areas, commercial bike hire (including e-bike) will have a role to play in meeting short trip or multi modal trip demands. **2040: Norm**	**R:** Reliability and resilience of underlying data. **R:** Optimisation of algorithms and underlying assumptions **R:** Willingness of customers / users to share movement and habitual data. **D:** Dependent upon underlying communications networks. **D:** Availability of fleet and network performance data. **D:** Commercial models particularly for rural networks
	Enhancement of network resilience, safety and environment through active network management using predictive and real-time monitoring. **Example(s):** National Traffic Information System, England[83]	Predictive and real time monitoring will be the norm for the SRN / KRN improving network resilience, management and optimisation o supply and demand. **2040: Norm**	Predictive and real time monitoring will be the norm for the SRN / KRN and some key centres improving network resilience, management and optimisation of supply and demand. **2040: Wide scale**	Performance enhancements being realised through digital signalling where implemented. **2040: Emerging**	Performance enhancements being realised through digital signalling where implemented. **2040: Emerging**	Predictive and real time monitoring will be the norm for the SRN / KRN and some key centres improving network resilience, management and optimisation of supply and demand. **2040: Wide scale**	Predictive and real time monitoring will be the norm for the SRN / KRN and some key centres improving network resilience, management and optimisation of supply and demand. **2040: Wide scale**	Predictive and real time monitoring will be the norm for the SRN / KRN and some key centres improving network resilience, management and optimisation of supply and demand. **2040: Wide scale**	Predictive and real time monitoring will be the norm for the SRN / KRN and some key centres improving network resilience, management and optimisation of supply and demand. **2040: Wide scale**	Predictive and real time monitoring will be the norm for the SRN / KRN and some key centres improving network resilience, management and optimisation of supply and demand. **2040: Wide scale**	**R:** Data security **D:** Dependent upon underlying communications networks. **D:** Availability of network performance, incident data. **D:** Commercial models particularly for rural networks

[82] Haulage Exchange: https://haulageexchange.co.uk/

[83] National Traffic Information Service, Mouchel Ltd. case study: http://www.mouchel.com/sectors-and-services/managing-national-traffic

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Personal prediction / monitoring of wellbeing and healthcare at a personal and social level. **Example(s):** Technology enabled care services[84] Availability of 'quantified self' fitness and other products[85]	N/a	N/a	N/a	N/a	Application of personal healthcare technology may reduce some short distance trips that could be taken by slow modes as part of a more active lifestyle. **2040: Wide scale**	Application of personal healthcare technology may reduce some short distance trips that could be taken by slow modes as part of a more active lifestyle. **2040: Wide scale**	Application of personal healthcare technology may reduce some short distance trips that could be taken by slow modes as part of a more active lifestyle. **2040: Wide scale**	Monitoring of personal healthcare may prevent unnecessary planned / emergency trips through other interventions. **2040: Wide scale**	Encourages use of active modes through active, connected lifestyle. **2040: Norm**	**R:** Willingness of users to share healthcare data with 3rd parties **D:** Development and application of scalable technology **D:** Dependent upon underlying communications networks.
Automation and robotics – *the replacement of human decision making and control with technology*	Autonomous personal vehicles (road based modes) single occupancy **Example(s):** Self-driving pods in Milton Keynes[86]	N/a	N/a	N/a	Impact is n/a but technology could potentially impact rail passenger trips through shift to this new mode, technology commercially available. **2040: Emerging**	Private car may develop into the personal car and result in increased trips if vehicles aren't shared, technology commercially available. **2040: Emerging**	Personal AVs may impact traditional, linear bus use in some areas. **2040: Emerging**	Personal AVs will impact taxi sector in some geographies. New service models emerging through AVs. **2040: Emerging**	Access to personal AVs may be impact traditional social needs transport uses. New service models may be emerging **2040: Emerging**	Access to personal AVs may impact local walking / cycling commuting / utility trips. **2040: Emerging**	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality

[84] Deloitte, 'Connected Health 2015': https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/life-sciences-health-care/deloitte-uk-connected-health.pdf

[85] Wikipedia, 'Quantified Self': https://en.wikipedia.org/wiki/Quantified_Self

[86] Transport Systems Catapult, Self driving pods, Milton Keynes: https://ts.catapult.org.uk/current-projects/self-driving-pods/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous personal vehicles (air based modes) single occupancy **Example(s):** Personal autonomous drone development[87]	N/a	N/a	N/a	May impact some rail trips in certain circumstances. **2040: Emerging**	Personal air based AV could impact some private car trips. **2040: Emerging**	Personal air based AVs may impact traditional, linear bus use, but given user base and costs, impacts will be small **2040: Emerging**	Personal air based AVs may impact traditional, linear taxi use, but given user base and costs, impacts will be small **2040: Emerging**	N/a	Access to personal air AVs may impact local walking / cycling commuting / utility trips, but given user base and costs, impacts will be small **2040: Emerging**	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality **D:** Applicability to rural networks
	Autonomous shared vehicles (road based modes) 'car' type solutions **Example(s):** Development of autonomous cars technology around the world[88]	N/a	N/a	N/a	Access to shared 'car' type AVs may impact rail travel for some users. Solutions expected to be commercially available. **2040: Wide scale**	Access to shared 'car' type AVs may impact traditional car use for some users. Solutions expected to be commercially available. **2040: Wide scale**	Access to shared 'car' type AVs may marginally decrease trips due to shift from 'public' modes. **2040: Wide scale**	Access to shared 'car' type AVs may marginally decrease trips due to shift from 'public' modes. **2040: Wide scale**	N/a	Access to shared 'car' type AVs may marginally decrease trips due to shift from 'public' modes. **2040: Wide scale**	**R:** Safety and security **R:** Public perception **D:** Development and availability and technology uptake **D:** Dependent upon underlying communications networks **D:** Applicability to rural networks **D:** Cost to consumers

[87] PC World, 'Ehang 184 personal drone is ready to fly': http://www.pcworld.com/article/3155344/consumer-electronics/the-ehang-184-personal-drone-is-ready-to-fly.html

[88] SMMT, 'Connected and Autonomous Vehicles: the UK Opportunity 2015': https://www.smmt.co.uk/wp-content/uploads/sites/2/Connected-and-Autonomous-Vehicles-%E2%80%93-The-UK-Economic-Opportu....pdf

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous shared vehicles (road based modes) multiple occupancy solutions **Example(s):** Self-driving taxis in Singapore[89]	N/a	Shared AV solutions which provide last mile delivery solutions as well as multiple occupancy may impact traditional last mile deliveries. **2040 Developing**	N/a	Shared AV solutions and services may impact rail use for short distance, particularly urban trips. Commercial service model expected to be emerging in key centres. **2040: Emerging**	Shared AV solutions may impact uptake and use of 2+ cars, may impact some single occupancy trips. Commercial service model expected to be emerging in key centres. **2040: Emerging**	Shared AV service solutions are expected to be disrupting traditional, linear bus services enabling on demand, flexible solutions. Commercial service model expected to be emerging in key centres. **2040: Emerging**	Shared AV service solutions are expected to be leading to a blurring between traditional bus / taxi services. Commercial service model expected to be emerging in key centres. **2040: Emerging**	Shared AV service solutions are expected to be leading to a blurring between traditional bus / taxi services. Commercial service model expected to be emerging in key centres. **2040: Emerging**	Access to shared AV solutions may impact local walking / cycling commuting / utility trips **2040: Emerging**	**R:** Safety and security **R:** Public perception **D:** Development and availability and technology uptake **D:** Dependent upon underlying communications networks. **D:** Development of commercial models **D:** Applicability to rural networks **D:** Cost to consumers **D:** Legislative framework for autonomous vehicles

[89] Guardian, 'Self-driving taxis roll-out in Singapore', Aug 2016: https://www.theguardian.com/technology/2016/aug/24/self-driving-taxis-roll-out-in-singapore-beating-uber-to-it

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Autonomous vehicles (rail based modes) **Example(s):** Development of driverless trains in Germany[90]	Autonomous trains may impact long distance road market through service and operator efficiencies. Service solutions expected for some key flows. **2040: Emerging**	N/a	Autonomous trains could result in service / performance efficiencies and result in more traffic. Service solutions expected for some key flows. **2040: Emerging**	Autonomous trains could result in service / performance efficiencies and result in more traffic. Service solutions expected for some key flows. **2040: Emerging**	N/a	N/a	N/a	N/a	`N/a	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality **D:** Industry acceptance **D:** Legislative framework for autonomous vehicles
	Autonomous shared vehicles (air based modes) **Example(s):** Multiple occupancy, high payload, autonomous aircraft development in Israel[91]	N/a	N/a	N/a	May impact some rail trips in certain circumstances. **2040: Emerging**	Shared air based AV could impact some private car trips. **2040: Emerging**	Shared AVs may impact traditional, linear bus use. **2040: Emerging**	Shared AVs may impact taxi sector in some geographies. **2040: Emerging**	Shared AVs could deliver significant improvements for emergency services. **2040: Emerging**	N/a	**R:** Safety and security **R:** Public perception **D:** Development and availability and access to technology **D:** Dependent upon underlying communications networks. **D:** Commercial reality **D:** Legislative framework for autonomous vehicles

[90] Popular Science, 'Germany may have driverless trains by 2023', June 2016: http://www.popsci.com/germany-may-have-driverless-trains-by-2023

[91] Reuters, 'Autonomous aircraft that goes where no helicopter dares', Jan 2017: http://www.reuters.com/video/2017/01/03/autonomous-aircraft-that-goes-where-no-h?videoId=370843747

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	Autonomous trunk haul freight (road based modes) **Example(s):** Self-driving truck deliveries in the USA[92]	Platooning and other autonomous solutions could be delivering efficiencies for trunk haul road freight and result in shifting of trip patterns. Service solutions expected for some key flows where commercial benefits can be realised. **2040: Wide scale**	N/a	AV technology to develop 'road train' type solutions may be impacting longer distance rail use in some cases. Service solutions expected for some key flows where commercial benefits can be realised. **2040: Wide scale**	N/a	N/a	N/a	N/a	N/a	N/a	**R:** Safety and security **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Industry acceptance **D:** Commercial business case **D:** Legislative framework for autonomous vehicles
	Autonomous delivery vehicles (road based modes) **Example(s):** Local delivery robots for last mile deliveries in London[93]	N/a	AV first mile / last mile deliveries will be impacting the use of LGV and private car/van for local distribution. Particularly for low value goods, delivered locally **2040:Wide scale**	N/a	N/a	AV first mile / last mile deliveries will be impacting the use of LGV and private car/van for local distribution. Particularly for low value goods, delivered locally **2040:Wide scale**	AV delivery solutions may be integrated with on-demand shared services. **2040: Emerging**	AV delivery solutions may be integrated with on-demand shared services. **2040: Emerging**	N/a	AV delivery solutions will impact the use of human powered delivery (walking and cycling based solutions). **2040: Emerging**	**R:** Safety and security including deliveries **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Commercial business case **D:** Legislative framework for autonomous vehicles

[92] Wired, 'Uber's self-driving truck makes its first delivery', Oct. 2016: https://www.wired.com/2016/10/ubers-self-driving-truck-makes-first-delivery-50000-beers/

[93] The Engineer, 'Autonomous delivery robots hit London', July 2016: https://www.theengineer.co.uk/autonomous-delivery-robots-hit-london/

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	Autonomous delivery vehicles (air based modes) 'drones' **Example(s):** Unmanned aerial vehicle test delivery in Cambridgeshire[94]	N/a	Drone based deliveries will provide first mile / last mile distribution for certain consumables / products in certain areas **2040: Emerging**	N/a	N/a	Drone based deliveries will provide first mile / last mile distribution for certain consumables / products in certain areas **2040: Emerging**	N/a	N/a	N/a	N/a	**R:** Safety and security including deliveries **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Commercial business case **D:** Legislative framework for autonomous vehicles
	Robotic maintenance of assets **Example(s):** National Centre for Robotics, UK is examining applications[95]	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved road network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved road network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved rail network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved rail network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved road network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved road network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved road network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved road network resilience. **2040: Emerging**	Applications will reduce the need for humans in hazardous, undesirable environments and facilitate improved road network resilience. **2040: Emerging**	**R:** Security of assets **D:** Development and availability of technology in transportation sector **D:** Commercial business case

[94] The Telegraph, 'Amazon makes first drone delivery to house in Cambridge', Dec 2016: http://www.telegraph.co.uk/technology/2016/12/14/amazon-makes-first-drone-delivery-house-cambridge/

[95] Leeds University, 'National facility for innovative robotics opens', Oct 2015: https://www.leeds.ac.uk/news/article/3611/national_facility_for_innovative_robotics_opens

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Automation of agricultural processes **Example(s):** Autonomous tractor development and trial in the UK[96]	Automation will be impacting methods of agricultural production and subsequent distribution chains in certain areas, for certain crops. **2040: Wide scale**	Automation will be impacting methods of agricultural production and subsequent distribution chains in certain areas, for certain crops. **2040: Wide scale**	N/a	N/a	Automation will be impacting methods of agricultural production and subsequent use of human resource in certain areas, for certain crops. therefore less travel to site. **2040: Wide scale**	N/a	N/a	N/a	N/a	**R:** Safety and security including deliveries **D:** Development and availability of technology **D;** Dependent in part on underlying communications networks **D:** Commercial business case **D:** Legislative framework for autonomous vehicles
Propulsion and energy – *the decarbonisation of energy consumption*	Petrol / diesel / hybrid propulsion (all modes) - move away from oil derived fuels for vehicle propulsion to hybrid solutions **Example(s):** Developments in vehicle propulsion around the world[97]	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	Shift away from petrol / oil to viable propulsion alternatives will have delivered positive environmental impacts **2040: Norm**	N/a	**D:** Cost of technology and consumer uptake

[96] BBC, 'In the future, will farming be fully automated?', Nov 2016: http://www.bbc.co.uk/news/business-38089984

[97] KPMG Global Automotive Executive Survey 2017: https://home.kpmg.com/xx/en/home/insights/2017/01/global-automotive-executive-survey-2017.html

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	Hydrogen propulsion (all modes) move from oil derived fuels to hydrogen propulsion. **Example(s):** Developments in hydrogen fuel cell technology[98]	Hydrogen propulsion will be applicable for some service solutions **2040: Wide scale**	Hydrogen propulsion will be applicable for some service solutions **2040: Wide scale**	Hydrogen propulsion will be applicable for some service solutions **2040: Wide scale**	Hydrogen propulsion will be applicable for some service solutions **2040: Wide scale**	Hydrogen propulsion will be available for some vehicle types. **2040: Wide scale**	Hydrogen propulsion will be available for some vehicle types. **2040: Wide scale**	Hydrogen propulsion will be available for some vehicle types. **2040: Wide scale**	Hydrogen propulsion will be available for some vehicle types. **2040: Wide scale**	Hydrogen powered bikes may be part of some cycle hire solutions. **2040: Emerging**	**R:** Safety and security of distribution / storage chains **D:** Cost of technology and consumer uptake **D:** Changing in service infrastructure from petrol/diesel to hydrogen **D:** Distribution and storage solutions
	Electric propulsion (all modes) **–** application of electric propulsion systems in all modes, battery electric or electrified systems. **Example(s):** Longer range electric cars[99] Independent electric multiple units (trains) in Essex[100]	Electric propulsion will be applicable for some service solutions **2040: Wide scale**	Electric propulsion will be applicable for some service solutions **2040: Wide scale**	Electrification of the railway will continue (wired or battery) and cover more lines **2040: Wide scale**	Electrification of the railway will continue (wired or battery) and cover more lines **2040: Wide scale**	Electric propulsion will be the norm for new vehicles. May reduce fuel costs and increase trips. **2040: Wide scale**	Electric propulsion will be available for some vehicle types. **2040: Wide scale**	Electric propulsion will be available for some vehicle types. **2040: Wide scale**	Electric propulsion will be available for some vehicle types. **2040: Wide scale**	**E-bikes will be common and enable wider cycling usage for shorter trips** **2040: Norm**	**D:** Development and applicability of technology **D:** Commercial case

[98] Toyota Mirai, hydrogen car: https://www.toyota.co.uk/new-cars/new-mirai/landing#

[99] Tesla cars: https://www.tesla.com/

[100] RalwayTechnology.com, 'Independently Powered Electric Multiple-Unit (IPEMU), Essex': http://www.railway-technology.com/projects/independently-powered-electric-multiple-unit-ipemu-essex/

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Inert propulsion (all modes) - development of inert propulsion systems (such as compressed air) to provide alternative drive train solutions. **Example(s):** Development of air powered cars in the USA[101]	N/a	N/a	N/a	N/a	May have applications for low, load personal travel. **2040: Emerging**	N/a	May have applications for low, load personal travel. **2040: Emerging**	N/a	N/a	**D:** Technology in early infancy and yet to be proven
Materials science and technology – *Use of new materials and systems to manage develop and make best use of assets.*	Self-healing technologies - within transportation and other infrastructure to reduce the need for unplanned maintenance interventions. **Example(s):** Self-healing pavements (highways)[102]	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. May reduce trips associated with maintenance of assets. Applications expected to be viable. **2040: Wide scale**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. May reduce trips associated with maintenance of assets. Applications expected to be viable. **2040: Wide scale**	N/a	N/a	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. Applications expected to be viable. **2040: Wide scale**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. Applications expected to be viable. **2040: Wide scale**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. Applications expected to be viable. **2040: Wide scale**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. Applications expected to be viable. **2040: Wide scale**	Improves the network resilience and reliability of highway networks through application of self-healing surfacing. Applications expected to be viable. **2040: Wide scale**	**D:** Rate of development of technology **D:** Commercial application and business case

[101] AIRPod 2.0 Compressed Air-Powered Car: http://zeropollutionmotors.us/

[102] 'Self-Healing Technology for Asphalt Pavements', Amir Tabakovic & Erik Schlangen, Nov 2015: https://www.researchgate.net/publication/292986082_Self-Healing_Technology_for_Asphalt_Pavements

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Use of lightweight technologies in industry and transportation applications. **Example(s):** Development of nano technology applications in transportation[103]	Lighter vehicles will reduce impact on highway infrastructure and deliver fuel efficiency. **2040: Wide scale**	Lighter vehicles will reduce impact on highway infrastructure and deliver fuel efficiency. **2040: Wide scale**	Lighter vehicles will reduce impact on rail infrastructure and deliver fuel efficiency. **2040: Wide scale**	Lighter vehicles will reduce impact on rail infrastructure and deliver fuel efficiency. **2040: Wide scale**	Lighter vehicles will reduce impact on highway infrastructure and deliver fuel efficiency. **2040: Wide scale**	Lighter vehicles will reduce impact on highway infrastructure and deliver fuel efficiency. **2040: Wide scale**	Lighter vehicles will reduce impact on highway infrastructure and deliver fuel efficiency. **2040: Wide scale**	Lighter vehicles will reduce impact on highway infrastructure and deliver fuel efficiency. **2040: Wide scale**	N/a	**R:** Rate of adoption in transportation industry and wider industrial application **D:** Industrial development and cost effectiveness
Additive / on demand manufacturing (inc. 3D printing) – on-demand *production of products or components and dis-integration of traditional production using advanced printed manufacturing techniques*	Home printing / production of products - to produce mundane, small scale consumables for use around the home. **Example(s):** 3D printers are becoming cheaper and more readily available for home users[104]	Will reduce the need to transport small utility items that can be produced closer to the point of use / consumption **2040: Wide scale**	Will reduce the need to transport small utility items that can be produced closer to the point of use / consumption **2040: Wide scale**	Will reduce the need to transport small utility items that can be produced closer to the point of use / consumption **2040: Wide scale**	N/a	Will reduce the need to transport small utility items that can be produced closer to the point of use / consumption **2040: Wide scale**	Will reduce the need to transport small utility items that can be produced closer to the point of use / consumption **2040: Wide scale**	Will reduce the need to transport small utility items that can be produced closer to the point of use / consumption **2040: Wide scale**	N/a	Will reduce the need to transport small utility items that can be produced closer to the point of use / consumption **2040: Wide scale**	**D:** Affordability of technology **D:** Ease of use for all **D:** Underlying communications networks for data files

[103] 'Nanotechnology in Transportation', Jeanne Nye, Andrew Greenberg, Ph.D. and Angela Jones, Ph.D., University of Wisconsin: http://ice.chem.wisc.edu/NanoDecisions/PDF/Transportation.pdf

[104] PC Mag, 'The Best 3D Printers of 2017': http://uk.pcmag.com/printer-reviews/36506/guide/the-best-3d-printers-of-2017

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Key to colours: Assessment of impact on trip patterns by mode	Significantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Community printing / production of components and products - use of 3D printing / production to produce scale consumables in greater quantities / sizes using shared, approaching industrial machines. **Example(s):** Commercial 3D printing services are becoming available worldwide[105]	Will reduce the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. **2040: Wide scale**	Will reduce the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. **2040: Wide scale**	Will reduce the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. **2040: Wide scale**	N/a	Will reduce the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2040: Wide scale**	Will reduce the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2040: Wide scale**	Will reduce the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2040: Wide scale**	N/a	Will reduce the need to transport small / medium sized utility items and small components that can be produced close to the point of consumption. But could increase local trips to printing hubs. **2040: Wide scale**	**D:** Availability of local hubs **D:** Cost and scalability of technology **D:** Ease of use for consumers **D:** Underlying communications networks for data files
	Industrial printing / production of components and products **-** to produce components and finished products on demand, closer to markets. **Example(s):** Commercial large scale 3D printers are becoming available[106]	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	N/a	Dis-integration of manufacturing chain may result in re-distribution of associated jobs. Will also result in changes to raw material distribution. **2040: Wide scale**	**D:** Commercialisation and scalability of technology **D:** Printing capabilities / complexity of outputs **D:** Availability of appropriate industrial scale premises **D:** Underlying communications networks for data files

[105] Wired, 'Bram de Zwart is ushering in a new historical era with mass 3D printing', Nov 2015: http://www.wired.co.uk/article/3d-hubs-bram-de-zwart

[106] HP, 'The 3D printer revolution starts now': http://www8.hp.com/uk/en/printers/3d-printers.html

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	3D printed food production - 'consumable' foods at the point of consumption. For example within the care sector, remote workers in hazardous environments. Allows for the conversion of bulk ingredients into food by small scale machine process. **Example(s):** 3D printing of food is in its infancy, but applications are being developed[107]	Localised food production is reducing associated distribution trips for some fund stuffs / applications. **2040: Emerging**	Localised food production is reducing associated distribution trips for some fund stuffs / applications. **2040: Emerging**	N/a	N/a	N/a	N/a	N/a	Localised food production is reducing associated distribution trips for some fund stuffs / applications. **2040: Emerging**	N/a	**R:** Food safety and security **D:** Public acceptability **D:** Commercial case **D:** Availability of technology
Collaborative consumption – *the sharing of services and assets*	Sole / family use transport **- e**xisting model of solely 'owned' / leased cars **Example(s):** Most vehicle manufacturers now offer lease options, some have no option to own[108]	N/a	N/a	N/a	N/a	The traditional model of private car use (sole 'ownership' is uncommon. Most new vehicles are leased, full time of fractional access. **2040: Norm**	N/a	N/a	N/a	N/a	**R:** Global financial performance **D:** Continued social models and perceptions of car access

[107] Popular Mechanics, 'Do We Really Want 3D-Printed Food?', Dec 2016: http://www.popularmechanics.com/home/food-drink/a24493/3d-printed-food/

[108] Auto Express, 'Personal leasing: is this the car rental revolution?', Jan 2016: http://www.autoexpress.co.uk/car-news/94171/personal-leasing-is-this-the-car-rental-revolution

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Flexible sole use (flexible access to sole use vehicles) – fractional sharing of sole use vehicles with other users. **Example(s):** New commercial models have been launched in the UK, Hiya Car[109]	N/a	N/a	N/a	Commercial service models widely accessible. Impacting some rail trips if those who don't have access to a vehicle or need a car 100% of the time switch to having access. **2040: Norm**	Commercial service models widely accessible. Resulting in more / varied trips as new, previous public transport dependent users now have access to vehicles. **2040: Norm**	Commercial service models widely accessible. Resulting in more / varied trips as new, previous public transport dependent users now have access to vehicles. **2040: Norm**	N/a	N/a	Commercial service models widely accessible. Impacting cycle usage as new options to access vehicles for occasional use. **2040: Norm**	**R:** Personal safety and security **D:** Wide scale commercialisation from exiting pilots **D:** Social need / acceptance **D:** Underlying communications networks
	Shared access (community or restricted group access) - to a fleet of vehicles for flexible use through group membership at corporate, club or community level. **Example(s):** Micro sharing model, Audi Unite in Sweden[110]	N/a	N/a	N/a	Commercial service models widely accessible. Impacting some rail trips due to switch to new service models. **2040: Norm**	Commercial service models widely accessible. Reduces the need to have access to a private car in the traditional sense. **2040: Norm**	Commercial service models widely accessible. Impacting traditional bus services due to switch to new service models. **2040: Norm**	Commercial service models widely accessible. Impacting traditional taxi services due to switch to new service models. **2040: Norm**	N/a	Commercial service models widely accessible. Impacting walking and cycling due to switch and ease of access to new service models. **2040: Norm**	**R:** Personal safety and security **R:** Applicability to low density populations **D:** Commercialisation of operational models

[109] Hiya Car 'Rent a car from someone local': https://www.hiyacar.co.uk/

[110] Audi Unite, 'Join a circle. Share an Audi': https://www.audiunite.com/se/service/en_unite.html

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Key to colours: *Assessment of impact on trip patterns by mode*	Signifcantly more	Slightly more	Neutral	Slightly less	Significantly less

Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Lift sharing (sharing of sole use vehicle) - **m**atching of available rides and potential users across modes. **Example(s):** Numerous commercial lift sharing platforms exist, Lift Share UK[111]	N/a	N/a	N/a	Impacting some rail trips if those who don't have access to a vehicle or need a car 100% of the time switch to having access. **2040: Norm**	May reduce overall trips to certain destinations / key centres **2040: Norm**	May impact traditional bus operations if widespread sharing is available. New service models may emerge. **2040: Norm**	Commercial service models widely accessible. Impacting traditional taxi operations as widespread sharing is available. **2040: Norm**	Benefitting education and social care transport for some customers and reducing single trips. **2040: Norm**	May impact some cycle commuter trips. **2040: Norm**	**R:** Personal safety and security **R:** Applicability to low density populations **D:** Social need / acceptance
	Ride sharing (shared use of fleet vehicles) - **o**n demand vehicles which respond to planned and real time customer demand. **Example(s):** A number of ride sharing platforms are in service, Slide, Bristol[112]	N/a	N/a	N/a	Some impact on short distance rail trips in urban areas. **2040: Norm**	Major disruptor / alternative to private car use in urban areas. **2040: Norm**	Major disruptor to traditional bus use in urban areas, enabling an evolution of urban bus / taxi travel. **2040: Norm**	Major disruptor to traditional bus use in urban areas, enabling an evolution of urban bus / taxi travel. **2040: Norm**	Major disruptor to traditional bus use in urban areas, enabling an evolution of urban bus / taxi travel. **2040: Norm**	Impact some walking / cycle commuter trips as users switch to new services. **2040: Norm**	**R:** Personal safety and security **R:** Applicability to low density populations **D:** Commercialisation of operations **D:** Business case **D:** Underlying communications networks

[111] Lift Share, 'Let's travel together': https://liftshare.com/uk

[112] Slide, 'A better ride to work': http://www.slidebristol.com/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Mobility as a Service - on account payment for transport services irrespective of mode, provision of real and predictive travel information to manage supply and demand, seamless integration between all modes, cash, ticket free. **Example(s):** MaaS models and applications are in development, Finland[113] Whim app West Midlands, UK[114]	N/a	N/a	N/a	Seamless travel information, choice, ticketing and payment may increase public transport usage. Commercially viable in urban areas. **2040: Wide scale**	Seamless travel information, choice, ticketing and payment may increase public transport usage thus reducing private car use. Commercially viable in urban areas. **2040: Wide scale**	Seamless travel information, choice, ticketing and payment may increase public transport usage. Commercially viable in urban areas. **2040: Wide scale**	Seamless travel information, choice, ticketing and payment may increase public transport usage. Commercially viable in urban areas. **2040: Wide scale**	N/a	Seamless travel information, choice, ticketing and payment may encourage cycle hire scheme use where they exist. Commercially viable in urban areas. **2040: Wide scale**	**R:** Perceptions around use of personal data **D:** Behavioural change of existing users **D:** Co-operation of all operators / service providers / data providers **D:** Underlying communications networks

[113] ITS Finland, 'Mobility as a Service': http://www.its-finland.fi/index.php/en/palvelut/mobility-as-a-service.html

[114] 'Whim app is live, West Midlands UK': http://maas.global/

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Freight aggregation – of movements, particularly last mile / first. **Example(s):** The LiMoLo project illustrated different last mile delivery models in the UK and Europe[115] Ongoing changes in the express logistics market are changing traditional distribution models[116]	Load aggregation already occurring in trunk haulage. **2040: Norm**	Local aggregation of trips from centres, and aggregation of drop offs to hubs at key centres / locations significantly reducing numbers local trips. **2040: Wide scale**	Load aggregation already occurring in trunk haulage. **2040: Norm**	N/a	N/a	N/a	N/a	N/a	N/a	**R:** Security in transit **D:** Change to existing commercial distribution networks **D:** Construction of aggregation facilities

[115] 'UK cities can adopt viable last-mile delivery schemes for no cost by tapping into existing research': http://freightinthecity.com/2015/07/uk-cities-can-adopt-viable-last-mile-delivery-schemes-for-no-cost-by-tapping-into-existing-research/#JwtzA7pWQkuQAAH2.99

[116] KPMG, Transport Tracker, Feb/Mar 2016, : https://assets.kpmg.com/content/dam/kpmg/pdf/2016/03/kpmg-transport-tracker.pdf

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Global technology trends	Transport / socio-economic disruptors	HGV distribution (trunk haul)	LGV distribution (local)	Rail freight	Rail passenger	Private car	Bus	Taxi	Social transport (health / education)	Walking / cycling	Risks (R) Dependencies (D)
	Shared 'last mile' delivery - development of multi-purpose public transport / delivery vehicles which undertake similar last mile / first mile functions. **Example(s):** Academic work has considered the opportunities for shared last mile[117]	N/a	Traditional 'van' based delivery systems augmented with new shared (inc. autonomous) delivery solutions **2040: Wide scale**	N/a	N/a	N/a	Traditional 'bus' as mode augmented with new shared (inc. autonomous) delivery solutions **2040: Wide scale**	Traditional 'taxi' as mode augmented with new shared (inc. autonomous) delivery solutions **2040: Wide scale**	N/a	N/a	**R:** Public acceptance **R:** Safety and security **D:** Development of technology **D:** Commercialisation of operational models **D:** Underlying communications networks
	'Hub' working / 'hot' offices, sharing of space - creation and use of shared office / working facilities in accessible locations. **Example(s):** There are increasing trends in homeworking in the UK[118]	N/a	N/a	N/a	Reducing the need to commute into traditional centres. **2040: Norm**	Reducing the need to commute into traditional centres. **2040: Norm**	Reducing the need to commute into traditional centres. **2040: Norm**	Reducing the need to commute into traditional centres. **2040: Norm**	N/a	Reducing the need to into traditional centres but encourage shorter trips to new centres **2040: Emerging**	**D:** Commercial case **D:** Availability of appropriately sited land **D:** Connectivity, digital and transport

[117] 'Exploring Last Mile Synergies in Passenger and Freight Transport', Niklas Arvidsson, Moshe Givoni & Johan Woxenius, Univeristy of Gothenberg, 2016: http://www.gu.se/english/research/publication/?publicationId=248299

[118] People management: 'Number of staff working from home passes 1.5 million', May 2016: http://www2.cipd.co.uk/pm/peoplemanagement/b/weblog/archive/2016/05/20/number-of-staff-working-from-home-passes-1-5-million.aspx

APPENDIX B – STRATEGY COMPONENTS

The following tables describe the strategy spatially (international, national, regional, local, rural and coastal) with individual components illustrated thematically (connectivity, capacity, reliability, resilience, agility, mobility and policy). Many strategy components are applicable across a number of spatial designations, as illustrated **(L = Local / Ru = Rural / C = Coastal)**

INTERNATIONAL - ACCESSING THE WORLD FROM THE EAST

International access is a key strength and significant opportunity for the East, to capitalise on this we will;

Connectivity	• Work with airline partners to develop international services from Norwich Airport to improve direct connectivity to international markets and opportunities. • Support the role of the Port of Felixstowe and Port of Ipswich in facilitating further import / export opportunities / routes for the UK. • Work with airport and port partners to consider connectivity to international hubs outside the region including Stansted and Southend Airports and Harwich International Port.
Capacity / Reliability / Resilience	• Work with Norwich Airport to determine future capacity, reliability and resilience constraints, future requirements and associated infrastructure. • Work with Port of Felixstowe and Port of Ipswich to determine future capacity, reliability and resilience constraints, future requirements and associated infrastructure.
Agility	• Work with Norwich Airport, the Port of Felixstowe and Port of Ipswich to promote regional and national accessibility and associated competitiveness in changing and fast moving international markets.
Mobility	• Encourage the development of direct services from Norwich Airport to improve connectivity to international markets and opportunities. • Support the role of the Port of Felixstowe in facilitating import / export opportunities for the East and the UK.
Policy	• Support and develop Norwich Airport in facilitating international access for the East of England catchment. • Support and develop the role of the Port of Felixstowe and Port of Ipswich for international freight access to the UK.

NATIONAL – ACCESSING THE REST OF THE UK FROM THE EAST

Accessibility between the East and the rest of the UK is essential in enabling future economic performance and competitiveness, therefore we will;

Connectivity	• Encourage the development of regional air services to/from Norwich to improve direct, fast connectivity with other parts of the UK. • Develop East West rail proposals to improve connectivity of the East to the Oxford Cambridge corridor. • Develop connectivity to Stansted Airport through improved direct rail services improved direct rail services from Norwich, Ipswich and other key centres and to Heathrow through Crossrail interchange from GEML
Capacity	• Ensure that the A11, A12 (south of Ipswich), A14 and A47 feature prominently in future Highways England Roads Investment Strategies to improve overall capacity and performance within the national Strategic Road Network (SRN). • Work with Highways England to identify capacity constraints outside of the East which impact network performance of the SRN within the region (such as the A120). • Ensure that the North to Felixstowe route remains a high priority for investment in Network Rail improvement plans to improve accessibility to the Midlands and the North • Ensure that capacity constraints and journey time improvements are a high priority within Network Rail programmes into London on the GEML and routes to Cambridge. • Work with Network Rail to ensure that next generation digital signalling is actively planned and developed for the GEML so as to not restrict future growth, capacity, operational and customer benefits.
Reliability / Resilience	• Work with Highways England to identify network reliability and resilience issues outside the East which impact the performance of the SRN within the region.

	• Work with Network Rail to identify reliability and resilience issues outside the East which impact performance of the rail network within the region.
Agility	• Promote the East as being 'open' to future transport innovation and technology to deliver economic and societal improvements, particularly where change could facilitate growth in other sectors, for example agri-tech.
Mobility	• Work with partners to increase the frequency and capacity of rail services to Cambridge, the Midlands and the North. • Monitor Great Eastern Main Line (GEML) usage to plan for increased frequency and / or capacity improvements to London. • Develop East West rail services once infrastructure commissioned to provide access to the Oxford / Cambridge corridor.
Policy	• With partners across the region promote priorities in digital, transport and technology improvements to benefit economic performance, facilitate inward investment, improve the customer experience and encourage sustainability.

REGIONAL – ENABLING EASIER ACCESSIBILITY ACROSS THE REGION

Improving accessibility between our centres across within the region is essential to future aspirations, therefore we will;

Connectivity	• Work with partners to prioritise and deliver super-fast and ultra-fast broadband speeds for all new and existing business and residential properties. **(L / Ru / C)** • Ensure that key SRN routes in the region are included in early Highways England 'connected highway' programmes to facilitate future capacity, operational and customer improvements. • Work with partners to ensure that key regional corridors (both road and rail) feature in mobile / wireless connectivity improvements and roll-out, particularly for next generation 5G technology. • Develop the principle of a Key Route Network (KRN) for the East to supplement the SRN in terms of 'primary' route connectivity for the region. • Work with Highways England to facilitate underlying digital communications to enable emerging autonomous technologies, including freight functionality, on the SRN to deliver operational and customer benefits. • Work with partners to develop and implement an appropriate multi-modal 'e-ticketing' platform to improve seamless connectivity between existing and future modes. **(L / Ru / C)** • Consider both the digital and transport connectivity when planning new settlements or major developments to build-in sustainable mobility options. **(L / Ru / C)**
Capacity	• Work with telecommunications companies to ensure that network capacity / rate of roll-out is meets the region's needs, particularly for new generation technologies such as 5G. **(L / Ru / C)** • Ensure that the SRN in the region is included in early Highways England 'connected highway' programmes to facilitate future capacity, operational and customer improvements. • Work with Network Rail to deliver rail key infrastructure upgrade priorities across the region to improve capacity and reliability - including Trowse Bridge, Ely Area Enhancements, Haughley junction – as well as key single track sections in the regional network. • Actively work with Highways England to prioritise and deliver pinch point improvements on the SRN including dual carriageway improvements to the A47 corridor. • Actively work with Highways England to consider the impacts of new developments upon the SRN and develop measures to mitigate any capacity impacts. • Work with Network Rail to consider benefits of electrifying the Felixstowe branch and Stowmarket, Ely to Peterborough route to improve freight movements. • Identify and prioritise Key Route Network (KRN) capacity, reliability and resilience constraints and develop integrated delivery programme.

	• Consider opportunities to influence peak demand network requirements through social and behavioural change programmes. **(L / Ru / C)**
Reliability	• Work with telecommunications partners to improve network reliability for both fixed and wireless networks. **(L / Ru / C)** • Encourage network operators and transport operators to provide 'open' data to facilitate the use by industry and others to enable innovative uses to deliver operational and customer benefits. • Identify and prioritise Key Route Network (KRN) capacity, reliability and resilience constraints and develop integrated delivery programme • Work with Network Rail to consider the business case and benefits of electrifying the Felixstowe branch and Stowmarket, Ely to Peterborough route to improve freight movements. • Promote the adoption of connected, self-monitoring technologies for roadside infrastructure on the SRN and KRN to improve reliability. • Encourage network operators to identify robotic applications to help remove human operatives from dangerous working environments.
Resilience	• Identify and prioritise KRN capacity, reliability and resilience constraints within the East as a whole and develop an integrated delivery programme. • Prioritise locations with Network Rail which are a resilience risk, particularly from weather, and develop and prioritise improvements. • Encourage all partners in the transportation sector to investigate and promote the use of new materials and technologies to improve road and rail network resilience.
Agility	• Consider the link between economic performance, spatial needs, societal trends and transportation when considering future policies, plans and major investments. **(L / Ru / C)** • Develop and adopt aligned 'period' based economic, land use and accessibility (transport) policies and plans to enable joined up decision making and the setting of investment priorities. **(L / Ru / C)** • Develop relationships with partners in the wider emerging transport innovation, 'smart' data and communications sectors to actively share and disseminate contemporary and future thinking and associated challenges for the benefit of accessibility and transportation in the East. **(L / Ru / C)** • Actively monitor the wider 'connected, autonomous and robotics' agenda (across all modes and sectors) within the context of capitalising on specific opportunities to meet the East's future needs, particularly in relation to transportation impacts, infrastructure investment requirements, priorities and decision points. **(L / Ru / C)**
Mobility	• Promote the East as being 'open' to transport service innovation particularly where such transport innovations could benefit hard to reach communities. **(L / Ru / C)** • Encourage the development of work 'hubs' at key locations within the region to encourage remote working and business to business connectivity. • Enhance capacity and frequency of trains to London on the GEML and to Cambridge • Develop regional 'metro' style rail services with regularised service frequencies, hours of operation to connect key centres in and around the East • Encourage the development of digital travel planning solutions to help customers plan, pay for and undertake trips with confidence, e.g. a Mobility as a Service (MaaS) solution. • Work with industry to develop sustainable, applicable freight aggregation solutions to serve retail and business to business needs. **(L)**
Policy	• Develop integrated economic, land use and accessibility policies. **(L / Ru / C)** • Develop an integrated infrastructure connectivity plan with associated periodic review process for the East including land use, digital and transportation. **(L / Ru / C)** • Develop a KRN network plan for the East. **(L / Ru / C)** • Regularly review network constraints on the SRN, KRN and to in key centres within the context of changing land use, economic and multi modal transportation needs. **(L / Ru / C)** • Promote the adoption of digital communications into wider accessibility ('transport') policies rather than just considering digital as a utility. **(L / Ru / C)**

	• Encourage the concentration of intensive land uses in most accessible (both digital and transport) locations. **(L)** • Ensure higher levels of accessibility into new developments. **(L / Ru / C)** • Encourage business to positively encourage part time hub and home working for those sectors for which it is applicable and of benefit. **(L / Ru / C)** • Develop policies to encourage local manufacturing using new technologies to reduce transport impacts. **(L / Ru / C)** • Promote early adoption of transport / technology change within public sector given its wider influence and importance. **(L / Ru / C)** • Work with partners to plan for emerging autonomous vehicle requirements (road and air) in terms of network requirements (digital and physical) and develop policies to encourage sustainable application. **(L / Ru / C)** • Actively monitor changes in access and transport patterns to capitalise on opportunities, promote positive outcomes and mitigate negative impacts. **(L / Ru / C)** • Develop greater policy links between healthcare, education, digital and transport sectors to actively plan and care for ageing populations and to improve educational attainment particularly for rural and coastal communities. **(L / Ru / C)**

LOCAL – IMPROVING ACCESS TO AND WITHIN THE MAJOR CENTRES IN THE EAST

It is essential that our towns and cities can capitalise upon their strengths to serve those that live, work, trade and play there. We will;

Connectivity	• Work with partners to prioritise, deliver and market mobile / wireless (including 5G) digital connectivity to a wide subscriber base. **(Ru / C)** • Develop local digital and transport connectivity plans to provide business and residents with the widest accessibility offer and ensure this is promoted to encourage awareness. **(Ru / C)** • Consider and prioritise connectivity between local networks and both the SRN and KRN. • Develop cycling and walking networks for all key centres of population integrating with regional networks as well as all key activities and needs to encourage an active lifestyle. **(Ru / C)** • Consider local connectivity needs when planning for essential key services including healthcare and education. **(Ru / C)** • Work with partners to develop a flexible and/or remote digital education offer to increase levels of attainment particularly for those in remote communities. **(Ru / C)**
Capacity	• Work with industry to develop and promote local freight aggregation centres to reduce the impact of local deliveries and where feasible pilot new, autonomous technologies. • Develop an integrated approach to multi modal interchange across the region at rail stations, on key bus routes and for key centres, and facilitate through the development of associated commercial models and land uses. • Consider the wider network impacts of new developments on the KRN (residential and business) to encourage long-term sustainable solutions. **(Ru / C)** • Work with partners to monitor market developments and consider alternative 'fuelling' networks including electric (for both at and away from the home) and hydrogen. **(Ru / C)** • Consider opportunities to influence peak demand network requirements through social and behavioural change programmes.
Reliability	• Identify and prioritise local roads capacity, reliability and resilience constraints and develop integrated delivery programme. **(Ru / C)** • Encourage network operators and transport operators to provide 'open' data to facilitate the use by industry and others to enable innovative uses to deliver operational and customer benefits. **(Ru / C)** • Promote the adoption of connected, self-monitoring technologies for roadside infrastructure to improve reliability and enhance performance. **(Ru / C)**

Resilience	• Work with utility companies to ensure resilience of local energy networks to facilitate a shift to electric propulsion for road vehicles. **(Ru / C)** • Work with telecommunications companies to ensure peak bandwidth provision within a broadening of the 'working day'. **(Ru / C)**
Mobility	• Actively work with partners to establish the East as a model for remote home and hub working as an alternative to travelling, with the public sector leading the way. **(Ru / C)** • Encourage new and existing public transport service providers to provide both linear and on-demand 'mesh' type services in key centres to meet population and business needs. **(Ru / C)** • Encourage the development and promotion of new public transport service models providing for emerging autonomous, demand responsive and other service models to address social care and education travel needs. **(Ru / C)** • Actively promote and encourage car sharing / car hire / shared access networks / solutions in key centres with local employers and to / from key hubs and destinations. **(Ru / C)**
Policy	• Develop land use policy for hubs/shared/flexible facilities. **(Ru / C)** • Develop policies and strategies to encourage emission free (at point of use) bus fleets. **(Ru / C)** • Develop policies and strategies for emission free (at point of use) public sector fleets. **(Ru / C)** • Develop specific transport policies for an aging population to encourage social and economic activity. **(Ru / C)** • Develop specific transport policies to improve educational attainment and associated transport impacts, remote learning, core hours etc. **(Ru / C)** • Continue to promote walking and cycling (including e-bike) as part of an active, quantified lifestyle. **(Ru / C)**

RURAL – ENSURING THE RURAL COMMUNITIES OF THE EAST ARE ACCESSIBLE

Our rural communities are a vital part of the economy of the East and are central to a varied tourism offer. We recognise their particular challenges therefore we will:

Connectivity	• Encourage the development of innovative, demand response and shared transportation networks. **(C)** • Consider local connectivity needs when planning for essential key services including healthcare and education. **(C)**
Capacity	• Identify and remove pinch points on key rural routes to the SRN and centres as part of wider KRN development. **(C)**
Reliability / Resilience	• Work with telecommunications partners to improve network reliability and resilience for both fixed and wireless networks. **(C)** • Encourage the development of solutions using crowd sourced / 3rd party data to improve network monitoring, reliability and resilience in traditionally 'hard to reach' areas. **(C)** • Encourage the adoption of connected, self-monitoring technologies for roadside infrastructure in rural areas to improve reliability and enhance performance. **(C)**
Mobility	• Encourage new and existing public transport service providers to provide on-demand type services to meet rural / coastal needs using autonomous vehicles where possible to deliver commercial services. **(C)**
Policy	• Promote opportunities in the East for Research & Development centre into autonomous agriculture solutions – including a focus on reducing transport network impacts and improving productivity. • Continue to develop community rail partnerships for rural and coastal branch lines to differentiate individual offers, promote to a wide audience and encourage use. **(C)**

COASTAL – ENSURING THE EAST'S COASTAL COMMUNITIES ARE ACCESSIBLE

Our coastal communities are some of most remote settlements but play a vital part of the East's unique offer, in addition to the measures above we will;

Connectivity	• Support local ports in developing niche freight opportunities to continue to directly serve the East and to access other regions.
Capacity	• Work with Network Rail to identify capacity improvements on lines to coastal communities to permit service expansion. • Identify and remove pinch points on key coastal links to key centres as part of wider KRN development.
Reliability / Resilience	• Consider the challenges of coastal environments, particularly in relation to weather effects, and the distances of parts of those networks from key centres.

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