



**Transport for
Greater Manchester**

GREATER MANCHESTER TRANSPORT STRATEGY 2040 EVIDENCE BASE

**A sustainable urban
mobility plan for the future**

GMCA GREATER
MANCHESTER
COMBINED
AUTHORITY

 **Greater Manchester**
Local Enterprise Partnership

February 2017



**Transport for
Greater Manchester**

GREATER MANCHESTER TRANSPORT STRATEGY 2040 EVIDENCE BASE

**A sustainable urban
mobility plan for the future**

GMCA GREATER
MANCHESTER
COMBINED
AUTHORITY

 **Greater Manchester**
Local Enterprise Partnership

February 2017



Overview of Content

This document provides the evidence base supporting the Greater Manchester Transport Strategy 2040.

The evidence base begins by setting out recent trends in Travel in Greater Manchester (page 4). This focuses on providing a picture of the current transport situation, with reference to recent developments in Greater Manchester.

There then follow six thematic sections that group trends and issues into the future in relation to the drivers shown in Figure 1.

Figure 1: Drivers of Transport Demand



These drivers can be found at:

- Economy and Employment - page 34;
- Society and Community - page 66;
- Urban Development - page 91;
- Environment and Resources – page 110;
- Technology and Innovation - page 130; and
- Policy and Governance - page 163.

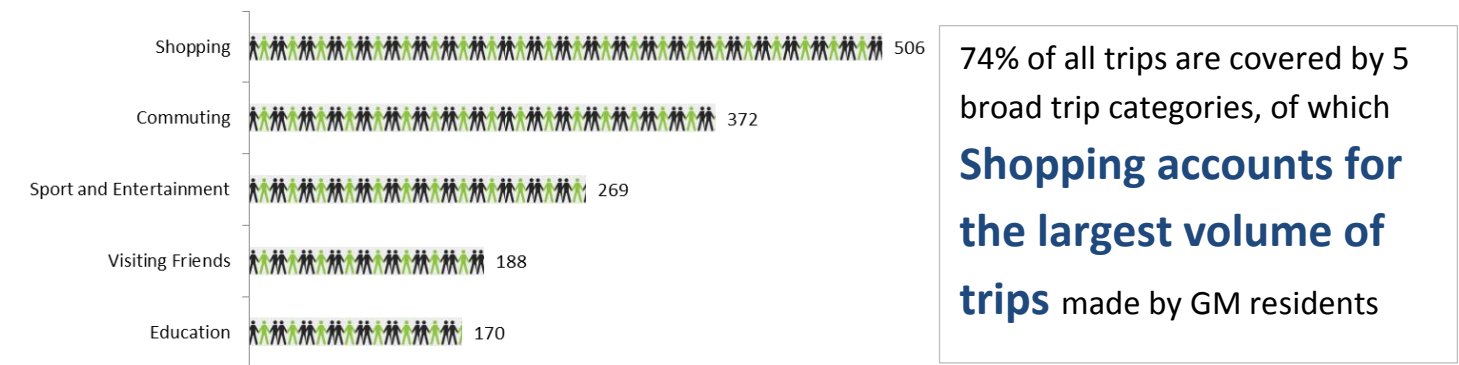
Each of these groups looks at future developments in the areas covered and the main implications that those trends are likely to have for the transport strategy.

Travel in Greater Manchester

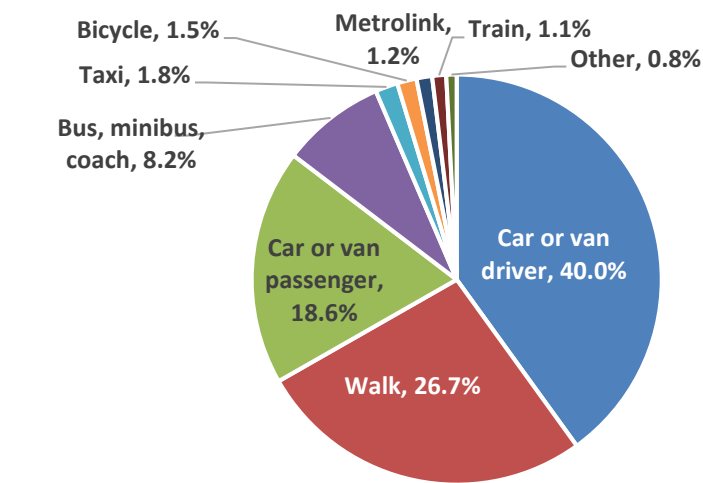


Travel in Greater Manchester: Summary of Recent Trends

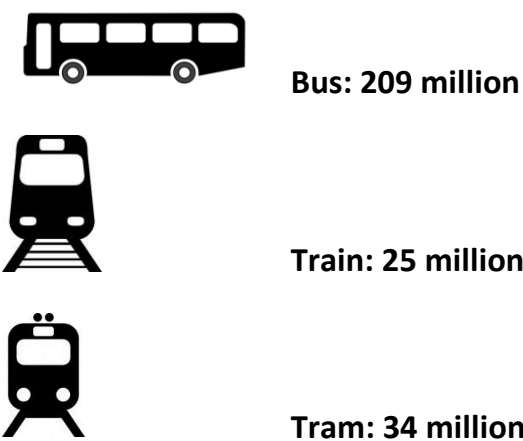
2.1 billion Journeys per year are made by Greater Manchester residents; approximately **5.7 million Journeys per day**.



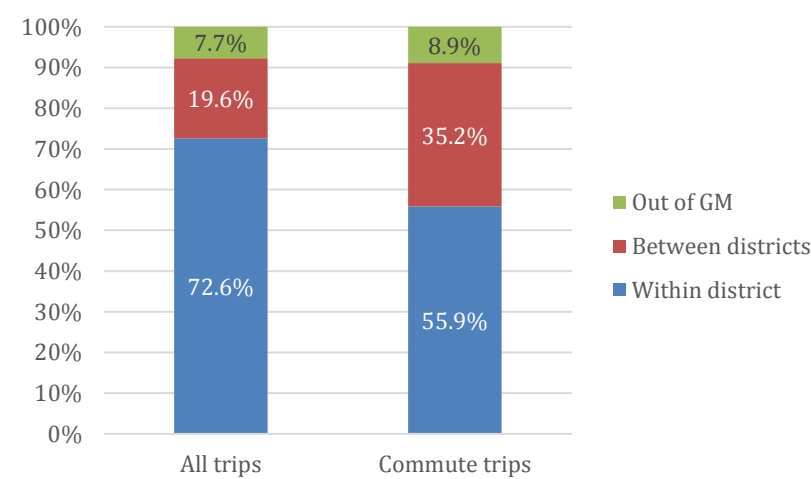
Car is the dominant mode of transport but walking accounts for 27% of trips



268 million Journeys per year on public transport

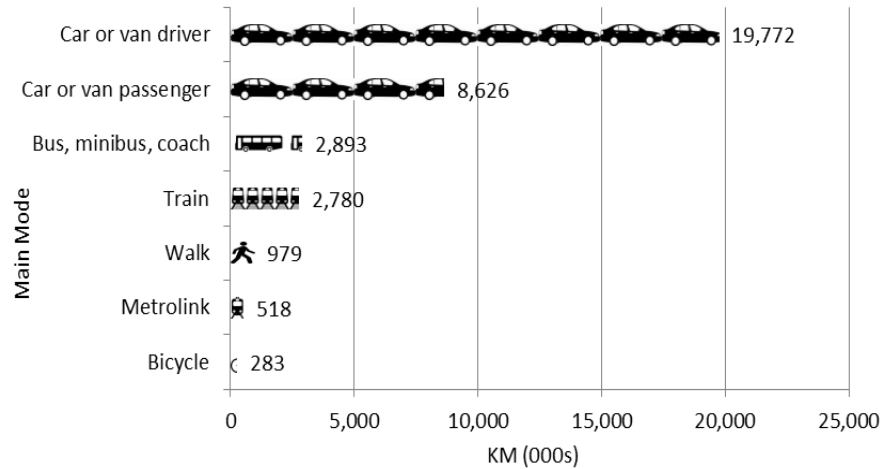
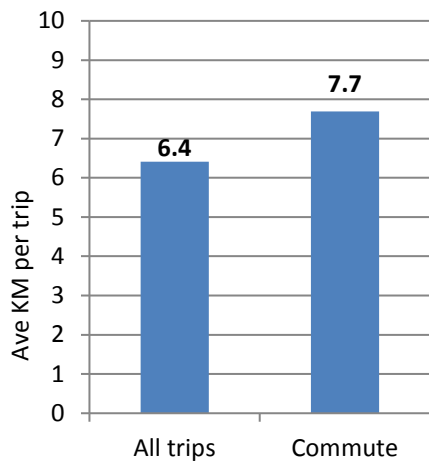


73% of all Journeys made by Greater Manchester residents take place wholly **within the local authority of residence**, with 20% involving movement between local authority areas. 8% of all trips end outside of Greater Manchester

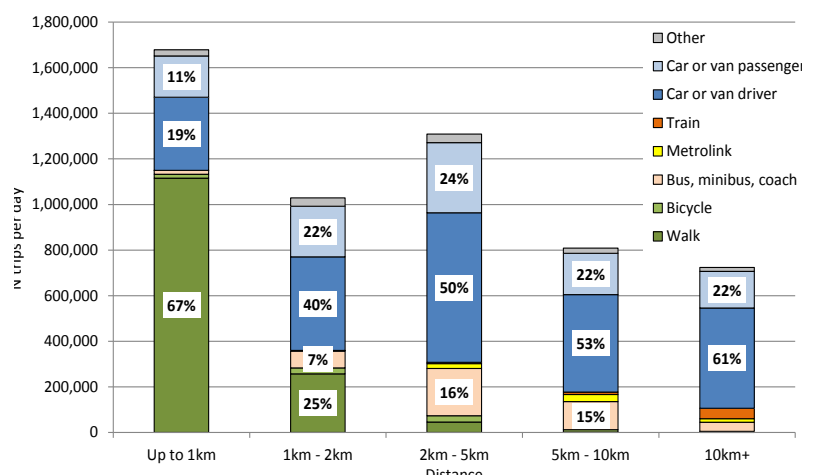
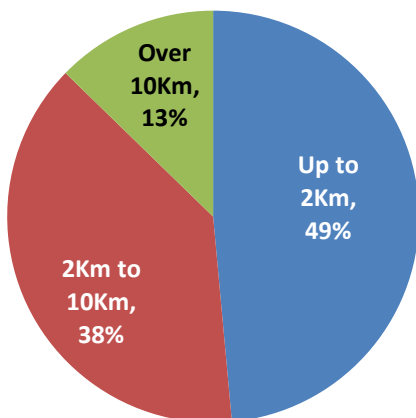


35% of commute trips made by Greater Manchester residents **cross local authority boundaries**, with **9% travelling outside of GM**

Greater Manchester residents travel **37 million km per day** averaging **6.4km per trip**, 7.7km for residents commuting to work. **77%** of all kilometres travelled are made **by car** (either as driver or passenger).

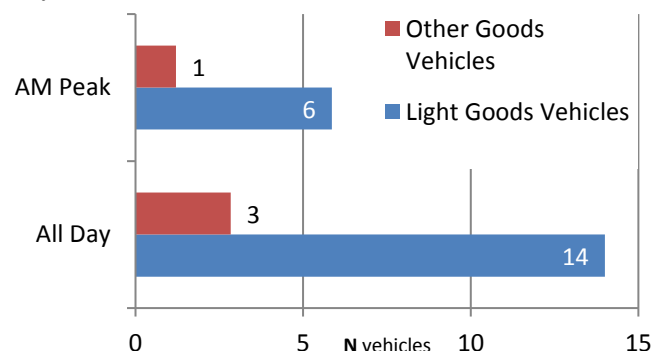


Almost **half of trips** made by Greater Manchester residents are **fewer than 2km in length**. **67%** of trips up to 1 km are made **on foot** and **30%** by car



Freight movements show that **Greater Manchester** is predominantly a **net importer** of goods rather than generating outbound movements. Approximately **50 million tonnes** of freight **leave** Greater Manchester and **58 million tonnes arrive** into the region per year.

On average **17,000 goods vehicles** make trips into **GM town centres** each day



Trips made by Greater Manchester Residents

Figure 2: Trips per person per year 2004 – 2015 Greater Manchester

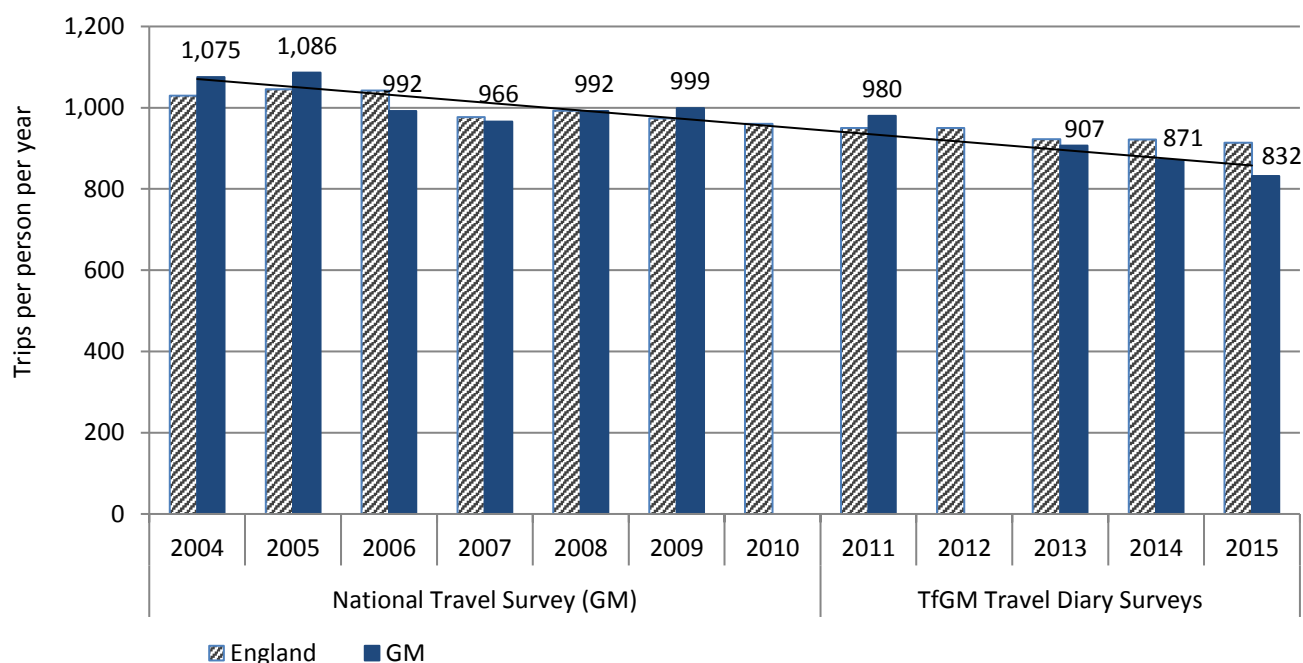


Table 1: Trips per person per year 2004– 2015 Greater Manchester compared to England

Area	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Greater Manchester	1,019	1,130	1,041	942	989	996	1,003	980		907	871	832
England	1,026	1,044	1,037	972	992	973	960	958	954	923	921	914

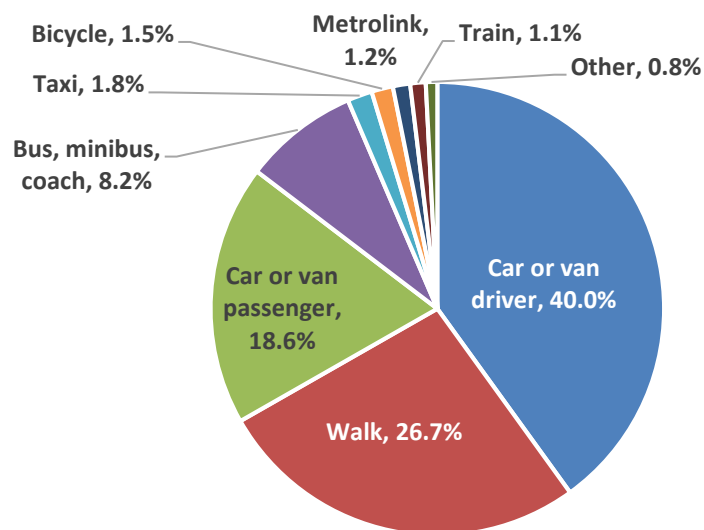
1. Greater Manchester Travel Diary Surveys indicate that each resident of Greater Manchester made approximately 832 trips throughout the year in 2015 compared just over 900 trips per resident as indicated in the National Travel Survey (Figure 2, Table 1).
2. The average number of trips per resident has fluctuated over the period 2004 to 2015 as recorded in the National Travel survey at both England and Greater Manchester levels. However, the period from 2010 onwards has shown a steady decrease in the average number of trips made in both the National Travel Survey (for England) and the Greater Manchester Travel Diary survey data¹.
3. The Greater Manchester Travel Diary surveys have indicated that up to a quarter of the population do not leave their home on an average day.

¹ Department for Transport National Travel Survey 2002 – 2015; TfGM Travel Diary Surveys 2011 – 2015. 2013 years 1&2 data, 2014 years 1,2&3, 2015 years 2,3&4.

Main mode of transport used

4. Figure 3 shows that 59% of the 6 million trips per day made by Greater Manchester residents are by car (either as driver or passenger), with 27% of trips being made on foot². Public transport accounts for 10% of all trips with taxi being used for 2% of trips. Just over 1% of trips are made by bicycle.

Figure 3: Main mode of transport used by GM residents, 2013-2015



5. 2.1 billion trips are made annually by Greater Manchester residents. Annualised mode share figures show that overall, 1.2 billion car trips are made by residents, 550 million walking trips and 220 million trips are made on public transport services combined (Table 2).

Table 2: Total trips by mode per year – GM residents

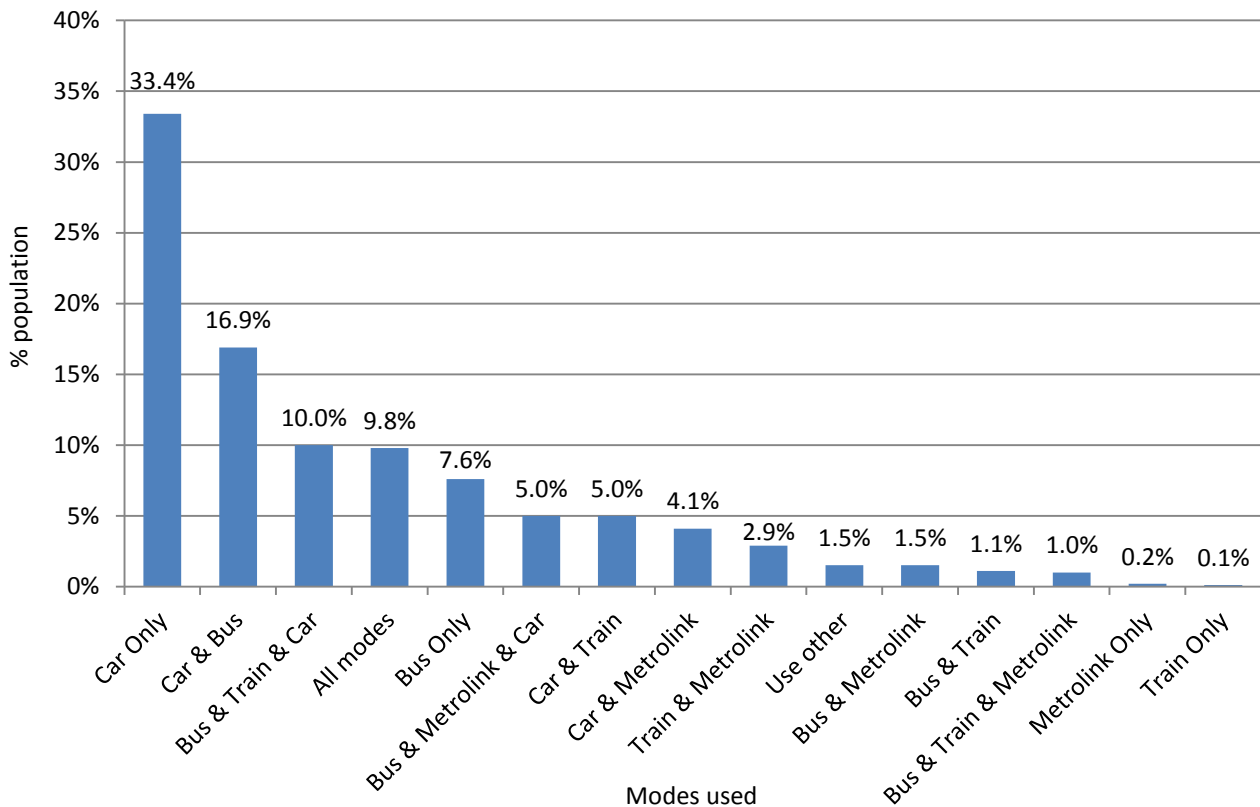
Mode	Trips per year	Mode	Trips per year
Car or van driver	833,676,000	Bicycle	31,832,000
Car or van passenger	387,361,000	Metrolink	25,618,000
Walk	556,076,000	Train	22,922,000
Bus, minibuss, coach	170,644,000	Other	17,001,000
Taxi, minicab	36,909,000	Total	2,082,039,000

6. Using TfGM survey data, population statistics and segmentation data, it is possible to estimate the types of motorized transport used by residents.

² TfGM Travel Diary Surveys, figures for an average day, all trips, 2013 – 2015.

7. The data indicates that 1,350,000 residents of Greater Manchester use some form of public transport at least once during the course of a year, of which over 1 million residents use the bus, over 500,000 residents use Metrolink and 600,000 residents use the train at some point.
8. It is estimated that that 699,000 residents travel solely by car (in that they used no other motorized method during the year to travel within GM) – around 33% of the overall Greater Manchester population (Figure 4).

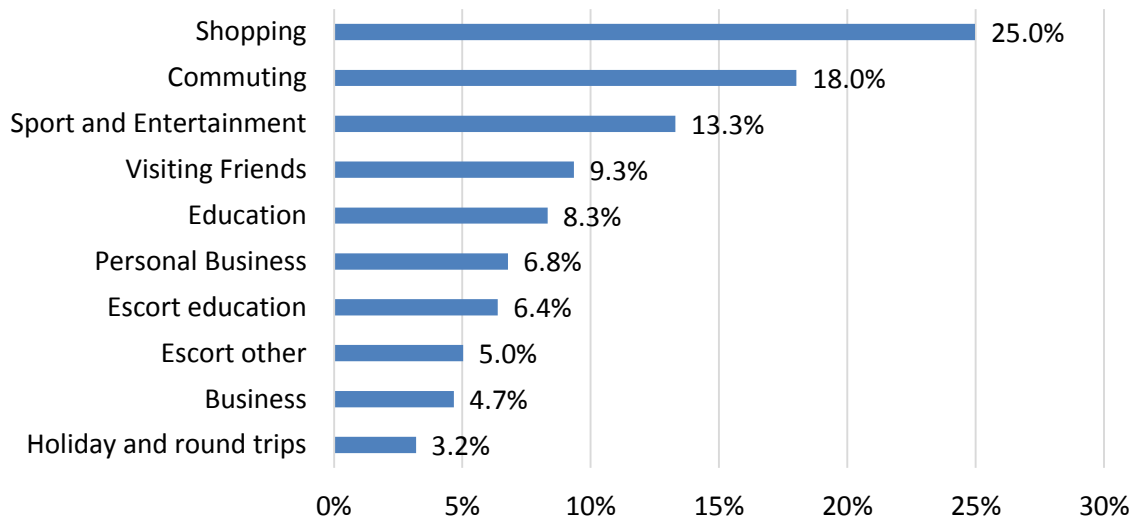
Figure 4: Modes of transport used by GM resident adult population, 2004-2010³



³ TfGM Multimodal Tracking Survey, 2004-2010; CACI Acorn data.

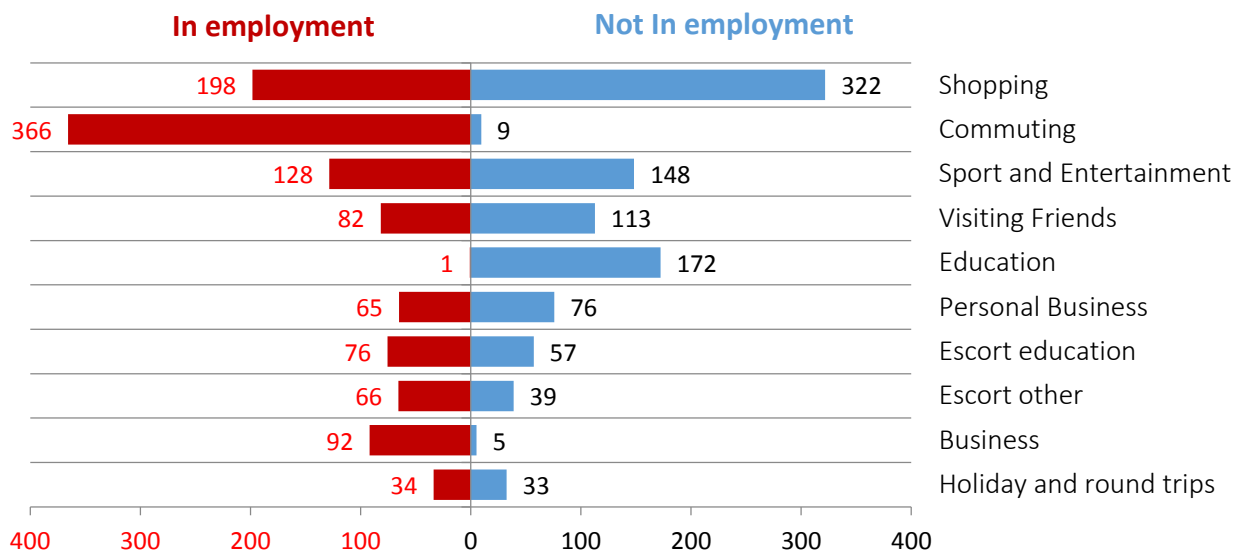
Journey Purpose

Figure 5: Journey purpose of trips made by GM residents, 2013-2015⁴



9. Shopping is the predominant journey purpose of the largest category of trips in Greater Manchester, followed by commuting, and sport and entertainment trips (Figure 5).
10. There are a number of distinct differences in the number of trips made by journey purpose when comparing by employment status (Figure 6).

Figure 6: Journey purpose of residents by employment status⁵



⁴ TfGM Travel Diary Surveys 2013 – 2015.

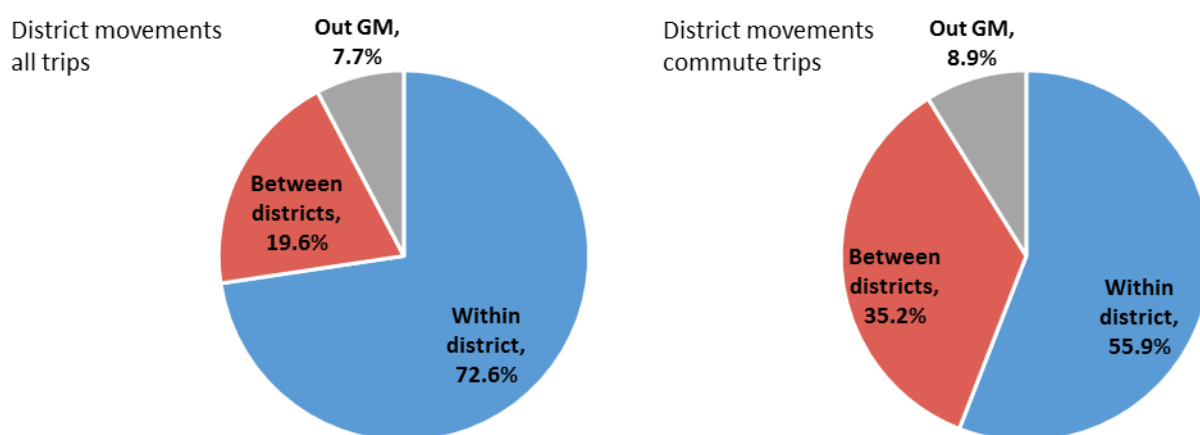
⁵ TfGM Travel Diary Surveys 2013 – 2015.

11. Residents in employment make 950 trips per person per year compared to 730 trips by residents not in employment (resident student population, retired residents, residents looking after the home and residents seeking work).

Trip distribution

12. On average just over 7 in every 10 trips made by GM residents take place wholly within the local authority area in which the trip originated⁶ (Figure 7).
13. Commuter trips are much more likely to involve travel outside of the district of residence, with just fewer than 4 in every 10 commute trips travelling to a workplace in another local authority area, and just less than 1 in 10 commuter trips travelling to a place of work outside of Greater Manchester.

Figure 7: Start and end location of trips made by GM residents, 2013-2015

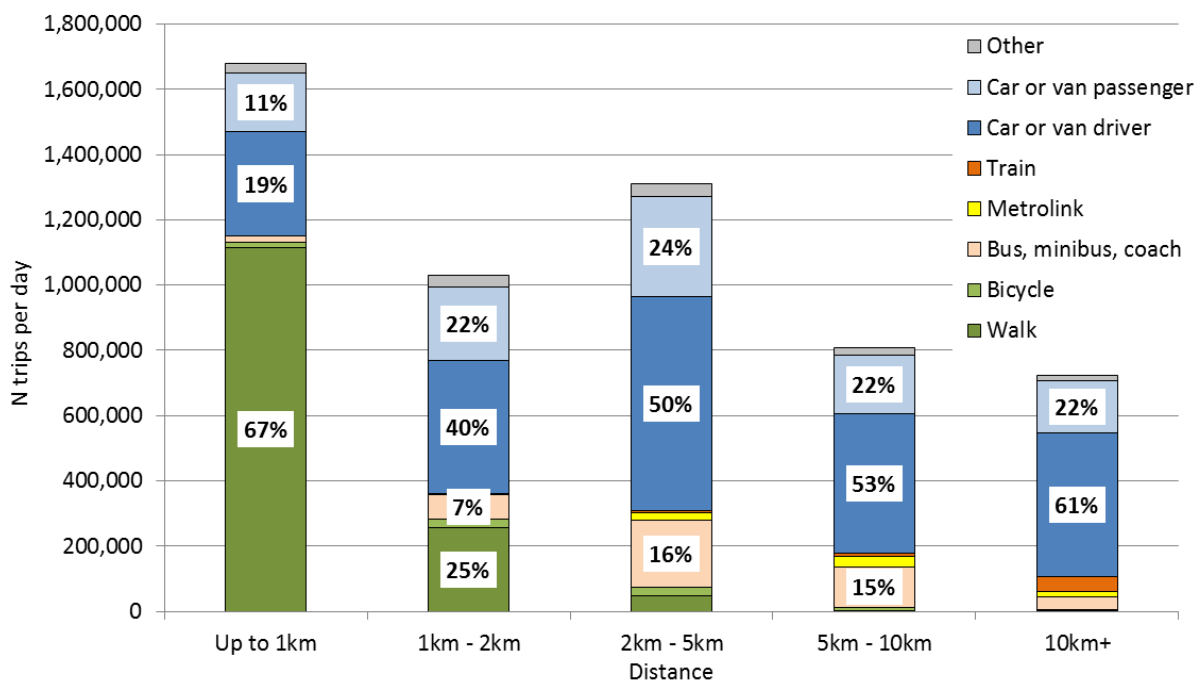


14. Approximately 1.7 million trips (from a total 6 million trips) per day have a length of less than 1km. Of these, over 2 in every 3 trips are made on foot, but nearly 1 in 3 is made by car (either as driver or passenger). For trips over 1km car is the most common mode of travel⁷ (Figure 8).

⁶ TfGM Travel Diary Surveys 2013 – 2015.

⁷ TfGM Travel Diary Surveys 2013 – 2015.

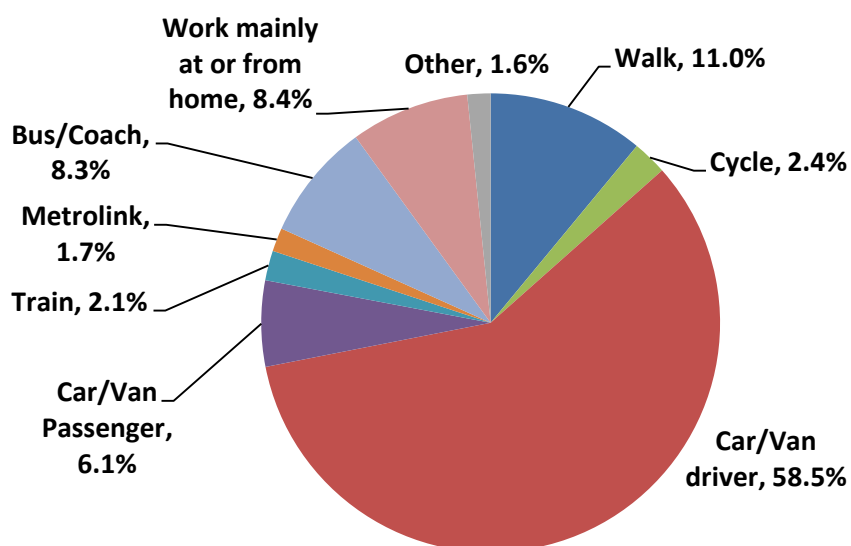
Figure 8: Mode of Travel by Distance Band - All Purposes



Travelling to work in Greater Manchester

15. Figure 9 shows the percentage of trips Greater Manchester residents make to their main place of work, by main mode of travel, on a daily or regular basis⁸.

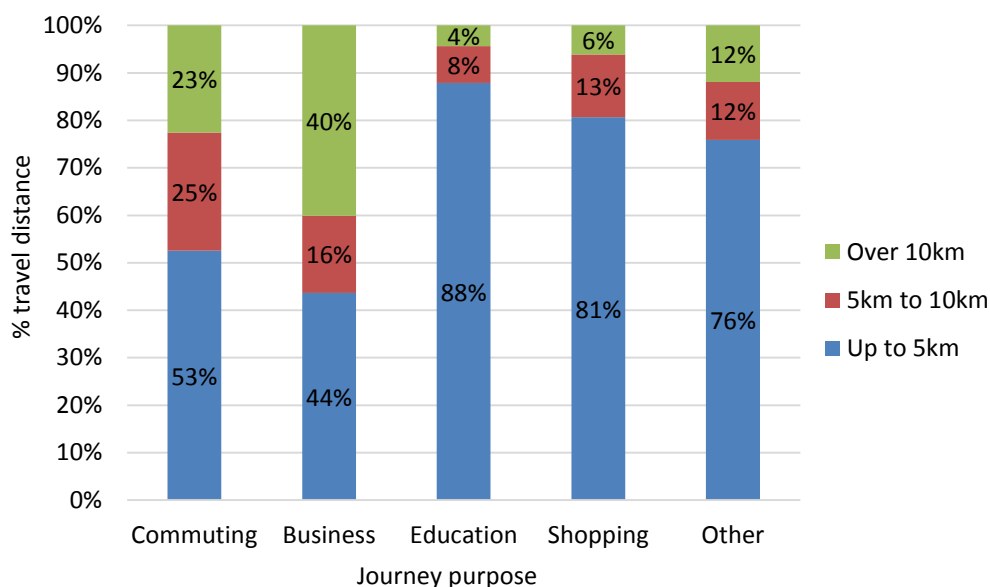
Figure 9: Main mode of travel to work, 2011



⁸ Office for National Statistics Census 2011 Table CT0015EW Method of travel to work.

16. Slightly fewer than half of GM residents travel over 5km to their place of work, with almost a quarter travelling over 10km⁹. The average commute trip distance for Greater Manchester residents is 7.6km, with residents travelling on business covering on average 24km (Figure 10).

Figure 10: Journey purpose by distance band, 2013-2015



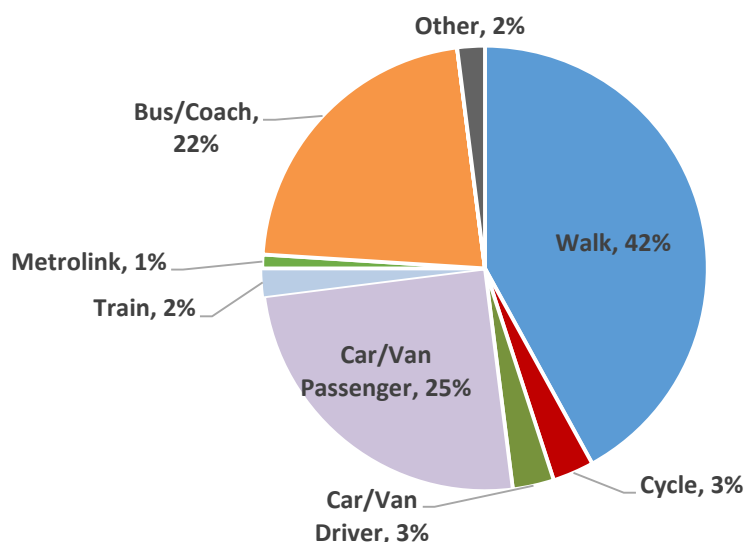
17. 58% of all commuters travelling up to 5km do so by car either as driver or passenger, 26% walk, 9% catch the bus, and 1% use Metrolink or train. 77% of GM residents travelling up to 5km for business purposes make the trip by car.

⁹ TfGM Travel Diary Surveys 2013 – 2015.

Travelling to Education in Greater Manchester

18. Figure 11 shows the percentage of trips pupils and students make to their main place of education, by main mode of travel, on a daily or regular basis¹⁰.

Figure 11: Main mode of travel to education, 2013-2015



19. When comparing main mode of travel by age range, the majority of primary school pupils walk to school, with approximately one third being driven to school (Table 3).
20. For those of secondary school, college and early university ages, bus or coach is the dominant mode of travel.
21. Cycling to education was most popular for those in the university age bands, and Metrolink was most popular with 19 - 21 year olds.

Table 3: Main mode of travel to education by age range

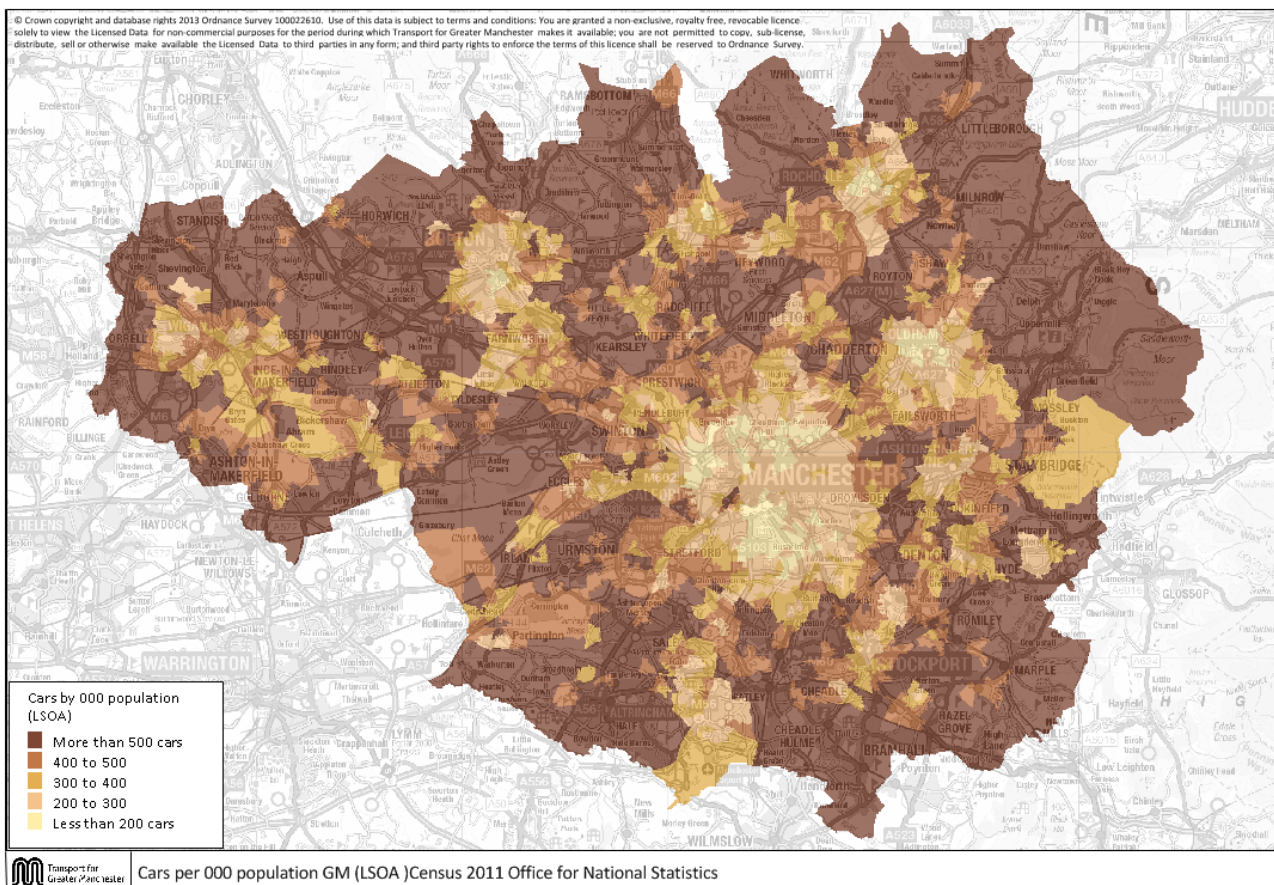
Main mode of travel to Education	Age Band					
	5 to 10	11 to 16	17 to 18	19 to 21	22 to 25	26+
Walk	53.5%	29.5%	22.0%	18.8%	18.1%	12.5%
Cycle	0.8%	1.6%	2.4%	10.7%	22.3%	8.3%
Car/Van Driver	0.0%	0.0%	3.1%	10.8%	10.9%	31.0%
Car/Van Passenger	32.7%	18.5%	11.8%	6.5%	8.2%	5.0%
Train	0.1%	0.6%	5.4%	10.5%	6.6%	8.0%
Metrolink	0.7%	2.3%	2.6%	3.2%	0.0%	1.5%
Bus/Coach	11.1%	45.0%	50.7%	36.2%	33.0%	28.4%
Study mainly at home	0.0%	0.0%	0.0%	0.8%	0.9%	1.9%
Other	1.1%	2.5%	2.0%	2.5%	0.0%	3.4%

¹⁰ TfGM Travel Diary Surveys 2013 – 2015.

Car Ownership

22. In 2011 there were 446 cars per 1,000 head of population within Greater Manchester¹¹. The numbers of cars differs significantly between local authorities, with Manchester local authority having the lowest ratio, 3:10 of cars to population, and Stockport local authority having the highest at 5:10 (Figure 12).
23. There are 1.5 million residents within Greater Manchester that hold a full driving license, which represents 70% of the population over the age of 17. The annual rate of change in license ownership is negligible at a less than a 1% increase year on year (2012-2016).
24. 31% of households in Greater Manchester have no access to a household vehicle. Manchester local authority has the highest percentage (44.5%) with Trafford having the lowest (21.7%).

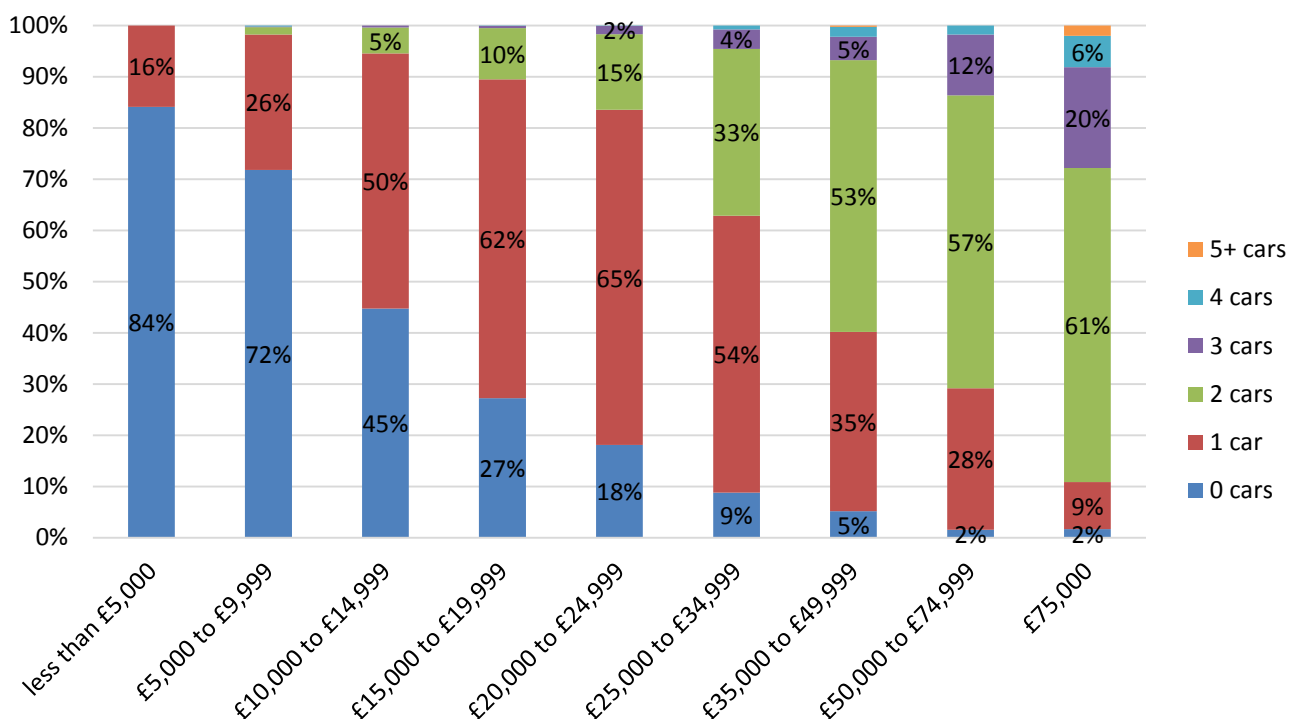
Figure 12: Car ownership differs across Greater Manchester.



¹¹ Office for National Statistics Census 2011 Table KS404 EW LSOA.

25. In terms of absolute numbers, although the percentage of households without a car or van has decreased on 2001 census data, an increase in the housing stock of the region means that in the absolute terms there are an additional 4,200 households with no access to a household vehicle (from 341,300 households in 2001 to 345,500 in 2011).
26. As illustrated in Figure 13, there is a correlation between household income and the number of cars owned per household¹².

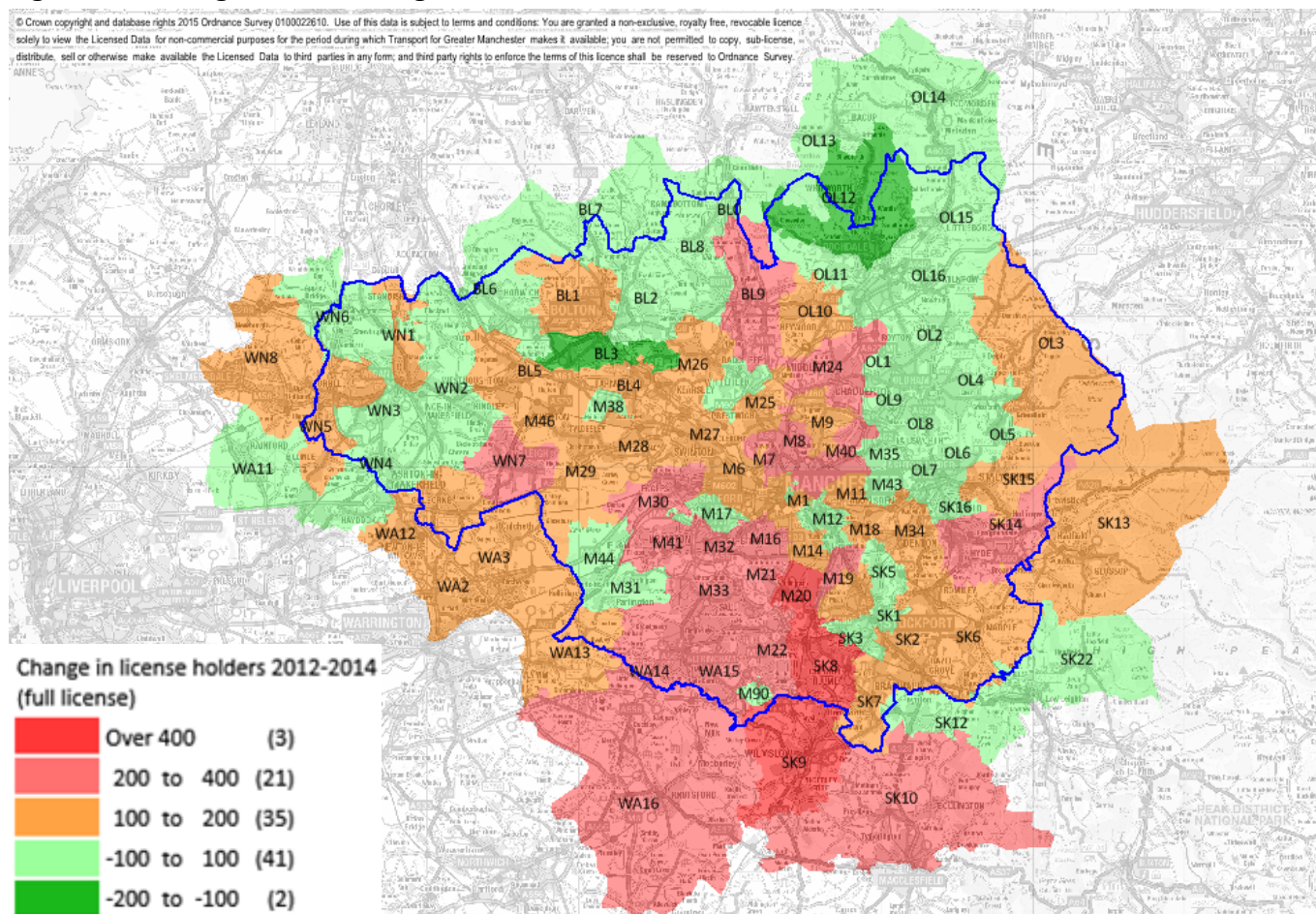
Figure 13: Car Ownership by household income (GM households), 2013-2015



27. Figure 14 shows analysis of the change in the number of adults holding a full driving licence over the period between 2012 and 2014. This has the potential to increase the pressure upon areas of the GM highway network that are already at capacity during peak periods.

¹² TfGM Travel Diary Surveys 2011 – 2014.

Figure 14: Change in Full Driving License Holders, 2012-2014



28. The cost of fuelling a vehicle in the North West has fluctuated over a 10 year period, and although prices have differed by fuel type the trend has followed the same pattern¹³ (Table 4).

Table 4: Average annual petrol and diesel price in the North West 2006 - 2015

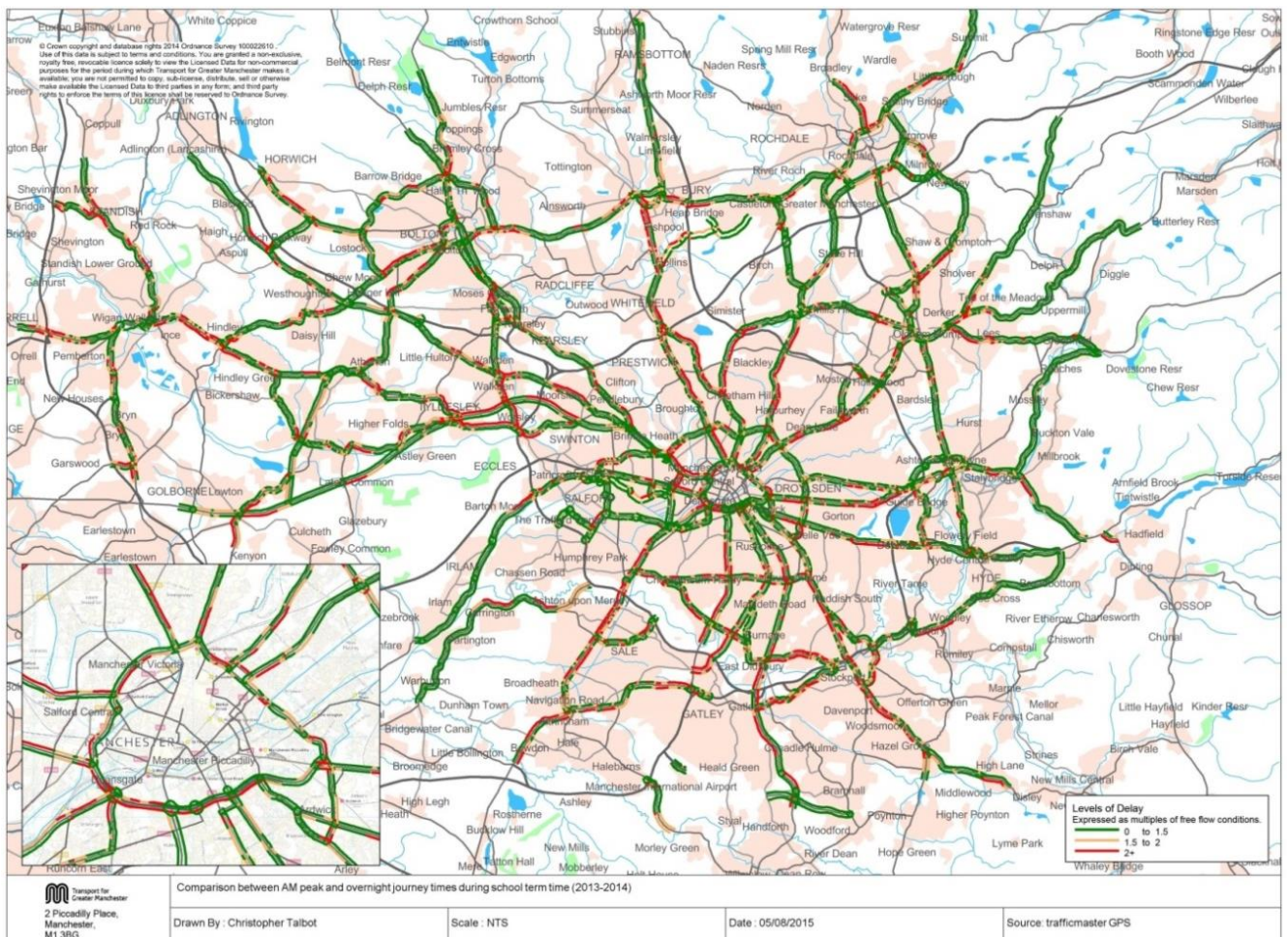
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Unleaded	£0.91	£0.94	£1.07	£0.99	£1.17	£1.33	£1.36	£1.35	£1.28	£1.12
Diesel	£0.95	£0.97	£1.17	£1.04	£1.19	£1.39	£1.42	£1.41	£1.34	£1.15

¹³ AA fuel price reports 2000 – 2014.

Journey times on the road network

29. As shown in Figure 15, during the weekday morning peak period (between the hours of 07:00 and 09:30) journey times on some parts of the Greater Manchester road network, shown in red, are double the journey times of the rest of the day¹⁴.

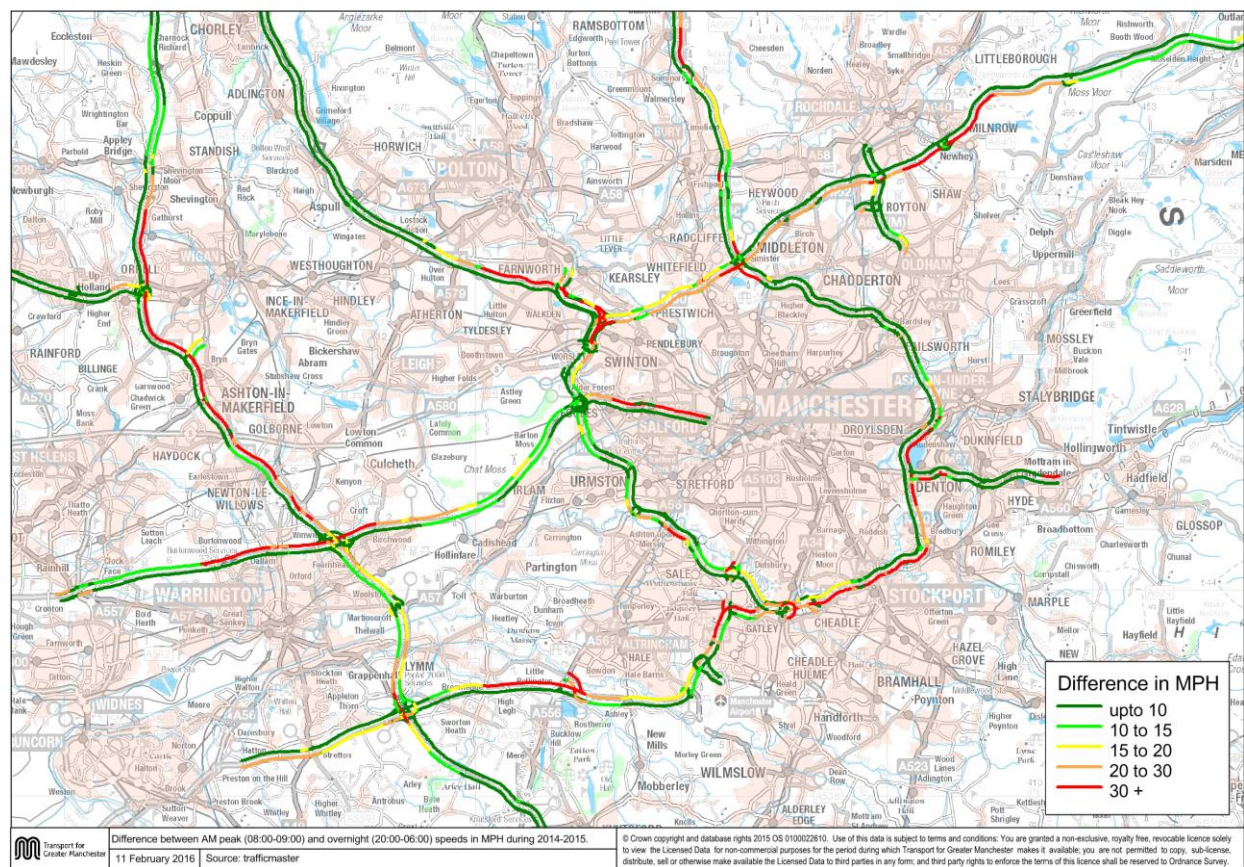
Figure 15: Journey times on the GM road network during the AM peak period 2013/14



30. Figures 16 and 17 demonstrate that differences exist in journey times between the morning peak period and the afternoon peak period (16:00 to 18:30), for the Strategic Road Network.
31. Journeys times during the afternoon peak period exhibit a greater delay on certain parts of the road network across Greater Manchester with the M56, the A580 East Lancs Road, and the M67 showing the biggest increase in journey times between the morning and afternoon peak periods.

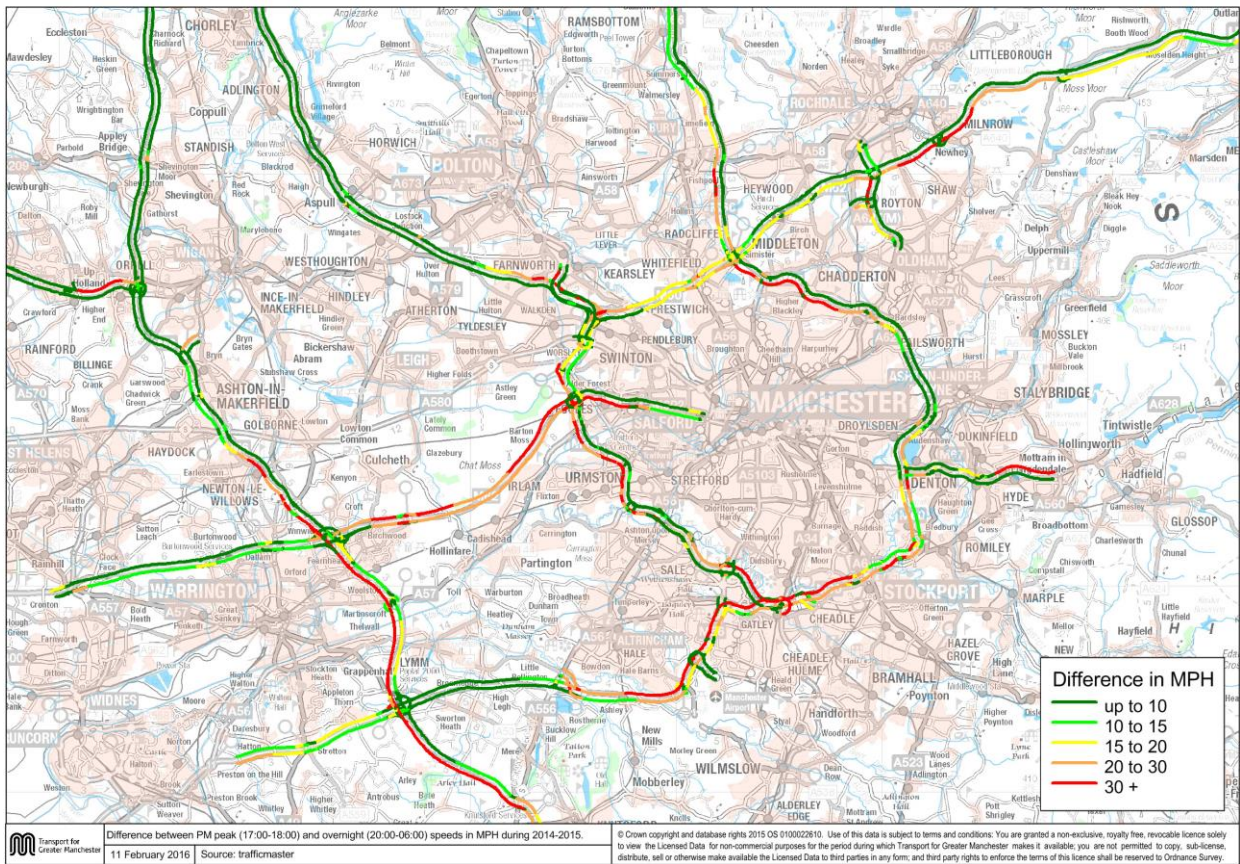
¹⁴ TfGM analysis of Trafficmaster data.

Figure 16 Delay on the Motorway network during the AM peak period 2014/15¹⁵



¹⁵ TfGM analysis of Trafficmaster data

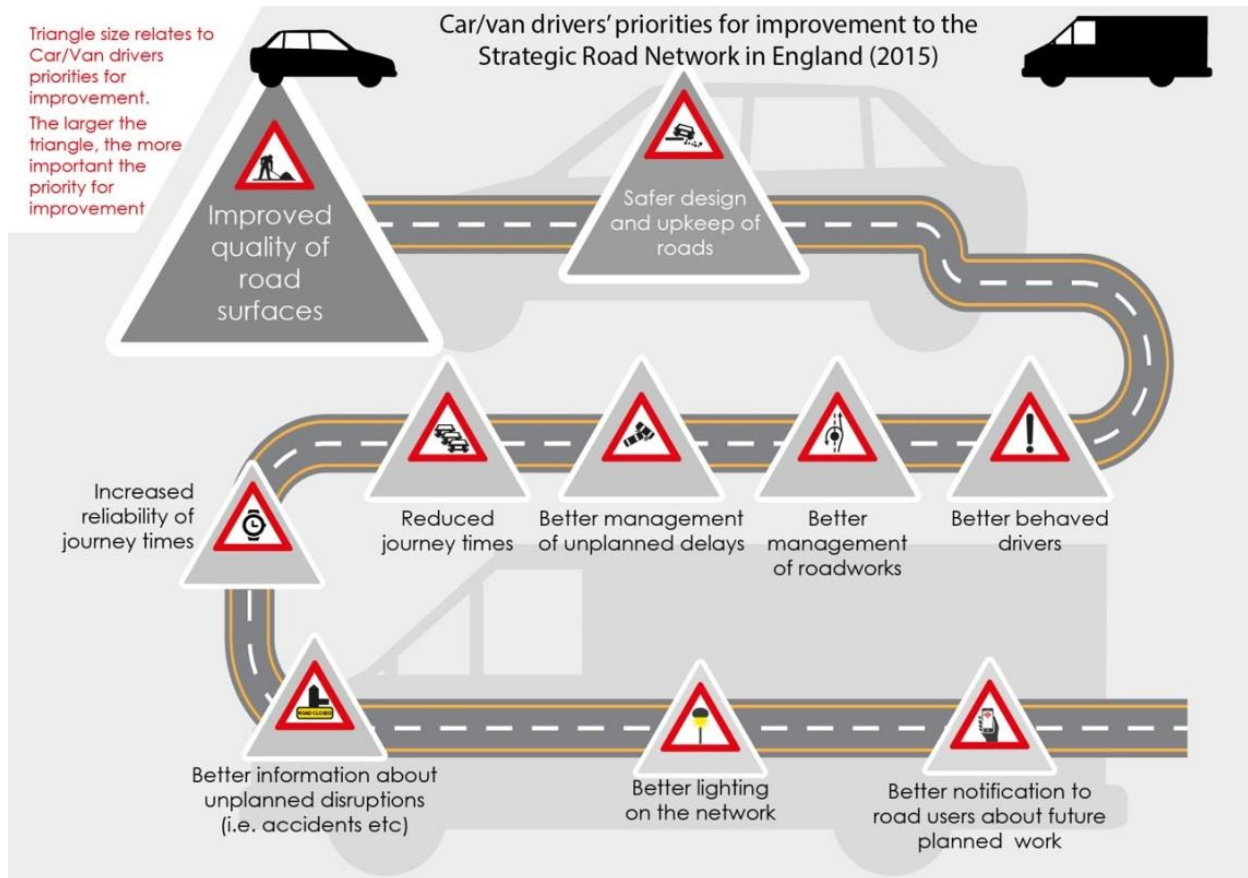
Figure 17: Delay on the GM Motorway network during the PM peak period 2014/15¹⁶



¹⁶ TfGM analysis of Trafficmaster data.

Road User Priorities: Car and Van Drivers

Figure 18: Top 10 Road user priorities for improvement to the strategic road network, car/ van drivers 2015¹⁷



32. The road network improvement that car/van drivers want as top priority is the 'quality of road surfaces', although concerns about road surface were not confined to potholes.

¹⁷ Road users' priorities for improvement: car and van drivers and motorcyclists, Transport Focus, July 2015
<http://www.transportfocus.org.uk/research/publications/road-users-priorities-for-improvement-car-and-van-drivers-and-motorcyclists>

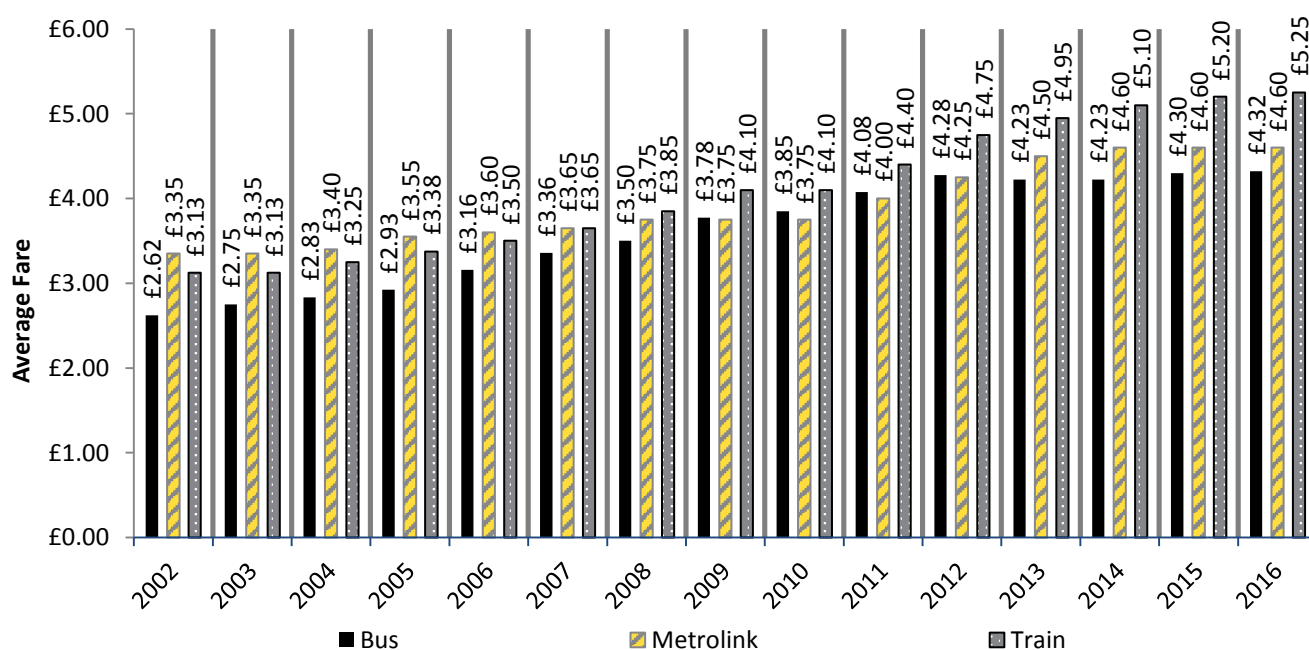
Public Transport

Table 5: Total passenger journeys on public transport services in GM (Bus, Train and Metrolink) 2005/06 – 2015/16¹⁸

	Year										
Mode	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Bus	219.2	226.3	226.7	233.0	226.6	224.0	218.6	219.7	216.7	210.9	208.5
Train	19.7	20.7	22.2	22.8	22.7	22.1	24.9	25.3	24.7	25.0	26.2
Metrolink	19.9	19.8	20.0	21.1	19.6	19.2	22.3	25.0	29.2	31.2	34.3
Total	258.8	266.8	268.9	276.9	268.9	265.3	265.8	270.0	270.6	267.1	269.0

33. Overall passenger journeys recorded on public transport services in Greater Manchester have risen between 2005 and 2015 (Table 5).
34. The rebuild of Manchester following the 1996 bombing has brought a greater number of trip attractions to the City Centre, the number of privately owned shopping, leisure and sports facilities has increased and an increasing number of major events such as sporting events and concerts attract residents and visitors from across the North West and beyond.
35. Greater Manchester has benefitted from a number of transport improvements since 2000 with the expansion of the Metrolink system, opening of train stations, resurgence in rail travel and the introduction of free concessionary fares, all of which have improved the attractiveness of public transport.

Figure 19: Average Public transport fares 2002 – 2016 by mode based upon average distance travelled (Bus day saver 3 miles, Metrolink return 4.5 miles, Train return 9 miles)



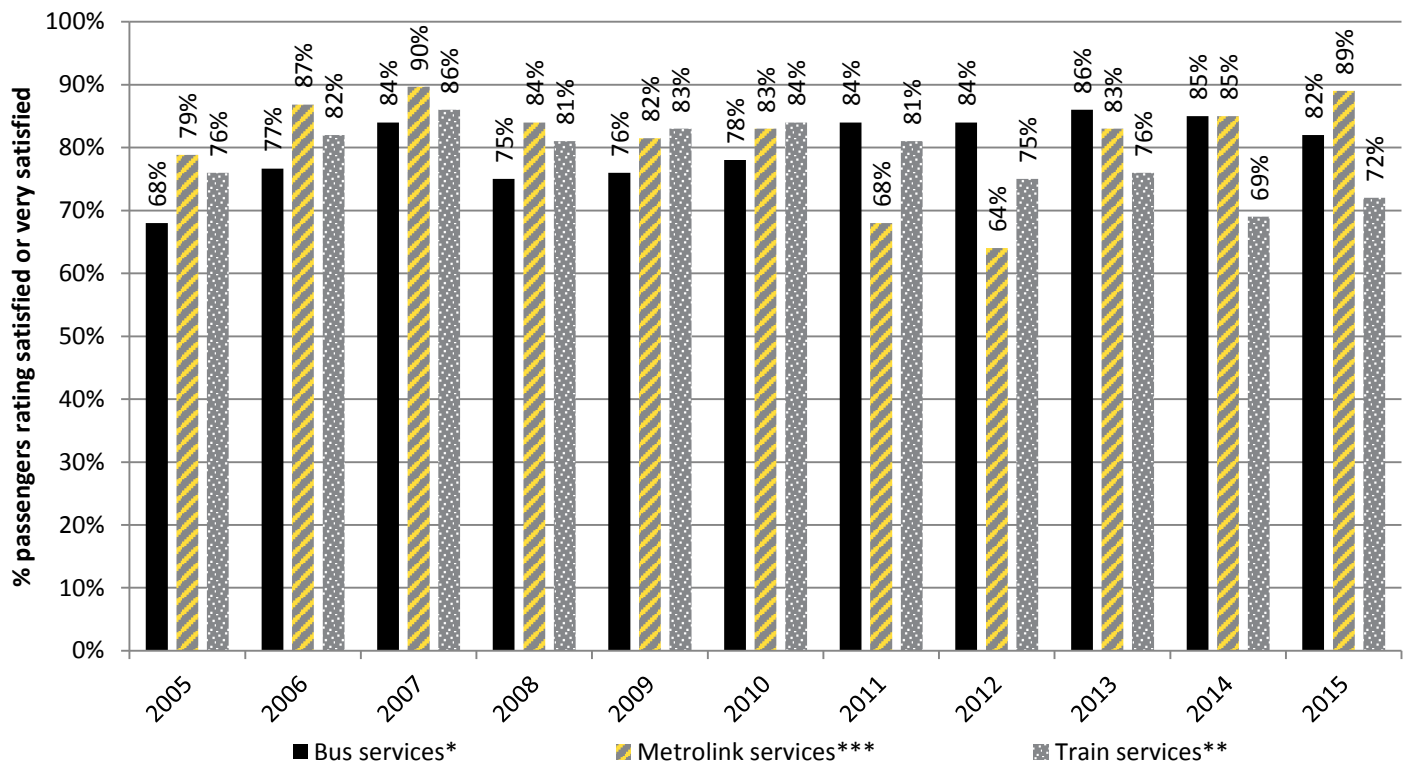
¹⁸ TfGM bus, Metrolink and train patronage estimates; note that rail trips are counted in full if made entirely within GM and that only half of those with one trip end in GM are included and a third of through trips are counted.

36. As shown in Figure 19, ticket prices for each of the three public transport modes have all increased between 2002 and 2016¹⁹.
37. Train fares have increased by a rate above inflation (as determined at a national level) consistently since 2003. Bus fares have also increased at an above inflationary rate year on year until 2013. Pressure on operators at a Greater Manchester level to try and keep fares at “affordable” levels resulted in an overall reduction in the price of an average day saver fare across Greater Manchester between 2012 and 2014.
38. Metrolink fares increased at a rate above inflation between 2010 and 2014, having increased at a rate below inflation between 2002 and 2008. Fares were held at 2014 levels in 2015 and 2016, as the network expanded further.

¹⁹ TfGM Highways Forecasting and Analytical Services Transport Statistics 2016: Background Information Section.

Passenger satisfaction - public transport services

Figure 20: Passenger satisfaction rating with the public transport journey by mode 2009 - 2015



39. Passenger satisfaction ratings with bus services increased between 2009 and 2010, and maintained a level above 80% over the subsequent 4 year period²⁰ (Figure 20). The decreased levels of passenger satisfaction with Metrolink services in 2011 and 2012 are explained by a change in survey methodology. Other than these 2 periods, satisfaction with Metrolink services has been above 80%. Satisfaction with train services in GM has been in decline since 2010, falling to below 70% for the first time in 2014.

Table 6: Top 3 delivery improvement priorities, GM Residents, 2004-2010²¹

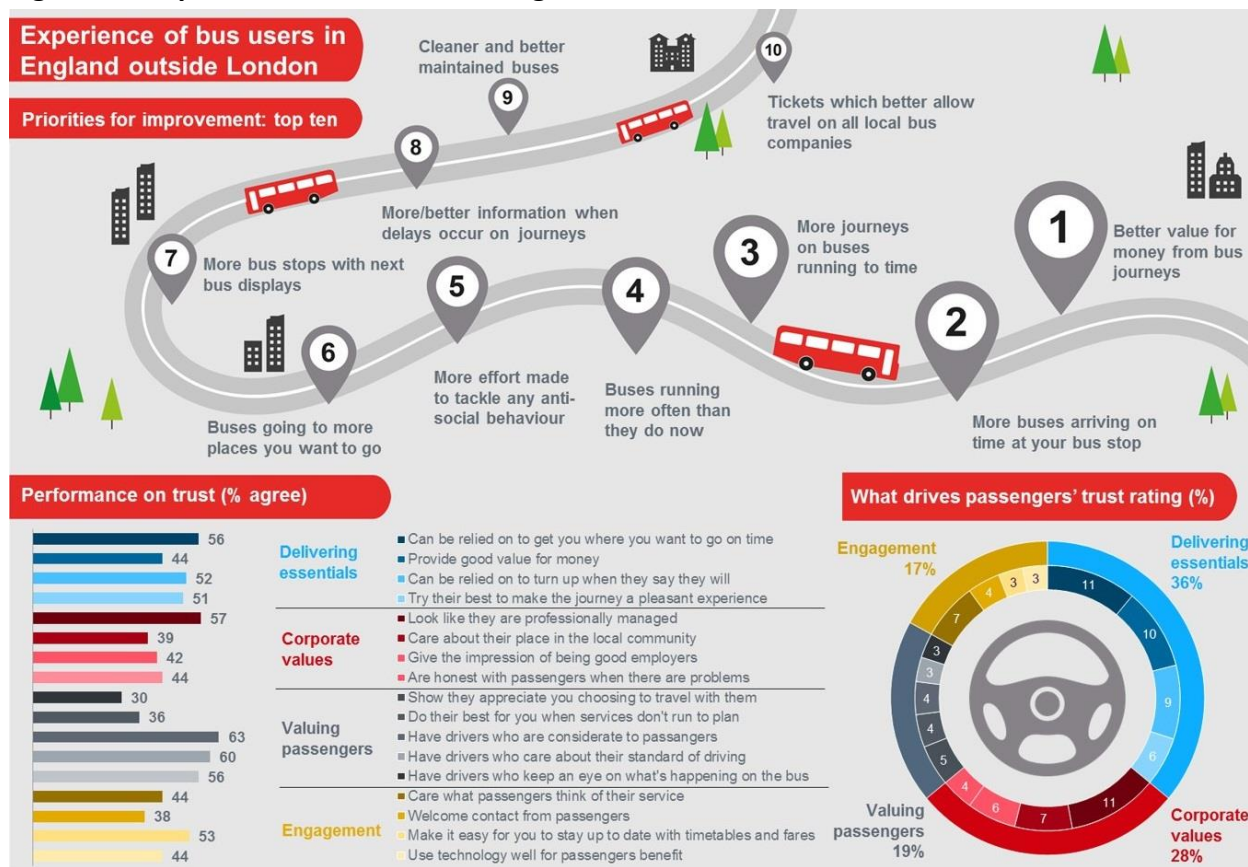
Bus	Metrolink	Train
On-bus journey time	Length of time the journey took	Scheduled journey length
Punctuality	Amount of personal space	Ease of getting on / off train
Availability of seating or space to stand	Punctuality	Punctuality

²⁰ Bus – Bus Passenger Surveys Transport Focus 2010 – 2015; Metrolink – Tram Passenger Surveys Transport Focus 2013 – 2014; Train – National Rail Passenger Surveys Transport Focus 2011 – 2015.

²¹ TfGM Multi-modal tracking survey 2004 – 2010.

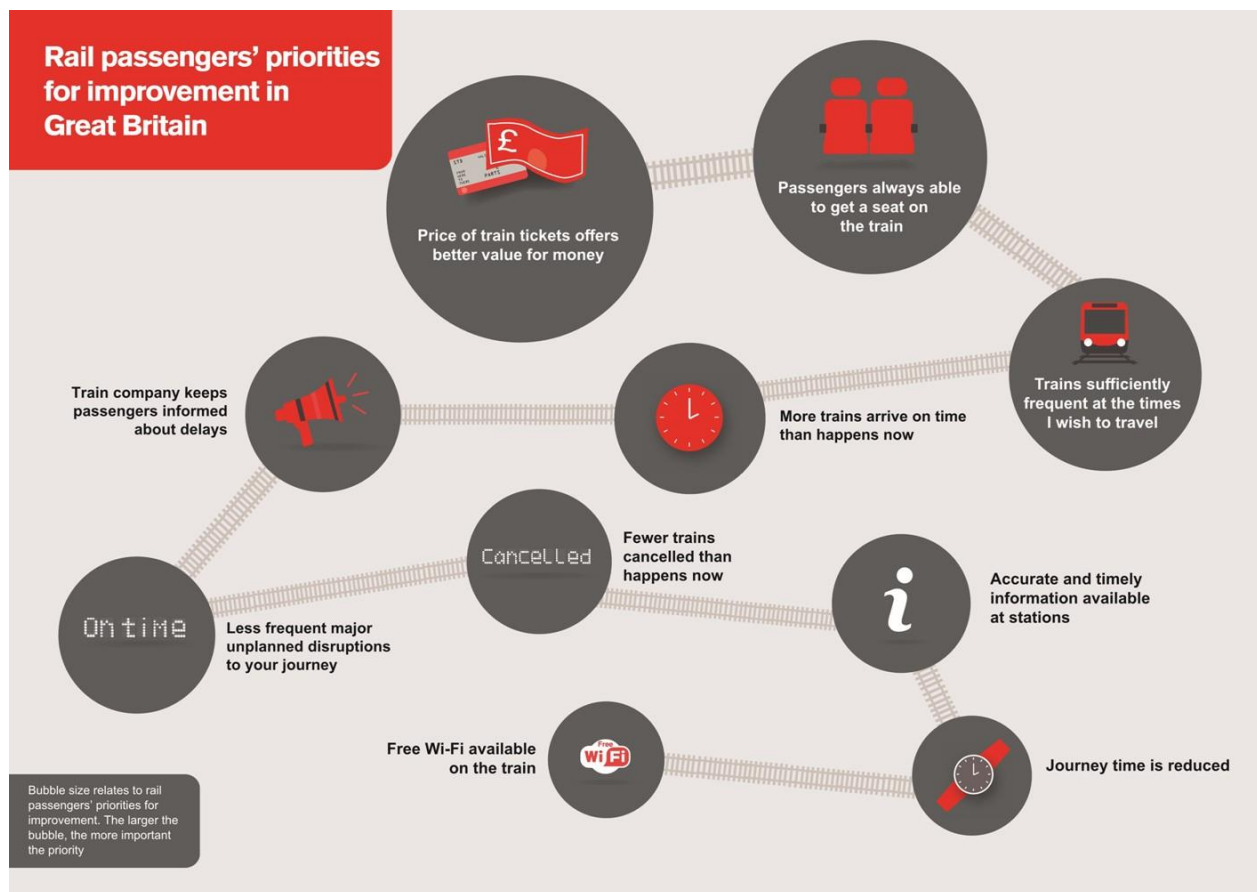
40. Reliable and on time services followed by affordable fares are the key improvement priorities for Greater Manchester public transport users. This differs slightly from the national bus and rail user priorities as identified by Transport Focus which emphasises the importance of value for money (Figures 21 and 22).

Figure 21: Experience of bus users in England outside London²²



²² Bus passengers have their say - Trust, what to improve and using buses more, Transport Focus, March 2016
<http://www.transportfocus.org.uk/research-publications/publications/bus-passengers-have-their-say/>

Figure 22: Rail passenger priorities for improvement in Great Britain²³



²³ Rail Passengers' Priorities for Improvement, Transport Focus, October 2014

<http://www.transportfocus.org.uk/research/publications/rail-passengers-priorities-for-improvements-october-2014>

Travel and Income

41. Median weekly income for Greater Manchester residents in employment has increased by 8% for full time employees and 20% for part time employees between 2010 and 2016²⁴ (Table 7).

Table 7: Median weekly earnings of GM residents in employment 2010 – 2016 by employment type

Type	2010	2011	2012	2013	2014	2015	2016
Full Time	£444.00	£434.90	£448.40	£460.00	£459.60	£472.20	£479.10
Part time	£144.00	£148.30	£150.40	£149.50	£150.40	£156.80	£172.30

42. For those residents with the lowest household incomes, the main modes of transport are walking and public transport (Figure 23). For those residents with mid to high incomes the main mode is predominantly car.

Figure 23: Main mode of travel by household income



43. Travel horizons also correlate to household income, with Greater Manchester residents with the highest incomes travelling further than those on lower incomes²⁵ (Table 8).

Table 8: Mean trip distance by income band, GM residents 2013-2015

	less than £5k	£5k to £9.9k	£10k to £14.9k	£15k to £19.9k	£20k to £24.9k	£25k to £34.9k	£35k to £49.9k	£50k to £74.9k	Above £75k
Mean Trip Distance (km)	2.2	3.0	3.0	5.4	5.2	6.2	8.3	9.2	11.2

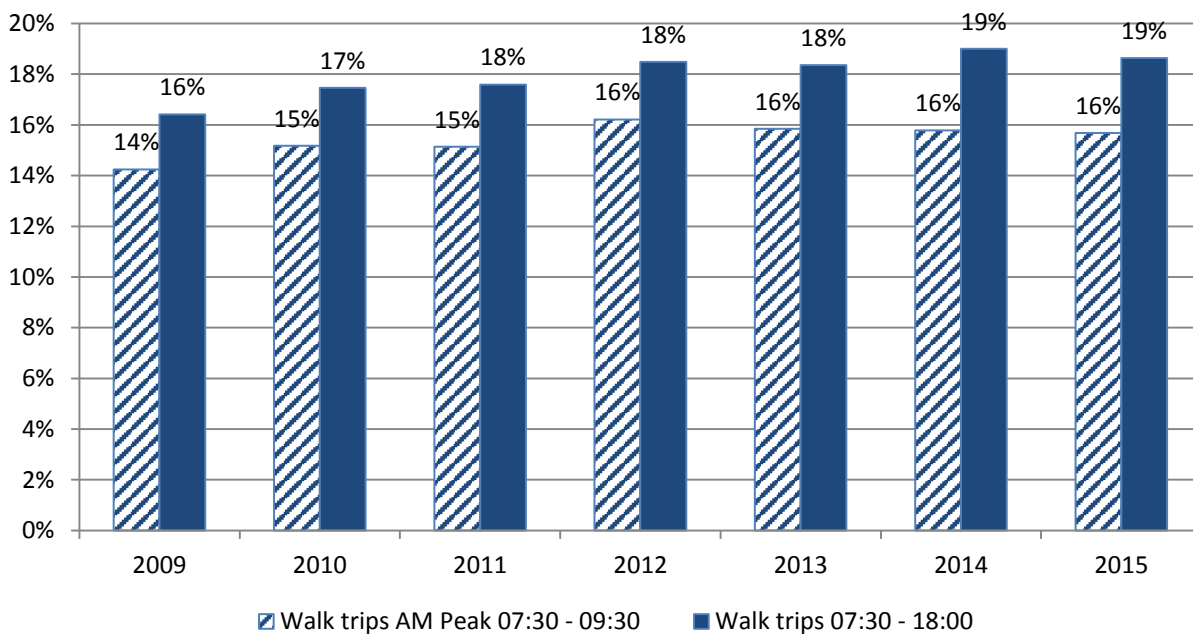
²⁴ Office for National Statistics, Annual Survey of Hours and Earnings 2010–2016.

²⁵ TfGM Travel Diary Surveys 2013 – 2015.

Active travel

44. There has been an increase in walking trips entering town centres across Greater Manchester between 2009 and 2015 (Figure 24). 19% of trips entering town centres across Greater Manchester during the day are made on foot.²⁶

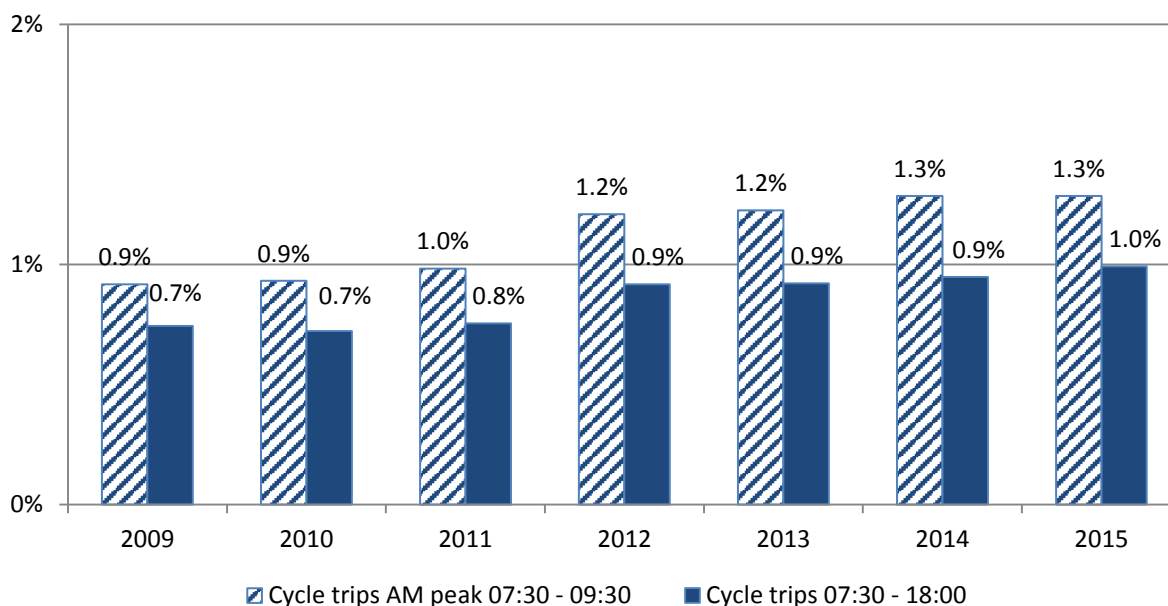
Figure 24: Percentage of pedestrians in relation to all inbound trips entering GM town centres 2009 - 2015



45. The average trip distance covered by pedestrians is 0.7km, with the average commute trip distance made on foot being 0.9km.
46. The number of bicycles entering town centres across Greater Manchester has been increasing since 2010, with the greatest increase occurring in the morning peak period (Figure 25).

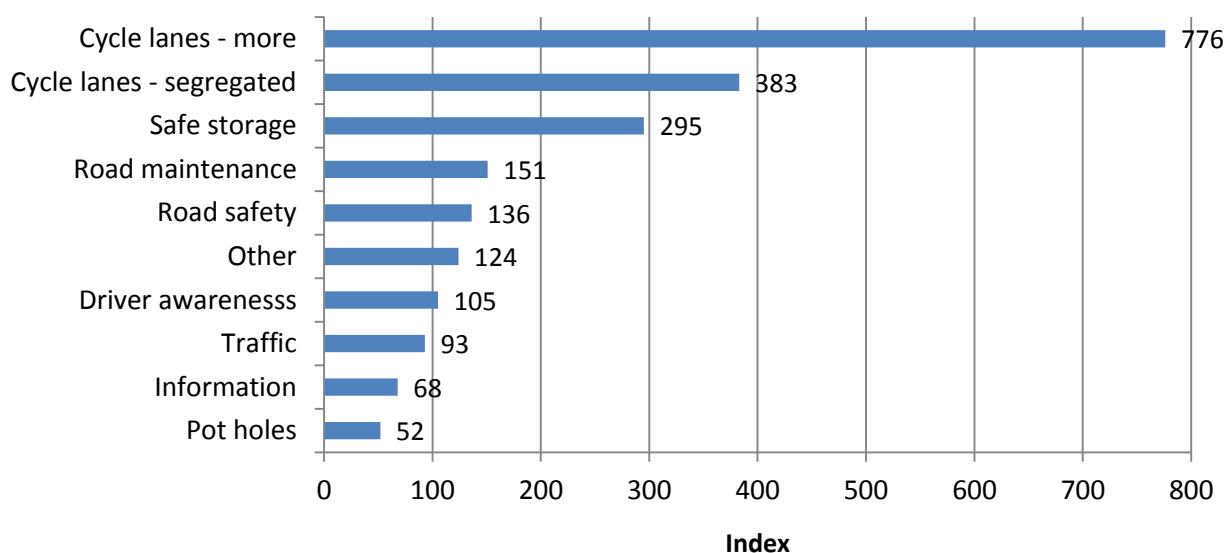
²⁶ TfGM Highways Forecasting and Analytical Services Key Centres Section. Covers: Altrincham, Ashton, Bolton, Bury, Eccles, Manchester, Oldham, Rochdale, Stockport and Wigan.

Figure 25: Percentage of cycles in relation to all inbound trips entering GM Town Centres 2009 – 2015.



Road User Priorities: Cyclists

Figure 26: Top 10 priorities for improving cycling in Greater Manchester, 2013²⁷



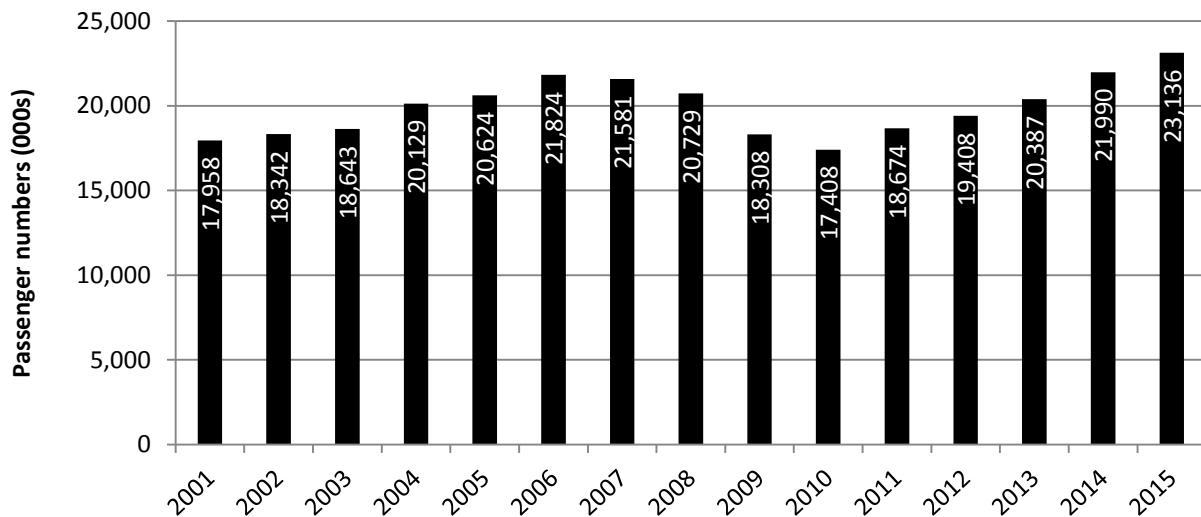
The biggest barrier to cycling in Greater Manchester was deemed to be volume of traffic, and consequently the top priority for improvement was the provision of more cycle lanes, twice as important as the second priority - the provision of segregated cycle lanes, followed by safe storage (Figure 26).

²⁷ TfGM Survey of Manchester City Centre Skyride participants 2013.

Air Passengers

47. From 2010, air passenger numbers travelling through Manchester Airport have increased, surpassing 2006 figures in 2015, when over 23 million passengers passed through the airport.²⁸ (Figure 27).

Figure 27: Total air passenger numbers through Manchester Airport 2000– 2015



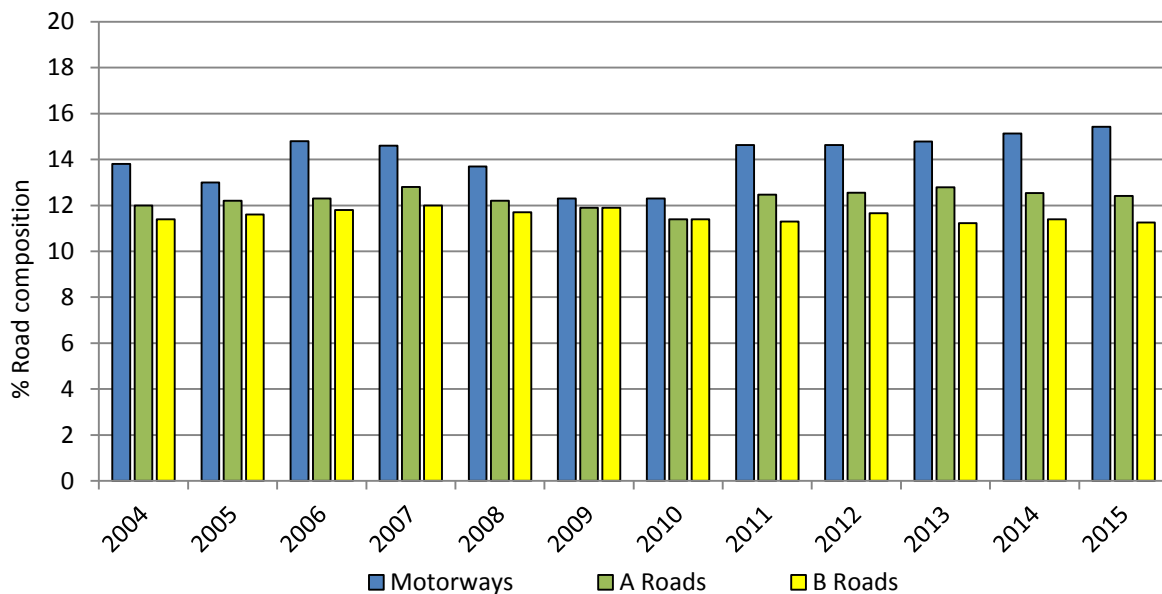
48. A total of 173,000 aircraft movements were reported by Manchester Airport during 2015, a 1.5% increase on 2014 movements.

²⁸ CAA Airport statistics 2000 – 2015 Table 08.

Freight

49. Britain has the highest rate of online shopping in Europe. In 2013, 72 per cent of British adults shopped online, up from 53 per cent in 2008. The Logistics Report (2014) suggests that the B2C parcel market (including deliveries and returns) is expected to grow at a rate of 4.8% per year to 2018, driven by online retail.

Figure 28: Light Goods Vehicles by road type in Greater Manchester 2004 – 2015²⁹



50. In contrast, the overall percentage of Goods Vehicles entering town centres across Greater Manchester has been consistently below 10% since the recession in 2009/10 (Figure 29).

²⁹ TfGM Highways Forecasting and Analytical Services Key Centres Section.

Figure 29: Light Goods Vehicles and Other Goods Vehicles Crossing Town Centre Cordon Points during the AM peak period (07:30 – 09:30) Greater Manchester 2000 – 2015³⁰

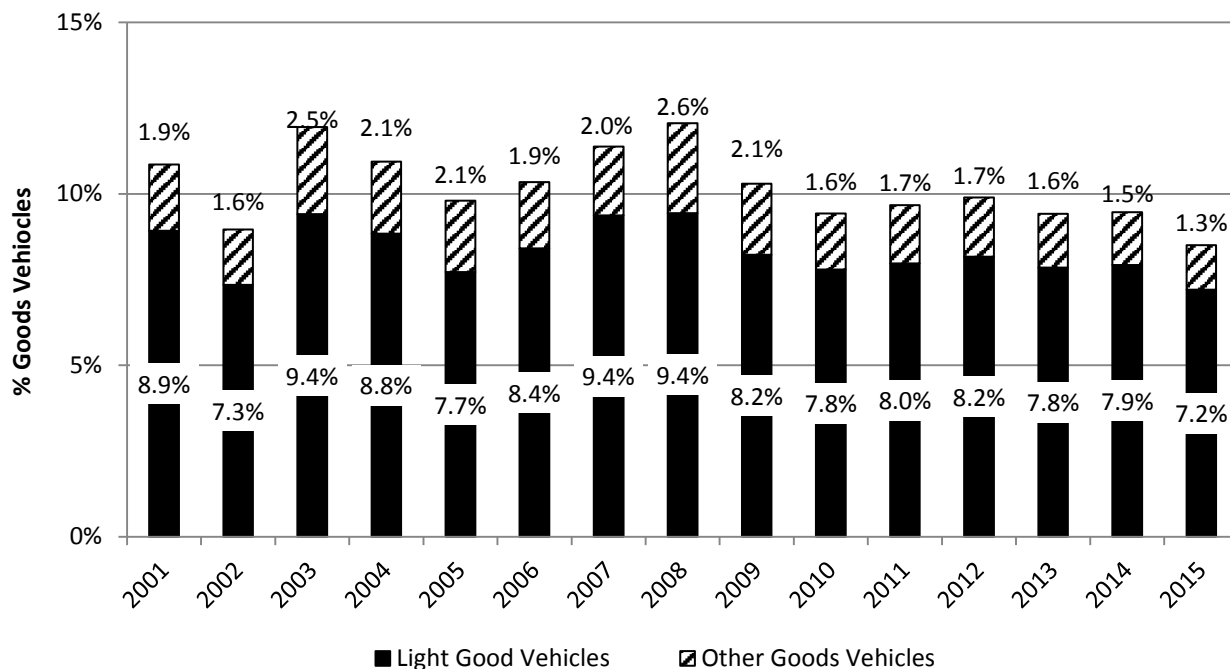
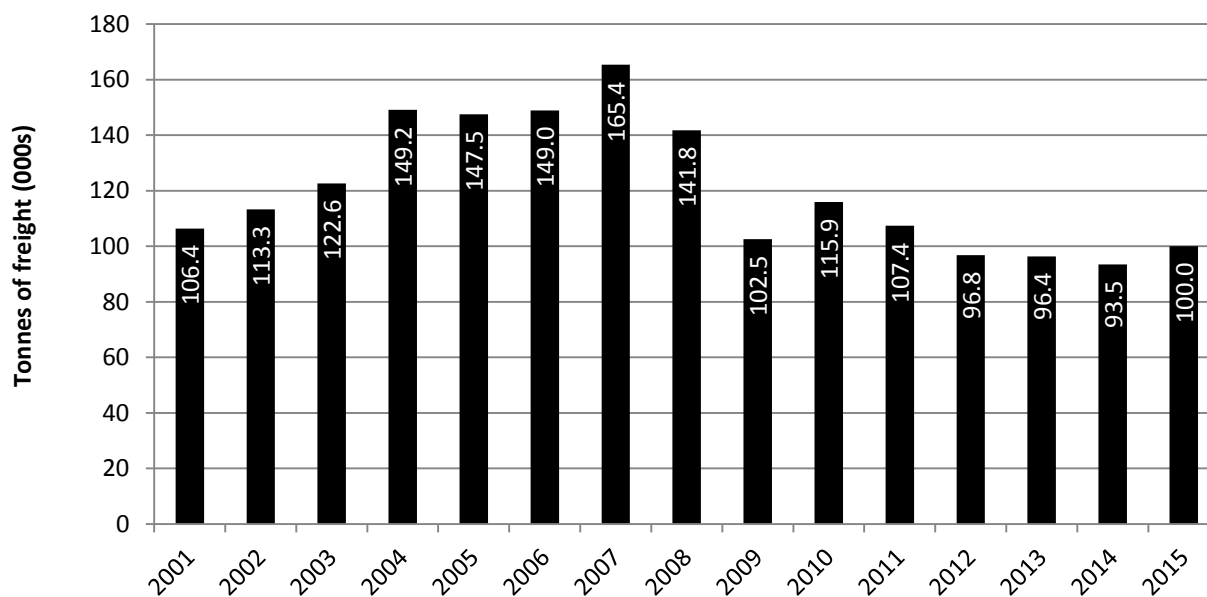


Figure 30: Air freight handled by Manchester Airport (thousand tonnes) 2001 - 2015³¹

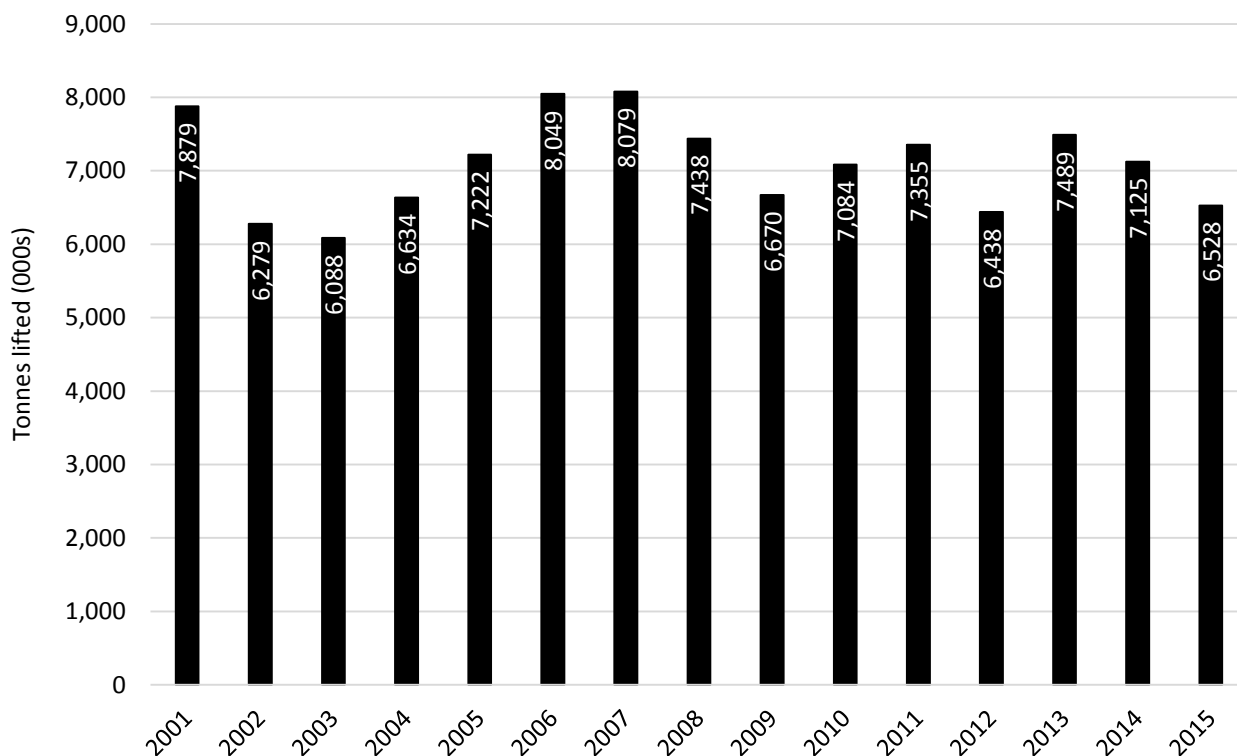


³⁰ TfGM Highways Forecasting and Analytical Services Key Centres Section.

³¹ CAA Airport Statistics Table 13.2 Freight handled by Manchester Airport 2001 – 2015.

51. The sharp decline in the quantity of freight lifted at Manchester Airport is evident post 2007, falling year on year from 2010 to 2014, recovering to 100,000 tonnes in 2015 (Figure 30).

Figure 31: Freight lifted through Manchester Ports (thousand tonnes) 2001 - 2015³²



52. The quantity of freight handled by Manchester ports has fluctuated significantly over the period shown, with the 2015 figure (7,125 thousand tonnes) being below the period average of 7,128 thousand tonnes (Figure 31).

³² Department for Transport Port Freight Statistics Table PORT0101 UK major and minor ports, all freight traffic, by port and direction, annually: 1965 – 2015

Economy and Employment



Economy and Employment: Summary of Trends and Implications

Increasing travel demand associated with a growing economy

- GM and Northern Powerhouse led initiatives aspire to deliver transformational change to rebalance the UK economy. This will lead to a significant increase in total travel demand in GM. The precise nature and location of these jobs will determine the scope of transport interventions.

Increasing productivity while delivering positive travel outcomes

- A more productive workforce, in higher paid jobs, focusing on more specialised and skilled activities, has historically tended to lead to increased commuting distances and more complex trip patterns. GMSF therefore needs to, and will, place a very strong emphasis on directing new development towards locations that will promote positive travel outcomes.

Greater labour market participation leading to more trips

- A greater proportion of people of traditional working age, 16-64, participating in employment or training will lead to more trips on the transport network.

Ageing population

- Employment in later life is increasing steadily, leading to a more diverse set of working patterns, additional travel demand, and a broadening set of traveller needs.

Accessing employment opportunities

- An increasingly centralised distribution of GM employment is expected, emphasising the need to continue to invest in improving accessibility to the regional centre and principal town centres by means other than car for residents across GM and beyond.
- There is some disparity between areas of employment deprivation and identified sites for employment growth. Transport has an important role to play in order to sustainably connect deprived communities with employment opportunities.
- For the majority of commuter movements the private car is the dominant mode, in part due to the dispersed nature of employment within and outside of GM. The city centre, where the majority of jobs are accessed by non-car modes, is a clear exception.

Transport network congestion and overcrowding

- If not managed effectively, severe road congestion and public transport overcrowding during peak periods could undermine GM's ability to improve economic productivity and deliver its growth aspirations.

A growing visitor economy

- An increase in the number of visitors to GM will lead to more trips on the transport network. It will be important to accommodate the needs of those who are unfamiliar with GM in a manner that promotes sustainable travel choices. In particular, this will require a simple, easy to use public transport network supported by targeted marketing materials and passenger information. A legible walking environment will also be critical.

A Growing GM Economy

53. GM is the main driver of the Northern economy and generates nearly 40% of the North West's total GVA and 19% of the Northern Powerhouse's GVA.³³ With a total GVA output of £56bn, GM is the largest city-region economy outside London, contributing 3.5% of total national economic output.³⁴ Just over 1.3m people are employed within firms located in GM, making up around a fifth of jobs in the Northern Powerhouse.
54. The Greater Manchester Forecasting Model (GMFM) suggests that employment in GM will continue to grow over the next 20 years. This analysis was used to inform the Greater Manchester Strategic Framework (GMSF) strategic options consultation initiated in autumn 2015.
55. The GMSF consultation feedback received was taken into account and led to a review of the evidence, specifically challenges around GM's ambition for growth and what scale of growth is needed to maximise GM's position as the engine of growth driving the Northern Powerhouse. This has led to an updated economic forecast (Accelerated Growth Scenario (AGS) 2015) and GMCA agreement that GM should be planning for and testing the impact of the following level of growth:
- GVA growth of 2.5% year on year, giving an uplift of £5 billion above baseline conditions by 2035;
 - Additional 200,000 jobs;
 - Population growth of 295,000, which translates into 227,000 net new homes
56. The GMSF draft for consultation (October 2016) places a strong and continuing emphasis on directing new development to brownfield land in urban locations, however the scale of planned growth requires the release of land from the Green Belt.
57. The aim of the GMSF is to provide opportunities for development across the whole of GM. A small number of locations however will make a disproportionate contribution to economic growth. These include the regional centre, Manchester Airport, and GM's principal town centres. Ensuring that these existing employment growth areas have appropriate levels of transport capacity and connectivity will be key.

³³ Note: The definition used covers the English regions of: North West, North East, and Yorkshire & Humberside

³⁴ ONS, Regional Gross Value Added (Income Approach)

58. While the majority of new jobs are forecast to be within these existing employment centres, GMSF provides an opportunity to improve and modernise GM's wider employment land offer particularly around industry, warehousing and logistics. Significant expansion of established employment locations is currently proposed, such as the Northern Gateway (building on the Heywood/ Pilsworth, Stakehill and Kingsway offers); Western Gateway (Port Salford, Carrington) and Eastern Gateway (Ashton Moss, M67) as well as the M61, M6 and East Lancs corridors. There will be a need for considerable investment in transport infrastructure and services to support the release of these sites.

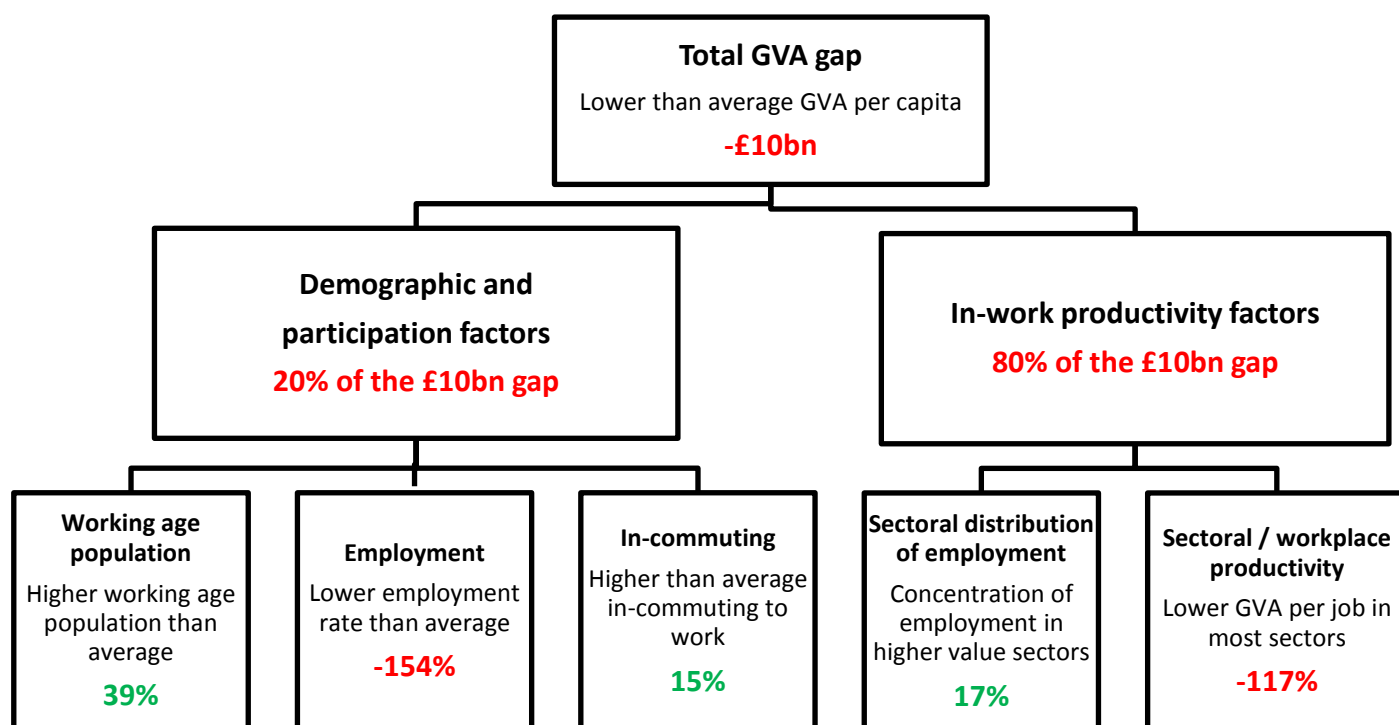
Implication for 2040 Strategy

The strong growth in employment expected for the conurbation is anticipated to lead to a significant increase in total travel demand in Greater Manchester. The precise nature and location of these jobs will determine the scope of transport interventions.

Prospective Increases in Productivity

59. Despite its economic assets and opportunities, productivity remains below what would be expected for a city of its size. If GM's GVA per capita were the same as the UK average, the city region would generate an additional £10bn per annum. Its economy would be fully 20% larger. Figure 32 breaks down the productivity gap into its composite parts and shows:
- Productivity in GM is low due to a mix of both demographic and “in work” productivity factors.
 - Demographic factors account for around 20%-25% of the productivity gap between GM and the UK. While GM benefits from a large working age population and high levels of in-commuting compared to other areas, low employment rates and high levels of economic inactivity act as a significant drag on its economic potential.
 - “In work” productivity accounts for 75-80% of the productivity gap. GM's sector mix gives it a boost compared to other parts of the UK, as it has concentrations of high value industries. However, the GVA generated on average in jobs across the city region acts as a brake and is the single biggest factor in accounting for the difference in productivity.
60. It is important to note that the productivity gap is not as substantial if London is excluded from the UK average, falling to around £2.7bn. In part this reflects different regional prices as prices are typically lower in regions with lower incomes per capita, although analysis undertaken for the Northern Powerhouse Independent Economic Review (June 2016) suggests this only explains about 3-4% of the 20% performance gap. Eurostat data from 2012 shows the performance gap compared with comparator European cities – Lille, Leipzig, Turin, Barcelona, Rotterdam, Cologne, Dusseldorf, Helsinki, Frankfurt and Munich – is larger still (40-50%)

Figure 32: Drivers of productivity and the composition of GVA gap, 2014/15 (green numbers indicate a positive contribution to GM's productivity performance, red a negative)



Source: New Economy analysis of ONS data (percentages indicate the main contributors to the productivity gap).

GM sector analysis

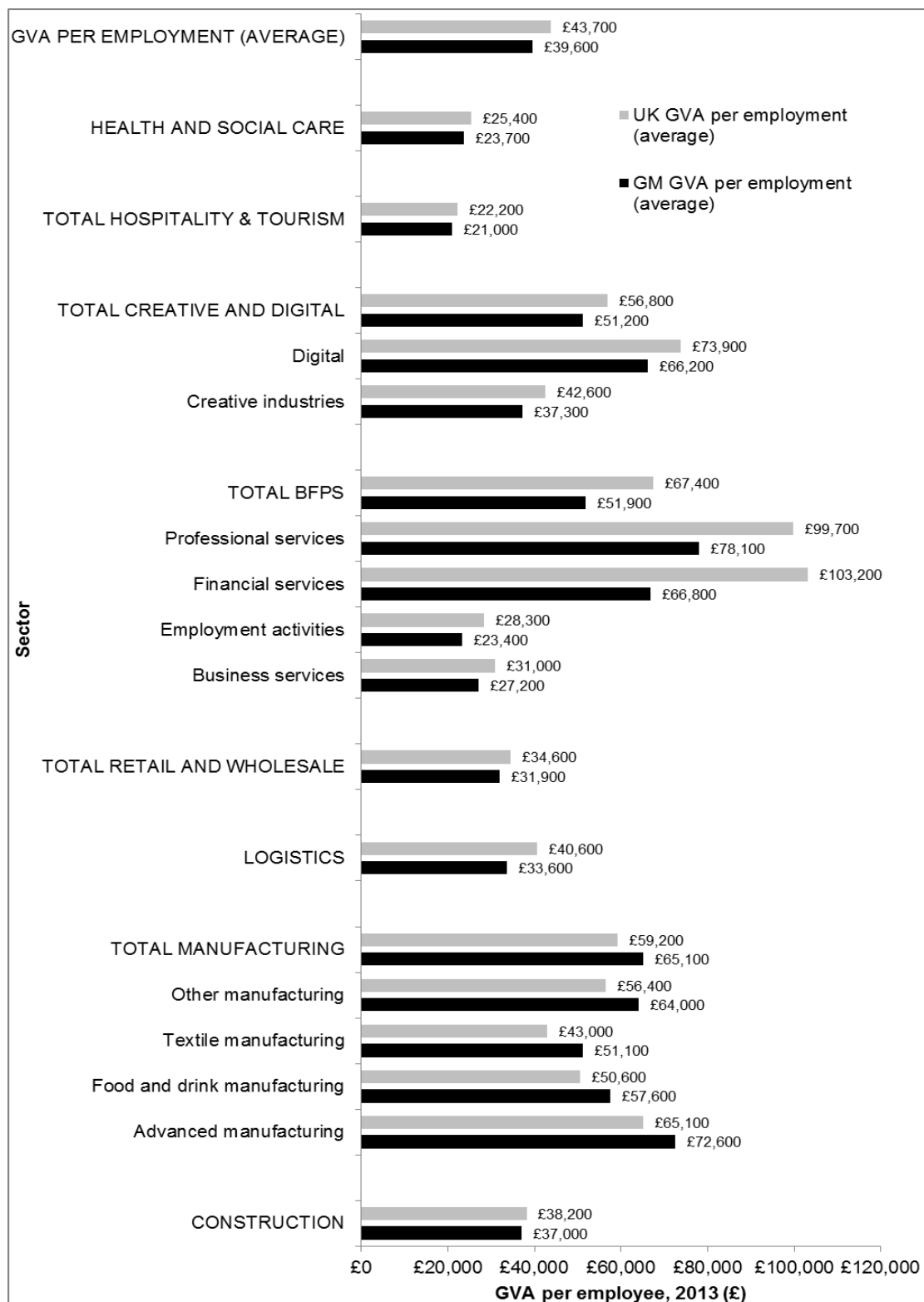
61. Aligning analysis of GM's sector strengths with work undertaken as part of the Northern Powerhouse Independent Economic Review has led to the identification of four leading sectors by New Economy. These sectors are critical in terms of creating a modern knowledge driven economy and accelerating growth. They are sectors in which GM is specialised and distinctive, where we have concentrations of national and international class assets, and which have the potential to drive growth. They are:

- **Manufacturing:** Advanced Manufacturing, Textiles Manufacturing, Food & Drink
- **Financial & Professional Services** (wider sector includes Business & Employment Services)
- **Digital and Creative Industries** (given the importance of design to other sectors)
- **Health Innovation** (this also includes social care)

62. Figure 33 shows productivity by sector (and sub-sector within these) in GM, compared to the GM whole economy average of £39,600 per worker in 2013³⁵.
63. A number of sectors are high productivity (in an absolute sense) and perform well against sectoral benchmarks for productivity in GM, in particular: the Advanced Manufacturing subsector (£72,600 per employment in GM), Food and Drink Manufacturing (£57,600) and Textiles (£51,100).
64. Some sectors have very high productivity compared with the GM average, but remain some way behind the average for the sector in the UK, for example Professional Services subsector (£78,100), and Financial Services (£66,800). The national average is skewed by some financial and professional services industries in London.
65. Some sectors in GM have generally lower levels of productivity (in an absolute sense cf. the GM average for all industries), but are close to their peers (and UK average) in terms of productivity within the respective sector, these include: Creative industries (£37,300), Construction (£37,000), Hospitality and Tourism (£21,000).
66. The critical issue for policy makers will be how to address the workplace productivity gap within each sector of GM's economy and help close the gap between GM and the UK average. In some sectors this will require productivity to grow as fast, and even faster, than other better performing parts of the UK economy. In others, it may rely on growing the employment and business base.
67. Of those residents that are in employment, there is a high concentration within low pay occupations when compared with the national average and a reliance on tax credits, which are being reduced over time, to supplement low earnings. This is an unsustainable situation if GM is to achieve its ambitions and become a net contributor and not a cost centre to the UK.

³⁵ Greater Manchester Forecasting Model (2014): GVA and Employment data by key sector and sub-sectors

Figure 33: Productivity - Gap between GM and UK average per sector, 2013 ³⁶



Source: Greater Manchester Forecasting Model (2014 update)

³⁶ Note: Grey bars = UK average, including London & South East; and Black bars are the GM sector average

GM workforce upskilling and possible implications on distance travelled to work

68. GMSF forecasts that some 200,000 additional jobs could be created in GM between 2015 and 2035, reflecting the leading role which GM is expected to play within the Northern Powerhouse. Of this growth we will see a higher proportion of people in employment being qualified to NVQ level 3 or above than today (53% of workers in 2015 compared with 60% in 2035; by which time 42% are forecast to be NVQ level 4+), with an accompanying reduction in the share of workers with low or no qualifications.
69. Table 9 uses Census 2011 data to demonstrate the tendency for GM residents in employment with Level 4+ qualifications (degree or equivalent as a minimum qualification) to travel longer distances to access employment. This suggests that skills and qualification levels play a major part in determining a resident's willingness to travel. In large part, this relates to the significantly higher earnings that higher level qualifications attract.

Table 9: Distance travelled to work by qualification

	Level 4+ qualifications		No qualifications	
	Number	%	Number	%
Less than 2km	50,847	12.7%	33,754	24.3%
2km to less than 5km	74,490	18.6%	34,228	24.6%
5km to less than 10km	91,081	22.8%	24,563	17.7%
10km to less than 20km	76,279	19.1%	13,114	9.4%
20km to less than 30km	22,390	5.6%	2,772	2.0%
30km to less than 40km	8,366	2.1%	1,118	0.8%
40km to less than 60km	8,477	2.1%	1,074	0.8%
60km and over	10,345	2.6%	2,213	1.6%
Work mainly at or from home	35,484	8.9%	12,586	9.1%
Other	22,548	5.6%	13,536	9.7%
Total	400,307	100.0%	138,958	100.0%

Source: New Economy analysis of Census 2011, GM residents in employment.

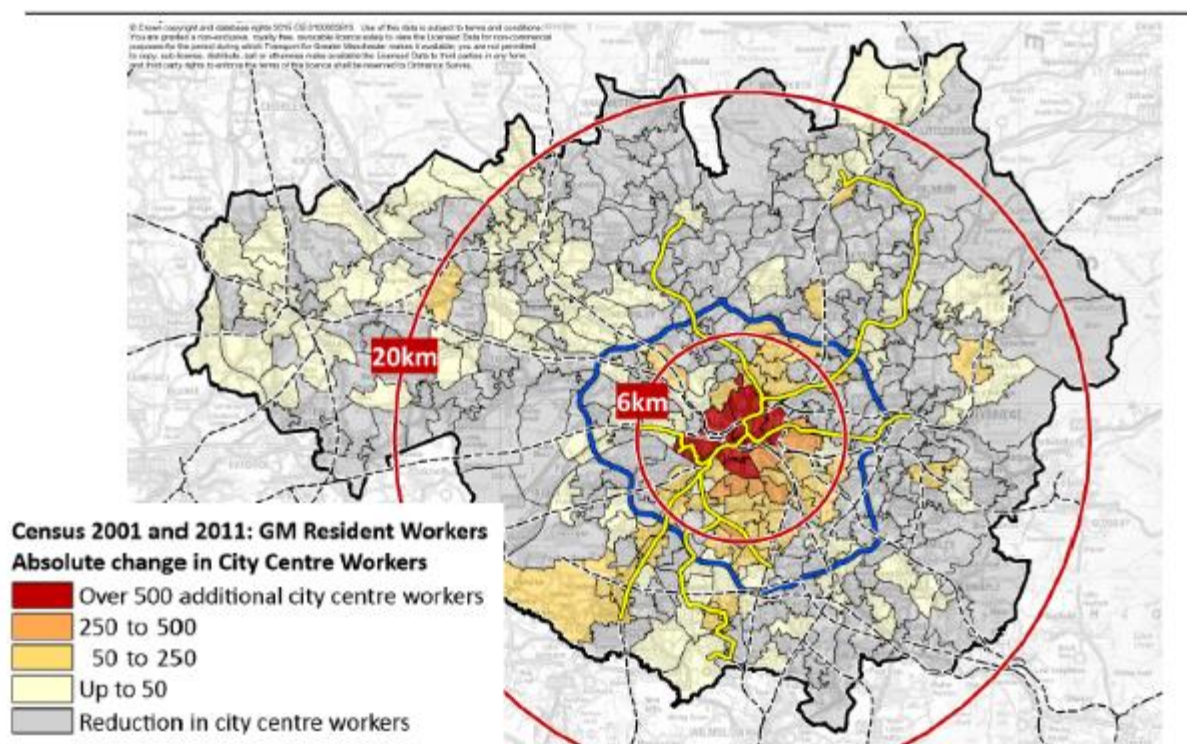
Implication for 2040 Strategy

A more productive workforce, in higher paid jobs, focusing on more specialised and skilled activities, has historically tended to lead to increased commuting distances and more complex trip patterns. GMSF therefore needs to, and will, place a very strong emphasis on directing new development towards locations that will promote positive travel outcomes.

Concentration of the city centre workforce

70. A trend that looks likely to moderate the potential for longer-distance trips to work is the increasing tendency for workers in Manchester City Centre to live within the urban core. Figure 34 compares 2001 and 2011 Census data. The changes in the home locations of city-centre workers need to be seen in the context of an increase between 2001 and 2011 of 14.3% in the number of city-centre jobs, compared with an increase of 11.5% in the number of jobs in Greater Manchester as a whole.

Figure 34: Change in home-locations of workers in Manchester City Centre



Implication for 2040 Strategy

More people living and working within the urban core will promote sustainable economic growth by strengthening the potential for reduced trip lengths and increasing the use of sustainable modes of travel.

Greater Labour Market Participation

Resident Employment Rate (RER)

71. A picture of healthy recent growth however masks the significant challenges which exist within the labour market. These are substantial enough to play out at a city region scale as well as more deeply at a local level. The RER, the proportion of the working age population who are employed provides a good measure of the health of the local labour market, and at a GM level it lags behind the national average. GM's RER is lower than the national average and is currently 69.5%, with 1,220,000 residents in employment compared to the population of 1,757,000 residents of working age (16-64). The RER in GM has increased from 66.9% in 2010, but it is still lagging behind the resident employment rate nationally (currently 73.4%).

Barriers to increasing the RER

72. There are major barriers to employment for residents across the conurbation. Significant demand side barriers aside, it is poor skills levels that act as a significant brake on GM's overall economic performance. Skills levels are also a key factor in explaining the disparity in economic outcomes seen between districts and neighbourhoods across GM. The correlation between employment rate and skills level is striking: 41% of residents with no qualifications are in work compared to 70% of those with a Level 2 qualification (equivalent to 5+ A*-C grades at GCSE) and 84% of those with a degree.
73. There are equally strong correlations between skill levels and earnings, and between skill levels and residents ability to access jobs. On most measures - from school readiness at age 5 to the adult qualification profile - GM as a whole underperforms and has concentrations of neighbourhoods that are amongst the worst performing nationally. These findings are in line with the recent Northern Powerhouse Independent Economic Review, which highlighted the importance of skills, alongside other factors, in explaining the North's underperformance.

Impacts of the current RER

74. Greater Manchester's GVA per capita benefits from having a higher than average working age population and high levels of in-commuting to work, however it is held back by high levels of unemployment and economic inactivity in the city region. If GM were to reach the national average employment rate its GVA per capita would be £2.9 billion higher.
75. In order to meet the forecast ambition for additional jobs, GM will need to continue to attract migrants to work and live in the city, and commuters to work within the conurbation and benefit from the economic opportunities. Crucially however, it will also need to boost the RER and to ensure that all residents, particularly those that are in the most deprived neighbourhoods have the skills and ability to access these opportunities.

Implication for 2040 Strategy

It is anticipated that a greater proportion of people of traditional working age, 16-64, will participate in employment or training, resulting in more trips on the transport network.

An Ageing Population, Remaining Economically Active for Longer

- 76. The ageing of the Greater Manchester population is discussed in the Society and Community section.
- 77. For a variety of reasons, older people are increasingly choosing to remain in the labour market. 7.3% of GM residents aged over 65 were in employment in 2015, equal to around 30,800 people³⁷. The number of GM residents over the age of 65 in employment has nearly doubled since 2005, when it stood at around 16,700. Since 2010 (when there were 23,000 over 65's in employment) this number has increased by 33.9%.
- 78. In GM, male residents over 65 are more likely to be in employment than female residents (with an employment rate of 9.3% for men compared to 5.7% for women). However, the number of older female workers is growing somewhat faster than that of males. Some 13,000 women over 65 in GM were in employment in 2015, an increase of 41.3% since 2010, while the number of older males in employment increased by 29.0% over the same period. Nationally, 3 million people of pensionable age are in employment. This group, which has increased by 50% since 2000, reports higher job satisfaction and is growing faster than younger workers.³⁸
- 79. Developing the right housing, alongside infrastructure, and services, is critical to enabling this growing cohort to access both employment and leisure/ cultural opportunities in a sustainable manner. This represents an opportunity for districts across GM to capture a share of a growing market.

Implication for 2040 Strategy

The trend for the proportion of people working in later life to increase is expected to continue, with implications for additional travel demand and a more diverse set of traveller needs.

³⁷ Annual Population Survey, Oct 2014 – Sept 2015

³⁸ HAPPI, Housing Our Ageing Population

Accessing Employment Opportunities

Distribution of Employment

80. Figure 35 uses Census 2011 data to show the distribution of employment across GM using the number of jobs per sq. km as a density measure. It is immediately noticeable that there is a significant concentration of employment opportunities within the regional centre (some 19% of GM employment) and along key radial routes to the south.
81. As a result of GM's polycentric nature, we also observe clusters of employment at each major town centre, as well as other strategic employment locations such as Salford Quays, Trafford Park, the Trafford Centre, and Manchester Airport. The significance of the 'Western Gateway' corridor stretching from the city centre westwards to the M60, which encompasses Salford Quays, Trafford Park and the Trafford Centre, is also clear. It is however noticeable that there are far fewer jobs to the east of the city centre.
82. Figure 35 also demonstrates that there are a number of significant employment clusters located outside of GM but within commuting distance of GM districts e.g. Warrington, Birchwood, St Helens, Huddersfield and Halifax.
83. Figure 36 shows the car driver mode share of the workplace population, which when compared with Figure 35, shows the important role that the city centre and core areas of the principal town centres play in accommodating large amounts of employment in a sustainable manner.

Figure 35: 2011 Employment Density

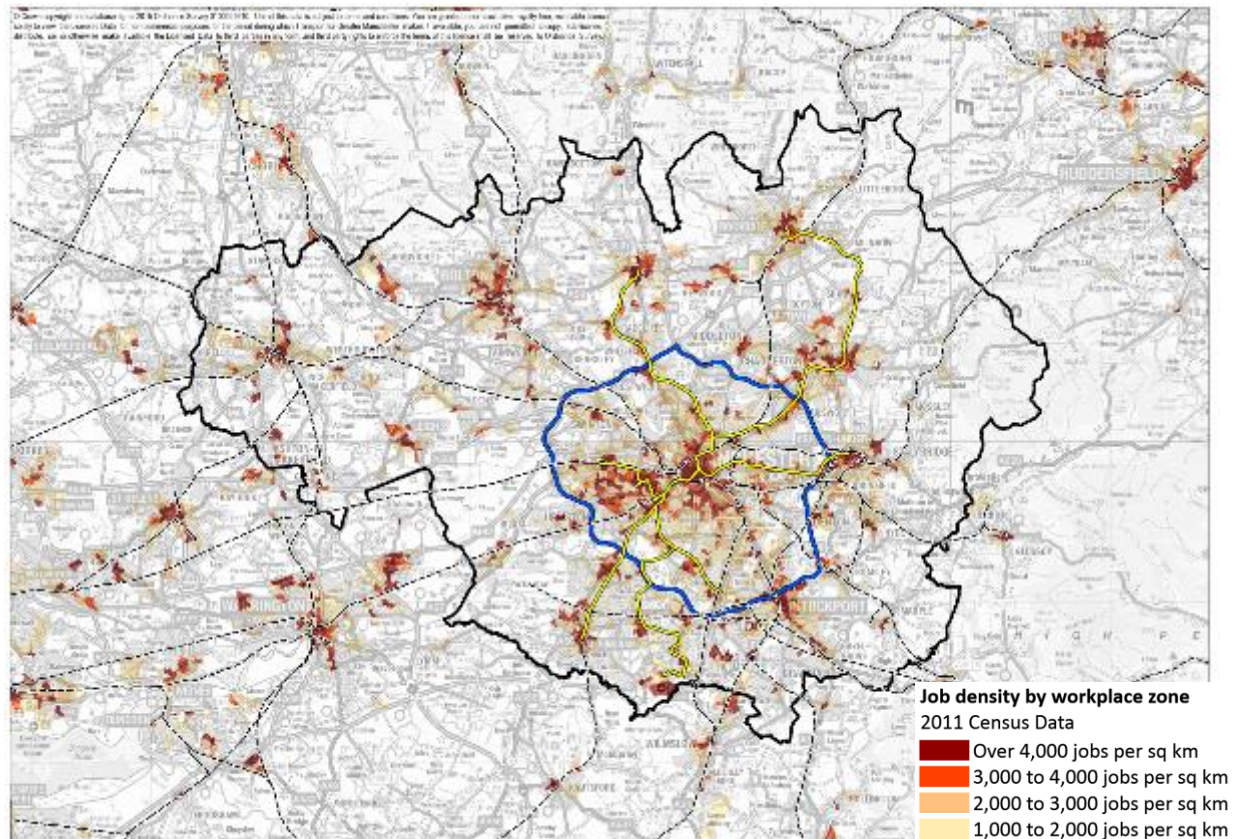
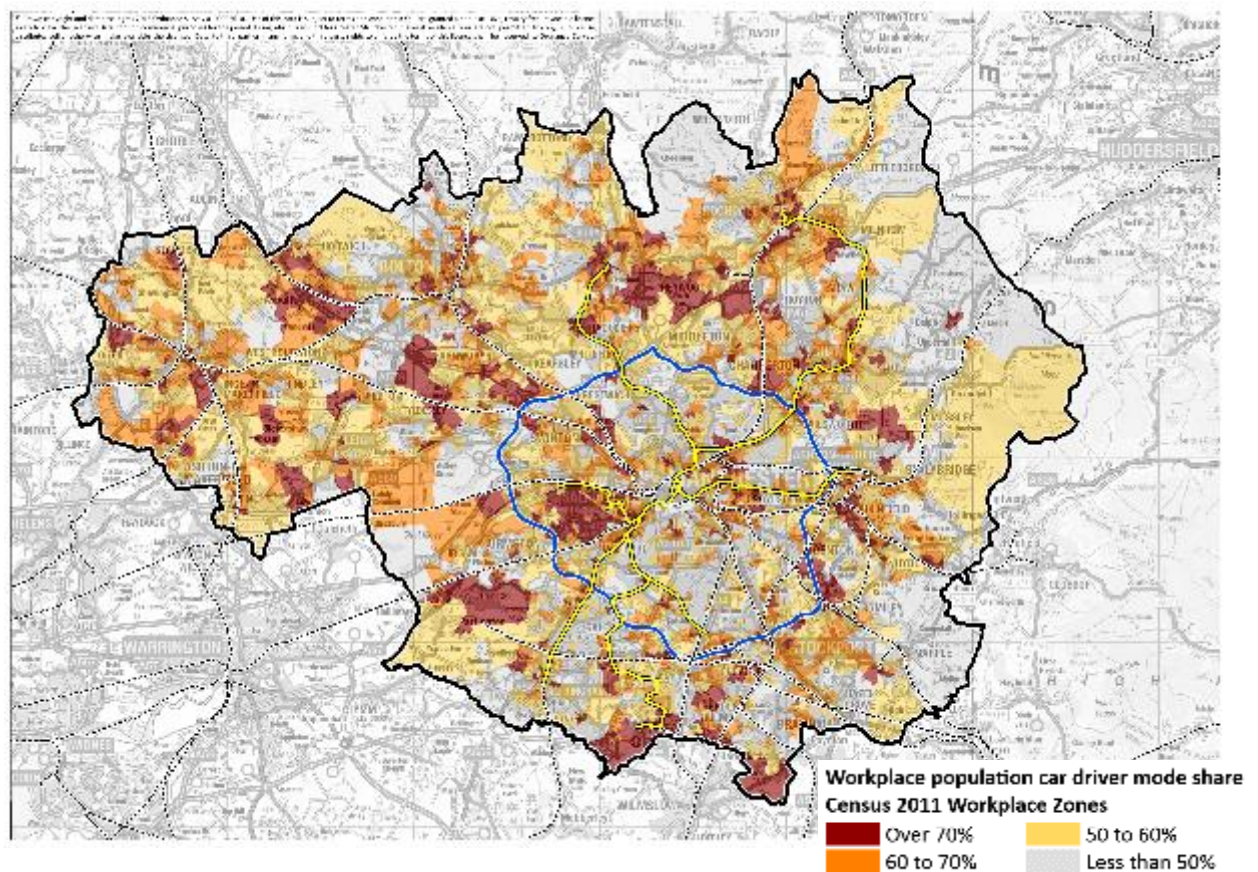
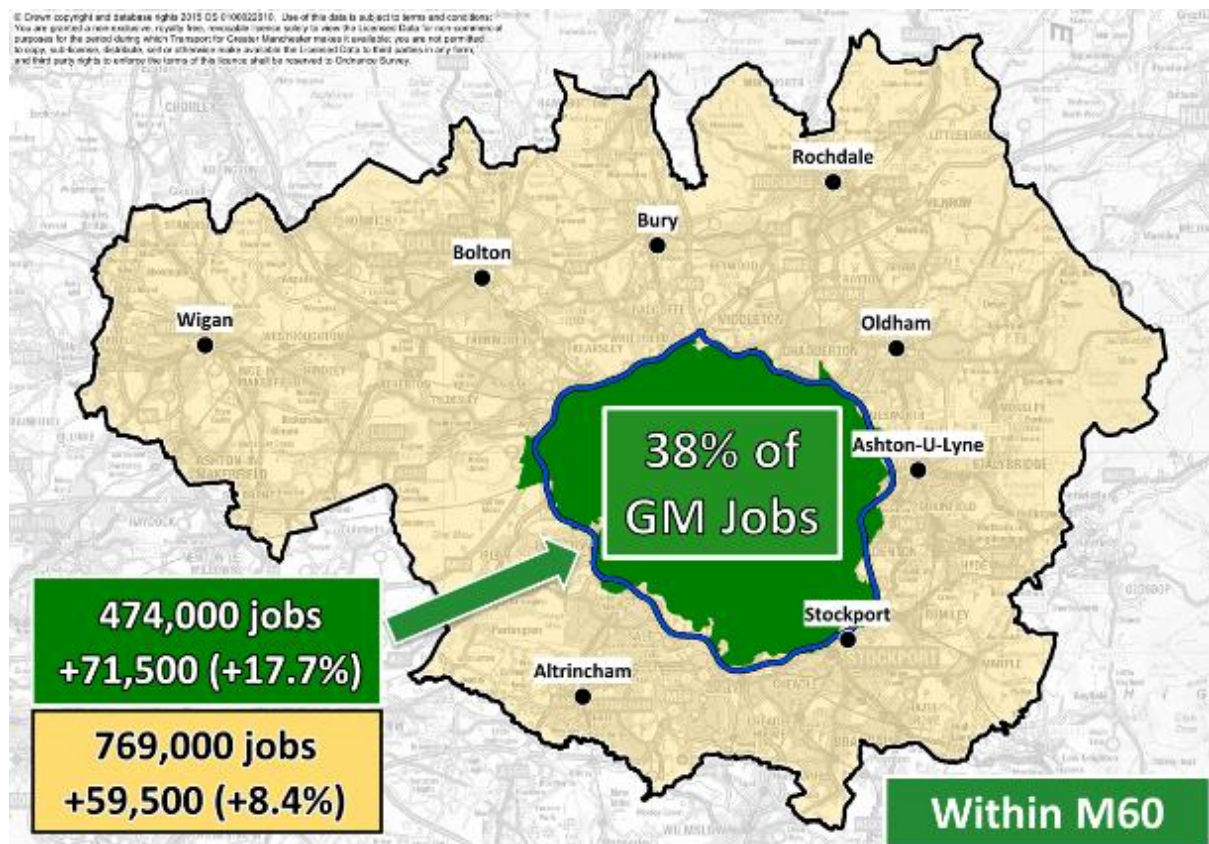


Figure 36: 2011 Workplace Population Car Driver mode share



84. Figure 37 uses Census 2011 to show that the area broadly within the M60 contained c.38% of GM employment (474,000 jobs), translating to c. 2,400 jobs per sq. km, whilst the area broadly outside the M60 contains c.62% of GM employment (769,000 jobs), at a density of c. 700 jobs per sq. km. A comparison against Census 2001 data demonstrates that the area within the M60 recorded a significantly higher level of job growth over this period. This has helped to support sustainable economic growth, as much of it is associated with areas where the workplace population displays relatively lower levels of dependency on the private car for accessing employment.

Figure 37: 2011 GM distribution of employment by M60 (and change since 2001)



The importance of the regional centre

85. The regional centre (which covers the city centre including the Corridor Manchester, Salford Quays and parts of East Manchester) is the main concentration of employment in GM, accounting for 19% of all jobs. It is the location in which the bulk of GM's most productive service activities, research assets, and nationally / internationally mobile jobs are clustered. The evidence suggests it will continue to be GM's most important location for jobs growth in the future, particularly high productivity service jobs.
86. Outside the regional centre, employment is more dispersed. Trafford Park accounts for 3% of employment, Manchester Airport 2% and collectively the 8 district town centres account for 10%. 65% of employment is therefore outside these large sites.

87. As Table 10 shows, the highest absolute levels of employment growth are in the conurbation core. Manchester and Salford have accounted for a net increase of 40,000 jobs over the last decade, whilst Bolton, Rochdale and Tameside have seen net reductions.

Table 10: Employment and GVA growth in GM by district, 2003-2013

District	Employment		GVA	
	Number	CAGR Percent	Number (£bn)	CAGR Percent
Bolton	-4,000	-1.1%	0.28	2.2%
Bury	1,000	0.5%	0.34	4.8%
Manchester	33,000	3.2%	2.5	6.1%
Oldham	-2,000	-0.6%	0.28	3.2%
Rochdale	-6,000	-2.4%	0.11	1.3%
Salford	7,000	1.9%	1.1	7.6%
Stockport	3,000	0.7%	0.65	4.4%
Tameside	-7,000	-2.8%	0.38	4.8%
Trafford	6,000	1.4%	0.67	3.8%
Wigan	1,000	0.2%	0.35	3.1%
GM	32,000	0.8%	6.65	4.6%

Source: New Economy analysis of Business Register and Employment Survey; and GMFM for long-term data series

88. The strengthening of the regional centre employment offering has played an important role in enhancing the profile of the city-region. The GMSF draft for consultation (October 2016) seeks to build on this success by placing particular emphasis on the ability of the regional centre, as well as Manchester Airport and the principal town centres, to make a disproportionately high contribution to economic growth across Greater Manchester. The scale of opportunities identified in these strategic locations and the surrounding areas suggest that the GM employment offer will become increasingly centralised by 2035.

Implication for 2040 Strategy

An increasingly centralised distribution of GM employment is expected, emphasising the need to continue to invest in improving accessibility to the regional centre and principal town centres by means other than car for residents across GM and beyond.

Commuter flows across the GM boundary

89. Table 11 indicates that GM supports employment across the wider region via a net gain of employees as a result of cross boundary commuting flows³⁹.

Table 11: GM Cross Boundary Commuter Flow Totals

Area	Total Workplace Population	In-Commuters	Out-Commuters	Net in-commuters
GM	1,223,865	155,350	127,664	27,686

Inbound commuter flows across the GM boundary

90. Cheshire East, Warrington and High Peak districts are the greatest contributors in respect of inbound GM cross boundary commuter movements. Together these district areas provide approximately 48,000 employees to GM, representing approximately a third of all inbound GM cross boundary commuter movements. This highlights the dispersed nature of GM cross boundary inbound commuter movements.
91. As GM's economic prospects improve over time, particularly through the provision of more productive / higher skilled jobs, there will need to be a balance between upskilling the GM workforce and providing for longer distance movement from non-GM residents.

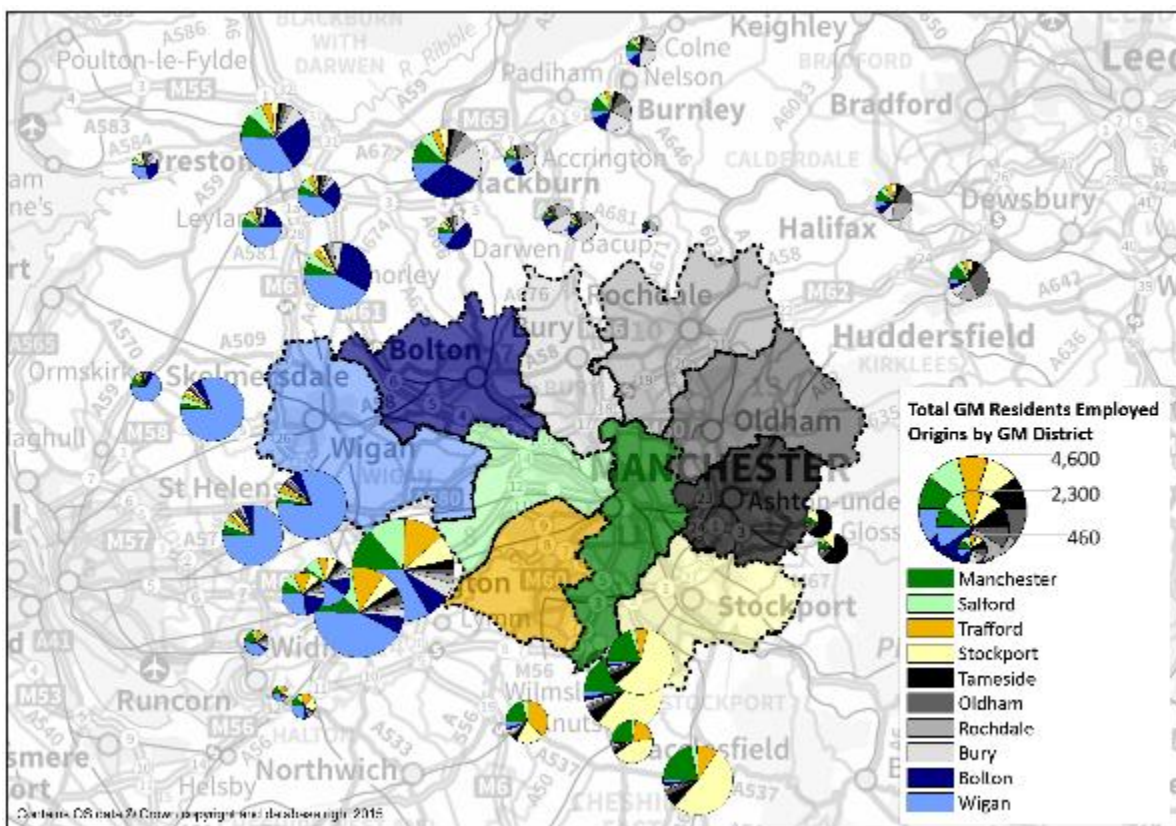
Outbound commuter flows across the GM boundary

92. As noted above, there are significant concentrations of employment located outside of GM but within commuting distance of nearby GM districts. Cheshire East, Warrington and St. Helens are the most significant destinations for external commuting. Together these district areas provide approximately 43,000 GM residents with employment, representing approximately a third of all outbound GM cross boundary commuter movements. Warrington stands out as a key net importer of GM residents in respect of employment.
93. In its entirety the overall outbound cross boundary commuting market is dispersed, but there are a number of employment clusters adjacent to GM in which significant concentrations of GM out-commuters travel. Figure 38 shows the proportion of GM residents working outside of GM at selected employment clusters (each area is based on an aggregation of Workplace Zones, each with a minimum of 1,000 jobs per sq. km) that were identified by mapping employment density. The percentage values represent the share of GM resident workers against the workplace population total for each employment cluster.

³⁹ 2011 Census: Origin Destination dataset

96. Figure 39 provides an indication of the district origins of GM resident workers at each of the selected employment clusters while showing the overall volume of GM resident workers. It is noticeable that the largest concentrations of GM resident workers are in locations that are well served by the highway and rail networks. This relationship is particularly striking on the M62 corridor, which accounts for the two locations with the highest absolute flow of GM out-commuters (Birchwood and Warrington), as well as the M6 / M61 and A34 corridors.
97. There are a total of 43,000 GM out-commuters across all the employment clusters identified. Wigan is the origin of the highest proportion at 30% (12,800), while Oldham and Rochdale are lowest at 4% each.
98. As the North West's economic prospects improve over time, particularly through the provision of more productive / higher skilled jobs, there will need to be careful consideration given to the implications on out-commuting travel from GM.

Figure 39: District Origin of GM Residents within Non-GM Employment Site Workplace Population

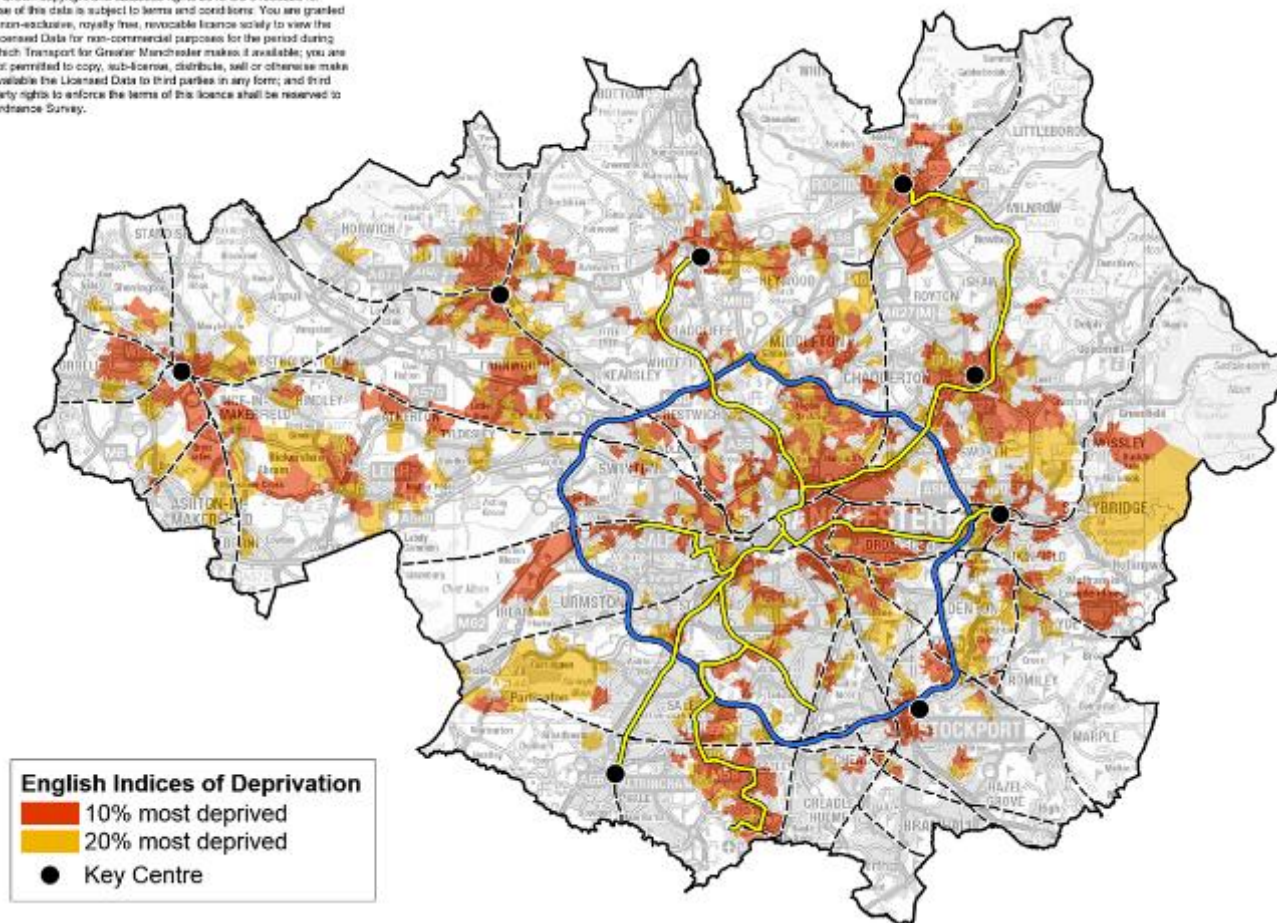


The distribution of future GM growth

99. The deep dive work undertaken by New Economy suggests that a twin track approach needs to be taken to support future net additional growth across GM.
100. First, there is a need to continue to support existing and new locations/sites that are attractive to the market in order to remain competitive and by ensuring that residents are able to access jobs in these locations through providing adequate transport options and by giving them the skills and capabilities to meet employer needs.
101. Second, in parts of the conurbation where market conditions are weaker, there is a need to take a long-term integrated and multifaceted approach combining planning, growth, transport, investment and reform activity to respond to the underlying economic weaknesses, reposition parts of the conurbation in the marketplace and create new sustainable growth locations.
102. Transport is fundamental to this approach and the economic prospects of all parts of GM. The more accessible that jobs are to people, the wider the labour pool is and the more opportunities individuals have to find suitable employment. Similarly, firms need to be able to have access to a workforce, connect with suppliers and deliver to customers effectively.
103. Figure 40 shows analysis of the employment indicator of the 2015 English Indices of Deprivation which highlights the communities within GM that fall within the bottom 20% across the country. Whilst there is evidence of an improving outlook across GM compared to previous datasets, it is clear that there are significant areas of relative deprivation, a notable example being to the east of the regional centre, an area which is also subject to low job densities.
104. Taking into account the location of important areas for future employment growth, most notably the regional centre, but also strategic employment sites such as Manchester Airport/ Enterprise Zone and the Western Gateway, it is clear that transport has an important role to play in providing improved employment opportunities for deprived communities.

Figure 40: Employment Domain: 2015 English Indices of Deprivation

© Crown copyright and database rights 2015 OS 0100022810.
Use of this data is subject to terms and conditions. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which Transport for Greater Manchester makes it available; you are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form; and third party rights to enforce the terms of this licence shall be reserved to Ordnance Survey.



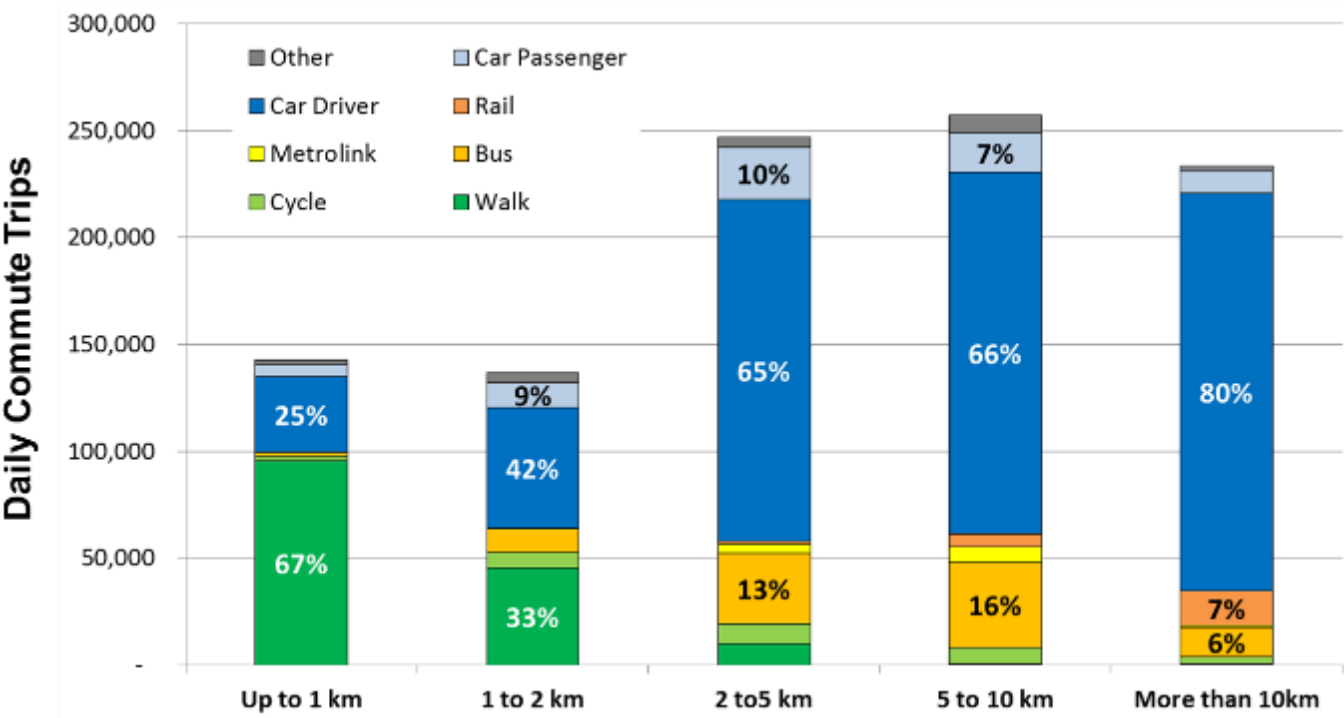
Implication for 2040 Strategy

There is some disparity between areas of employment deprivation and identified sites for employment growth. Transport has an important role to play in order to sustainably connect deprived communities with employment opportunities

Reliance on the car for accessing employment within GM

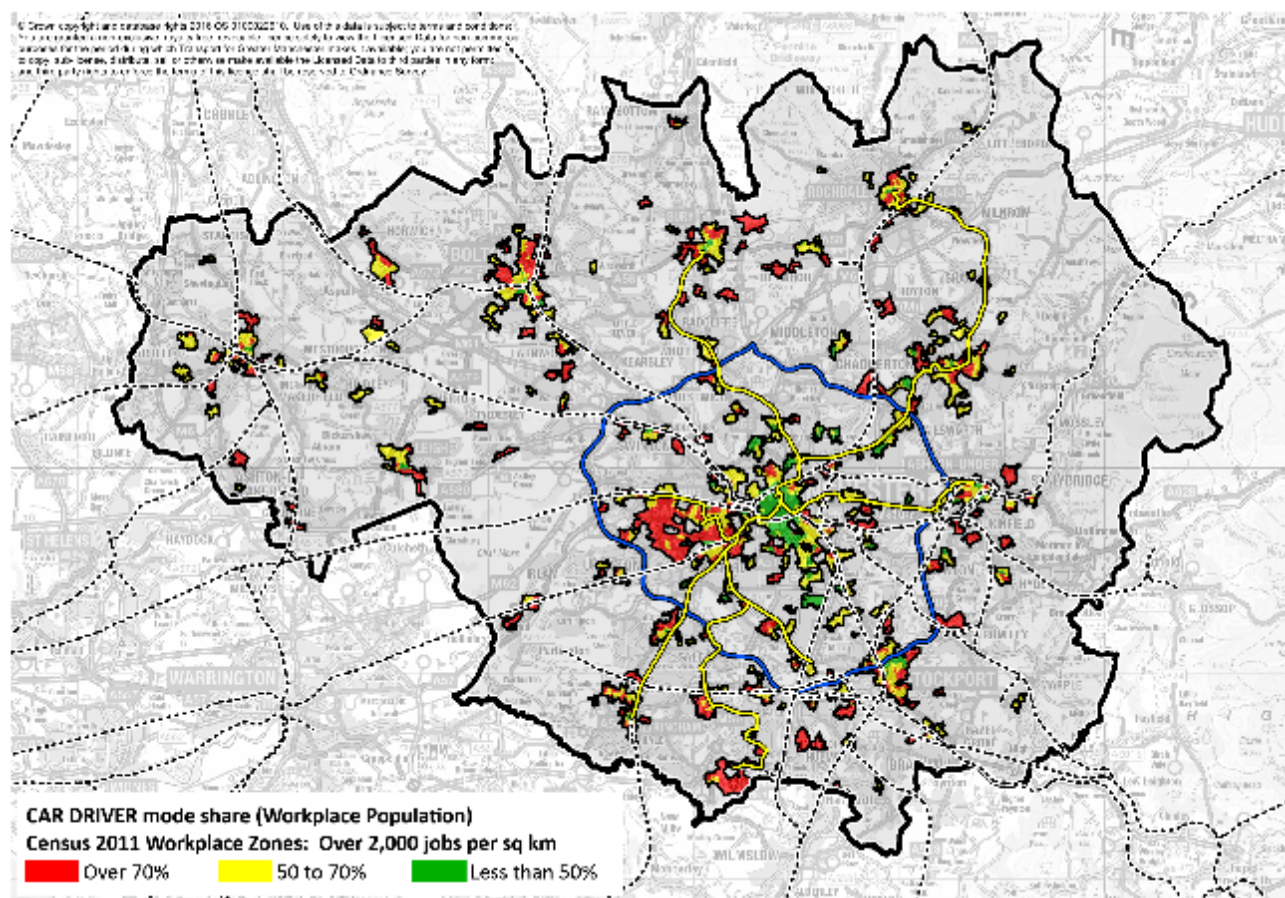
105. Travel Diary Surveys for the 3 years to the end of 2015 (GM TRADS) indicate that that the mode choice of a commuting trip is sensitive to the total distance travelled. Figure 41 shows that for commuting trips over 2km, car driver is highly dominant, but even within 2km large volumes of commuting trips are undertaken with a car. It is possible that some of these commuting trips are linked to other journeys; such as dropping children at school.

Figure 41: Mode of Travel by Distance Band, Commuting Trips by GM Residents



106. Figure 42 shows the areas of GM that have at least 2,000 jobs per sq. km. These areas comprise less than 10% of the total area of GM, yet they accommodate over 55% of GM’s jobs. Figure 42 also shows the proportion of jobs within these areas that are accessed by workers driving a car. It is clear that with the obvious exceptions of the regional centre and selected areas around GM’s town centres, car is the dominant mode of commute travel in most areas of GM.

Figure 42: 2011 Car Driver mode share of Workplace Population



107. The remainder of employment opportunities across GM as identified by Census 2011 are highly dispersed. This represents a major challenge to ensuring that they are easily accessible without reliance on a car. Census 2011 demonstrates this by showing that 67% of GM's 1,220,000 usual resident workers rely on a car to access a job.
108. Analysis of comparable Census 2001 and 2011 journey to work datasets has pointed to significant spatial variation across GM in respect of changes in commuter car driver mode share by age. It is clear however that there was an overall decrease across GM in the number of people aged 25-34 driving a car to access employment between census years. Figure 43 shows that the area within the M60 which was the subject of an increase of c.30% in the number of residents in employment (all ages), fared particularly favourably in terms of commuter car driver mode share for the 25-34 cohort; down from 54% in 2001, to 45% in 2011. This is in contrast to Figure 43 which shows that for those aged 50 and above, car driver mode shares to access employment have increased both within and outside the M60.

Figure 43: Mode Share % Point Change: Census 2001 vs Census 2011 JtW: Car Driver (25-34)

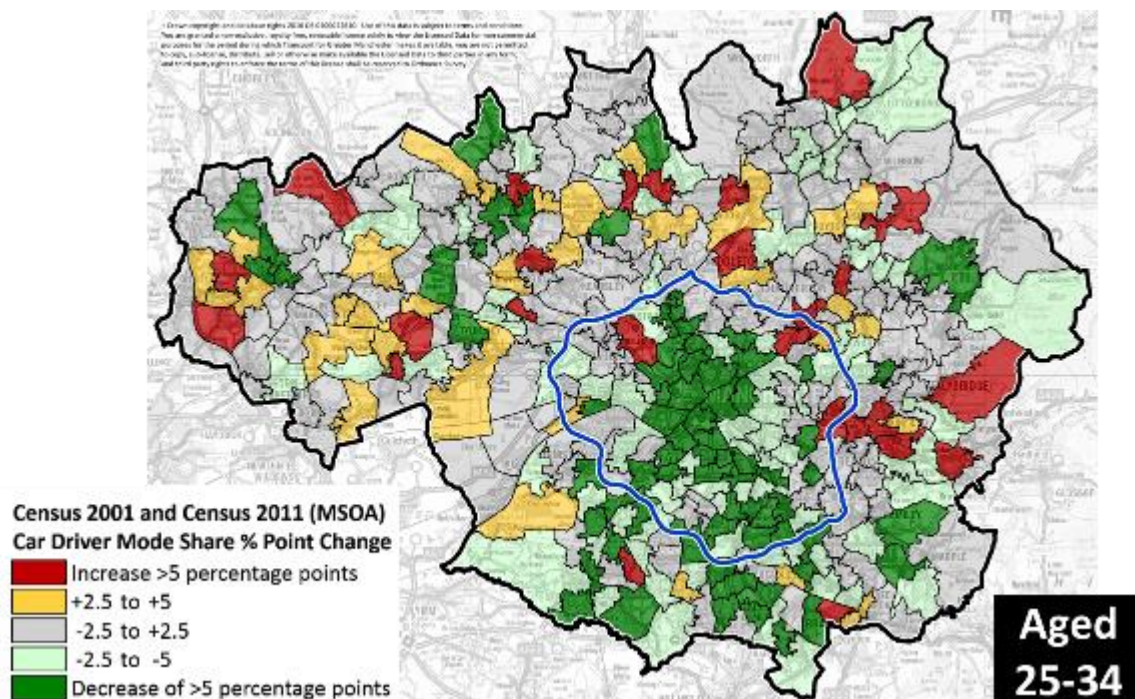
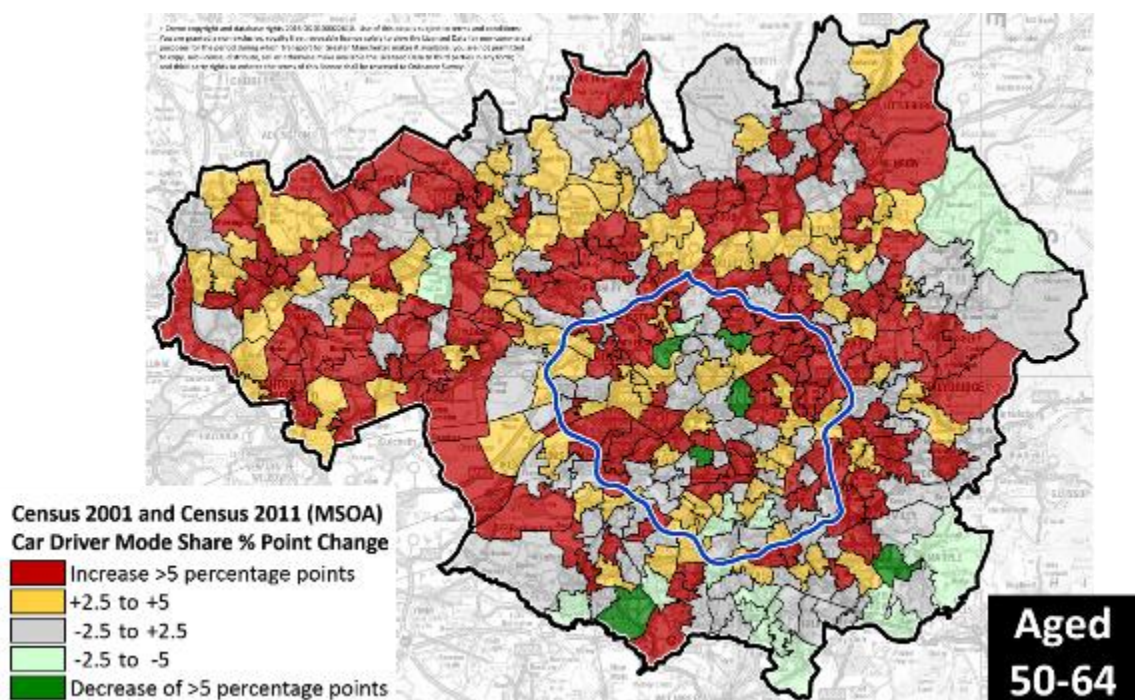


Figure 44: Mode Share % Point Change: Census 2001 vs Census 2011 JtW: Car Driver (50-64)



Implication for 2040 Strategy

For the majority of commuter movements the private car is the dominant mode, in part due to the dispersed nature of employment within and outside of GM. The city centre, where the majority of jobs are accessed by non-car modes, is a clear exception.

Transport Network Congestion and Overcrowding

Transport investment and productivity

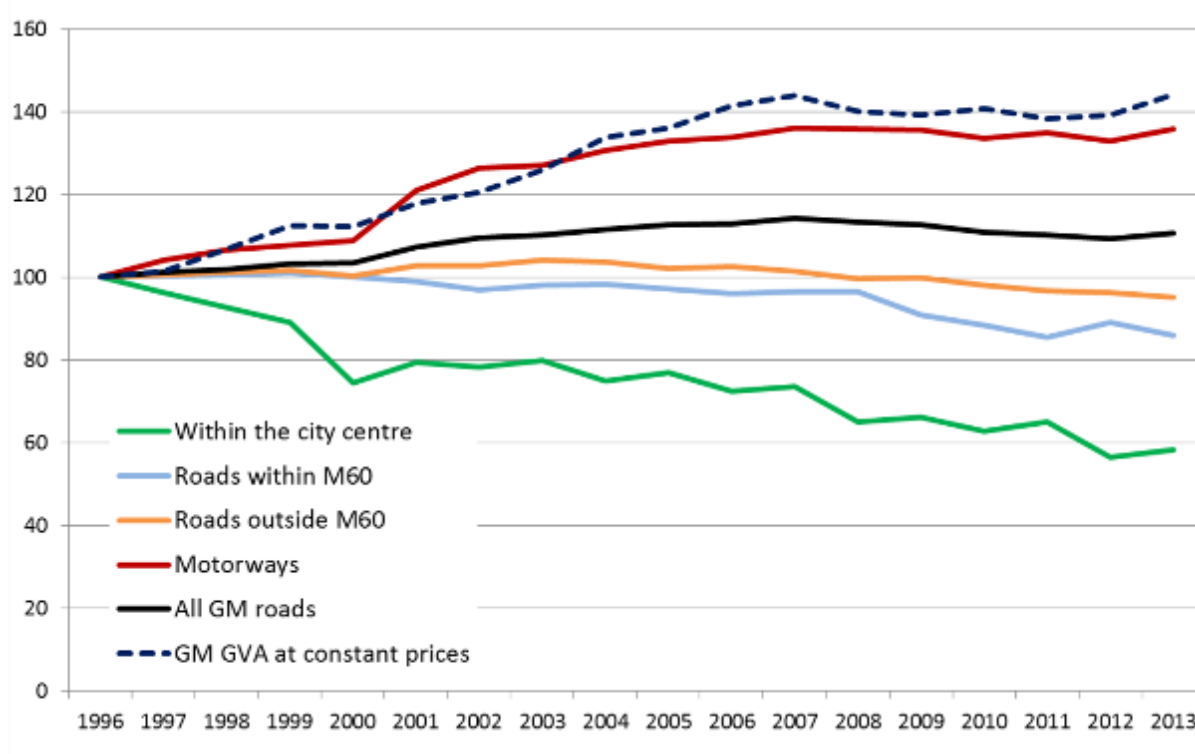
109. Closing both the productivity gap by getting more residents into work and improving in-work productivity remains an important aim for public, private and social sectors in GM. A faster-growing, more productive conurbation will be a better place to live, with more dynamism and innovation in the good times, and more resilience in the bad times. It will also boost the UK's growth rate.
110. Broadly speaking there are two ways to bring about an increase in GVA output and productivity. One is to enhance productivity by making GM more attractive for people to live in, thus bringing the skills and talent needed by employers. The other is to reduce the costs of agglomeration, including reducing housing and commercial property constraints, transport and congestion costs; and supporting people into work.
111. Transport enables cities to specialise, developing sector-specific advantages. Historically this was manifested in cities that specialised in textiles or steel, for example. While some manufacturing clusters are still important, the phenomenon is now apparent in service sectors, particularly knowledge-intensive activities. If better transport or communication enables some of the ancillary activities to be 'outsourced' to another city, it reduces costs and creates space for the high-value activities to further concentrate in the central cluster.
112. Improved transport links will generally make a location more attractive to invest in where existing trends are supportive of business investment. The 2014 Greater Manchester Business Survey⁴⁰ supports this general principle by demonstrating that in terms of major business disruptions experienced in the last 12 months, half of respondents (50%) cited at least one and this is most likely to have been transport and congestion (21%). Progress appears to have been made in respect of business satisfaction with access to public transport with 71% of respondents in the 2014 survey indicating they were content, up from 55% in 2012.
113. However, approximately 1 in 10 businesses continue to view 'access to transport' as a barrier to growth. The role of transport is explicit here, but it is also important to note its potential to assist in reducing the impact to businesses of other identified barriers, such as 'access to markets and sales opportunities' and 'lack of staff or skills', each of which were cited by 24% of respondents.

⁴⁰ Greater Manchester Business Survey (2014), The Business Growth Hub and New Economy

The regional centre: an example of decoupling economic growth and congestion

114. While organisations like INRIX have observed correlations between increasing congestion and economic growth⁴¹, academics stress the need to effectively de-couple these two elements, particularly as excessive traffic congestion is understood to hinder further economic productivity.
115. While GM has conformed to the norm of traffic growth accompanying economic growth, there have been signs of a decoupling of car use and economic growth in some locations. The greatest economic growth within GM has been achieved alongside a decline in car modal share and traffic flow, as exemplified by the regional centre.
116. Figure 45 summarises how traffic volumes - mostly car - have changed in recent years. Note that total motor traffic volumes in Greater Manchester increased by approximately 12% between 1996 and 2013, with all of that growth accounted for by increased travel on motorways, on which vehicle km has increased by 36%.

Figure 45: Changes in motor vehicle kilometres⁴² by area of Greater Manchester (1996 values set to 100)



⁴¹ INRIX (2015) Growing economy drives traffic congestion up in over three quarters of UK cities. Available: <http://inrix.com/press/scorecard-report-united-kingdom/>

⁴² Values for the all-purpose road network are totals for links on which traffic counts were carried out throughout the period. Values for motorway are estimated vehicle kilometrage for all motors: a check has confirmed that comparing link-flow over time for motorways yields similar results (but creates complications due to the opening of new sections

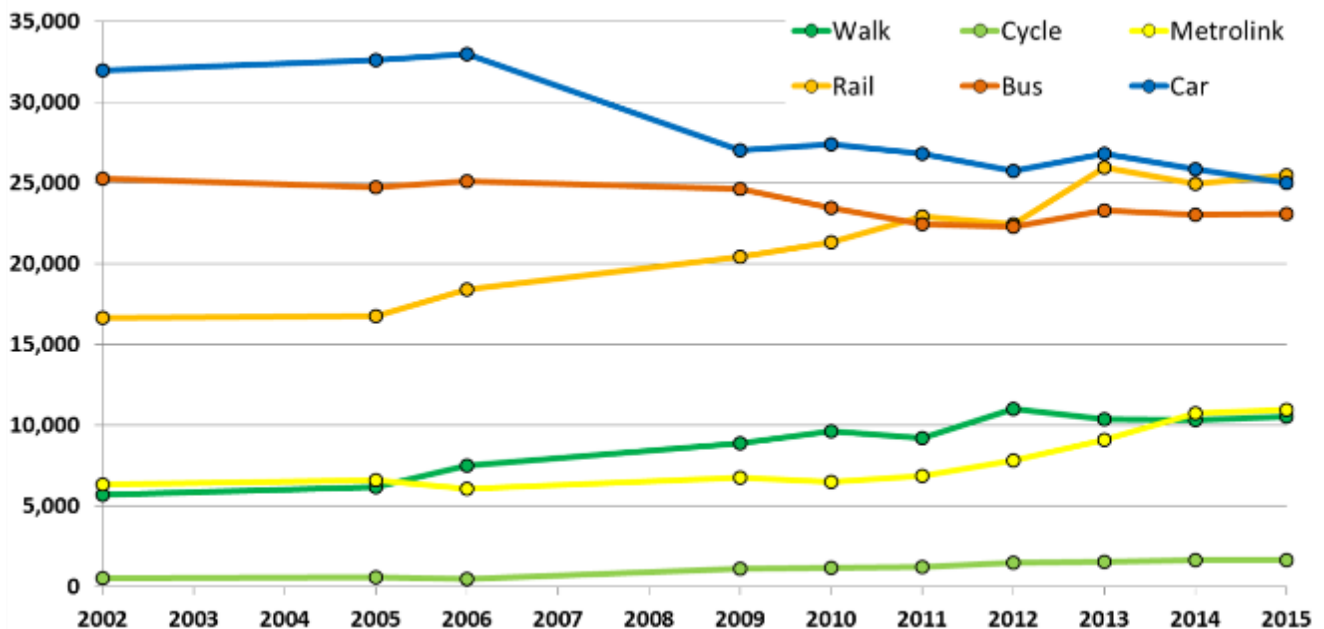
117. Conclusions that can be drawn from Figure 45 include:

- Motor vehicle km has fallen since 1996 on the all-purpose road network, with the largest proportional reductions within the Manchester and Salford Inner Relief Route (MSIRR) and the smallest proportional reductions outside the M60.
- Overall road traffic has increased much less than proportionally with GVA.
- The districts of Manchester and Salford have seen higher-than-average GVA growth than Greater Manchester as a whole, and the decline in road traffic in those areas (mostly “within MSIRR” and “within M60”) has been proportionally largest.

118. The above conclusions match those of TfL in a recent comparison of changes in road traffic volumes and GVA in inner and outer London⁴³.

119. Figure 46 demonstrates how inbound car movements across the Manchester city centre cordon⁴⁴ have fallen between 2002 and 2015, whilst rail and Metrolink have seen significant growth over the same period. This trend is evident post-recession against the backdrop of a 7% increase in the employment base within the wider regional centre between 2009 and 2014, as shown in Figure 47.

Figure 46: AM Peak (07:30-09:30): Total inbound movements across the Manchester cordon

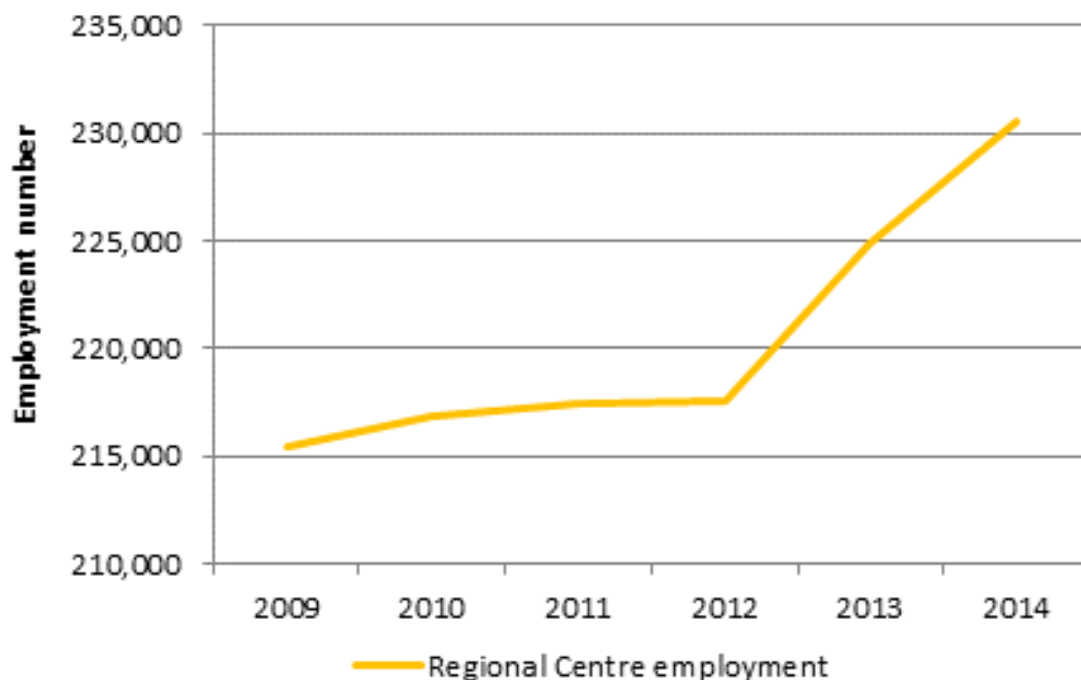


of motorway, specifically M60 Denton – Middleton, which is included in the 136% in Table 1). Note that “within M60” means within M60 but outside MSIRR. Values interpolated between 1996 and 1999.

⁴³ Travel in London Report 7.

⁴⁴ Note that the Manchester cordon is based on the alignment of the MSIRR, as opposed to the wider regional centre.

Figure 47: Employment growth in the regional centre, 2009-2014



Source: Business Register and Employment Survey

120. Significant investment in the regional centre has helped to achieve the recent high level of economic growth alongside a backdrop of increasing non-car mode share. It has been forecast that this employment growth will continue, with the city centre alone having the potential to accommodate c.100,000 additional jobs by 2040. However, it is clear that further significant investment in the capacity and coverage of non-car infrastructure will be required to deliver this level of growth sustainably. The alternative to this scenario is likely to be one of increasing congestion that hampers further growth of the city centre.
121. As previously noted, the regional centre currently only accounts for approaching 1 in 5 of all jobs across GM, and it is likely that the overall employment offering of GM will remain geographically dispersed for the long term. It is therefore critical that appropriate measures are also identified for improving journey times and reliability through the use of non-car modes across the wider GM region.

122. The GM highway network has an important role to play in facilitating the reliable and efficient movement of people and goods, both within GM and beyond it. Figures 16 and 17 (in the Travel in GM section) are based on a comparison of Trafficmaster speed data on the Strategic Road Network during each peak period, with that collected overnight, to provide an indication of where traffic flows may be impeded by congestion⁴⁵. This approach points to a number of areas of the Strategic Road Network within GM having differences in excess of 30mph, a notable example being the M60 to the south of the conurbation.

Implication for 2040 Strategy

If not managed effectively, severe road congestion and public transport overcrowding during peak periods could undermine GM's ability to improve economic productivity and deliver its growth aspirations.

A Growing Visitor Economy

123. GM's economy is strengthened by its status as a tourist destination, and its accessibility as an international destination. As of 2014, Manchester Airport handles almost 22 million passengers per year and offers direct flights to over 200 destinations worldwide. The tourism economy generates £7.5billion annually to GM.⁴⁶ However, with significant developments to GM's tourism offer occurring, there is further opportunity for economic development.
124. There are over one million international leisure visitors to GM annually, making it the third most visited UK destination, following London and Edinburgh, for international visits.⁴⁷ Its attraction has been reinforced by being in the Lonely Planet's top ten cities to visit in 2015 and 2016, the only UK city to do so. Significant destinations for tourism are spread throughout GM, though a number of destinations within the regional centre, Salford Quays, and Oxford Road are among the most visited. Table 12 highlights the top 10 attractions in GM based on annual visitor numbers.

⁴⁵ Of course this is not to imply that zero difference from free flow speeds would be either desirable or an efficient allocation of scarce resources. See forthcoming outputs from the CREATE project and Professor Peter Jones for a full discussion of the relative merits of alternative approaches to congestion indicators.

⁴⁶ Visit Manchester, New Economy

⁴⁷ Greater Manchester Leisure Visitor Survey (2014), Marketing Manchester / New Economy

Table 12: Top 10 GM Attractions, 2014

Attraction	District	2014 visitors	Admittance
The Lowry	Salford	866,773	Free
Museum of Science and Industry	Manchester	678,867	Free
Manchester Art Gallery	Manchester	531,904	Free
National Football Museum	Manchester	466,788	Free
Manchester Museum	Manchester	426,517	Free
Imperial War Museum North	Trafford	409,746	Free
Runway Visitor Park	Manchester	368,300	Free
The Corrie Tour	Manchester	363,687	Paid Entry
Bolton Museum, Aquarium and Archive	Bolton	361,909	Free
Manchester United Museum and Tour Centre	Trafford	356,476	Paid entry

125. The GM Strategy (GMS) for 2014-2020, entitled 'Stronger Together', identifies a number of priorities to support the development of GM's economy and tourism has an important role to play in this respect, as GM seeks to build its global brand and improve its international competitiveness.
126. GM is aiming to increase the value of the visitor economy to £8.8bn by 2020 (a 17% increase from £7.5billion in 2014). This will be supported by an increase in the number of jobs supported by tourism activity in GM to around 112,000 full-time equivalents by 2020 (a 22% increase from 92,000 in 2014)⁴⁸.
127. To further strengthen this sector, it will be important to ensure GM's transport network becomes increasingly easy to navigate for the unfamiliar visitor, with focus on main visitor destinations.

⁴⁸ Greater Manchester Tourism Economic Activity Monitor (November 2015), Marketing Manchester / New Economy

GM visitor travel choices

128. 50% of all visitors entered GM through private transport using the UK road network, with this rising to 57% for day visits and decreasing to 41% for staying visits. The next most frequent method used was train (27%), showing consistent levels of usage for both day visitors (28%) and staying visitors (26%). The other most frequently used method varied between day and staying visitors. 19% of staying visitors reported travelling by air, with a further 8% using bus /coach. This compares to 9% travelling by bus/coach, for a day visit, and just 1% by air.
129. When looking at visits to Manchester city centre alone, the proportions arriving by train and those arriving in private transport were both 37%. There is also an increased proportion arriving by air of 11% compared to 8% for the full GM sample.
130. Although a significant proportion of visitors still arrive in GM by private transport (50%), this has decreased from 62% in 2010 mainly due to an increase in those arriving by train from 20% in 2010 to 27% in 2014, but also an increase in those using a bus or coach, from 6% in 2010 to 9% in 2014.
131. Around a quarter of visitors (26%) used public transport to get around GM during their visit. As would be expected, due to time availability, this increases for staying visitors at 41% compared to 16% of day visitors. The most reported transport used was Metrolink (58%) followed by: bus (38%); train (15%) and Metroshuttle bus (4%).⁴⁹
132. 54% of visitors who were visiting more than one district of GM used public transport to make these journeys. For those just visiting one district the sample shows that over a quarter still used public transport during their visit. For those visiting more than one district the modes used were: Metrolink tram (66%), bus (36%), train (23%) and Metroshuttle bus (2%). The use of the Metrolink tram was highest for those sampled in Salford, Trafford & Manchester city centre.
133. 42% of visitors reported that a smartcard would provide encouragement to use public transport to get around GM. This rises for those with increased time with over half (52%) of staying visitors reporting they would be encouraged, compared to 35% of day visitors.

⁴⁹ Note that visitors could provide as many modes of transport as they had taken or planned to take during their visit so the total adds to over 100%. (GM Leisure Visitor Survey)

GM visitor average spend

- ¹³⁴. The average spend for day visitors to GM is £35, with staying visitors spending £79 on average. However, this rises to £97 for visitors staying in paid for accommodation. With over 2,400 hotel rooms planned for construction across GM the opportunity for further economic growth is clear, but it will require continuing support by way of improving accessibility across the city region.

Implication for 2040 Strategy

An increase in the number of visitors to GM will lead to more trips on the transport network. It will be important to accommodate the needs of those who are unfamiliar with GM in a manner that promotes sustainable travel choices. In particular, this will require a simple, easy to use public transport network supported by targeted marketing materials and passenger information. A legible walking environment will also be critical.

Society and Community



Society and Community: Summary of Trends and Implications

A growing GM resident population

- A rapidly growing Greater Manchester population will lead to an increase in the number of trips to be fulfilled on the transport network. The spatial distribution of this growth will have significant implications for the type and scale of transport interventions required.

An ageing GM resident population

- The ageing of the Greater Manchester population will have wide-ranging implications that will include the need to provide more accessible transport infrastructure and services.

Tackling inequality

- Need to tackle income and employment-related inequality through reducing barriers to accessing opportunities, including considering the affordability of transport and improving access to key facilities such as employment, health and education.
- Transport has a role to play in tackling high levels of health inequality across Greater Manchester by developing active travel infrastructure and supporting widespread take-up among a broader range of groups.

Behavioural change

- Attitudes and behaviours are changing in different ways across different social groups. Interventions will have to be tailored appropriately in recognition of this.

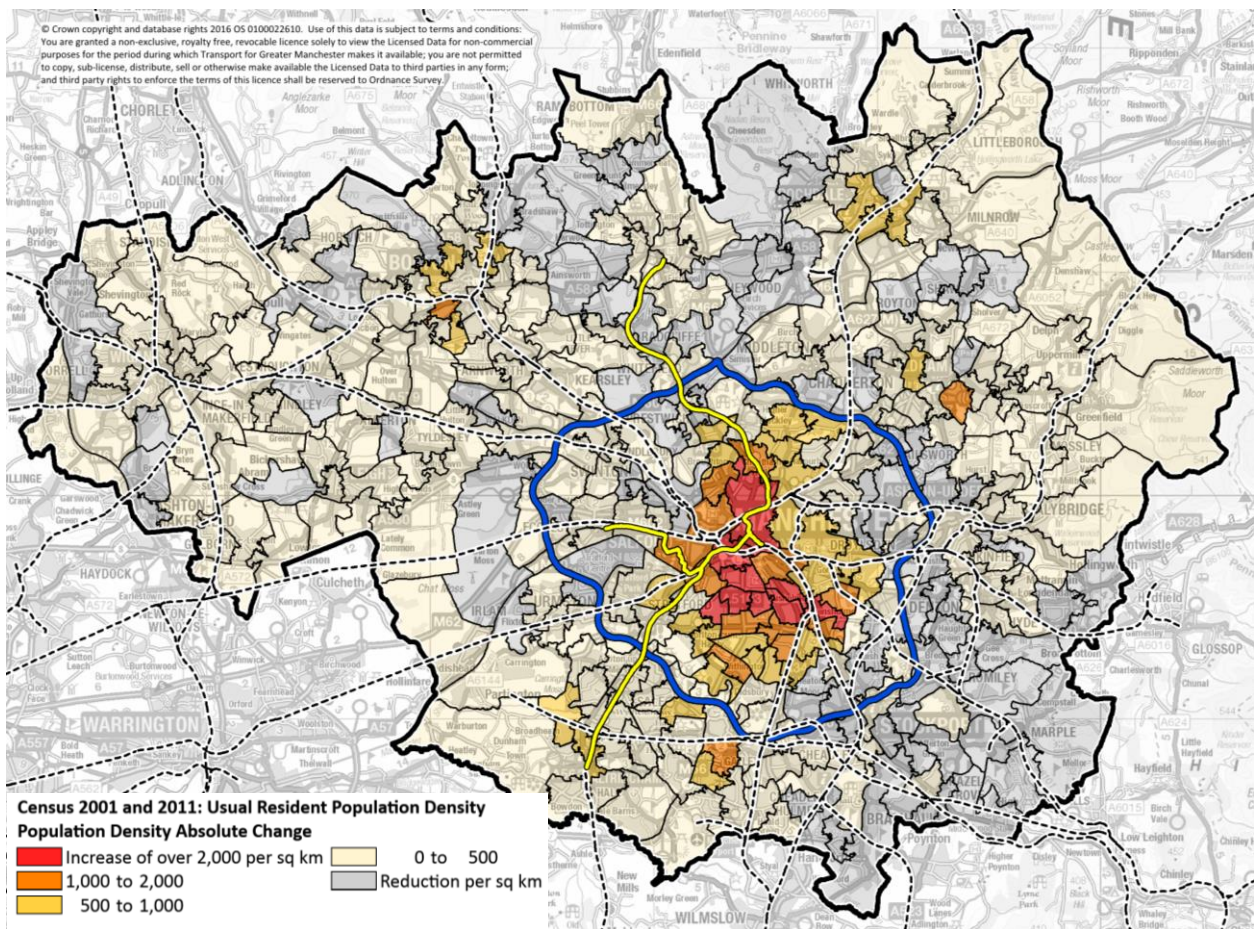
Security and Safety

- There is a need to improve perceptions of personal safety and security when walking, cycling and using public transport to encourage greater uptake of those modes and better communicating the evidence on actual incidents.
- Despite a trend of falling casualties in recent decades, there remains an ongoing issue in relation to vulnerable road users including children. There is a need for interventions to lower risk for vulnerable road users.

Greater Manchester's Increasing Population

135. A changing population underpins many of the challenges and opportunities that will shape transport provision moving towards 2040. Between 2003 and 2013, the population of Greater Manchester increased significantly by 6.9%⁵⁰. The increase has not been evenly spread, and has been largely concentrated in the centre and south of GM, within the M60 and around some town centres (Figure 44). There have also been population reductions in some outer areas of GM.

Figure 44: Population Density Change, 2001-2011



⁵⁰ ONS (2014) Population Estimates for England and Wales Mid-2013. Available at:

<http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--england-and-wales--scotland-and-northern-ireland/2013/stb---mid-2013-uk-population-estimates.html>

136. Population growth has been fuelled particularly by the in-migration of young people to the conurbation core. Greater Manchester has a younger age profile than nationally: for example, over 52% of Manchester's population was under 30 in 2012⁵¹. Urban densification is a trend found throughout the developed world and is linked to young people preferring living near urban centres, avoiding the need for long car trips to reach work and leisure activities.

Implication for 2040 Strategy

Urban densification means more demand for public transport and active travel and less demand for car travel. That is partly because short-distance trips to urban centres favour active modes and public transport – especially bus travel. Also, car ownership is less attractive in dense urban areas due to costs and difficulties of parking cars there. So urban densification offers a major opportunity to reduce car dependence and to promote the concept of mobility as a service, in which citizens choose between walking, cycling, public transport, taxis, and car-hire – perhaps through membership of car clubs. It will be important to provide a walkable urban environment and to provide attractive and frequent public transport in the urban core.

137. By 2035, the population of GM is predicted to grow by a further 295,000 people to just over 3 million people. This will be facilitated by the provision of an additional 200,000 jobs and 227,000 net new homes, delivering significant additional travel demand across GM⁵². Further detail on employment forecasts and spatial distribution of growth, is covered within Economy and Employment, and Urban Development sections of the evidence base.
138. A review of projected population growth was conducted as part of the Greater Manchester Spatial Framework (GMSF). As part of a wider consultation process, an accelerated growth scenario was selected, based on ONS subnational population projections that were revised to meet Northern Powerhouse goals of economic growth (AGS-SNPP 2014). This growth expectation informs the scale of development within GMSF (mentioned previously). Further details of how growth assumptions were derived and selected can be found within the Strategic Options Background Paper 3, produced as part of the GMSF.

⁵¹ ONS (2012) Census: Population Estimates – local authority based by single year of age.

⁵² GMCA (2016) Draft Greater Manchester Spatial Framework. Retrieved 5 December 2015, from: https://www.greatermanchester-ca.gov.uk/info/20081/draft_plan)

139. How future growth will play out depends largely on wider policy developments supporting economic growth. For example, analysis shows that these areas that have seen significant densification of employment also tend to have less car-dependent lifestyles. Transport provision will have to be planned carefully to respond appropriately to growth.

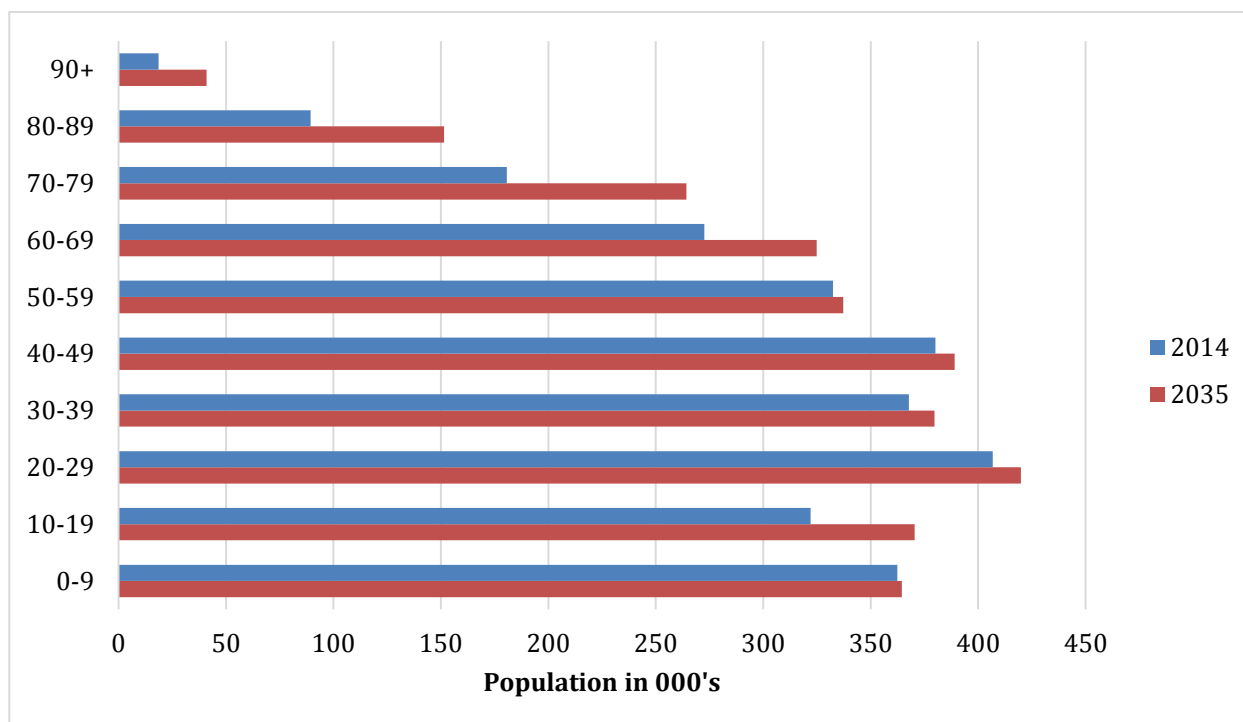
Implication for 2040 Strategy

A rapidly growing Greater Manchester population will lead to an increase in the number of trips to be fulfilled on the transport network. The spatial distribution of this growth will have significant implications for the type and scale of transport interventions required.

Greater Manchester's Ageing Population

140. While the total population of GM is increasing, there is a great deal of variation in projections among age groups. ONS projections⁵³ suggest we are likely to see a broad population increase, with significant increase in those aged 60 or over. A breakdown of absolute growth between age groups from 2014-2035 is shown in Figure 45.

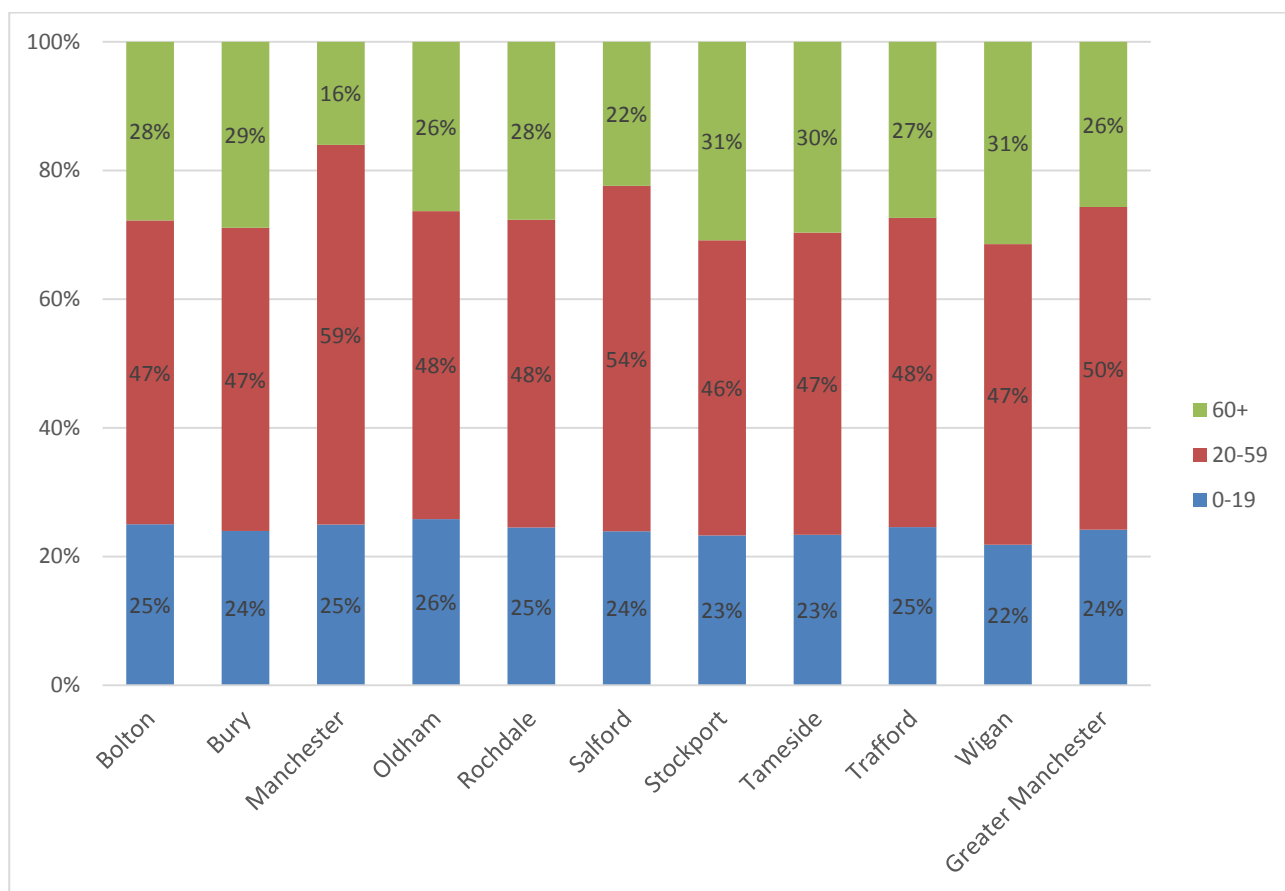
Figure 45: Age Distribution of Projected Population in Greater Manchester, ONS 2016



141. A key factor will be people living longer, with those over the age of 70 expected to grow significantly. This growth in the elderly population is most notable in Wigan, Tameside and Stockport, where the 60+ age group is forecast to make up approximately 30% of their resident populations by 2035 (Figure 46). This may present a challenge in the funding and provision of accessible transport services.

⁵³ ONS, Population Projections Unit (2016) 2014-based Subnational Population Projections for Local Authorities and Higher Administrative Areas in England.

Figure 46: Age Distribution of 2035 Projected Population within Districts, ONS 2016



142. The ratio of elderly men to women is expected to become more balanced, compared to today, potentially leading to more households with two elderly occupants. This will impact to some extent on housing needs and prices as well as on health facilities and transport opportunities.
143. It is well understood that ageing impacts upon an individual's ability for fully independent mobility, particularly regarding opportunities to use a private vehicle. Research conducted into older people's changing travel capabilities found giving up car use can lead to a reduction in independent mobility, and is associated with significant lifestyle change. This can result in physical and mental health problems, though research found that those who plan and give up driving gradually suffer far fewer negative effects than those who are told to give up driving immediately⁵⁴.

⁵⁴ Musselwhite, C & Haddad, H. (2010) Mobility, accessibility and quality of later life. *Quality in Ageing and Older Adults*, 11(1), 25-37.

144. There is a marked increase in difficulty for reaching key services (e.g. hospitals, banks, supermarkets) reported by those aged over 80, and while individuals live longer, access to health services for older age groups has been recognised as a priority⁵⁵. Transport needs to be inclusive, allowing individuals to retain their independence as much as possible.
145. However, it is uncertain if the current health status of older age groups is likely to be the same in the future. For example, the extent to which the health of those in a given age group will continue to improve over time is unclear.

Implication for 2040 Strategy

The ageing of the Greater Manchester population will have wide-ranging implications that will include the need to provide more accessible transport infrastructure and services.

Tackling Inequality

Levels of Income and Employment Related Inequality in GM

146. Addressing inequality will be a critical element of delivering a more successful GM for 2040. Inequality is linked strongly with negative societal impacts⁵⁶. Detailed analysis within the “Economy and Employment” subsection indicates factors including disparity of median wages, unemployment rates by age group, and education attainment within GM.
147. Within Greater Manchester, the proportion of workers aged 16-64 that are economically active has increased from 2005-2016. However, this varies considerably across districts (Table 13). While Trafford and Salford have seen the highest growth in the proportion economically active between 2005 and 2016, increasing 5.7% and 6.2% respectively⁵⁷, Bolton, Oldham, Bury and Rochdale have experienced a decline over time.

Table 13: Greater Manchester’s Economically Active Population (of those aged 16-64)

Area	Number Economically Active		Proportion Economically Active		Change
	2005	2016	2005	2016	
Bolton	129,600	129,600	76.6%	75.0%	-1.6%
Bury	90,400	88,600	78.7%	75.3%	-3.5%
Manchester	197,500	253,800	65.0%	68.9%	3.9%

⁵⁵ Age UK and International Centre for Longevity UK (2015). The Future of Transport in an Ageing Society. London

⁵⁶ Wilkinson, R.G. & Pickett, K (2009). The Spirit Level: Why More Equal Societies Almost Always Do Better. Allen Lane: London

⁵⁷ NOMIS ONS (2016) Annual Population Survey: Economic Activity Rate, Aged 16-64. April 2004-March 2005, April 2015-March 2016. Available from:

<https://www.nomisweb.co.uk/query/construct/summary.asp?menuopt=200&subcomp=>

	Number Economically Active		Proportion Economically Active		
Area	2005	2016	2005	2016	Change
Oldham	101,800	103,600	73.7%	73.0%	-0.8%
Rochdale	97,600	91,600	74.2%	68.4%	-5.8%
Salford	99,000	122,600	70.6%	76.8%	6.2%
Stockport	146,400	144,700	81.3%	82.5%	1.2%
Tameside	103,200	106,100	75.8%	75.8%	0.0%
Trafford	104,600	121,500	76.6%	82.3%	5.7%
Wigan	155,300	161,800	77.1%	80.5%	3.4%
Greater Manchester	1,225,400	1,323,700	74.2%	75.3%	1.1%

148. More widely across Northwest England, levels of economic activity amongst people aged 16-24 have declined⁵⁸, reflecting, in part, a trend of 'lifestage delay', where young people remain at home longer before becoming financially independent compared with previous generations. Since 1997, there has been a steady increase in those aged 20-34 living with their parents. Future Foundation research indicates that 32% of men, and 22% of women aged 20-34 may still be living with their parents by 2020⁵⁹. Additionally, according to the same source, a significant proportion of young people aged 18-34 (48%) now believe they will never retire.

149. From 2004-2014, we have seen an improvement of rankings of deprivation in areas across Greater Manchester. We cannot however assume significant changes on an absolute level, as this is relative to the rest of the country. Improvements in levels of deprivation are clear within the Regional Centre and Oxford Road corridor. However, areas to the east of the regional centre within the M60, and surrounding many of our major town centres, still fall within the 10-20% of most deprived areas nationally, and great efforts need to be made to improve the quality of life and opportunities for these residents. The map at Figure 47 highlights the areas of greatest deprivation⁶⁰.

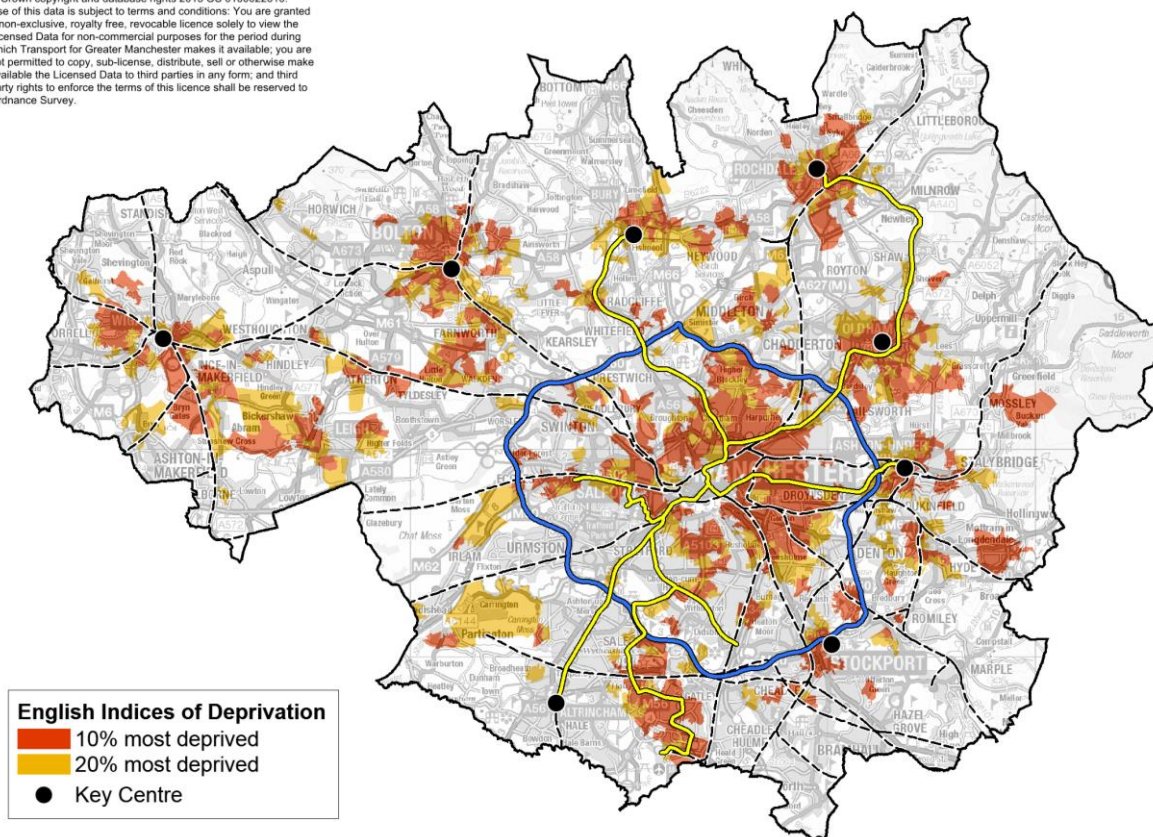
⁵⁸ ONS (2015) Regional labour market statistics: H102 Headline Indicators for the North West. Retrieved 11 November, 2015, from <http://www.ons.gov.uk/ons/rel/subnational-labour/regional-labour-market-statistics/november-2015/stb-regional-lms-november-2015.html>

⁵⁹ Future Foundation (2015) Future Consumer Trend Map: TfGM Workshop Report. 2 November 2015.

⁶⁰ Index of Multiple Deprivation is compiled (and weighted) by a range of factors including: Income Deprivation (22.5%), Employment Deprivation (22.5%), Education, Skills and Training Deprivation (13.5%), Health Deprivation and Disability (13.5%), Crime (9.3%), Barriers to Housing and Services (9.3%), Living Environment Deprivation (9.3%)

Figure 47: Index of Multiple Deprivation 2014

© Crown copyright and database rights 2015 OS 0100022610.
Use of this data is subject to terms and conditions: You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which Transport for Greater Manchester makes it available; you are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form; and third party rights to enforce the terms of this licence shall be reserved to Ordnance Survey.



150. The index is related to a range of factors such as the employment opportunities available to local residents. Transport has a role in improving access to employment opportunities from deprived areas by strengthening existing centres of employment, but also linking areas of low employment opportunity, with areas of new job creation.
151. The main clusters of employment in GM are explored within the Economy and Employment section of the evidence base. It will be important to strengthen the local transport offer, particularly for those areas of existing higher employment densities, that still fall within the 20% most deprived areas nationally.

152. Transport enables a significant quality of life for the individuals and communities it serves through enabling social contact, improved physical health through activity, and allowing access to economic and voluntary opportunities⁶¹. Evidence submitted to the Greater Manchester Poverty Commission highlighted the prohibitive cost of public transport for some, restricting access to public services, supermarkets and employment, for individuals who lack personal transport⁶². Interviews conducted with jobseekers in GM found 35% found transport a barrier in getting to work⁶³.
153. Research by Shelter and the Chartered Institute of Housing⁶⁴ suggests that areas with more jobs and the best transport links, where rents are likely to be higher, will become unaffordable for low income, private renting families more quickly than areas with fewer jobs, as a result of rising housing costs.
154. Transport accessibility varies widely across GM. Some of the most accessible areas include the regional centre, Oxford Road corridor and town centres. Higher population densities in these locations support higher density housing and more frequent public transport services, compared to those living in more rural, sparsely populated areas.
155. The availability of private vehicles among households across Greater Manchester varies considerably (Table 14). Over recent years, there has been an increase in car availability in areas most inaccessible by public transport on the periphery of GM. There has been a decrease in the % of households across GM with no access to a car or van.

⁶¹ Age UK and International Centre for Longevity UK (2015). The Future of Transport in an Ageing Society. London

⁶² Greater Manchester Poverty Commission (2013) Recommendations Report. Available: <http://www.povertymanchester.org/sites/default/files/GMPC%20Recommendations%20Report.pdf>

⁶³ TfGM (2016) Local Sustainable Transport Fund. Outcome Monitoring Report 2015. (not yet published)

⁶⁴ Shelter (2011) 'The Impact of Welfare Reform Bill measures on affordability for low income private renting families'

Table 14: Levels of Vehicle Ownership in Greater Manchester

Greater Manchester	All households	No Car/Van Households	% of Households with no car/van
2001 Census	1.040m	0.341m	32.8%
2011 Census	1.128m	0.345m	30.6%
Within M60 only			
2001 Census	0.292m	0.122m	41.2%
2011 Census	0.336m	0.134m	39.9%

156. Access to the internet and online services is increasing across the population, including among older age groups. National research indicated the proportion of those aged 65+ going online, rose from 33% in 2012, to 42% in 2014⁶⁵. Nevertheless, national studies indicate lower internet access among older and lower socio-economic groups. Lack of access to internet services can reinforce inequalities across Greater Manchester, particularly as transport information services are increasingly delivered through internet channels. It is imperative that transport information and services can still reach those without internet access.

Inclusive Growth in Greater Manchester

157. Inclusive growth is about ensuring the widest range of people and places are able to contribute to, and benefit from, economic success⁶⁶. The GMCA is contributing evidence to research conducted by the RSA's Inclusive Growth Commission. This is likely to be an important theme within the Greater Manchester Strategy moving into the future, and the GMCA has dedicated a portfolio to ensure inclusive growth is prioritised further. Research conducted by the University of Manchester and Joseph Rowntree Foundation indicates that while the GM economy has performed relatively strongly to that of other UK cities, experiencing the fourth highest growth rate between 2007 and 2014, an estimated 620,000 people in GM were living in relative poverty in 2013/14⁶⁷.

⁶⁵ Ofcom, 2014. Adults' Media Use and Attitudes Report. Retrived 21 September, 2015, from: stakeholders.ofcom.org.uk/binaries/research/media-literacy/adults-2014/2014_Adults_report.pdf

⁶⁶ RSA Inclusive Growth Commission (2016) Emerging Findings. Retrieved 14 November, 2016, from:

<https://www.thersa.org/globalassets/pdfs/reports/rsa-inclusive-growth-commission-interim-report.pdf>

⁶⁷ Inclusive Growth Analysis Unit (2016) Towards Inclusive Growth in Greater Manchester. Retrieved 14 November, 2016, from: <http://www.cities.manchester.ac.uk/medialibrary/igau/Inclusive-Growth-Summary-Report.pdf>

Implication for 2040 Strategy

Need to tackle income and employment-related inequality through reducing barriers to accessing opportunities, including considering the affordability of transport and improving access to key facilities such as employment, health and education.

Issues of Health Inequality in Greater Manchester

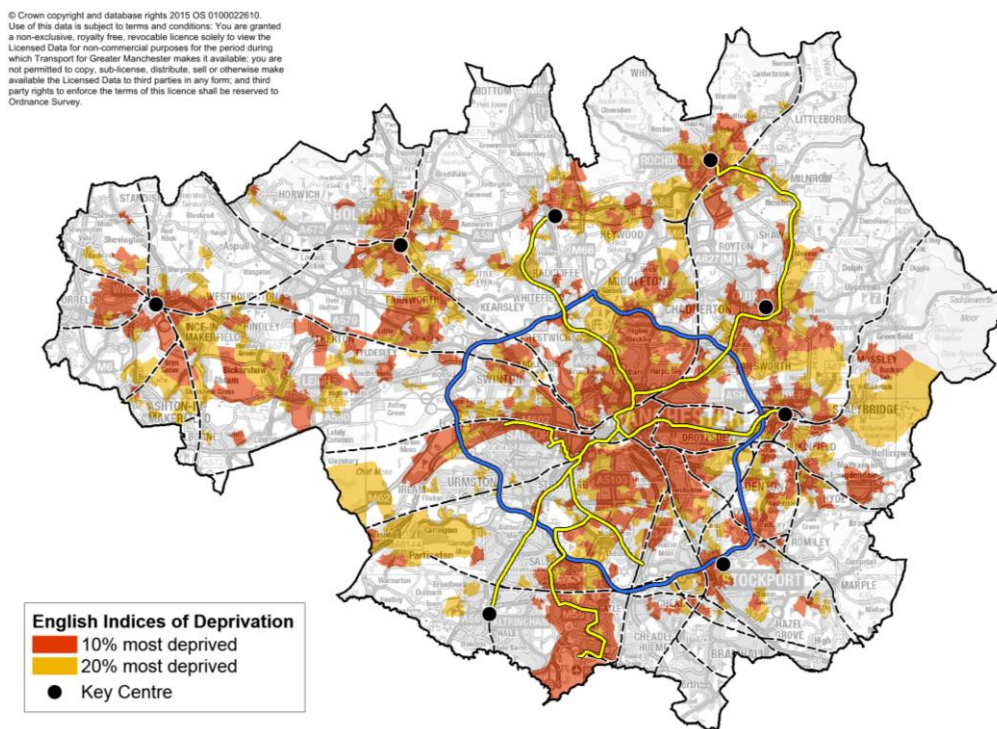
158. While the overall health of Greater Manchester residents has improved for several decades, including an increase in life expectancy (2002–2012, average life expectancy increased 3.3 years for men, and 2.2 years for women⁶⁸), the health sector considers that eight out of the ten Greater Manchester districts have overall ‘bad health’.
159. 130,000 people in Greater Manchester qualify for incapacity benefit, which not only impacts on those individuals’ life chances, but also reduces Greater Manchester’s productivity and increases the public cost of benefits. There is a potential transport dimension to many health problems, such as obesity, mental illness, diabetes, heart disease, asthma and respiratory disease.
160. This has particularly important implications for Greater Manchester. The latest figures show⁶⁹:
- a. 47% of adults within GM do not meet the Chief Medical Officer’s recommendations for physical activity, while 32% of adults engage in fewer than 30 minutes of activity weekly – both worse than the national average of 44% and 28.9% respectively;
 - b. In 2012/13, it was estimated that 20% of children in GM were classed as obese, higher than the national average of 18.9%;
 - c. For every inactive resident that takes up running, it is estimated the NHS would save over £100 per year; and
 - d. Local authorities in Greater Manchester are among those in the country with the highest prevalence of high blood pressure, type 2 diabetes, and heart disease, all strongly linked to a lack of physical activity. The costs to the NHS in GM of diseases linked to physical inactivity in 2012/13 exceeded £35 million.
161. Increasing levels of active travel in GM could therefore not only help to deliver mode shift but could also help improve health outcomes in GM.

⁶⁸ ONS (2014). Life expectancy at birth and at age 65 for the UK and local areas in England and Wales.

⁶⁹ Greater Sport (2015) Greater Manchester Moving: The Blueprint for Physical Activity and Sport in Greater Manchester: 7

162. Long term health problems and disabilities limit day-to-day activities for 18% of jobseekers⁷⁰. It is imperative that transport networks become increasingly accessible, including providing good access to healthcare for GM's residents when required.
163. Exposure to traffic related air pollution is associated with adverse health effects, including respiratory problems, increased incidence of illness, and premature death⁷¹. This often disproportionately affects the poorest communities by negatively reinforcing of health issues. People with existing mental or physical health problems are the most likely to be sensitive to traffic noise⁷², with those living closest to major roads worst affected. Further detail on this is provided within the Environment and Resources section.
164. Levels of health deprivation vary significantly across GM. While there are some areas of Trafford, such as Altrincham, and of Stockport that perform relatively well, most of the core area within the M60 lie within the bottom 10% nationally. The Index of Health Deprivation for 2014 is shown in Figure 48.

Figure 48: Health Deprivation, 2014



⁷⁰ TfGM (2015) LSTF Jobseeker Surveys (not yet published).

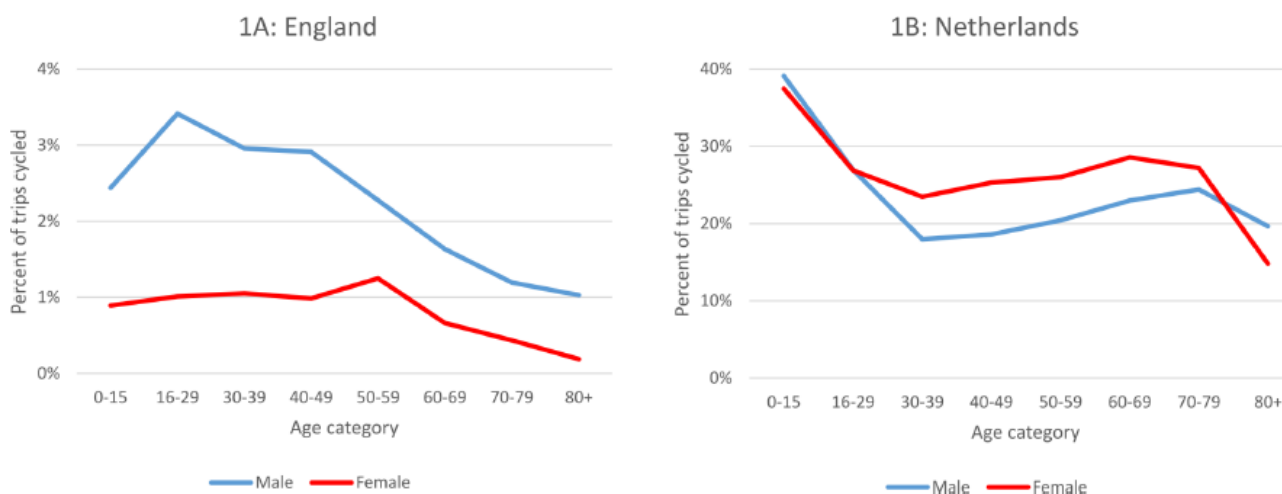
⁷¹ Hoek, G., Krishnam, R., Beelen, R., Peters, A., Ostro, B., Brunekreef, B., Kaufman, J. (2013) Long term air pollution exposure and cardio-respiratory mortality: a review. *Environmental Health*, 12:43.

⁷² Stansfield, S. & Haines, M. (1997) Environmental noise and health: a review of non-auditory effects. In: IEH report on the non-auditory effects of noise. Leicester: Institute for Environmental Health

Active Travel in Greater Manchester

165. Active travel has great potential to address symptoms and causes of inequality, and specifically, health inequality. Areas of health deprivation in GM are often found within urban areas, where a range of facilities (for example; employment, leisure, health) are located within a relatively short distance. GM Travel Diary Surveys (TRADS)⁷³ indicate private cars remain the dominant mode for travel, yet 38% of trips less than 2km are made by car as a driver/passenger. There is great potential for active travel modes to replace short car trips.
166. As active travel levels increase, people benefit across groups, directly and indirectly, helping to reduce entrenched inequalities to those with limited access to alternatives (whether because of cost, location, service availability etc.). There is a well-established link between reduced personal car use, increased active travel, and improved physical and mental health^{74,75} even when incorporating public transport use⁷⁶.
167. At present, however, there is a gender and age imbalance in travel modes such as cycling in England (shown in Figure 49) as compared to the Netherlands (as an example). Note that the two graphs have very different scales on the vertical axes.

Figure 49: Age and Gender Distribution of Trips – UK vs. Netherlands⁷⁷



⁷³ TfGM (2015) Travel Diary Surveys – Trips made by GM Residents. Scaled to a GM level, derived from a representative sample size of 12,221, across years 1-3.

⁷⁴ Travelwest: Travel choices made simple (2015). Essential Evidence. Retrieved 10 November, 2015, from <http://travelwest.info/essentialevidence>

⁷⁵ Gatersleben, B., Uzzle, D. (2007) Affective Appraisals of the Daily Commute. Comparing Perceptions of Drivers, Cyclists, Walkers and Users of Public Transport. *Environment and Behaviour*, 39(3): 416-431.

⁷⁶ Martin, A., Panter, J., Suhrcke, M., Ogilvie, D. (2015) Impact of changes in mode of travel to work on changes in body mass index: evidence from the British Household Panel Survey, *Journal of Epidemiology and Community Health*, 0: 1-9

⁷⁷ Anna Goodman, Analysis of England and Netherlands national travel survey datasets. Cited in Rachel Aldred's 'Cycling Evidence' presentation to TfGM, 2016.

Implication for 2040 Strategy

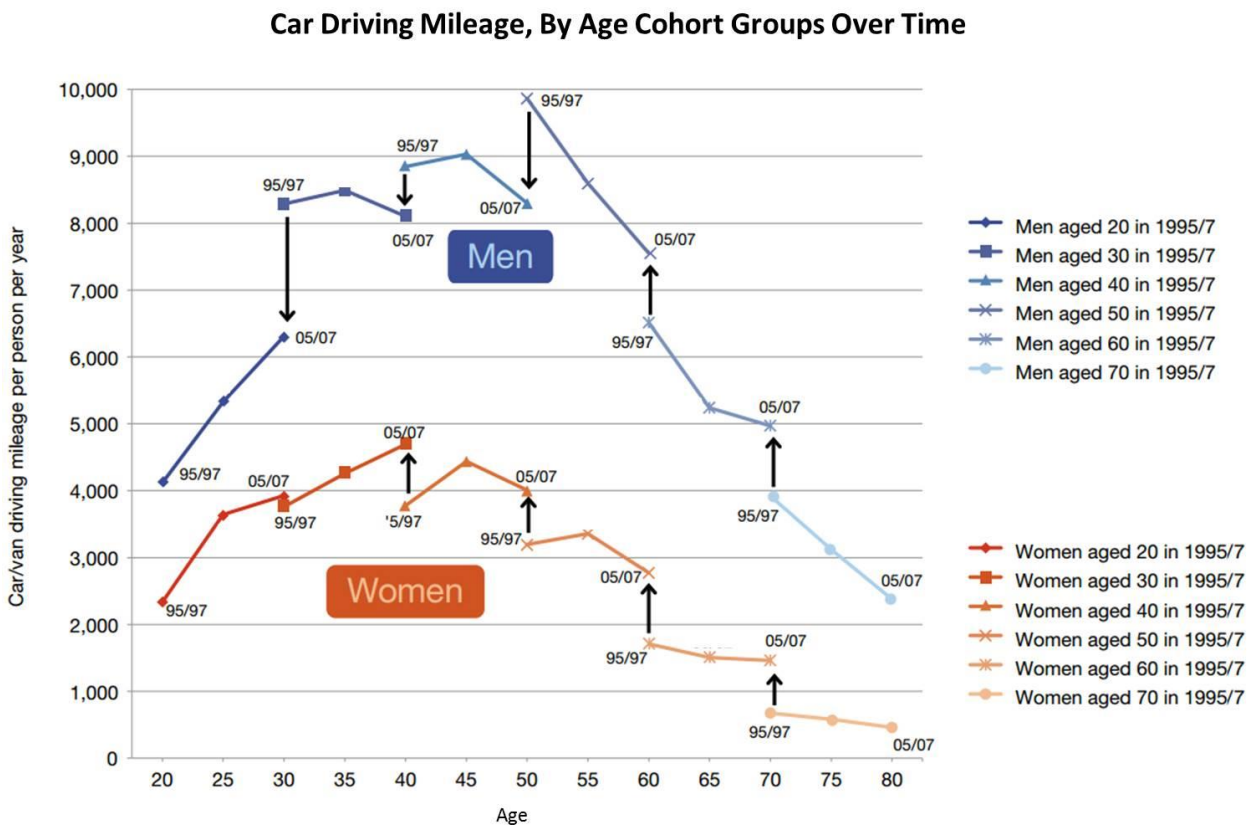
Transport has a role to play in tackling high levels of health inequality across Greater Manchester by developing active travel infrastructure and supporting widespread take-up among a broader range of groups.

Changing Attitudes and Travel Behaviour

168. The extent to which behaviours are directly attributable to attitudes, and the scope for attitudinal change, is uncertain. National research indicates a change over time of car driving mileage between age cohorts and genders, showing significant reductions of private vehicle mileage among younger male groups, but an increase in private vehicle mileage among females⁷⁸. The decline in vehicle mileage has been partly attributed to national taxation changes in the late 1990s, reversing a system incentivising car travel for those with access to company cars.
169. Figure 50 indicates where driving levels increased or decreased within an age cohort by means of a vertical arrow in the direction of the trend. There was a reduction in vehicle mileage among males aged 30, of almost 2000 miles annually. While women aged 30 saw a small increase, this represents a marked contrast to other female cohorts, that all saw much larger increases in private vehicle mileage, though from a much lower base. Meanwhile, both men and women aged 60+ saw a significant increase in mileage per capita. In light of projected ageing population trends and an increase in economic activity among more elderly people, this presents a significant challenge.

⁷⁸ Le Vine, S. & Jones, P. (2012) Making sense of car and train travel trends in Britain: 24. RAC Foundation.

Figure 50: GB Car Driving by Age Cohort over time⁷⁹



170. There is a significant body of evidence to suggest attitudes towards travel are changing. National research⁸⁰ suggests a rise in functional attitudes towards travel across ages, and journeys increasingly split across modes, but with differences between groups (Table 15).

⁷⁹ Le Vine, S. & Jones, P. (2012) Making sense of car and train travel trends in Britain. RAC Foundation.

⁸⁰ ITC, 2015. The Independent Transport Commission. Retrieved 18 August, 2015, from <http://www.theitc.org.uk/wp-content/uploads/2015/07/ITC-ORR-Road-Rail-Attitudinal-Report-Final.pdf>

Table 15: Changing Attitudes to Travel⁸¹

Group of Interest	Key Points
Young People (under 30 with significantly different attitudes to other groups)	<ul style="list-style-type: none"> - Cost is a dominant factor in mode choice. - Car ownership doesn't infer a higher status - cars less attractive than alternative consumer products (for example, smartphones). - Those who own cars increasingly also travel by PT, with a growing tendency to separate car ownership from use - Environmental and health issues not a significant driver of travel behaviour - Men less concerned about safety than women.
Migrant Populations (communities expected to grow faster in coming years)	<ul style="list-style-type: none"> - Black, Asian and Minority Ethnic groups – stronger aspirations to car ownership, less inclined to cycle/train use, associated with status and higher likelihood of travelling with larger family groups. - Generally lower rates of car ownership and high walking rates. 80% of migrants were unlikely to acquire a car in the future compared to 50% of non-migrants (p.5). Habits of walking and living close to destinations are likely to continue.
Over 55s (fastest growing age cohort):	<ul style="list-style-type: none"> - Older people use a wider range of modes due to concessionary fares. - Many older people choose to live close to public transport links to safeguard their mobility. - Older people are receptive to travel behaviour change if driven by the desire to retain independent mobility. - Proportion holding licences is increasing.
Business Travellers and Commuters:	<ul style="list-style-type: none"> - Commuting distances growing due to factors like housing cost/provision and school allocation and choice. - Increasing workplace flexibility. - Mode of transport varies significantly according to workplace location and parking availability. - Fixed line PT routes preferred by commuters.

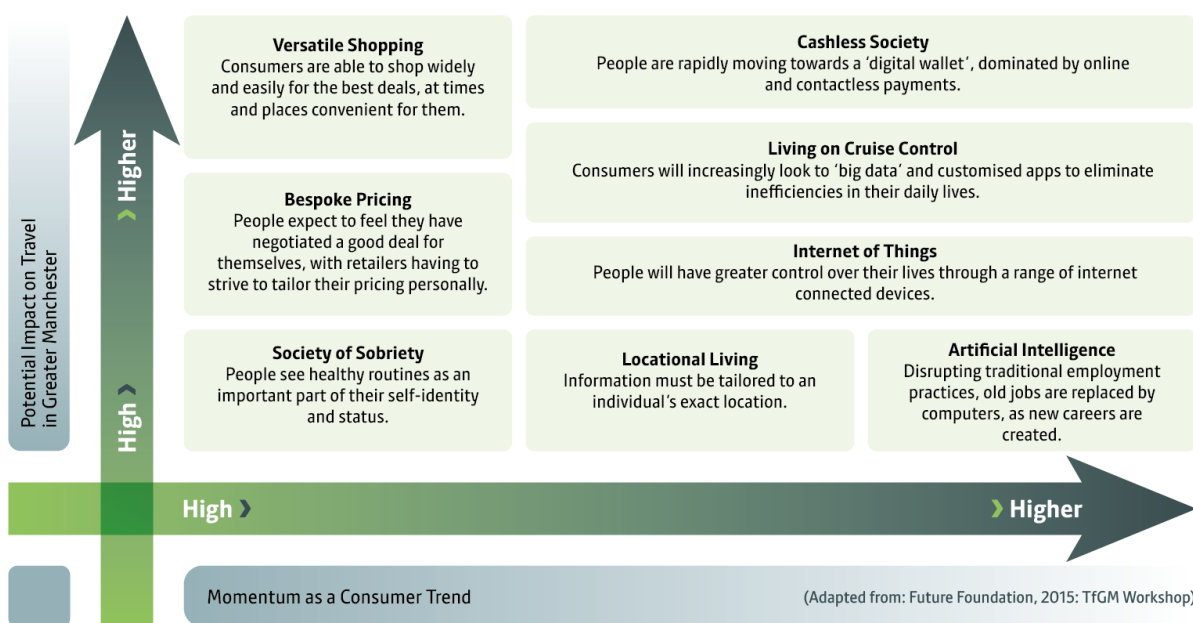
⁸¹ ITC, 2015. The Independent Transport Commission. Retrieved 18 August, 2015, from <http://www.theitc.org.uk/wp-content/uploads/2015/07/ITC-ORR-Road-Rail-Attitudinal-Report-Final.pdf>

171. Workshops held with Future Foundation helped summarise several key societal trends that could have a particular impact on transport in GM's future⁸² (Figure 51).

Figure 51: Future Foundation Consumer Trend Analysis

Future consumer trend analysis

TfGM has worked with consumer trend experts "Future Foundation" to identify a range of major consumer trends that could have an impact on travel and transport in Greater Manchester over the coming years. These are summarised below in relation to their current momentum and their potential impact on travel in Greater Manchester:



172. Other wider trends were identified. These include home based activities, which are becoming more popular and may lead to reduced travel demand for some individuals. There is an increasing expectation of high standards of customer service, and a feeling of justification in feeling anger if customer service is below expectations, a trend dubbed "Concierge Living". It will be important that public transport is competitive in both price, and service, particularly when combined with the "Maximised Behaviours" trend where customers are increasingly price sensitive, and actively searching for their best price option. Within GM, the satisfaction with travel mode affordability varies significantly. While 73% of bus passengers were satisfied with affordability, only 48% of Metrolink passengers were satisfied. The primary concern of young people with regard to transport was cost⁸³.

⁸² Adapted from: Future Foundation, 2015: TfGM Workshop.

⁸³ WSP (2013) Feasibility Study into Engaging with Young People and Delivering Modal Shift. Presentation delivered 02/12/2013

173. Additionally, peer to peer platforms facilitated by new technology are empowering the individual to break away from traditional consumption routes, based increasingly around shared interests. This may have particular relevance for consultation strategies, and how different voices may be expressed through different means of communication and engagement. Particularly as amongst teenagers within GM, there is a stigma associated with potential social media connectivity to organisations like TfGM and how this may alter their relative status among peers⁸⁴.
174. Considering health inequality, the current dominance of car use, and unequal uptake of cycling in GM, many other cities across Western Europe, cycling is gender neutral, and participation remains high, even across older age groups⁸⁵. Despite a perception that Northern European cities have an inherently more ‘pro-cycling’ culture, the evidence suggests the contrary, and current ‘cycling cultures’ have been achieved more deliberately through long-term application of policy change and deliberate efforts to deliver modal shift⁸⁶.
175. Within GM, attitudes to travel appear to show significant scope for increased uptake of more sustainable forms of travel. Recent evidence indicates there was a 4% increase in trips by bike in Greater Manchester between 2013 and 2014⁸⁷, and that 75% of people in Greater Manchester want to see more investment on cycling, and 72% agree that things would be better if people rode bikes more.
176. This may reflect an emerging “society of sobriety” within the UK, where (55% of Generation Y) individuals rate their healthy lifestyle as an important part of their identity. Unhealthy choices are increasingly perceived as risks to the individual, damaging their health, wealth and particularly, their social standing⁸⁸. Amongst teenagers in GM, health has been found to be a more relevant motivator to change behaviour than the environment⁸⁹.
177. Changing attitudes and behaviour towards issues such as sustainable transport tend to vary across groups, implying the need to tailor interventions across different groups to achieve greatest impact.

⁸⁴ WSP (2013) Feasibility Study into Engaging with Young People and Delivering Modal Shift. Presentation delivered 02/12/2013

⁸⁵ Aldred, R., Woodcock, J., Goodman, A. (2016) Does More Cycling Mean More Diversity in Cycling? *Transport Reviews*, 36:1, 28-44. Available: <http://www.tandfonline.com/doi/full/10.1080/01441647.2015.1014451>

⁸⁶ Melia, S. (2015) *Urban Transport: Without The Hot Air*. UIT Cambridge, Cambridge, UK.

⁸⁷ TfGM & Sustrans (2015). *Bike Life: Greater Manchester 2015*. Manchester

⁸⁸ Future Foundation (2015) *Society and Sobriety: nVision Research 2015*

⁸⁹ WSP (2013) Feasibility Study into Engaging with Young People and Delivering Modal Shift. Presentation delivered 02/12/2013

Implication for 2040 Strategy

Attitudes and behaviours are changing in different ways across different social groups. Interventions will have to be tailored appropriately in recognition of this.

Perceptions of Personal Safety and Security

178. Safety and security is a fundamental issue for transport. The nature of this subject is broad, and is reflected in everything from fear of crime and anti-social behaviour, to concerns about road safety limiting active travel uptake. Additionally, we recognise that perceptions of safety and security can be just as important as actual safety and security, in influencing people's travel behaviour.
179. Reported transport crime and anti-social behaviour incidents are recorded below (Table 16). With the recent introduction of the dedicated Travel Safe Unit, which has a remit to tackle crimes on the transport network that have previously gone unreported and unrecorded, there was an anticipation that recorded crimes may increase in the near term future.

Table 16: Total Incidents of Reported Transport Crime and Anti-Social Behaviour in Greater Manchester⁹⁰

2012	2013	2014	2015
6,148	6,954	6,040	6,915

⁹⁰ TfGM (2016) Incidents of crime and antisocial behaviour reported to TfGM by Operators, Bus station staff and British Transport Police.

180. Perceptions of security can be critical in determining travel habits. Studies conducted on the bus network in 2009/2010-2010/11 as part of the “Knife Enabled Crime Gateway Programme” revealed approximately a third of users avoided travelling at night due to concerns over crime and anti-social behaviour⁹¹. Further studies identifying passengers’ perceived top 5 priorities in 2010 revealed safety as a top 5 priority for bus and Metrolink when compared against other issues like cost and frequency. Perceptions and the importance of safety were found to be more important for disabled users, though this varied between modes. No groups rated safety as a top 5 priority for improvement on rail.
181. Research found that users of transport modes including Rail and Metrolink tended to perceive them as safer than non-users did. The perception of safety also significantly varies between hours of daylight or darkness. The proportion of residents who felt fairly safe, or very safe, for several public transport modes in daylight and darkness hours is show in Table 17⁹².

Table 17: Perceptions of Safety on Public Transport

Proportions of residents who felt fairly/very safe on public transport		
Mode	Daylight Hours	When It Is Dark
Bus	96%	52%
Train	94%	49%
Metrolink	93%	46%

182. Customer satisfaction surveys conducted by Transport Focus have found that while the proportion who are satisfied with personal safety and security has had no significant change from 2014, there has been a reduction in satisfaction with personal security, on board bus services in 2015⁹³ (Table 18).

⁹¹ TfGM (2011) KEC Gateway Passenger Check Programme Evaluation

⁹² GMPTE (2010) Greater Manchester Residents Survey Winter 2010. Topline Results

⁹³ Transport Focus (2016) Transport Focus Customer Satisfaction 2015

Table 18: Customer Satisfaction with Safety and Security, 2015

Autumn 2015 Transport Focus satisfaction	Bus	Rail	Metrolink
Stop of station measures			
Personal safety at stop/security at station	➡ 75%	➡ 70%	➡ 84%
On-board measures			
Personal security	↓ 79%	➡ 73%	➡ 80%

183. It often remains difficult to disentangle perceptions of safety from actual levels. Regarding active travel for example, despite positive attitudes to active travel, safety remains a concern for many. Nearly 80% of Greater Manchester residents want better safety for people riding bikes, with only 19% of people believing that safety for children riding a bike is good/very good. Yet within Greater Manchester there are 3.6 million miles cycled for every serious injury or worse⁹⁴.
184. Qualitative studies conducted within Greater Manchester among teenage school students highlight that parents and peers have a significant influence on travel patterns. Issues of safety, particularly when travelling alone, potentially limit independent mobility⁹⁵.
185. Research indicates that non-injury incidents, or “near misses”, that traditionally go unreported, happen on a daily basis across the UK. These may have a substantial impact on cycling experience and uptake, and within the current recording system, are not given the same weight as collisions involving injuries. It has been recommended that more attention should be paid to under-recording of non-injury incidents, and communicating with risk-averse individuals in future⁹⁶.

Implication for 2040 Strategy

There is a need to improve perceptions of personal safety and security when walking, cycling and using public transport to encourage greater uptake of those modes and better communicating the evidence on actual incidents.

⁹⁴ TfGM & Sustrans (2015). Bike Life: Greater Manchester 2015. Manchester

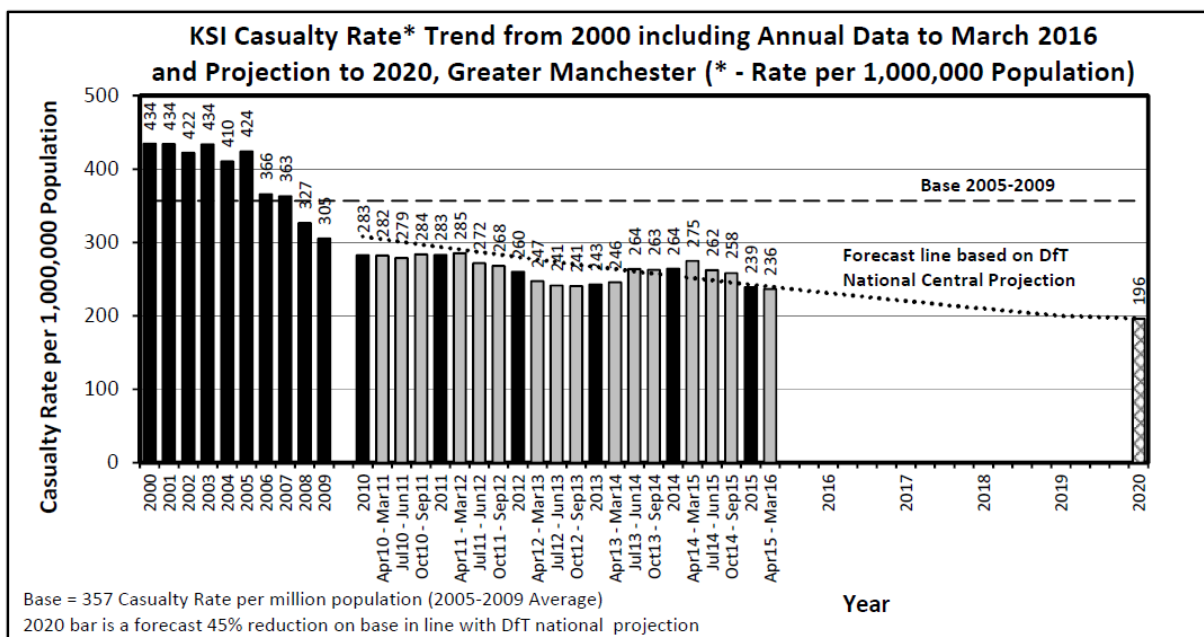
⁹⁵ WSP (2013) Feasibility Study into Engaging with Young People and Delivering Modal Shift. Presentation delivered 02/12/2013

⁹⁶ Aldred, R. & Crosweller, S. (2015) Investigating the rates and impacts of near misses and related incidents among UK cyclists. Journal of Transport and Health, 2, 379-393.

Trends in Road Casualties

186. During 2015, there were 3,073 reported incidents involving injury on the road network of GM, resulting in 4,320 casualties. Both figures were 23% lower than those in 2014, and were the lowest on record⁹⁷. This has been part of a wider trend where collisions involving casualties in GM has been declining over several years. However, non-injury incidents are known to be under-recorded within the UK. Sustained efforts both nationally and locally to improve historic levels of under reporting of non-injury collisions may see a relative increase in recorded collisions in the nearer future.
187. Greater Manchester has seen a significant reduction of people killed or seriously injured (KSI) on the transport network from 2000, as part of a long term effort to improve road safety (Figure 52). Annual variations within this wider downward trend are attributed to some extent by a wider range of external factors, including, but not limited to, seasonal weather, economic growth, and fuel prices. These are reflected by wider patterns nationally.

Figure 52: Casualty Trends in Greater Manchester



⁹⁷ TfGM (2016) Data Solutions Report 1875. Reported Road Casualty Statistics, Greater Manchester 2015

188. Rates of KSI casualties vary considerably between districts, while a higher proportion of collisions occur in deprived areas and a disproportionate number of collisions involve vulnerable road users (such as pedestrians, cyclists and motorcycle users).
189. Between 2013 and 2015 there was an annual average of 25 KSI casualties per 100,000 head of population in GM, compared to the national average of 38. Within GM, Bolton had the highest KSI rate per head of population, closely followed by Manchester. These higher rates are to be expected as Bolton and Manchester both attract many trips from outside their district boundaries for work, shopping and leisure purposes. Despite this, both the Bolton and Manchester KSI rates were still lower than the national rate.
190. The Greater Manchester Casualty Reduction Partnership aims to protect vulnerable road users with particular emphasis on pedestrians, cyclists, motorcyclists, and young drivers aged 17-25.
191. While these groups make up a minority of overall road users, they represent a majority of all serious casualties or fatalities. In 2015, pedestrians, pedal cyclists and motorcyclists account for 18%, 10%, and 9% of all casualties respectively. The proportion of KSI collisions involving a young driver aged 17-25 was 20%. Detail on casualty rates within Greater Manchester can be found within TfGM's Highways Forecasting and Analytical Services report⁹⁸. Future interventions should give particular consideration to the most vulnerable road user groups.

Implication for 2040 Strategy

Despite a trend of falling casualties in recent decades, there remains an ongoing issue in relation to vulnerable road users including children. There is a need for interventions to lower risk for vulnerable road users.

⁹⁸ TfGM (2016) Data Solutions Report 1875. Reported Road Casualty Statistics, Greater Manchester 2015. Available from: <http://www.gmtu.gov.uk/reports/casualty2015.htm>

Urban Development



Urban Development: Summary of Trends and Implications

Increasing travel demand associated with GM growth

- As reflected in Economy and Employment and Society and Community sections, the prospective high levels of economic growth and new housing delivery within Greater Manchester and neighbouring areas will equate to a large increase in the overall demand for travel in Greater Manchester. Furthermore, the location, density and design of that development will significantly affect the levels of traffic impact.

Location and density of future development

- The scale of growth within the existing urban area will put pressure on existing infrastructure. A significant mode shift will be needed to reduce highway congestion, requiring further investment in public transport and active travel, supported by travel demand management.
- Some proposed development areas are not readily served by public transport. This raises challenges in terms of providing attractive alternatives to car travel.
- The design of new development will affect the likelihood of viable public transport links being provided and will determine the type of public transport that can be supported.

Promoting sustainable access to employment

- Motorway-based manufacturing/ logistics sites are unlikely to have existing public transport. There is a need to identify appropriate interventions to promote non-car access for workers to these sites.
- Significant investment in high capacity, sustainable transport provision will be crucial to support ongoing growth of existing key employment areas such as the City Centre, The Quays the Airport Gateway and the main town centres, without exacerbating congestion.

Regeneration

- There is a need to support the regeneration of GM's Key Centres. This will involve improving access by all modes, improving the environment for workers and visitors by reducing the dominance of the car and improving linkages across the centres for pedestrians and cyclists, including public realm enhancements and establishing clear, evidence-based parking policies that support regeneration aspirations.

Introduction

192. The pattern of development has a significant influence on travel behaviour and transport infrastructure requirements. Greater Manchester is anticipating high levels of economic growth by 2040 (see the section on Economy and Employment), along with an unprecedented demand for housing (see the section on Society and Community). This will inevitably increase demands on the transport network in terms of both managing increased volumes of trips and providing links to new locations and the 2040 Transport Strategy will need to make provision for this. However the location and density of development and the quality of local facilities can greatly influence demands on the network. For example, locations which offer a range of attractive facilities can reduce the need to travel or to use the car for day to day journeys, while higher density developments are more walkable and can increase the likelihood of providing viable public transport.

193. This section describes:

- the levels of growth expected in Greater Manchester and the broad locations identified;
- the levels of growth expected in the surrounding areas;
- the role and future development of Greater Manchester's main town centres; and
- the impact of new development on travel.

Future Levels of Growth

194. The Draft Greater Manchester Spatial Framework (GMCA, 2016) identified the level of growth that should be planned for up to 2035. The economic forecast was tested against a number of factors, including: the Northern Powerhouse Independent Economic Review; forecasts produced by the leading forecasting houses as well as Oxford Economics (Cambridge Econometrics and Experian); assumptions around resident employment rate and the potential impacts of Brexit. Initial population forecasts were updated to take into account the 2014 Sub-National Population Projections (released May 2016) and the Sub National household projections (released July 2016). Various scenarios were modelled using different household formation rates as was the impact of the Government's Local Plan Expert Group recommendations that were made in Spring 2016.

195. As a result of this work, the Draft GMSF is planning for:

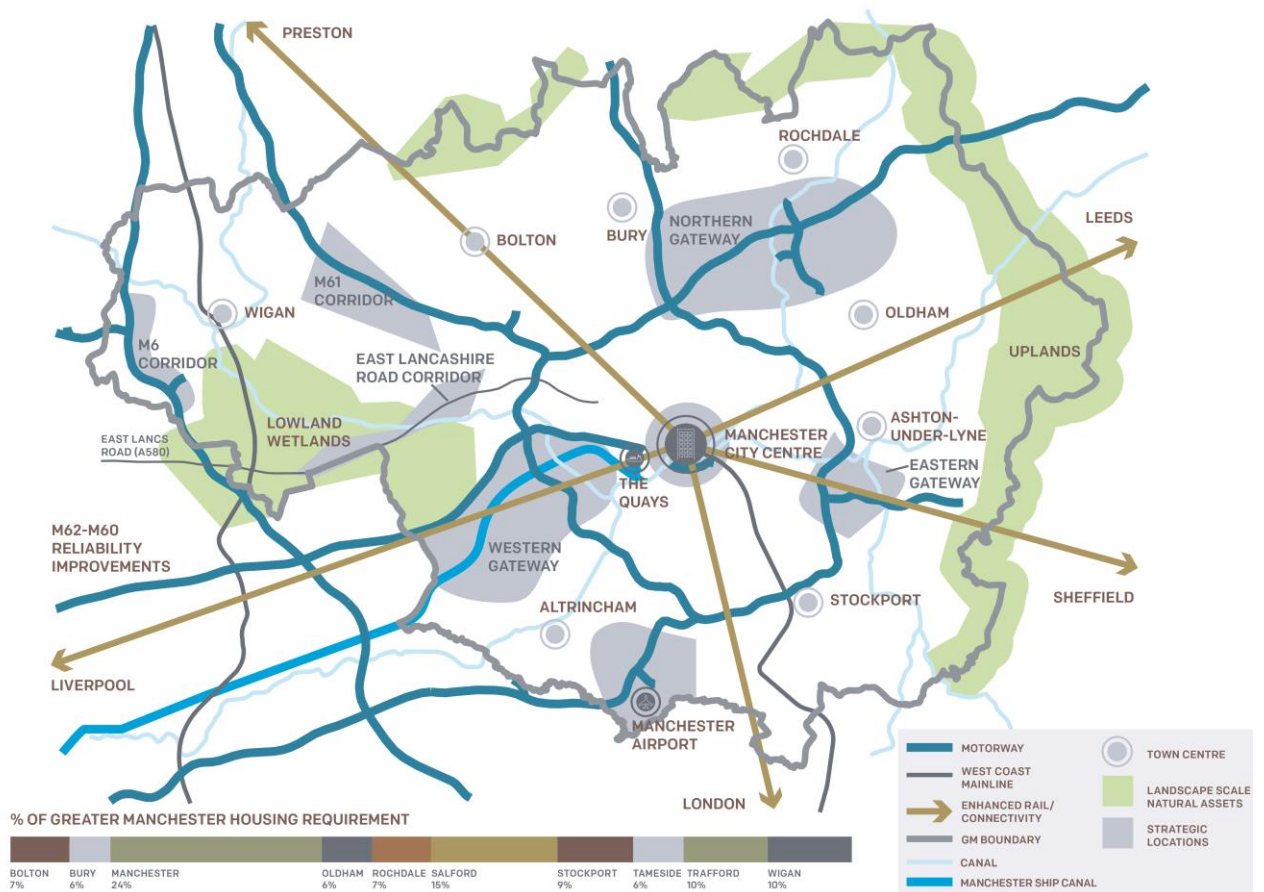
- GVA growth of 2.5% year on year, giving an uplift of £5bn above baseline conditions by 2035;
- Additional 200,000 jobs; and

- Population growth of 295,000, which translates into some 227,000 net new homes.
196. There is a strong emphasis on directing new development to brownfield sites and in urban locations. However the scale of growth also requires the release of some land from the Green Belt, and this is focussed on a relatively small number of large sites, to enable the creation of new mixed use neighbourhoods supported by proper infrastructure and services.

Strategic Locations for Growth

197. The strategic locations for growth are shown on the Draft GMSF Key Diagram, shown below.

Figure 53: Draft GMSF Key Diagram



Industry and Warehousing Development

198. Draft GMSF identified a need for around 4,000,000 m² of industrial and warehousing floorspace over the period 2015-2035. Key locations identified for new industrial and warehousing in Greater Manchester are:

- Western Gateway (which includes Trafford Park, Port Salford and Carrington);
- Northern Gateway (which includes Heywood/Pilsworth, Stakehill and Kingsway);
- Eastern Gateway (which includes Ashton Moss, Bredbury Park Industrial Estate and the Tame Valley);
- M6 corridor in Wigan, around junctions 25 and 26 ;
- M61 Corridor in Bolton (Logistics North at junction 4 and West of Wingates near junction 6);
- East Lancashire Road Corridor;
- Central Park in Manchester; and
- Manchester Airport.

Implication for 2040 Strategy

Motorway-based manufacturing/ logistics sites are unlikely to have existing public transport. There is a need to identify appropriate interventions to promote non-car access for workers to these sites.

Office Development

199. Draft GMSF identified a need for a minimum of 2,450,000 m² of office floorspace over the period 2015-2035, distributed in accordance with the table below.

Table 19: Distribution of Office Floorspace

District	Floorspace (m ²)
Bolton	100,000
Bury	90,000
Manchester	1,360,000
Oldham	80,000
Rochdale	75,000
Salford	415,000
Stockport	140,000
Tameside	35,000
Trafford	120,000
Wigan	35,000

200. New office floorspace will be focused in a small number of key locations:

- City Centre;
- The Quays, including MediaCityUK;
- Airport Gateway; and
- Main town centres (Altrincham, Ashton-under-Lyne, Bolton, Bury, Oldham, Rochdale Stockport, Wigan)

Implication for 2040 Strategy

Significant investment in high capacity, sustainable transport provision will be crucial to support ongoing growth of existing key employment areas such as the City Centre, The Quays the Airport Gateway and the main town centres, without exacerbating congestion.

Housing Development

201. The table below sets out the proposed distribution of the approximately 227,000 additional homes required across Greater Manchester, together with a broad indication of the balance of houses and apartments.

Table 20: Housing Requirement to 2035

District	Total requirement	Average Annual Requirement	Houses (%)	Apartments (%)
Bolton	16,800	840	85%	15%
Bury	12,500	625	85%	15%
Manchester	55,300	2,765	15%	85%
Oldham	13,700	685	85%	15%
Rochdale	15,500	775	90%	10%
Salford	34,900	1,745	30%	70%
Stockport	19,300	965	75%	25%
Tameside	13,600	680	80%	20%
Trafford	23,100	1,155	60%	40%
Wigan	22,500	1,125	90%	10%
GM Total	227,200	11,360	55-60%	40-45%

202. Significant levels of residential development are proposed in the Strategic Locations, as follows:

- City Centre (40,000);
- Western Gateway (11,500 Carrington/Partington/Sale West and 2,250 western Cadishead/Irlam);
- Northern Gateway (5,200 south of Heywood/south of M62, 2,800 around Stakehill, 1,500 Crompton/Newhey);
- The Quays (6,000);
- M61 Corridor (6,000);
- Eastern Gateway (2,300 Godley Green and 2,000 Littlemoss); and
- East Lancs Road Corridor (3,600).

203. Other significant locations proposed are:

- High Lane (4,000);
- Off the A34, Stockport (3,700);
- Woodford (2,400);
- Elton Reservoir, Bury (3,460);
- Heald Green (2,000);
- Walshaw (1,250);
- North of New Springs, Wigan (1,050); and
- Broadbent Moss and Beal Valley, Oldham (1,900).

204. In order to allow time for the masterplanning of major sites, the provision of essential infrastructure, and the development industry to build up sufficient capacity, the total requirement of around 227,000 net additional dwellings will be delivered in accordance with the following phasing:

- 6,100 in 2015/16
- 7,400 in 2016/17
- 8,700 in 2017/18
- 10,000 in 2018/19

- 11,000 in 2019/20
- 11,900 in 2020/21
- 12,200 in 2021/22
- 12,300 each year over the period 2022-2035

205. Some 72% of the homes required will be located within the existing urban area, most of which is well served by public transport. It will be important to make the optimum use of this land, by increasing densities, where appropriate, in the most accessible locations: houses might typically have an overall density of 35 dwellings per hectare, whereas apartments might be built at 100 dwellings per hectare, greatly reducing the amount of land needed and increasing the viability of public transport services. Almost half of all household growth is forecast to be in the form of single person households, which will partly drive the growth in demand for apartments.
206. Although increased densities can reduce the need for additional land, the scale of growth proposed in Draft GMSF means that there will clearly be implications for transport provision, as a result of the additional trips generated.
207. Many of the Green Belt sites allocated for residential development are not currently well served by public transport and the proposed low density of development will make serving these sites challenging.

Implications for 2040 Strategy

The scale of growth within the existing urban area will put pressure on existing infrastructure. A significant mode shift will be needed to reduce highway congestion, requiring further investment in public transport and active travel, supported by travel demand management.

Some proposed development areas are not readily served by public transport. This raises challenges in terms of providing attractive alternatives to car travel.

Neighbouring Authorities

208. Significant development is also being planned in neighbouring authorities. In some cases Local Plans have yet to be approved, but Table 21 shows proposals as at July 2015. This shows that significant levels of growth are planned, which will increase the number of journeys into and out of Greater Manchester. The most significant proposals, from a Greater Manchester perspective, are in Cheshire East where current proposals (not yet approved) are for 31,000 jobs and 36,000 dwellings by 2030. The major Omega development is under construction in Warrington, which could accommodate 12-20,000 jobs when fully complete (Warrington Council, 2014, page 34), while in St Helens the 85 ha Parkside site could also generate significant additional jobs.

Table 21: Current Growth proposals, Neighbouring Authorities

District	Status	Time period	Employment land	Net additional dwellings
Blackburn with Darwen	Adopted Core Strategy ⁹⁹	2011-2026	105.5 ha	9,365
Calderdale	Unitary Development Plan (saved policies) ¹⁰⁰	2001-2016	120 ha	6,750
Cheshire East	Core Strategy (Examination - latest proposed amendments) ¹⁰¹	2010-2030	378 ha (31,400 jobs)	36,000
Chorley	Central Lancashire Adopted Core Strategy (Preston, South Ribble, Chorley) ¹⁰²	2010-2026	112 ha	417 p.a.
High Peak	Adopted Local Plan ¹⁰³	2011-2031	45.216 ha	7,000
Kirklees	Unitary Development Plan (Saved Policies) ¹⁰⁴	1998-2016	278.4 ha	

⁹⁹ Blackburn with Darwen Council (2011): Core Strategy

www.blackburn.gov.uk/Lists/DownloadableDocuments/Adopted_Core_Strategy_final_A4.pdf

¹⁰⁰ Calderdale Council (2009) Unitary Development Plan

www.calderdale.gov.uk/environment/planning/developmentplan/index.html

¹⁰¹ Cheshire East Council (2015): Core Strategy www.cheshireeast-consult.limehouse.co.uk/portal/planning/cs/library

¹⁰² Preston, south Ribble and Chorley Councils (2012): Central Lancashire Core Strategy www.chorley.gov.uk/Documents/Planning/Planning%20Policy/Central%20Lancashire%20Core%20Strategy%20-%20July%202012%20v1.pdf

¹⁰³ High Peak Council (2015): Local Plan www.highpeak-consult.limehouse.co.uk/portal/high_peak/localplansubmission?pointId=2893514

¹⁰⁴ Kirklees Council (2007): Unitary Development Plan www.kirklees.gov.uk/business/regeneration/udp/pdf/UDP.pdf

District	Status	Time period	Employment land	Net additional dwellings
Rossendale	Adopted Core Strategy ¹⁰⁵	2011-2026	20.84 ha	3,700
St. Helens	Adopted Local Plan Core Strategy ¹⁰⁶	2011-2027	122 ha	10,320
Warrington	Adopted Local Plan Core Strategy ¹⁰⁷	2006-2027	277 ha	10,500 (but overturned by High Court 2015 – under review)
West Lancashire	Adopted Local Plan ¹⁰⁸	2012-2027	75 ha	4,860

Implication for 2040 Strategy

As reflected in Economy and Employment and Society and Community sections, the prospective high levels of economic growth and new housing delivery within Greater Manchester and neighbouring areas will equate to a large increase in the overall volume of trips on the transport network. Furthermore, the location, density and design of that development will significantly affect the levels of traffic impact.

Town Centres

²⁰⁹ The eight main town centres (Altrincham, Ashton, Bolton, Bury, Oldham, Rochdale, Stockport and Wigan) are significant employers, providing 10% of GM jobs. They provide a critical mass of facilities and services and are the hubs of local transport networks, making them highly sustainable locations. Significant investment has been made, or is planned, in improved public transport infrastructure and services. However a 2010 study by the Business Leadership Council¹⁰⁹ concluded that they were making a diminishing contribution to the Greater Manchester economy due to a number of factors, such as:

- competition from out-of-town, office/retail/leisure;

¹⁰⁵ Rossendale Council (2011) : Core Strategy

www.rossendale.gov.uk/downloads/download/331/core_strategy_local_plan_part_1_adopted

¹⁰⁶ St Helens Council (2012): Local Plan Core Strategy www.sthelens.gov.uk/media/354627/ldf43e.pdf

¹⁰⁷ Warrington Council (2014): Adopted Local Plan Core Strategy

www.warrington.gov.uk/info/200564/planning_policy/1903/local_plan

¹⁰⁸ West Lancashire Council (2013): Local Plan www.westlancs.gov.uk/planning/planning-policy/the-local-plan/the-local-plan-2012-2027.aspx

¹⁰⁹ Business Leadership Council, 2010: Town Centre Study

- the increasing prominence of the Regional Centre;
- a decline in the quality of the retail offer;
- a decline in the attraction of town centres for office/commercial employment and for leisure activity;
- increasing dependence on the public sector for investment; and
- reduced ability to compete for mobile investment.

210. A further study of the eight town centres (GMCA, 2013¹¹⁰), based on private sector expertise in retail analysis showed that they are very different in terms of the scale of their offer and recent trends. Table 22 illustrates some of these differences in terms of:

- Catchment area: the primary catchment area is the area from which a town centre draws very high market shares (i.e. 50% of its fashion/clothing spend);
- Retained market share: the proportion of spending from the catchment area retained by a centre (based on fashion/clothing spend);
- Retail offer and scale: the *venuescore* figure rates towns and shopping centres in terms of the presence of leading multiple retailers; and
- National rank: town and shopping centres are also ranked nationally (and within the region) in terms of their retail offer, showing how they change in relation to each other over time.

Table 22: Traditional town centre indicators for retail

Source: Javelin Group	Altrincham	Ashton	Bolton	Bury	Oldham	Rochdale	Stockport	Wigan
Primary catchment size	109,000	136,000	175,000	176,000	179,000	90,000	280,000	120,000
Retained market share	28%	20%	46%	36%	26%	27%	29%	59%
Venuescore (presence of multiples)	110	129	212	174	149	124	166	176
UK / NW Rank* (1 = highest)	227 / 24	183 / 20	66 / 5	108 / 11	147 / 17	203 / 23	118 / 18	104 / 10

¹¹⁰GMCA, 2013: Greater Manchester Town Centres Review, https://www.greatermanchester-ca.gov.uk/downloads/file/16/gm_town_centre_review

*red moved down; green moved up, amber stable (average over last 10 years)

211. Bolton, Bury and Wigan have the largest town centre based retail offer within GM. They have also remained largely dominant within their primary catchment areas in recent years, maintaining a status as the main shopping destination for households who live close by. Bolton and Bury (along with Oldham) have also improved their position on the national retail ranking in recent years, whereas Wigan has remained stable in its position as the 104th retail centre in the country.
212. The smaller retail centres of Altrincham, Ashton and Rochdale are less dominant within their immediate catchment area and, although Ashton has remained stable on the national rank of retail centres, Altrincham and Rochdale (along with Stockport) have moved down the retail hierarchy over the last ten years. For all eight GM town centres, it is the Trafford Centre and regional centre which account for most of the spend leaking from their primary catchment area. This is a well identified trend, as more affluent residents are likely to be drawn to these locations and presents a particular challenges for smaller centres with a more limited retail offer.
213. The study found that town centres are now facing a fundamental challenge due to changes in retail sector (particularly the growth of e-commerce, which accounted for nearly half of all retail sales between 2003 and 2010). Nationally the expectation¹¹¹ is that there will be 30% fewer chain stores by 2020 and 20% less retail floorspace on the high street. This is being compounded by the national downturn in retail spending. The centres most at threat are likely to be the mid-tier ones, such as GM's 8 key centres. Comparison retail is becoming increasingly centralised in a few, larger centres, while small local centres can fulfil the role of convenience and offer collection points for sales placed online.
214. Based on analysis from the Javelin Group, Table 23 lists the position of GM town centres on Javelin's *Battlefield Britain Index* – a measure of the long-term risks from current consumer and retail trends. This is based on a scorecard of factors, measuring variables such as current retail offer, leisure offer, rents and characteristics of the population in the catchment area.

Table 23: National rank of town centres at risk from consumer trends

Source: Javelin Group	Altrincham	Ashton	Bolton	Bury	Oldham	Rochdale	Stockport	Wigan
Battlefield Britain Ranking (1 – 196, where 1 is most at risk)	32	5	41	37	20	13	30	137

¹¹¹ Javelin Group of retail analysts

215. From this analysis, seven out of the eight Greater Manchester town centres fall into the ‘at risk’ category. Only Wigan is identified as not at risk – although this is an important factor, it assumed to be largely due to the fact that Wigan is much more isolated than other GM centres. Smaller town centres, especially those across the north-east of the conurbation, are particularly at risk from retail and online shopping trends – Ashton, Rochdale and Oldham are all within the top 20 most at risk town centres within the country on Javelin’s analysis.
216. The Town Centres Review made specific recommendations for each of the centres as follows:
- **Altrincham** should develop a role as a modern market town, attracting visitors from Cheshire as well as locals so it can thrive alongside the Trafford Centre. Key issues are:
 - Improving access and movement around the town centre.
 - Protecting the remaining mainstream retail offer and encouraging a complementary independent offer.
 - Refurbishing the market, to focus on higher quality of goods and specialist food based retailers, and renewing the role of the wider market quarter.
 - Development of the residential offer.
 - **Ashton-Under-Lyne** should seek to maintain its role in serving the primary catchment area, providing a focus for shopping, access to transport, education and skills, so enhancing local quality of life. Key issues include:
 - The need to consolidate activity and investment, focussing on the successful markets, the two managed centres and Northern Core.
 - Maximising the impact of students with the relocation of the college campus into the town centre.
 - Managing competition from the close proximity of Snipe Retail Park and Ashton Moss.
 - Reliance on public sector investment and property take-up in the short term (i.e. transport interchange, college, office take up in St Petersfield).
 - Improving the public realm, particularly as Metrolink project is completed.
 - **Bolton** should become the focus for in-town office and commercial development for the north of the conurbation. It has already created a strong ‘Knowledge Quarter’ with the University, College and others, raising footfall and helping to support other amenities. This places the town in a strong position to address a number of key issues around:

- Realising the potential for larger scale office use, proving the demand for refurbished and new office/commercial space
 - Consolidating retail, bringing retail activity into a smaller core based around the market and shopping centres
 - Developing town centre housing, turning interest into schemes
 - Establishing incubator and flexible work space, maximising the impact of the knowledge quarter by facilitating new businesses and jobs.
- **Bury** has a clear strategy for the retail and visitor elements of the town centre economy, demonstrating successful strategic planning and execution over a long period. It needs to maintain the visitor offer and join up its individual attractions to create an offer of GM significance. Key issues include:
 - An opportunity to attract more independent evening and leisure businesses around Market Place, strengthening the Bury brand
 - The need for a more entrepreneurial role for the council in shaping the future of the Millgate centre
 - The need to unite the different areas of the town centre, with some physical public realm improvements and a degree of master-planning
 - Residential opportunities, with more family based options being possible.
- **Oldham** town centre is at the heart of the District's wider investment prospectus, with a significant amount of direct financial investment already committed. The Council needs to manage the building phases of its investment commitments and develop the leisure and cultural role of the town. Key issues include:
 - Shaping the future of the Spindles shopping centre to complement the scheme to create a cinema in the old Town Hall
 - Managing the threat from out of town retailing, such as that posed by expansion of the Alexandra Retail Park
 - A need to invest in the public realm with more coherence and legibility in terms of movement particularly in light of Metrolink's arrival
 - Bringing vitality and distinctiveness through exploring options around housing, particularly targeting groups such as students and Asian families.
- **Rochdale** needs to attract more visitors, from both within and outside the Borough. Proposals to create a riverside, heritage-themed town centre would be unique for GM and demonstrate the ambition that is required. Key issues include:
 - The need for a more distinct visitor offer which could focus around the Toad Lane and Town Hall area as well as the potential of the River Roch re-opening at the Butts

- Defining the rationale and strategy for growth in visitors and tourism, both from within the Rochdale district and further afield
 - The potential to deliver Town Centre East retail/leisure/hotel scheme, and careful consideration of its relationship with existing shopping centres
 - Bringing forward private residential, particularly on the edge of the centre.
- **Stockport** should be the focus for in-town office and commercial development for the south of the conurbation and the Grand Central development will be key to this being realised. Key issues include:
 - The development of a stronger identity with a more vibrant focus including creation of a critical mass of independent business around Underbanks and Market Place
 - The office and commercial quarter has scope to expand particularly in the light of Grand Central
 - Accessibility, particularly linkages across the A6 and to the office quarter
 - The need for a long term plan for the Merseyway centre, which performs relatively well but needs a stronger long term vision.
- **Wigan** provides a vibrant and broadly based retail, leisure, education and service role for this part of the city region. Wigan's location presents an opportunity to look beyond GM boundaries and attract customers and investment from parts of Lancashire and Merseyside. Key issues include:
 - The future of the Galleries Shopping Centre, a new role with a stronger connection to the Innovation Zone needs to be supported in the short term
 - Transport, the business case for transport schemes needs to be agreed and priorities set for the town centre
 - Edge of centre sites, ensuring new uses don't undermine town centre businesses
 - Raising ambition, creating a stronger identity for Wigan, attracting customers from a higher income base and wider catchment beyond GM.
217. All the key centres have regeneration strategies aimed at widening their appeal through: a better quality offer; broadening the range of uses by including housing and community facilities; and improving the cultural offer to increase footfall. These are currently being implemented. Recommendations for transport improvements varied between centres, but common themes were:
- a need to improve the quality of waiting facilities, including the desire to relocate or redevelop interchanges to free up development sites or to better integrate the transport offer;

- a need to improve internal connectivity - improving movement in and around centres (including from public transport stations and stops) for pedestrians and cyclists; and
- a need for reliable evidence on the impact and importance of free parking/reduced fees and any benefits to town centre businesses.

218. High quality and attractive environments were identified as playing a fundamental role in increasing dwell time and raising footfall, helping to grow turnover for neighbouring businesses and therefore raising property values, which leads to new business investment. The report concluded that public realm is increasingly important as a form of infrastructure, connecting businesses to their customers and town centres to their wider hinterlands, improving business confidence and turnover as well as stimulating further investment. Examples of where this approach will be important were identified as follows:

- Oldham and Rochdale, where investment in public realm will help to connect passengers using the new Metrolink service to town centre shops, restaurants, cafes, etc.;
- Wigan, where public realm improvements across a busy road will be an important part of measures to attract students and young people in the Innovation Zone to town centre shopping areas;
- Ashton and Bury, where public realm investment around successful markets is required to encourage new customers and increase flows between the markets and the rest of the centre; and
- Altrincham, where a public space and movement strategy is predicated on the need to increase access to the core of the town centre.

219. Many of these improvements are now being implemented.

220. A further report (New Economy, 2014¹¹²), examined the role of car parking policy within the centres. The scope of the national parking policy has shifted from urging the maximum use of parking provision to emphasise the role of local conditions and reasonable tariffs combined with practical parking locations. It is the local authorities who are responsible for both setting their own parking policy and collecting car parking revenue. The report concluded that the link between town centre prosperity and car parking is weak, due to lack of clear evidence. However a practical and efficient car parking policy can help generate more footfall. Town centre car parking strategy can be influenced in four broad areas by the local authorities: setting the correct tariff, offering limited free parking, having fair parking enforcement and improving the overall car parking experience, for example through the use of technology.

¹¹² New Economy, 2014: Car Parking in Town Centres
http://www.neweconomymanchester.com/media/1023/town_centre_car_parking_2014.pdf

221. Car parking policy in the principal GM town centres is broadly similar with the differences in pricing reflecting the needs and demands of individual town centres. The majority of the eight town centres have parking offers and limited free parking but the use of new technology is not widespread. A lack of evaluation of existing parking policy and possible free parking trials means that it is difficult to show what works best. Few examples exist but in Swindon, a reduced tariff was assessed to have increased the length of time people stayed in the town centre and in Middlesbrough a free car parking element led to a doubling of use of the parking spaces. More locally, Bolton and Oldham's free parking offers have produced positive feedback from retailers in their evaluation of the schemes that have taken place. Overall, a clear and evidence based car parking strategy designed around the needs of local business and with an understanding of the existing car parking occupancy can attract visitors back to town centres and boost the overall town centre vitality.

Implication for 2040 Strategy

There is a need to support the regeneration of GM's Key Centres. This will involve improving access by all modes, improving the environment for workers and visitors by reducing the dominance of the car and improving linkages across the centres for pedestrians and cyclists, including public realm enhancements and establishing clear, evidence-based parking policies that support regeneration aspirations.

Impact of New Development on Travel

222. The impact that new development will have on the transport network will depend on the number and length of additional trips being generated and extent to which these are being made by car, or by sustainable modes. A mode shift to public transport or active modes (walking and cycling) will reduce the demand placed on the highway network.

223. There is evidence that travel distances and mode share can be affected through strategic planning. This is summarised in research for the Commission for Integrated Transport (CfIT, 2009)¹¹³ ¹¹⁴. This concluded that density has an influence on travel behaviour, even when other urban structure variables, socio-economic and attitudes are accounted for. The main association appears to be with travel distance - at lower densities, travel distances tend to be longer. Car mode share also tends to be higher, but there is often less significance to the relationship. Trip rates remain similar across density ranges.
224. Analysis of the National Travel Survey data by Halcrow et al for CfIT (2009) showed that:
- areas with higher densities tend to have shorter annual travel distances and lower car mode shares than average;
 - distance by public transport increases with density, particularly over 30 persons per hectare;
 - there is a broadly inverse relationship between settlement size and average distance travelled – metropolitan areas, large urban areas and settlements larger than 25,000 population tend to have shorter annual average travel distances; and
 - there is broadly an inverse relationship between distances travelled by car driver and accessibility of key services.
225. Urban form affects the ability to provide a public transport alternative to the car and the extent to which people will use it. Minimum densities for viable public transport depend on the type of public transport, the local urban and cultural context, and the availability of alternative modes. Everything else being equal, higher densities support higher frequency and specification in services and help to justify dedicated rights-of-way.
226. A report by the Urban Task Force (1999)¹¹⁵ suggests that the lower the density of development, the more people are beyond walking distance of facilities. This promotes car use and makes it hard to justify a bus route. In a new settlement of 7,500 houses, a bus route only begins to become viable at densities of 40-60 dw/ha. Fixed track public transport, like Metrolink or Guided Bus, require far higher population catchments. The distance that most people are prepared to walk to public transport is generally taken to be 400m¹¹⁶ for a bus service, based on DfT guidance (2005), although many people will walk

¹¹³Halcrow Group Ltd et al for CfIT (2009): Planning for Sustainable Transport. Retrieved 04/11/2015 from www.plan4sustainabletransport.org

¹¹⁴ Halcrow Group Ltd et al for CfIT (2009): Land Use and Transport: Settlement Patterns and the Demand for Travel. Retrieved 04/11/2015 from www.plan4sustainabletransport.org

¹¹⁵The Urban Task Force (1999): Towards an Urban Renaissance, p61

¹¹⁶ Department for Transport (2005): Inclusive Mobility Guidance, p32

further to rail or tram services. Where layouts mean that these distances are exceeded, car use is more likely.

Implication for 2040 Strategy

The design of new development will affect the likelihood of viable public transport links being provided and will determine the type of public transport that can be supported.

Environment and Resources



Environment and Resources: Summary of Trends and Implications

Reducing transport emissions and increasing network resilience

- Future levels of growth in GM are likely to result in an increased demand for travel. The Strategy needs to contribute to climate change reduction by cutting carbon emissions from transport: mode shift and measures to encourage the faster uptake of low emission vehicles will be required.
- There is a need to embed flood resilience measures where feasible to minimise flood risk and damage from soil shrinkage.

Air Quality

- NO₂ and PM₁₀ emissions from vehicles must be reduced because of the health impacts.
- To improve air quality, measures will be most effective if targeted at problem areas e.g. the largest urban centres and towards the vehicles that contribute most to the problem e.g. buses on busy corridors and HGVs.
- Road widening or new highways may bring more people within areas of poor air quality. This has implications for the location and design of schemes and reinforces the need to reduce vehicular demand on the network.

Noise

- There is a need to ensure that opportunities are taken to reduce traffic noise where feasible, e.g. through choice of surfacing materials and encouraging take-up of quieter ULEVs.

Biodiversity

- Individual schemes need to be designed to minimise and, where possible, to enhance their impact on biodiversity.

Water Quality

- To improve water quality in line with the EU water framework directive, measures should be introduced, where possible, to reduce or diffuse pollution from transport.

Introduction

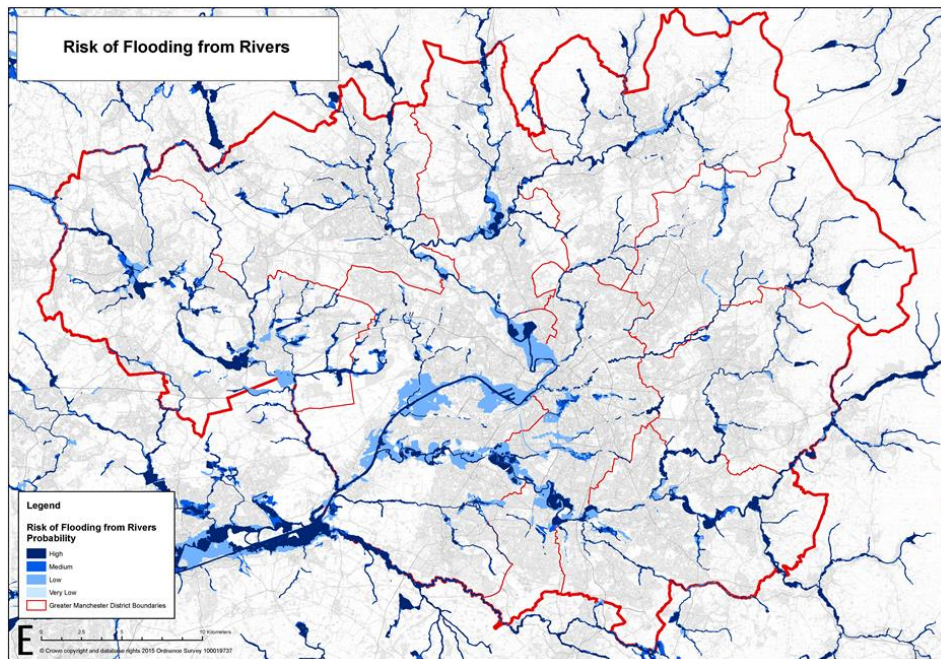
227. Transport has a significant impact on the environment, either through the physical presence of its infrastructure, or through the emissions from vehicles. Significant economic and population growth in Greater Manchester (described in the Economy and Employment and Society and Community sections) is likely to result in a greater demand for travel and therefore potentially more severe environmental impacts.
228. It will be necessary for the 2040 Transport Strategy to mitigate these impacts through three categories of intervention: avoid, shift or improve.
- The greatest impact interventions can be considered as ‘avoid’ interventions, where the need for travel has been removed significantly or completely;
 - ‘Shift’ interventions are much more common, and encourage residents to switch to a more sustainable mode of travel; and
 - ‘Improve’ interventions are aimed at improving the environmental impact of a journey that cannot easily be transferred on to a more preferable mode e.g. by reducing emissions from vehicles.
229. It will not be possible to solve all the environmental issues outlined in this section through transport measures. The need for travel arises from the location of employment, homes and other facilities. Integration between spatial planning and transport is therefore the most effective ‘avoid’ intervention. New residential development that is located close to a range of local facilities and good public transport links will reduce the need to travel by car. The most sustainable locations will be those in urban centres, where many day-to-day trips can be made on foot or by bike, with longer journeys catered for by extensive public transport networks.
230. This section covers:
- Climate Change;
 - Air Quality;
 - Noise; and
 - Biodiversity.

Climate Change

231. The predicted impact of climate change is well understood: north-west England can expect to experience warmer, drier summers impacting on water supply and soil shrinkage/subsidence, and warmer, wetter winters with increased flood risk from rivers and surface runoff. More extreme weather patterns are likely, with more intense rainstorms, heatwaves and droughts. In addition climate change will impact on the behaviour and distribution of species and may encourage the spread of invasive species. 2006 was recorded as the warmest year for 348 years.
232. The recent winter and summer floods have brought the problem of weather and climate impacts on critical infrastructure into sharp focus. The UK Climate Change Risk Assessment highlighted flooding as a key risk, with specific reference made to the consequences for transport infrastructure;
- “Without action, a range of important infrastructure such as roads and railways could be affected by a significantly increased risk of flooding” (Defra 2012 p. 12)¹¹⁷.
233. With the risk of flooding increasing with climate change, compounded by factors including growing transport demand and development pressure, key elements of GM’s transport network will be placed at greater threat of malfunction or damage. This risk is worsened due to the age of the country’s transport infrastructure.
234. Figure 54 provides a map of the risk from fluvial flooding (while it is recognised that surface flooding may provide a greater or equal risk to transport infrastructure).

¹¹⁷ Defra. 2012. Summary of the key findings of the UK Climate Change Risk Assessment 2012. Defra, London.

Figure 54: Risk of Flooding from Rivers



235.

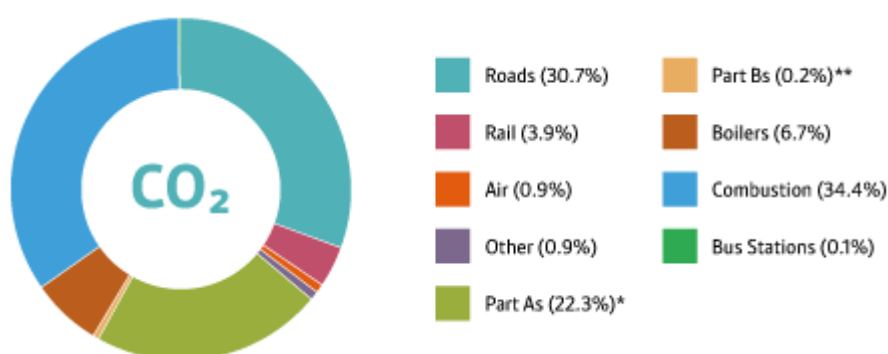
236. It is therefore critical to reduce flood risk, not only through the introduction of adaptation measures but proactive risk mitigation through transport infrastructure design and improved management of blue-green infrastructure (the interface between water management infrastructure and green infrastructure).
237. As a result of climate change, heat-related deaths are forecast to increase steeply in the UK, with the elderly population particularly vulnerable¹¹⁸. The impact of climate change will therefore be amplified by the ageing population. Levels of ozone, which is a respiratory irritant, will also increase, while changes in the seasons, temperature and weather patterns may also have an impact on exposure to pollen, therefore increasing allergies. Tackling climate change makes economic as well as environmental sense. The “Mini-Stern” review for Manchester ¹¹⁹ concluded that by not exploiting opportunities and mitigating effectively against climate change, the Greater Manchester economy could lose £20 billion by 2020. This would mean Greater Manchester falling short of its economic and regeneration goals. The low carbon goods and services businesses are already employing 37,000 people across the region with £5.4 billion of sales and 4% year on year growth.

¹¹⁸ Health Protection Agency (2012) *Health impacts of Climate Change in the UK*,

¹¹⁹ Deloitte (2008) *Assessing the economic impact of EU and UK climate change legislation on Manchester City region and the North West*

238. In line with international frameworks and targets including the UNFCC Kyoto Protocol, the EU has committed to reduce carbon emissions by 20% (relative to 1990) by 2020. At the national level, the UK's Climate Change Act 2008 included the obligation to reduce national greenhouse gas emissions by 80% relative to 1990 by 2050. The protocol agreements will run until 2020 and discussions on a new agreement were held in 2015. This resulted in the Paris agreement that will become ratified and legally binding if enough high emissions producing nations sign the agreement in 2016.
239. Responding to this, Greater Manchester has an ambitious target to reduce carbon emissions by 48% compared to 1990. This was set out in the Greater Manchester Climate Change Strategy, 2011.
240. The 20 years following 1990 saw absolute carbon emissions drop from 21.1 mega tonnes CO₂ to 16.5 mega tonnes CO₂ in Greater Manchester¹²⁰. This was in part due to a move from coal to gas for electricity generation, improvements in vehicle emission technology and a shift from industry to a knowledge economy.
241. Transport is responsible for around a third of all carbon emissions in GM, as shown in Figure 55.

Figure 55: Emissions in Greater Manchester, 2014¹²¹



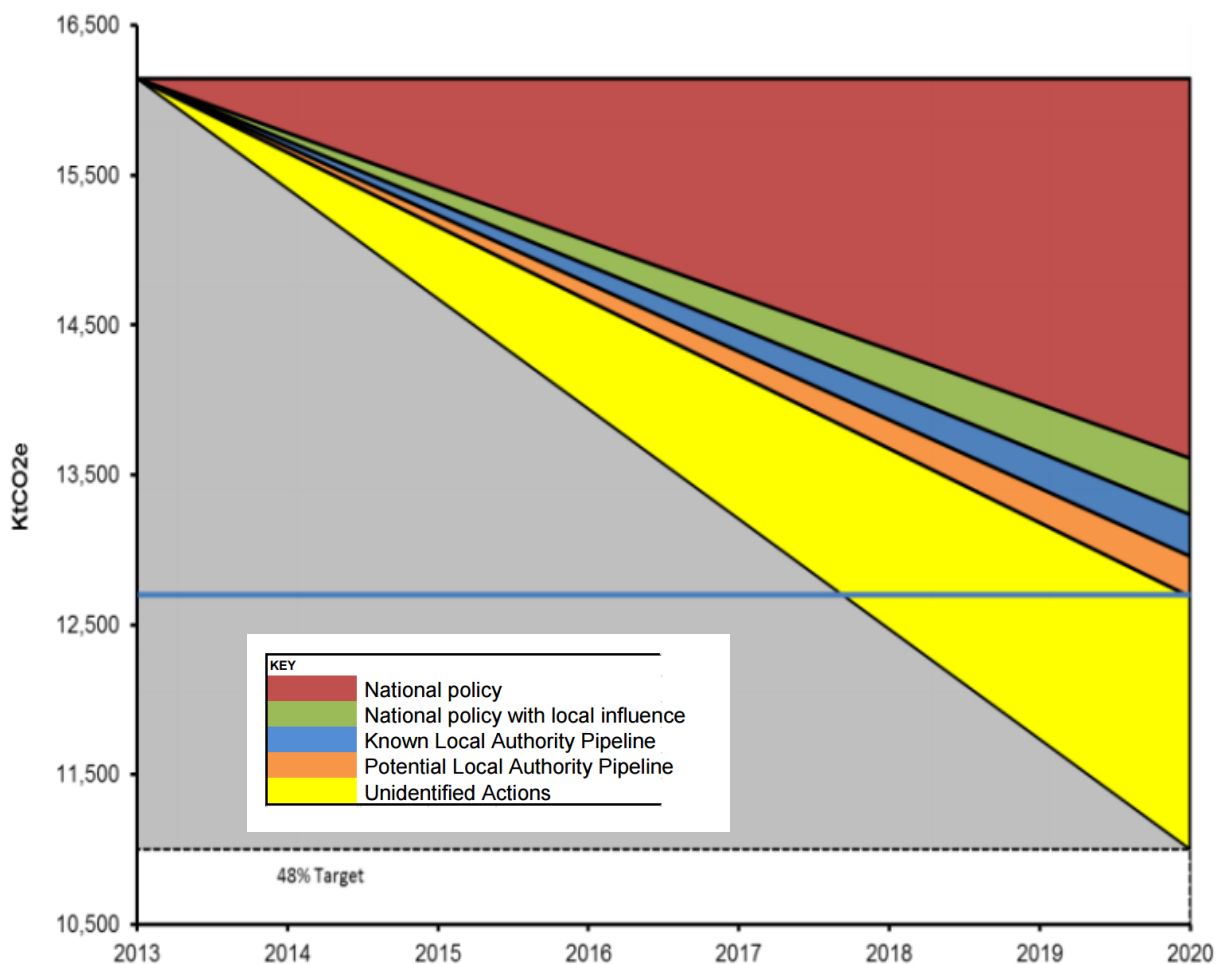
Notes: * Part As - Installations regulated by Environment Agency (large and more complex activities, generally those with a greater potential for pollution);
 ** Part Bs - Installations regulated by local authorities (smaller activities, generally with lower potential for pollution).

¹²⁰ Greater Manchester Low Carbon Hub. (2015). *Greater Manchester Climate Change and Low Emission Strategies*.

¹²¹ Emissions Inventory for Greater Manchester (EMIGMA), 2014.

242. A 2014 study¹²² considered the extent to which measures that had already been identified would achieve the desired reduction in carbon emissions. Different programmes of measures are portrayed as removing 'wedges' of carbon, as shown in Figure 56. This shows that there is a large wedge of carbon that will only be reduced in line with Greater Manchester's ambitious 2020 target with the delivery of a portfolio of currently unidentified interventions.

Figure 56: Greater Manchester Carbon Wedges Forecast up to 2020.

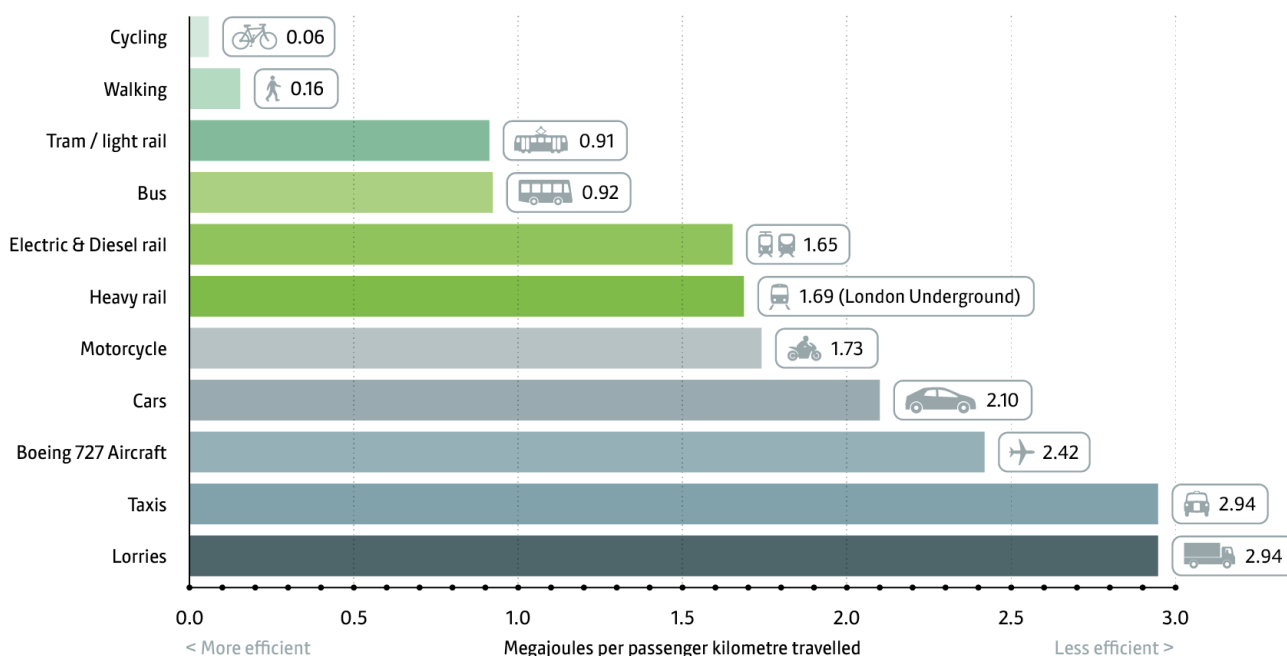


¹²² Atkins (2014) for TfGM *Ticket to Kyoto: Low Carbon Transport in Greater Manchester*

243. Measures for reducing carbon emissions are set out the Greater Manchester Climate Change Implementation Plan, 2012¹²³. These include: the expansion of Metrolink (zero-emission at the point of use); bus priority and other measures to encourage the use of public transport; cycling measures, including cycle routes, parking and promotional activity; Travel Choices programmes; hybrid buses; provision of electric vehicle charging points; and measures to reduce energy consumption (e.g. lighting).
244. A hierarchy of sustainable modes was prepared by University College London and can be seen in the chart in Figure 57. This is based on energy consumption (including maintenance) per transport kilometre, per passenger loading¹²⁴.

Figure 57: Relative Transport Energy Efficiency

Transport Energy Efficiency



Adapted from Banister, D. (2009). *Sustainable Transport and Public Policy*. Transport Engineering and Planning. Pg. 192-214

¹²³ Available here <http://media.ontheplatform.org.uk/sites/default/files/CCLES%20Imp%20Consultation%20-%20final.pdf>

¹²⁴ Banister, D. (2009). *Sustainable Transport and Public Policy*. Transport Engineering and Planning. Pg. 192-214

Implication for 2040 Strategy

Future levels of growth in GM are likely to result in an increased demand for travel. The Strategy needs to contribute to climate change reduction by cutting carbon emissions from transport: mode shift and measures to encourage the faster uptake of low emission vehicles will be required. The transport network will need to be resilient to increased flood risk and damage from soil shrinkage.

Air Quality

245. According to the World Health Organisation (WHO), air pollution is now the world's largest single environmental health risk. With more and more of us living in cities, emissions are having a greater effect on people's health, especially in urban areas. This has implications for air quality; harmful emissions and climate change resilience. UK Cities account for 9% of land use, but 54% of population, 59% of jobs and 61% of output¹²⁵.
246. The European Ambient Air Quality Directive 2008 (2008/50/EC) sets legally binding limits for key pollutants in the air we breathe outdoors, based on World Health Organisation recommendations. Countries that are part of the EU must meet these limit values by a given date and the UK Government has therefore set national standards which local authorities must work to achieve. Local authorities therefore have a statutory duty, under the provisions of the Environment Act 1995, the National Air Quality Strategy 2000 and Air Quality Regulations, to review and assess air quality against these standards.
247. The main pollutants of concern in the UK are oxides of nitrogen, principally nitrogen dioxide (NO₂), and particulates (PM). Poor air quality has a real and significant effect on people's lives, contributing to bronchitis, asthma and other respiratory illness, as well as cardio-vascular problems and cancer. Long-term exposure to air pollution is understood to be a contributory factor in deaths from respiratory and cardio-vascular disease. It is likely that air pollution contributes a small amount to the deaths of a large number of people, rather than being the sole cause of the death of individuals. This health burden is estimated as an effect on annual mortality in the UK equivalent to around 40,000 deaths¹²⁶ (2016 figures), with the estimate for Greater Manchester being over 1,000 from

¹²⁵ Centre for Cities (2015) *Cities Outlook*

¹²⁶ See: <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>

particulates alone¹²⁷. This mortality effect of air pollution is now included as an indicator in the national Public Health Outcomes Framework¹²⁸.

248. Short-term exposure to poor air quality can also have health effects. Some groups are at greater risk of symptoms, particularly adults and children with heart or lung problems, and public health advice is now included with the national Daily Air Quality Index¹²⁹.
249. Youth for Public Transport (Y4PT), a foundation created by UITP, launched an initiative called the Breathable Cities World Campaign. This aimed primarily at measuring people's exposure to and inhalation of air pollutants through different modes of transport in order to estimate the impact on human health. This is part of a wider initiative to raise awareness about the importance of human health-friendly modes of transport. Findings from the Y4PT study in Bogotá, Colombia, suggest that impact on health of transport is a direct relationship between the exposure to urban air quality and the rate and depth of inhalation of this air¹³⁰.
250. Car occupants are typically exposed to higher levels of air pollution than cyclists or pedestrians¹³¹.
251. As well as the human cost of emissions, there is an indirect impact on the economy as a whole: health problems affect the ability to work and contribute to low productivity. Poor air quality is estimated to cost society between £ 8.5 billion and £20.2 billion a year¹³². This impact is seen as comparable to those relating to physical inactivity at £10.7 billion and alcohol misuse at £12-billion to £18 billion (Commons Select Committee 2010). Air pollution also has wide-ranging environmental impacts, including loss of biodiversity and reduced crop yields.

NO₂ and PM₁₀ Emissions

252. In Greater Manchester, road transport contributes 65% of emissions of nitrogen oxides and 79% of particulates, as shown in Figure 58.

¹²⁷ Public Health England (2014) *Estimating local mortality burdens associated with particulate air pollution, GM figure relates to 2008*.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/332854/PHE_CRCE_010.pdf

¹²⁸ PHOF indicator 3.1: 'Fraction of all-cause adult mortality attributable to long-term exposure to current levels of anthropogenic particulate air pollution'. <https://www.gov.uk/government/collections/public-health-outcomes-framework>

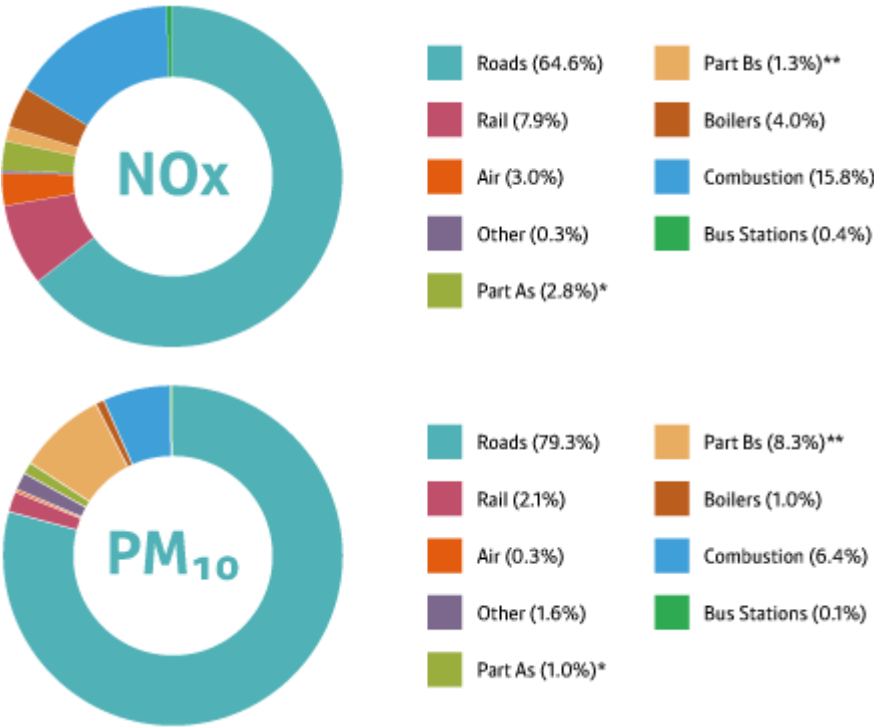
¹²⁹ <http://uk-air.defra.gov.uk/>

¹³⁰ UITP. (2015). *Help Our Cities Breathe Again*. Retrieved 13 November 2015, from www.uitp.org/news/y4pt-breathable

¹³¹ Taylor, D. & Fergusson, M., (1997). *Road user exposure to air pollution*. Institute for European Environmental Policy & Environmental Transport Association.

¹³² Defra (2007) *The National Air Quality Strategy*

Figure 58: Emissions Inventory for GM (EMIGMA), 2014¹³³



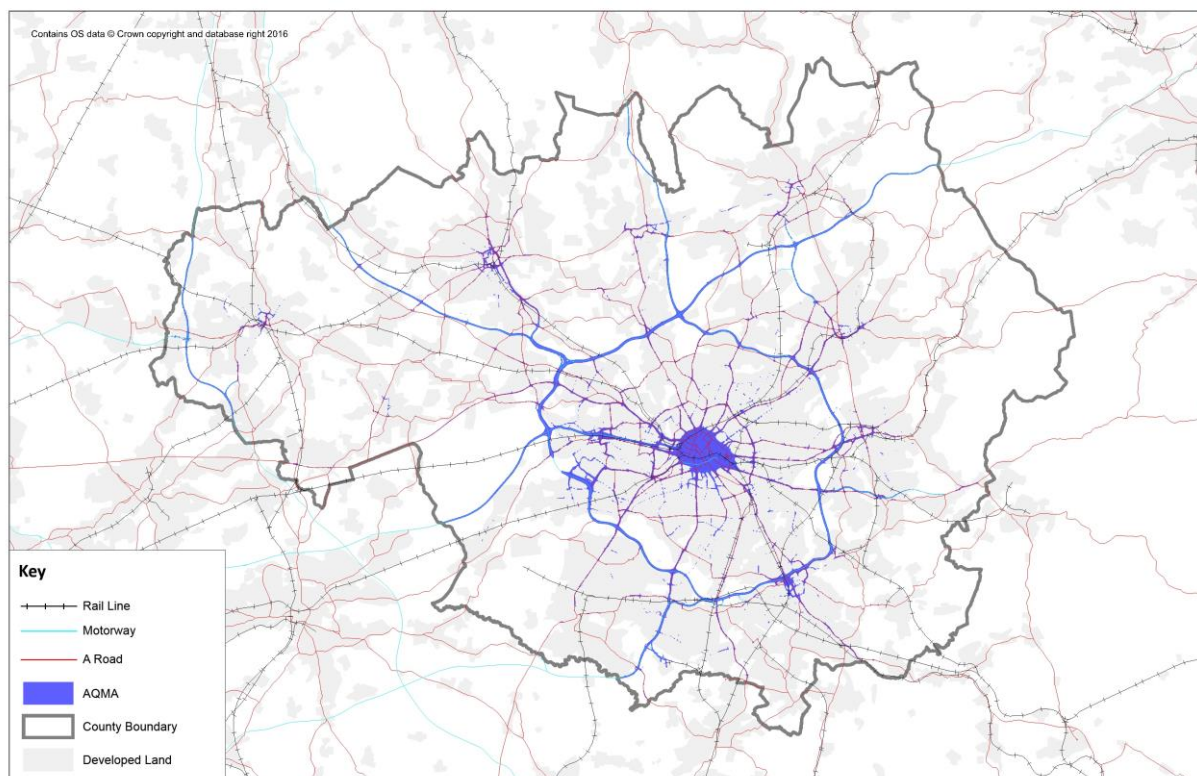
Notes: * Part As - Installations regulated by Environment Agency (large and more complex activities, generally those with a greater potential for pollution);

** Part Bs - Installations regulated by local authorities (smaller activities, generally with lower potential for pollution).

253. Greater Manchester is one of a number of major UK conurbations where NO₂ limits are exceeded. Where air quality objectives are not likely to be achieved, local authorities must designate Air Quality Management Areas (AQMA). Figure 59 shows the area in Greater Manchester covered by an AQMA (declared in May 2016).

¹³³ Emissions Inventory for Greater Manchester (EMIGMA), 2014.

Figure 59: GM Air Quality Management Area



254. Given the contribution of transport to emissions, it is not surprising that the AQMA reflects the location of the confluence of the routes into central Manchester. In terms of the effect on people, this is greatest where high density residential areas coincide with major highways.
255. NO_x emissions are expected to decline sharply in the UK in the period up to 2020 as more Euro VI engines enter fleets. Table 24 shows that:
- Petrol engines will contribute very little to NO_x emissions after 2015;
 - The performance of diesel cars will only improve slightly over the period; and
 - Emissions from HGVs will fall dramatically by 2020, as haulage and logistics companies replace their vehicles every 5-7 years.
256. However, this will not be sufficient to meet EU limits. As with other major urban areas in the UK, Greater Manchester is not forecast to comply until 2020¹³⁴ unless additional action is taken.

¹³⁴ Department of Environment Food and Rural Affairs (2015) *Draft Plans to improve air quality in the UK. Tackling NO₂ in our towns and cities. UK Overview Document*

Table 24: NO_x Emissions by Vehicle Type* (g km⁻¹)¹³⁵

Vehicle class	2005	2010	2015	2020	2025	2030
Artic HGVs	7.10	4.50	1.51	0.35	0.24	0.23
Rigid HGVs	5.08	3.88	2.07	0.63	0.27	0.23
Diesel LGVs	1.14	0.94	0.96	0.57	0.43	0.38
Diesel cars	0.77	0.68	0.67	0.63	0.45	0.42
Petrol cars	0.66	0.25	0.10	0.06	0.06	0.06

*Fleet weighted emission factors accounts for the composition of a given vehicle class according to the assumed proportions of the various Euro standard compliant vehicles across the national fleet.

257. Levels of particulates have fallen but have been stable over recent years. Although Greater Manchester currently meets EU limits for particulates, there is an ongoing significant health impact even at lower levels. To improve the health of the population, the EU has also set a target of a 20% reduction in urban background concentrations of PM_{2.5} between 2010 and 2020. It should be noted that the direct emission of particulates from vehicle exhausts is not the only source. Significant contributions are also made by tyre and brake wear, road surface wear and the re-suspension of particles. These sources will not be improved by Euro engine standards.
258. Different vehicle types contribute differently to emissions¹³⁶. Large goods vehicles contribute the greatest proportion of NO_x emissions, and this contribution is disproportionately large. Buses make only a low contribution to emissions overall, but this can be significant on heavily-bussed urban corridors.
259. The measures described in relation to carbon will also help to improve air quality. Detailed plans for improving air quality are set out in the GM Air Quality Action Plan, 2016¹³⁷.

¹³⁵ Source: derived from Defra emission factors by Clean Air Thinking, 2014.

¹³⁶ TfGM (2014) *Emissions Inventory for Greater Manchester*

¹³⁷ See: <http://www.tfgm.com/GMLES/>

Vehicle Technology and Alternative Fuels

260. Although mode shift will contribute to reducing emissions, the most effective measure will be to reduce emissions from the vehicle engines themselves. Significant advances in technology have been made since the introduction of EU regulations that have mandated incremental improvements for air quality pollutants through EURO standards and fleet average limits for CO₂.¹³⁸
261. These advances include the fitting of abatement technology, light weighting, aerodynamics and engine efficiency. With continued and expanded legislation further improvements will be expected within all vehicle fleets.
262. A move from finite fossil fuels to alternative fuel sources will be required to achieve greater reductions in emissions. Alternative energy carriers include electricity, gas, hydrogen and biofuels.
263. Up to now, battery electric vehicles, or electric vehicles have had a low take up. With uptake projected to be consistent over a long period of time, national-level intervention is required to kick-start the uptake. The Office for Low Emission Vehicles (OLEV) has taken some action to promote the take up of electric vehicles through providing funding opportunities, but more must be done at a national and local level.
264. Range anxiety, the perceived mistrust that electric vehicles will not reach the destination, is one concern of current motorists, and one that will be addressed as the technology improves over time, and through positive promotional campaigns from manufacturers and transport operators. Increased exposure to electric vehicles is likely to reduce range anxiety, for example through travelling in electric vehicles when used as taxis, fleet vehicles or hire cars. Other barriers include charging time and ability to find a free charging point.
265. Although currently impeding take up, the typical range allowed for by an electric vehicle's battery is likely to continue to improve through technological innovation. Building on this, integration with the electricity grid, and the potential for integration of renewable energy sources could revolutionise this mode of travel.
266. The cost of implementing electric vehicle charging infrastructure is not insignificant. Building a network requires capital expenditure to upgrade the grid, purchase and install urban charging infrastructure, and revenue funding to operate and maintain the system.
267. Greater Manchester is ahead of many city regions in this respect, with a network of 200 charge points and a fully operational management system, providing free charging at the point-of-use for members.

¹³⁸ More information can be found here: http://ec.europa.eu/clima/policies/transport/vehicles/cars/index_en.htm and at this location: <http://ec.europa.eu/environment/air/transport/road.htm>

268. The potential for ultra low emission vehicles (ULEV) to contribute to lower emissions is considerable. The UK has set a target, via the Office of Low Emission Vehicles¹³⁹, that every new car will be a ULEV by 2040. Some countries such as the Netherlands are suggesting that they might aim to achieve this target by 2025¹⁴⁰.
269. Based on data for 2015, ULEV market share of new car sales in the UK stood at 1.37%¹⁴¹. This compares to Norway's 22.9% share (also for 2015)¹⁴², a share that demonstrates how incentivising purchase and use towards ULEV can affect uptake significantly.
270. Faster charging infrastructure improves the attraction of the electric vehicle network, and therefore the use of the vehicles, especially to long-distance travellers. Initially, local schemes through taxis and car sharing may provide the most effective use of these vehicles and associated infrastructure.
271. For vehicles that still require motorised propulsion, the provision of power is a key source of emissions.
272. Greater Manchester has 72 MW¹⁴³ of renewable energy installed across the region, producing around 70 GW of electricity per year. This saves around 30,000 tonnes of CO₂ each year. Greater Manchester has invested £110 million in research on new energy techniques¹⁴⁴.
273. Transport for Greater Manchester is using infrastructure available to generate renewable power, e.g. the Archimidean Screw on the River Roch adjacent to Rochdale Interchange; a wind turbine adjacent to Horwich Parkway station; and photovoltaics on several new-build interchanges.
274. As well as renewable energy, Greater Manchester has a very active Hydrogen sector. The Greater Manchester Hydrogen Partnership are tasked to maximise opportunities for innovation and shorten the route for new technologies to reach the market; develop and deliver the Greater Manchester Hydrogen Action Plan as a transition to clean energy; create a network of Greater Manchester based fuel cells to reduce grid demand for electricity; and create opportunities for hydrogen technology research.

¹³⁹ Driving the Future Today – a strategy for ultra-low emission vehicles in the UK, September 2013, OLEV.

¹⁴⁰ <http://www.alphr.com/cars/1003241/dutch-politicians-just-voted-to-ban-sales-of-petrol-and-diesel-cars-by-2025> gives details of this intent; last retrieved 24/6/16.

¹⁴¹ Source: DfT table VEH0131 and VEH0130 at <https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01>.

¹⁴² See <http://www.evnorway.no/>

¹⁴³ 1 gigawatt (GW) = 1,000 megawatts.

¹⁴⁴ GMCA (2013) *Greater Manchester Climate Change Implementation Plan*

275. The partnership was set up in 2012 to develop a network of hydrogen fuel cell stakeholders to bring together knowledge and skills to improve Greater Manchester's capacity to address the challenges of grid demand, energy security and ability to create a lower carbon economy. GMHP work very closely with Hydrogen London, SHFCA (Scottish Hydrogen and Fuel Cell Association) and UKHFCA (UK Hydrogen and Fuel Cell Association).
276. The partnership will help drive forward Greater Manchester's Energy Plan which outlines how the region's approach to energy will help meet Greater Manchester's ambitious target of a 48% cut in CO₂ emissions by 2020.
277. As well as hydrogen power, there is also the potential to investigate and consider investing in the use of alternative fuels, including gas, electricity and biofuel.

Implications for 2040 Strategy

NO₂ and PM₁₀ emissions from vehicles must be reduced because of the health impacts.

To improve air quality, measures will be most effective if targeted at problem areas e.g. the largest urban centres and towards the vehicles that contribute most to the problem e.g. buses on busy corridors and HGVs.

Road widening or new highways may bring more people within areas of poor air quality. This has implications for the location and design of schemes and reinforces the need to reduce vehicular demand on the network.

Noise

278. A growing body of research reveals that road transport noise can cause sleep disturbance and a collection of adverse health effects. People with existing mental or physical health problems are the most likely to be sensitive to noise. Effects from noise pollution can be a problem in rural, as well as urban areas¹⁴⁵.

¹⁴⁵ Transport and Health Study Group. (2011). Health on the Move 2. Retrieved 12 November 2015, from www.transportandhealth.org.uk/

279. Noise mapping has been carried out throughout applicable areas in England by DEFRA. The Environmental Noise Directive requires European Member States to establish through the process of noise mapping the number of people exposed to noise levels above 55 dB(A) in the daytime and 50 dB(A) at night from major roads, major railways, major airports and in agglomerations (large urban areas). In these urban areas, noise from all other roads, railways, aircraft movements and significant industrial premises has been mapped, in addition to the major sources.¹⁴⁶
280. The maps do not cover the whole of Greater Manchester, however the areas of highest exposure to noise are as to be expected – trunk roads figure prominently in the regional and district centres (Figure 60). Motorways have the highest levels of noise, including the M60 and the M602, although these are less likely to be in the direct vicinity of residential areas, unlike A and B roads. With regard to air travel, the area directly surrounding the airport, and take-off and landing approaches are the worst affected areas.

Figure 60: Noise mapping from road transport in central Manchester¹⁴⁷



¹⁴⁶ Major roads are considered to have over 6 million vehicles annually. Major railways are considered to have more than 60,000 trains annually. Major airports are considered to have over 50,000 aircraft movements annually.

¹⁴⁷ <http://services.defra.gov.uk/wps/portal/noise/maps>

281. The components of noise pollution from road traffic are predominantly engine noise below 55 kmph and friction between tyres and road above 55 kmph. Any reduction in noise pollution in recent years is likely to have come from engine improvements, rather than tyres. Reducing car traffic on roads will have little effect on noise pollution, as the noise caused by heavy goods vehicles and buses, for instance, mask the noise from smaller vehicles. Although larger and louder vehicles should be targeted first, a traffic reduction of around 40% would be required to perceive reduced noise.
282. Defra suggest therefore that policymakers should identify complementary, cost-effective measures that reduce noise at source. These may include technology improvements to vehicle components, such as engines and tyres, improvements to infrastructure, such as low-noise road surfaces, traffic management to limit vehicles to speeds where noise is lessened or restricting access to sensitive areas for the noisiest vehicles.
283. It may also be noted that most alternative fuel, low emission vehicle technologies have the added benefit of significant noise reduction. Other opportunities to reduce noise may include practices that allow for quiet time deliveries; trucks and unloading practice would need to reduce noise for overnight deliveries, thus reducing daytime congestion and noise.

Implication for 2040 Strategy

There is a need to ensure that opportunities are taken to reduce traffic noise where feasible, e.g. through choice of surfacing materials and encouraging take-up of quieter ULEVs.

Biodiversity

284. Biodiversity is vital to all urban areas, as the availability of nature is restricted in the development of urban areas. Greater Manchester's natural assets store and sequester approximately 21 million tonnes of carbon a year, reduce the risk of floods and also aid cooling.¹⁴⁸
285. The Greater Manchester Natural Capital Group acts as an ambassador for the natural environment, providing leadership and co-ordination for activity across green infrastructure, waterways and biodiversity. The group has an ambition up to 2020 and beyond to have no net loss in habitat quality and a year on year increase in external funding for the delivery of physical natural environmental enhancements.

¹⁴⁸ GMCA (2015) *Greater Manchester Climate Change and Low Emission Strategies*

286. The group is currently delivering two of the four national DEFRA Payments for Ecosystem Services Action Learning Projects. However, management and preservation of biodiversity is a challenge when planning and delivering transport interventions in Greater Manchester.
287. In terms of environmental protection and management, TfGM has standard procedures, including environmental impact assessment for all major new transport schemes, to minimise and mitigate any adverse impacts. Through tree and habitat replacement policies habitats that are being lost are replaced and enhanced where possible e.g. with a greater number of trees or habitats of a higher value. Construction work is subject to audit and consequently timed to avoid the bird nesting season and where protected species are found, they are moved according to nationally agreed best practice.

Leigh-Salford-Manchester Busway

- During the Leigh-Salford-Manchester Busway construction, there were various biodiversity challenges. Following the second annual survey of the busway route, prior to commencement of works, it was discovered that colonies of Great Crested Newt had grown in size to medium/large colonies. This required a process taking 60 days to move the colonies to other areas, to protect the wildlife of the area.
- There were significant challenges during this process, including a time delay on construction and physical constraints placed on the project and the contractor for the life of the project by Natural England. Strict compliance to the terms of a licence was required, and any changes required the licence to be amended – a process taking in excess of 30 days.
- During the same construction process of the busway, 300,000m³ of earth was moved along a linear landscape of 4.5 miles (7km). That amount of earth is the equivalent to 120 Olympic sized swimming pools.
- This earth has been moved to either reduce or increase levels along the guided section or to create community woodland containing approximately 35,000 trees as part of an environmental commitment.

288. In addition to specific schemes, the general growth in traffic, particularly heavy goods vehicles, can also have a significant impact, through air pollution, noise and climate change. This is of particular concern in relation to the Peak District National Park, where heavy trans-Pennine traffic passes through a vulnerable ecosystem. Greater Manchester and its surrounding areas also contain a number of statutory nature conservation sites of European level Importance. These include Special Areas of Conservation, Special Protection Areas and Ramsar Sites, known collectively as European Sites. These sites are protected under the European Habitats Directive. Where schemes could have an adverse effect on the integrity of a European Site, schemes are subject to a Habitats Regulations Assessment at the project level which is in accordance with national and European law.

Implication for 2040 Strategy

Individual schemes need to be designed to minimise and, where possible, enhance their impact on biodiversity

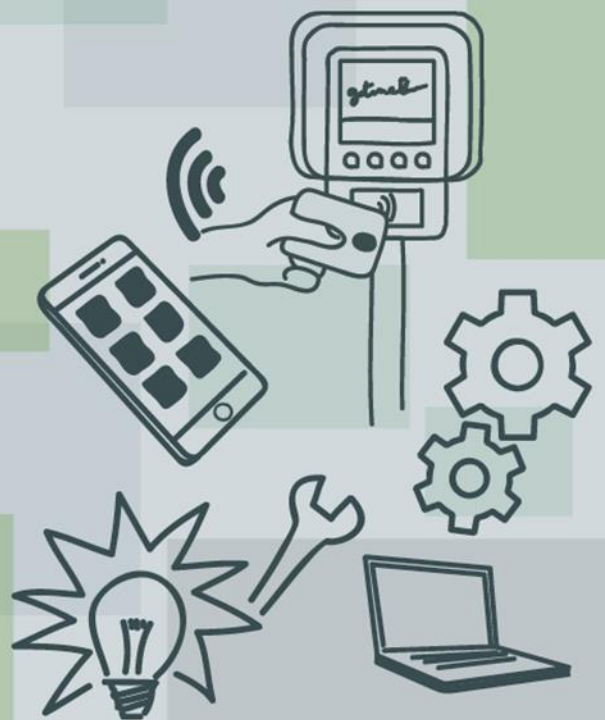
Water Quality

289. The quality of the water in our rivers, lakes and estuaries is of crucial importance as an indicator of how well we look after our environment. Good quality waters also have great amenity and recreational value, enhance biodiversity and help reduce the costs and environmental impacts, such as from energy use, of treating water to make it fit to drink. The more polluted the water is, the more it costs to treat, and the greater the carbon footprint of the treatment
290. Under the EU water framework directive all water bodies are required to reach 'good' status or potential by 2027. Regulation 17 of the Water Environment Regulations places a duty on all public bodies to have regard to their local River Basin Management plan.
291. Transport networks often bisect important green-blue corridors. New and existing transport infrastructure projects should seek to actively enhance the natural environment through the adoption of green infrastructure solutions such as SUDs that will reduce the diffuse pollution caused by transport modes.

Implication for 2040 Strategy

To improve water quality in line with the EU water framework directive, measures should be introduced, where possible, to reduce or diffuse pollution from transport.

Technology and Innovation



Technology and Innovation: Summary of Trends and Implications

Potential for technology and innovation opportunities to impact upon strategy implementation

- Technology and innovation developments could have massive positive or disruptive implications for the implementation of the strategy. There is a need to maintain a close interest in developments elsewhere through networking - particularly with those developments associated with high quality gathering of evidence of effectiveness.
- Exploration of new technologies and innovative tools and techniques should focus on opportunities to better deliver the strategic goals and objectives of the 2040 Transport Strategy, focusing on the outcomes to be delivered rather than the technology outputs.

Improving the customer experience

- Technology and innovation have great potential to provide much higher quality offerings in the areas of walking, cycling and public transport and customer experience in general. There is a need to continue to engage in these areas of transport development.

Improving performance and resilience through technology and innovation development

- There is a need to adopt a positive stance towards use of Greater Manchester as a test bed for transport innovations through the development and evaluation of pilot projects. An in-depth understanding of implications of more promising innovations is necessary, when innovations which support Greater Manchester's wider goals are identified.

Reducing transport impacts on the environment and enabling a reduction in the need to travel and transport goods

- Technology developments have the potential to make a significant impact on environment and resources. It is therefore important to maintain an active interest in advances in this area, particularly where innovations would enable a reduction in the need to travel and the impact of emissions on the city regions environment.

Improved access to better data

- Data is becoming increasingly valuable, and a cause for concern by some members of the public. How Greater Manchester addresses security issues, maintains the trust of the public and uses new processes in data storage and utilisation will be a key focus in the future.

Introduction

292. The speed of technological evolution is fast and often difficult to predict, with successes based on a range of factors. How Greater Manchester chooses to utilise new technologies that emerge over the next twenty-five years will have a significant impact on the transport network. The 2040 Vision identified 5 key areas where transport innovation and technology may be most relevant to delivering our desired transport outcomes. These were:
- Improving customer experience;
 - Improving performance and resilience;
 - Improved access to better data;
 - Reducing the need to travel and transport goods; and
 - Reducing transport's impact on the environment.
293. The following evidence provides an analysis of some of the current areas of opportunity and risk relating to technology, innovation and transport. To prepare for this ever changing context, Greater Manchester has developed an Agenda for Intelligent Mobility¹⁴⁹, which highlights the importance of an increasingly agile approach to responding to technological advances and understanding how widespread adoption of technologies are impacting travel demand and behaviours.
294. When assessing the overall viability and usability of new technological innovations, Greater Manchester will need to create a set of criteria to allow for the efficient and successful merging of new technology into citizens' day to day lives. Currently projects are assessed on a case by case basis, which will continue; however, these innovations will need to be structured so they enable Greater Manchester to meet its wider goals relating to the efficient movement of people and goods.
295. Greater Manchester will also need to consider the ethical, philosophical and regulatory ramifications of new innovations. Regulations regarding robotics, Information Technology and automated systems will need to be investigated and negotiated, before the implementation of technologies similar to those discussed in this section. Currently, regulations devised and implemented through previous technological advances can hold back new innovations and prevent technologies which may positively benefit customers being utilised.

¹⁴⁹ Transport for Greater Manchester. (2016). Agenda for Intelligent Mobility.

296. By remaining prepared and flexible, Greater Manchester will be able to take advantage of new developments working alongside public and private sector partners where they best support delivery of our strategic ambitions. Our model of innovating is based around four principles: customer centric, collaboration, commercial opportunities and technology. The first three principles must be in place to fulfil the potential of technology across the city region.
297. The matrix shown in Figure 61 has been applied throughout this section to determine the level of risk different technologies present, along with the likelihood each innovation has for helping Greater Manchester achieve its strategic goals.

Figure 61: Approach to Technological Developments

	Level of risk		
	Minor	Moderate	Major
Unlikely	Safe	Safe	Avoid
Possible	Safe	Safe	Avoid
Likely	Explore	Explore	Explore with caution

Improving the customer experience

298. Some of the concepts that are emerging through technology and innovation will have a significant impact on improving the customer experience, the economy and the environment. This part of the evidence base sets out a range of initiatives that may improve the customer experience in the future.

Focus on: Cashless Payment methods

299. Smart card schemes have been utilised by multiple countries since 1995, and GM recently rolled out the My Get Me There card, the city region's first step towards smart payment technology. However, contactless payment opportunities are developing at an increasingly rapid rate due to investments from key organisations, such as Apple, Google and Mastercard.

- 300. By using smart payment technology, information about the user and their journey can be stored, analysed, and used to improve future services. Users can choose how much information to share with TfGM on the understanding that the more they share, the more they are likely to receive in journey improvements, incentives and improved network management.
- 301. Customers will also be able to access the transport network more efficiently, leading to improved customer satisfaction, particularly when all modes can be accessed and paid for using smart payment methods. Work will need to be undertaken to ensure equal opportunities are presented to all members of society; to allow all socio-economic groups to take advantage of smart payment solutions and incentives i.e. some means of easily accessible smart payment systems will be required.

Case Study: Contactless Payment, London

Contactless payment opportunities are the natural successor of smart cards, and Transport for London, has set the global standard specification for contactless technology, in working with the international banking industry, and indeed Google, in helping this sector understand the requirements of a transport system when it comes to contactless payment technology. Figure 62 highlights the efficiency of contactless payment methods in increasing capacity on rail and underground services, when compared to the tradition tickets with magnetic strips. The data collected is also use to predict behaviour and for network management.

Figure 62: Efficiency of contactless payment methods (Source: Transport for London) ¹⁵⁰

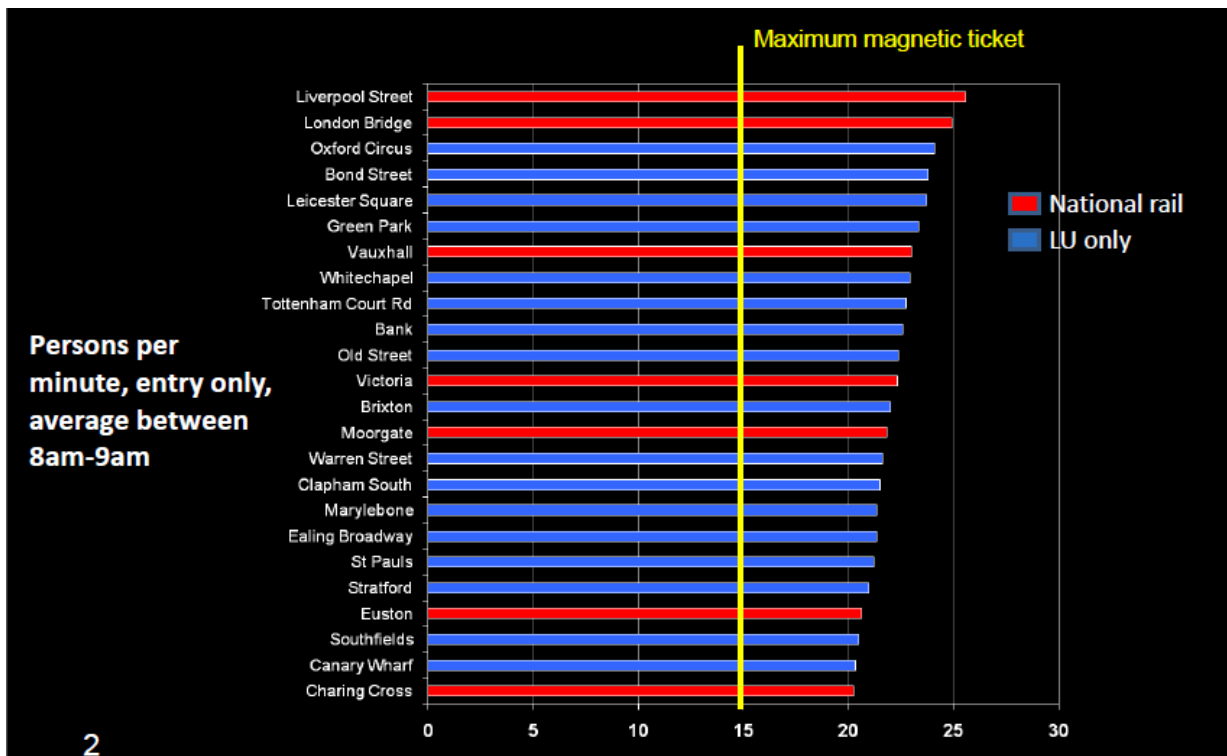
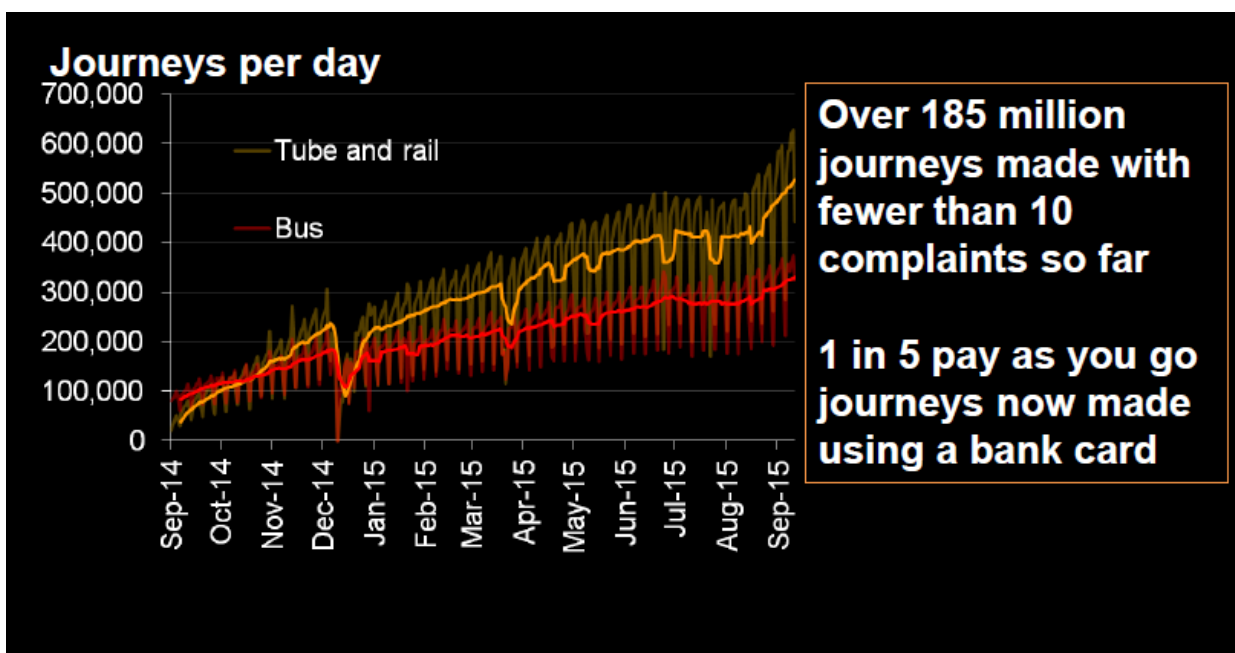
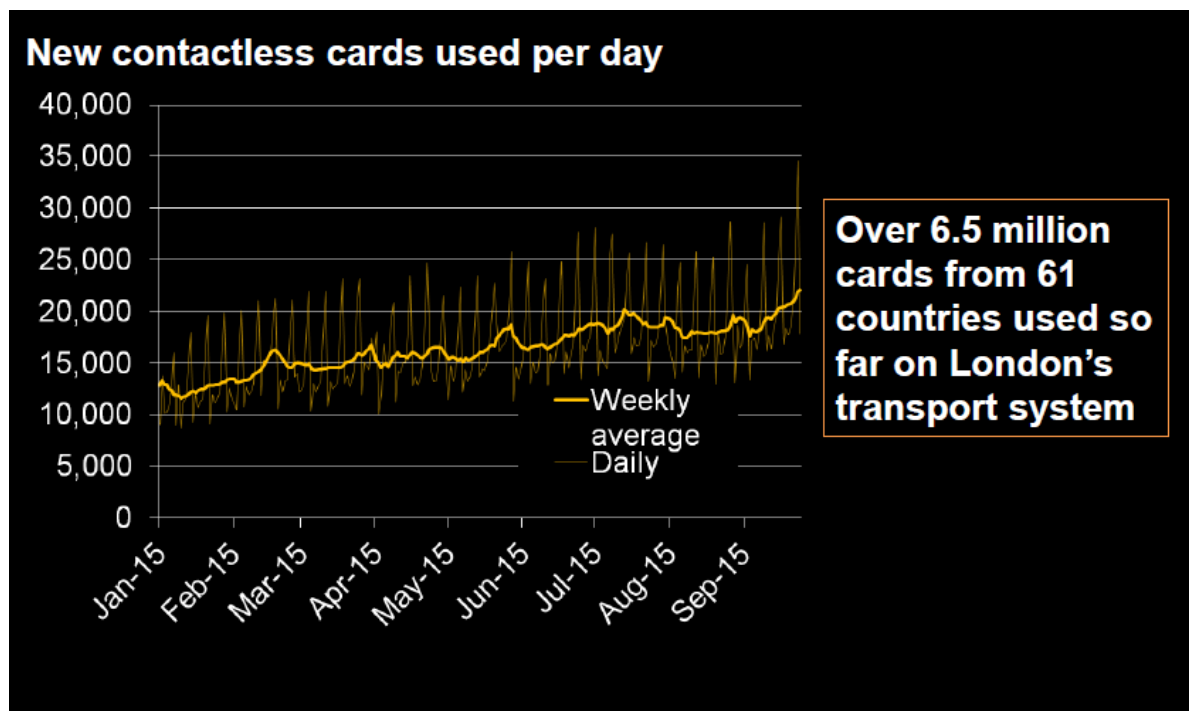


Figure 63: Number of journeys per day using contactless payment methods (Source: Transport for London)



¹⁵⁰ Hudson, M. (2015). Contactless Payments in Public Transport. Presented on 19/11/2015 at the POLIS conference, Brussels.

Figure 64: New users of contactless payment technology (Source: Transport for London)



302. The rise of contactless payments has been significant since its launch in 2014 (highlighted in the above figures). With very few marketing campaigns to promote contactless payments, consumers have adopted the new technology quickly, recognising the efficiency it represents when trying to access different transport modes. Contactless payments also reduce the overall cost of administering the smart payment system (when compared to the Oyster Card) for Transport for London¹⁵¹.

Focus on: Mobility as a Service

303. “Mobility as a Service” (MaaS) is a concept that is becoming increasingly relevant when investigating technologically enhanced mobility (Intelligent Mobility) and data enhanced route planning. The ability to pay for a service, instead of a product, is growing in momentum in different industries and it relates significantly to the sharing economy, with consumers paying for an outcome instead of a physical object.

¹⁵¹ Hudson, M. (2015). Contactless Payments in Public Transport. Presented on 19/11/2015 at the POLIS conference, Brussels

304. When using MaaS, consumers' needs are typically met by one provider, offering multiple service options or "bundles". The concept encourages an "eco-system" approach to service provision, identifying a transport network as a single inter-linked operation, and transport within that network as an integrated service. Through the integration of services, MaaS will provide a new approach to mobility, with an emphasis on enabling lifestyles which positively impact Greater Manchester residents and improve their quality of life. Alongside this, MaaS will enable travel demand to be managed more effectively, improving overall network management.
305. Users within MaaS dictate and determine how the transport network operates, with connected devices allowing users to access transport services, and services that evolve as they are accessed. An example of MaaS working successfully is through bus networks that change routes depending on the passengers on board, such as those currently being utilised in Helsinki, Finland.

Case study: Kutsuplus, Finland

Finland is currently the only country working towards fully implementing MaaS across their entire transport network. Twenty three organisations in Finland have partnered to develop a dedicated, integrated transport network, using MaaS. One example of how MaaS has been rolled out is Kutsuplus: an intelligent, adaptable bus that could be summoned by users, and allowed users to determine the route it would take. Payment was made through a smartphone "trip wallet" that could be shared with friends and family, and times of departure could be selected at the user's convenience.

The buses offered nine seats per bus, with space available for prams and other large carry-on items¹⁵². Over 20,000 users were registered with the service and feedback was positive overall. Unfortunately, Kutsuplus has since stopped operating; however the same model has been picked up in multiple cities across the globe with positive early results.

306. For MaaS to be successful in Greater Manchester, TfGM has an important role to play in informing customers about the availability of such services, ensuring the services are easily accessible and encouraging the development of 'one-stop-shop' platforms/gateways that simplify and integrate multiple service options, while also being a proactive demand management tool for transport operators.

¹⁵² Kutsuplus (2015) Product Tour. Retrieved on 10/11/2015 from: <https://kutsuplus.fi/tour>

307. As a first step in ensuring the success of MaaS in Greater Manchester, TfGM's supporting Travelspirit¹⁵³: an organisation which connects organisations, individuals and businesses to work together and facilitate the growth of sustainable MaaS, which supports the wider goals of cities and city regions.
308. Travelspirit is a Community Interest Company serving a global community of transport operators, planners, policy-makers, software developers and digital businesses. Common interest unites these collaborators to ensure future mobility is inclusive, integrated and sustainable.

Focus on: Applications and Social Media

309. Travel time has traditionally been considered unproductive, wasted time. As technology has advanced, transport users have been able to take advantage of mobile devices to improve their journeys. A Norwegian study highlighted that around 65% of commuters and 47% of business travellers felt their journeys are more productively spent if they are connected, or using, an electronic device¹⁵⁴.
310. The "gamification" of transport will allow consumers to take enjoyment in their journeys. Applications that link consumers to other users on the Greater Manchester transport network, along with friends and relatives, will allow for competitions and achievements to be gained through trying new transport modes. These types of applications will also allow TfGM to inform (or nudge) transport users of possible, more sustainable, methods of travel. However, it is essential for privacy and anonymity to be taken into account when collecting customer data.

Case Study: Google Waze

Google Waze is a mobile application that builds on information generated through a community, for navigation and traffic anticipation¹⁵⁵. This allows the application to change and adapt in real-time depending on the user's locations. The application combines information regarding planned routes and car data to suggest the optimal route to a destination. Furthermore, it allows for message exchanges and contains basic game-like functions to increase involvement by users, e.g. points are awarded to drivers who cover certain routes. The more people who use the system, the better the application becomes, and the wider the area the application can cover. This application attempts to prevent congestion, but does not currently have any "nudge" functions to encourage sustainable transport choices.

¹⁵³ Travelspirit (2016). Accessed from: <http://www.travelspirit.io/>

¹⁵⁴ Gripsrud, M., & Hjorthol, R. (2012). Working on the train: from 'dead time' to productive and vital time. *Transportation*, 39, 941-956

¹⁵⁵ McCall, R., Koenig, V., & Kracheel, M. (2012) Using Gamification and Metaphor to Design a Mobility Platform for Computers. *International Journal of Mobile Human Interaction*, 5, 1-15

311. Improvements in consumer satisfaction, through the implementation of effective technological developments, will lead to an attraction of “choice-users”: a public transport user who has access to a car, but chooses public transport instead as it represents an easier and more efficient method of travel.
312. Customer satisfaction can also increase or decrease due to the customers’ ability to provide feedback that will be acknowledged and considered. TfGM currently operate across multiple social media platforms, but with limited timings and ability to respond to customers in real-time.

Case Study: Social Media at KLM Airways

In response to the volcanic eruption in Iceland in 2010, KLM introduced a social media team to respond to customers who use their services. Originally it started with volunteers providing the service in a time of crisis. It has since expanded to a full-time team of 150 staff that operate across Facebook and Twitter, responding to customers’ questions and complaints. Information regarding response times are displayed and updated throughout the day, and the service operates twenty four hours a day. KLM’s customer satisfaction has increased through the implementation of this dedicated service, which allows customers to speak to KLM staff in real-time, and across channels that are convenient for them¹⁵⁶.

313. Table 25 provides a summary of the measures related to customer experience and the opportunities for strategy development.

¹⁵⁶ KLM (2015) What has KLM learned from 5 years of social media service? Retrieved on 25/11/15 from <https://blog.klm.com/what-has-klm-learned-from-5-years-of-social-media-service/>

Table 25: Measures to Improve Customer Experience

Concept	Potential implications for 2040 Strategy	Risk associated with innovation
Contactless payment methods: transport payments made via a bank card at the point of use	Positive for economy, environment and quality of life. This innovation removes the need for paper tickets, saving time and resources at the point of use. It also removes the need for transport operators to handle cash, reducing the boarding time for some transport modes.	Explore
Mobility as a Service: an integrated mobility concept which enables equal accessibility, affordability and reliability for users. It also lessens the need to own a private vehicle through sharing systems	Positive for economy, environment and quality of life, if organised effectively in partnership with GM and TfGM. Mobility as a Service requires high levels of collaboration and projects that support each other	Explore with caution
Gamification of public transport: applications on connected devices e.g. smart phones and tablets, which enable travellers to compete against others to win points for travelling sustainably or outside peak hours	Positive for quality of life, also potentially positive for economy and environment through “nudging” consumers into sustainable transport choices	Safe, however, privacy and anonymity are essential when collecting any customer data
Applications that learn from consumers experiences and adjust route recommendations, and social media led consumer feedback and engagement	Positive for quality of life and consumer engagement and enabling more effective Travel Demand Management	Explore

Implication for 2040 Strategy

TfGM will need to remain proactive in research and development to ensure opportunities that improve the customer experience are exploited and any potential remove pain points is maximised to the full. Technology and innovations offer new methods in access, information provision and Travel Demand Management, but only if utilised effectively across an integrated transport network.

Improving Performance and Resilience

314. In busy urban environments, there are often limited opportunities to increase the capacity of our networks without significant negative impacts. However, increasingly technology can be used to improve the performance and efficiency of our existing infrastructure. Some key opportunities for new technologies to improve network performance are highlighted below.

Focus on: Autonomous Vehicles

315. Autonomous, and semi-autonomous, vehicles are emerging as a disruptive innovation, and are being developed with urgency by multiple car and technology manufacturers, such as Google and Tesla. The estimated market value for connected cars is estimated to reach 39 billion Euros by 2018¹⁵⁷.
316. With 90% of collisions involving driver error, autonomous vehicles aim to significantly reduce collisions through connected and automated technologies¹⁵⁸. Autonomous vehicles will also aim to reduce congestion in urban areas, by exploiting the ability to safely drive closer together and therefore take up less road space.
317. Autonomous vehicles could also free up significant areas of land in busy urban areas currently taken up by car parking if shared mobility is pursued. New developments which have designated shared autonomous zones could offer between 15% and 20% additional developable area compared with a typical urban development¹⁵⁹.

¹⁵⁷ Bloomberg (2014). The Internet of Things: A \$4.6 Trillion Market. Retrieved on 04/11/15 from <http://www.bloomberg.com/professional/blog/internet-things-4-6-trillion-market/>

¹⁵⁸ Atkins (2015). Connected and Autonomous Vehicles: Introducing the Future of Mobility. London: Atkins Global

¹⁵⁹ WSP (2016). Making Places Better: Autonomous Vehicles and future opportunities. London: WSP

318. The development of autonomous vehicle technology will affect Greater Manchester in a variety of ways. Autonomous cars are being developed by major car manufacturers, and GM will have to play a role in influencing the regulatory and infrastructure framework, alongside determining who will be responsible for costs such as insurance and liability claims, and for adapting infrastructure to accommodate such vehicles.
319. Public confidence in the technology involved will influence the level of uptake and usage in autonomous vehicles. Campaigns and promotions will need to be tailored to reassure both users and non-users that the technology is safe, and pedestrians and cyclists are also safe when inhabiting the space around the vehicles.
320. Security will also play a large role in autonomous technological developments. The protection of data will be essential, along with security systems that prevent autonomous vehicles being hacked¹⁶⁰. Similarly, the ownership and use of data used by and generated by autonomous vehicles will be a critical issue for local authorities.
321. Autonomous trains and buses are less talked about transport modes, when compared to driverless cars. However, there are multiple examples of autonomous trains operating successfully around the world, including in China, Brazil, London and Copenhagen. Alongside this, there have been successful autonomous bus trials in France, Switzerland and the Netherlands.
322. Autonomous technologies could offer new opportunities to deliver bespoke, door-to-door, public transport services at a lower cost, particularly in less densely populated areas where traditional mass transit is less economically viable.
323. In recognition of this the government have set aside funding for the Centre for Connected and Autonomous Vehicles (CCAV), who have been charged with offering targeted investment, through competition funding, to enable innovative projects to be piloted in real-world scenarios. TfGM have played a key role, through discussions, consultations and applying for funding through CCAV, to ensure new opportunities, which support the city regions wider goals, are explored.
324. Current projects being investigated in Greater Manchester include shared, autonomous transport that offers first and last mile solutions, and platooning vehicles which would significantly reduce capacity requirements between major economic hubs, such as Manchester Airport and Stockport rail station.

¹⁶⁰ Bandyopadhyay, D., & Sen, J. (2011). Internet of Things: Applications and Challenges in Technology and Standardization. *Wireless Personal Communications*, 58, 49-69

Case study – Copenhagen



161

Copenhagen's automated, unattended Metro began operating in 2002. It currently operates along 17km of double lined track, runs twenty four hours a day, and does not require employees on-board for safe operation. Docking, opening and closing doors, launching and journeys are performed through full automation. This is different to the Docklands Railway in London, which requires a staff member on board at all times to operate the doors and in case of emergencies. Copenhagen's automated Metro is currently being expanded to completely encircle the city, enclosed in tunnels, with seventeen more stations planned for construction.

Focus on: Autonomous Traffic Management

325. Mobility in an urban area presents multiple challenges: flows of people and traffic that change significantly through the day and week; activities that can represent multiple trips; and unpredictable activities, such as leisure trips and changes in commuter patterns. Traffic management systems must maintain order within this continuously shifting context to provide the best possible customer experience.
326. One increasingly popular method of demand management is autonomous traffic management. An autonomous system reacts in real-time to changes in mobility patterns, including peak and non-peak travel times. Alongside real-time changes in traffic patterns, an autonomous traffic management system can improve traffic flows and re-route traffic away from areas of disruption and congestion and provide better information to customers on their travel choices.

¹⁶¹ Anon (2014). Innotrans 2014, World's Largest RR Trade Fair. Retrieved 03/11/15 from http://www.4rail.net/art_innotrans2014_main.php

Case study: Autonomous traffic management, Singapore

Singapore has utilised smart traffic management systems across four divisions: control, monitoring and enforcement, information management, and revenue management¹⁶². Signals are automatically determined based on traffic volume and priority schemes are set up to detect when elderly pedestrians are crossing (by tapping their smart card to the pedestrian crossing point) allowing for a longer crossing time. Transport facilities are constantly monitored and disturbances in the system are identified as they happen, with the transport system allocating any necessary emergency services. Singapore's traffic system operates twenty-four hours a day, using an Intelligent Transport System that was created specifically for the city.

- 327. Further development of smart traffic management solutions would allow Greater Manchester to efficiently respond to short and long-term changes in travel patterns. An autonomous management system could also be operated twenty-four hours a day, allowing for more consistent performance regardless of the hour of day.
- 328. GM is already positioning itself at the forefront of advanced traffic management solutions, through the implementation of AToM (Advanced Traffic Management), which allows analysts to use real-time highway information to relay an up to date picture of the highway network, allowing users to make more efficient travel choices. This forms the basis for GM's future traffic management system, including the potential to explore autonomous traffic management.

Focus on: The Sharing Economy

- 329. Climate change, congestion, transport costs and an increase in connectivity, are just a few of the many reasons for the current rise of the sharing economy in transport¹⁶³. An increase in the use of shared vehicles could alter demand and patterns of transport usage across Greater Manchester. By preparing for shared-use mobility, Greater Manchester and its partners could also capitalise on the increasing popularity of low-emission vehicles¹⁶⁴ and smart technology.

¹⁶² Haque, M., Chin, H., & Debnath, A. (2013). Sustainable, safe, smart – three key elements of Singapore's evolving transport policies. *Transport Policy*, 27, 20-31

¹⁶³ CIVITAS. (2015). Car sharing: New forms of vehicle use and ownership.

¹⁶⁴ Office for Low Emission Vehicles. (2014). *Investing in ultra-low emission vehicles in the UK, 2015 to 2020*. London: Office for Low Emission Vehicles

330. Car club (in contrast to car sharing) opportunities are currently being utilised in a variety of countries to support lower-car lifestyles and to tackle peak-hour congestion. Evidence shows that for each car club vehicle, four cars can be removed from the road due to members selling their car¹⁶⁵, equivalent to around 2,700 vehicles removed from the roads in England and Wales. This number varies depending on area, with Bremen (Germany) seeing between eight and eleven cars removed from the roads per shared vehicle¹⁶⁶.
331. Car clubs can also help increase wider transport provision in off-peak times, when public transport availability may be more limited. Currently, the majority of car sharing users are under 34 (50%), while a smaller percentage are over 50 (14%)¹⁶⁷. Also 69% of car club members in the UK are male, compared to 54% of licence holders¹⁶⁸. Rebalancing use will be essential to delivering sustainable growth in shared mobility, and to allow a variety of demographics to benefit from shared-use mobility.
332. The technology associated with the consumer experience, operator management, fleet monitoring and digital mapping is developing rapidly. This should lead to a more convenient, flexible, on-demand service but also greatly improve the opportunity to integrate transport solutions within one system for the convenience of the customer.
333. Alongside improvements to the customer experience, shared mobility will also enable space to be used more effectively in dense urban spaces, offering new opportunities in place making.

¹⁶⁵ Carplus (2014/15) Carplus annual survey of car clubs. Leeds: Carplus

¹⁶⁶ CIVITAS. (2015). Car sharing: new forms of vehicle use and ownership. Brussels: European Union

¹⁶⁷ Kamargianni, M., Matyas, M., Li, W., & Schafer, A. (2015). *Feasibility study for "Mobility as a Service" concept in London*. London: UCL Energy Institute

¹⁶⁸ Carplus (2014/15) Carplus annual survey of car clubs. Leeds: Carplus

Case Study – Salford City Council Car Club

Salford City Council (SCC) introduced their car club service in 2014, which is operated by Co-Wheels. The service is part of a new organisational approach for business travel called Green Wheels, which aims to save money, reduce carbon emissions and to improve sustainable travel choices for staff and members of the general public.

Green Wheels has changed the Council's approach to staff travel to make sustainable travel modes such as car sharing, the car club, cycling and public transport preferable to the private car, 'grey fleet', usage. Prior to the implementation of the scheme there were 384 essential car users and 1,123 casual car users at SCC.

- 334. Alongside reducing the number of cars on the road, car clubs members are three times more likely to be regular cyclists compared to the average person in England or Wales, twice as likely to be regular train users, and a third more likely to use the bus¹⁶⁹. Changes to regulations, the reduction or removal of fuel costs, maintenance, insurance and purchasing could encourage more Greater Manchester residents to explore car sharing as a travel choice. This would contribute towards reducing congestion, improving accessibility in the regional centre and lowering emissions across Greater Manchester.
- 335. The World of Collaborative Mobility argues: "[The Sharing Economy] is economically sustainable because it makes better use of existing capacities and requires no additional investments in infrastructures. It is ecologically sustainable because, by making better use of existing capacities, it spares finite resources; then again, it is socially sustainable because it promotes new forms of communal mobility organisation"¹⁷⁰.

Focus on: Robotics

- 336. Advancements in nanotechnology, particularly in materials that are stronger and smarter, could enable Greater Manchester to safely carry out repairs and construction opportunities during peak times on highways, tunnels and railways¹⁷¹. Intelligent and "swarm" robots can work simultaneously towards a single goal due to the utilisation of a "hive mind", also known as an intelligently connected network¹⁷², and they are more robust than individual robots that rely on all parts functioning correctly at all times¹⁷³.

¹⁶⁹ Carplus (2014/15) Carplus annual survey of car clubs. Leeds: Carplus

¹⁷⁰ Beckmann, J. (n.d). Collaborative mobility: Peer-to-Peer expands into the world of transport. Bern: Mobility Academy

¹⁷¹ Arup. (2014). *Future of Rail 2050*. London: Arup

¹⁷² G. Baldassarre, D. Parisi, and S. Nolfi. (2006). Distributed coordination of simulated robots based on self-organization. *Artificial Life*, 12(3), 289–311

¹⁷³ Tang, Y., & Zheng, Z. (2013). Research Advance in Swarm Robotics. *Defence Technology*, 9,(1),18–39

337. Swarm robotics, a concept based on bee colonies, allows for a more robust construction and repair system, due to the ability of the swarm to continue working towards an end goal, even if one or more of the robots in the swarm are compromised¹⁷⁴. Intelligent robots are already being built into ageing infrastructure i.e. water pipes, and crawling robots are being implemented to test load-bearing cables on bridges and in elevators¹⁷⁵.
338. Land and air robots are currently being tested by multiple organisations, including York University and Liverpool University. Robotics will allow for coordinated construction and maintenance efforts across Greater Manchester's transport network.

Focus on: ITS and freight and logistics

339. Freight and logistics contribute over £1bn to the GVA of Greater Manchester, and employs over 90,000 people. However, with increases in online shopping, changes to delivery patterns and the high number of deliveries which are returned (around a third of all deliveries are not successfully made), the freight and logistics sector must utilise new advancements in technology and innovation to mitigate the impact of negative externalities of the sector on Greater Manchester residents.
340. Advanced communications and information technologies enable improvements to be made in infrastructure development and resilience, traffic and fleet management and utilisation, and better monitoring of the overall network.
341. Intelligent Transport Systems (ITS) are a combination of information and telecommunications technologies, enabling information gathering and sharing. ITS can be applied to road transport to improve efficiency and safety, to traffic control centres to improve monitoring and enforcement of regulations, and to city planning, utilising ITS solutions to reduce air and noise pollution to create traffic free zones in cities¹⁷⁶.
342. ITS are vital for the introduction of "eFreight": technology enhanced freight and logistics operations, where "en route" information on the location and condition of transport good is made available online¹⁷⁷. This would enable transport authorities to monitor freight movements and ensure the transport network can work as effectively as possible.

¹⁷⁴ G. Baldassarre, D. Parisi, and S. Nolfi. (2006). Distributed coordination of simulated robots based on self-organization. *Artificial Life*, 12(3), 289–311

¹⁷⁵ Arup. (2014). *Future of Rail 2050*. London: Arup

¹⁷⁶ Intelligent Transport Systems UK. (2016). Article can found at: <http://www.its-uk.org.uk/about/aboutus>

¹⁷⁷ European Commission. (2016). Article can be found at: http://ec.europa.eu/transport/themes/its/road/application_areas/freight_and_logistics_en

343. Alongside this, ITS can be incorporated into new consolidation centres, and can be used to better utilise alternative delivery means such as cargo bicycles. Harmonised information, collected through ITS, would also support services across modes, such rail and maritime freight and logistics operations.
344. Table 26 summarises the opportunities around using new technologies for improving performance.

Table 26: Measures to Improve Performance and Resilience

Concept	Potential implications for 2040 Strategy	Risk associated with innovation
Autonomous Vehicles: Cars with high levels of autonomy or do not require input from a human driver in the decision making process	Potentially positive overall for buses and trains, but fully autonomous cars may raise a number of potential concerns with congestion, safety, liability, health impact of increased car use, infrastructure requirements, and data privacy and ownership.	Explore with caution
Autonomous traffic management e.g. allowing for real-time adjustment of the network in response to demand	Potentially positive overall by tackling congestion and customer information management.	Explore
The Sharing Economy, e.g. sharing cars to enable lower levels of car ownership and use	Positive overall for travellers, as it offers accessible, flexible transport without the need to own a private vehicle	Safe
Application of Robotics and Autonomous Systems in maintenance, cleaning and repairs	Positive overall for transport and city region authorities as it would improve efficiencies and reduce costs	Explore with caution

Implication for 2040 Strategy

Greater Manchester is currently a test bed for a number of initiatives. It's important to ensure this engagement in research, development and deployment continues, as it'll support wider aims to achieve improved performance and secure increased resilience across the transport network in future.

Improved access to better data

345. Data is becoming increasingly valuable, and a cause for concern by some members of the public. How data is stored and used requires multiple guidelines, protocols and security systems. How Greater Manchester addresses these issues, along with gaining and maintaining the trust of those whose data are held, will affect how, and how much, data is stored by transport services. Focus on: Real-time Information
346. Increased connectivity, more access to consumer data, and more flexible patterns of movement will change how consumers travel and the quality of service they demand. One way of improving customer satisfaction, through dedicated information provision, is providing real-time information to customers' mobile devices.

Case Study: OneBusAway, Seattle

The OneBusAway information system offers consumers real-time transport information via website, telephone, text-messaging and smart-phone. While some areas offer real-time information displays at stations and bus stops, few offer such a comprehensive service to multiple devices. The OneBusAway system takes advantage of the fact that implementing and maintaining public displays can be an expensive process, and often limits where real-time information can be displayed. Information via customer devices and the internet has the added benefit of allowing the user to be in control of their wait time, allowing them to maximise their productive time. The OneBusAway's most successful application to date has been a location aware iPhone application that informs users of the nearest bus stop and the next bus at any point in their day¹⁷⁸.

347. The OPTIS (Optimised Public Transport Information System) application will be GM's first step towards multi-operator real-time information. The application will provide real-time information through a multi-modal journey planner that can be accessed through an app or via the internet. The same information will be available on passenger information displays in newer bus stations and on the stops on the Leigh-Salford-Manchester Busway.

Focus on: Open data

348. Data will be an important part of new developments, and how TfGM and other organisations choose to make use of citizens' data will guide how services are developed and provided in the future.

¹⁷⁸ Watkins, K., Ferris, B., Boming, A., Rutherford, G., & Layton, D. (2011). Where is my bus? Impact of mobile real-time information on the perceived and actual wait time of transit riders. *Transportation research*, 839-848

349. Data can be held in multiple ways: through TfGM, which opens the organisation up to security requirements, data regulations and ethical questions. Alternatively, data could be held by the individual, or in a cloud, and lent out to TfGM and other organisations that use the data to provide relevant applications, using the data shared, and give something back to the consumer that is both useful and proportional to the amount of data they chose to share. This removes responsibility for holding the data from organisations, and instead only useful data relating to journeys and modes will be “borrowed” by organisations.
350. In line with UK and London policy in this area, it is the intention for TfGM to adopt a clear Open Transport Data Plan & Principles for Greater Manchester, to meet GMCA’s local transport policies around the promotion of sustainable travel and economic growth.
351. This approach would improve TfGM’s reputation and standing within the innovation and ‘mobility as a service’ space, across the UK and Europe, increasing the chances of attracting innovation and research funding for ourselves, Greater Manchester Universities and SMEs.
352. Alongside open data, TfGM has a commitment to open source initiatives, currently highlighted in the new TravelSpirit collaboration. Working with the world's experts in making Open Source commercial enterprises work, TravelSpirit is set to become the world’s first ‘built from the community up’, Mobility as a Service Open Source Project. To create a sustainable project, it will be critical to establish an ‘ecosystem’ of businesses for a diverse range of applications / geo-spatially diverse communities and neighbourhoods around the globe.
353. A collaboration between transport authorities and providers, university researchers and software experts, such an ecosystem offers an open arena for innovative Mobility as a Service projects to be devised, funded and launched.

Case study: Open data, Transport for London

Traditionally transport data has been shared in different formats and structures; however Transport for London has implemented a unified Application Programming Interface (API) that allows developers to gain and use London’s transport data in real-time and in high volumes, without having to write codes for individual modes. Journey times, routes, fares and disruption data are all available for developers to utilise to create tools, applications and improve services. So far, Transport for London has had over 5,000 developers access and use the data that has been made available to them¹⁷⁹.

¹⁷⁹ Transport for London. (2015). Our Open Data. Retrieved on 10/12/2015 from <https://tfl.gov.uk/info-for/open-data-users/our-open-data>

Focus on: Using IoT ‘big data’

354. The “Internet of Things” concept (see below for more information) has huge potential applications for transport. For example, stations and transport interchanges can become areas to test new innovations in improving the customer experience on public transport through providing information and understanding customer needs in new and innovative ways¹⁸⁰.
355. Educational, interesting, and entertaining technologies can be piloted on our transport networks, such as: games apps that promote healthy travel behaviour; smart, interactive surfaces that educate users of different ages; travel promotions; and applications that support a more seamless, pleasant journey experience.

Case study – ProRail, the Netherlands



181

ProRail have implemented a trial digital wall, showing seat availability for incoming trains, on a rail platform in the Netherlands. This new technology will potentially remove “scramble” moments. It will also help with future rail provision and can be utilised with minimal changes to infrastructure in stations. As the IoT develops it will become increasingly easy to provide useful information for consumers on the platforms.

¹⁸⁰ Arup. (2014). *Future of Rail: 2050*. London: Arup

¹⁸¹ Edenspiekermann (2015) ProRail and NS: Innovation that improves safety and comfort. Retrieved on 03/11/15 from: <http://www.edenspiekermann.com/projects/prorail-and-ns-dutch-railways>

356. GM will need to be mindful of public confidence in data security when considering which innovations to encourage or implement. With a significant number of members of the public interacting online, through applications and connected devices, i.e. smart phones and cars, citizens are becoming increasingly aware of the importance of protecting their personal data¹⁸². Supportive regulations, security measures and campaigns to ensure public confidence in operations which utilise citizens' data will be important here.
357. GM plays a key role in the new Cityverve project, funded by a £10 million grant from central government and match funded by private sector contributions. The project is still in the early stages; however, its long-term projects include talking bus stops and Ebikes. The project is being conducted in collaboration with multiple sectors, to try and solve challenges that have cross-sector relevance. Data collection that will allow services to be provided and scheduled more efficiently and effectively for customers will be a key outcome of the project, alongside new innovations in connected devices and objects.
358. Some currently relevant concepts are highlighted in Table 27.

Table 27: Measures to Improve Access to Data

Concept	Potential implications for 2040 Strategy	Risk associated with innovation
Applications that can be customised to suit consumers' needs: These applications can offer customers new mobility choices which would positively affect their lifestyle, based on choices they already make.	Positive for quality of life as the applications would provide tailored, personalised mobility opportunities relevant to individuals.	Safe
Real-time information: Up to date times for buses etc. will enable travellers to better plan their journeys	Positive overall as travellers would be able to monitor, plan and adapt their journeys more effectively	Safe
Analysis of IoT 'big data' (e.g. mobile phone and telematics) to inform service provision	Positive for the economy and quality of life. It may have positive environmental impacts in the long term	Explore

¹⁸² Future Foundation. (2015). TfGM workshop – Power of Anon slide.

Concept	Potential implications for 2040 Strategy	Risk associated with innovation
<p>Open Source transport service platforms:</p> <p>Enables new applications and information services to enter the market using real-time data</p>	<p>Positive overall, particularly for the economy (supports open innovation) and quality of life (applications and tools useful for transport users reach the market quicker)</p>	<p>Explore</p>

Implication for 2040 Strategy

The ability to gather data and utilise it to improve service delivery and investment would have a significant impact on how the transport network in Greater Manchester runs daily, during events and also major incidents. New opportunities are emerging in data collection, storage and utilisation, and TfGM will need to continue to be proactive in this area.

Reducing the need to travel

359. Travel time has traditionally been viewed as unproductive time. Technology embedded into homes, along with improvements in web based services, will affect services and provision requirements across the transport network. Following on from Greater Manchester's Get Digital campaign, connectivity will also play a key role in enabling access to services and products without needing to travel.

Focus on: The Internet of Things (IoT)

The Internet of Things

The internet of Things (IoT) is a concept based on embedding technology into physical objects, allowing them to be wirelessly connected to a network, and each other.



Applications for the IoT range from transport, health, education, employment, and in the home. Estimates for the number of connected objects differ greatly, with some organisations anticipating 200 billion objects will be connected by 2020¹⁸⁴, which equates to 26 objects per human being on Earth.

360. Technology embedded into more surfaces over the next twenty five years will allow for more flexible working times and situations, due to improved connectivity and accessibility for service, products and physical objects. Public transport will need to prepare for possible changes in requirements, and remain flexible to potential changes in demand.¹⁸⁵
361. Applications that keep consumers informed will play a particular role here, not only in relation to disruptions in the system, but also by offering details on modes that are the most costly for the individual, for the environment, and on time.
362. In the future, building high speed broadband facilities into all new transport infrastructure will allow stations to become dedicated meeting points for business, providing virtual conferencing opportunities outside the home/office environment, this will work alongside applications that inform consumers of meeting spaces that are available to them, and areas that are meant for creative/business uses.

¹⁸³ Northwestern University Transportation Centre. (2015). The Internet of Things in Transportation and Logistics. Retrieved on 04/11/15 from <http://www.transportation.northwestern.edu/industry/bac-meetings/2015-fall/fall2015workshop.html>

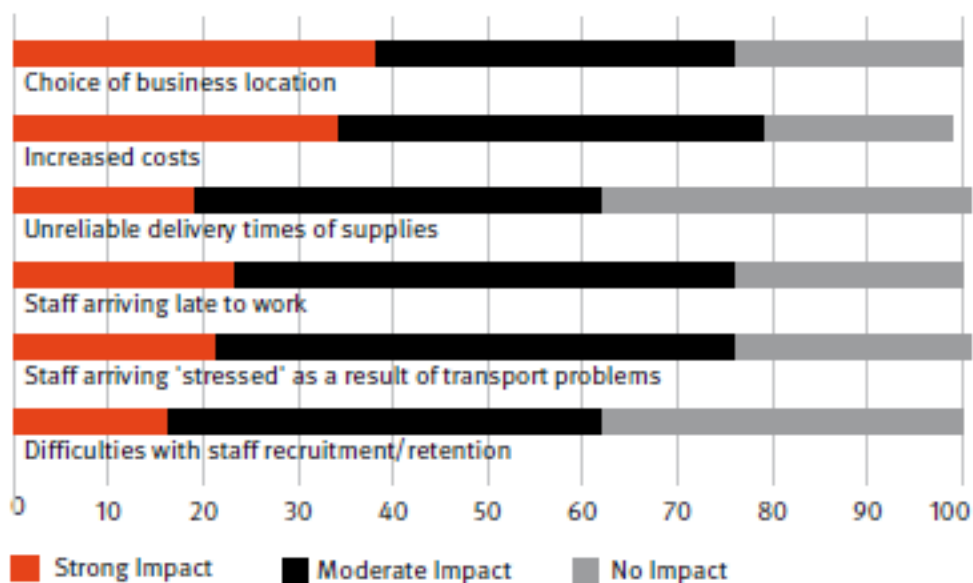
¹⁸⁴ Intel (2014). A guide to Internet of Things. Retrieved on 25/11/2015 from <http://www.intel.com/content/www/us/en/internet-of-things/infographics/guide-to-iot.html>

¹⁸⁵ Deloitte. (2015). Transport in the Digital Age: Disruptive Trends for Smart Mobility. London: Deloitte

Focus on: Changes to work patterns altering traditional ideas of “peak time” travel

363. GM’s current “Get Digital” campaign, which aims for Manchester to become a Digital City by 2020 through the implementation of fibre optic broadband across the city region, will allow more businesses to consider flexible working patterns for their employees¹⁸⁶.
364. Faster file transfers and the use of Virtual Private Networks will enable employers to consider the benefits of working from home and in non-traditional spaces, leading to potential reductions in the cost of office spaces for businesses and a reduction in the number of commuters during peak travel, and the overall number of consumers accessing the transport network¹⁸⁷.
365. Figure 65 highlights how organisations currently see transport impacting on their business. Flexible working patterns, allowing employees to work from home and access virtual meeting spaces, along with physical spaces outside of traditional offices, could have significant effect on reducing transports impact on businesses across the city region, along with providing an effective transport demand management tool for transport providers.

Figure 65: Impacts of transport on business (Source: CBI)



366. If more consumers choose to work from home, and use their travel time for leisure purposes, we may see a change in peak-time travel, with consumers’ travel becoming more spread out through the day, and increasingly into the evening as they take advantage of the night-time economy.

¹⁸⁶ Greater Manchester Combined Authority. (2015). Get Digital. Retrieved on 10/12/2015 from <http://www.get-digital.info/>

¹⁸⁷ CBI. (2010). Tackling Congestion, Driving Growth. London: CBI

367. Travel to health and education facilities will change in the near future, with more opportunities being offered through connected devices in the home. Web based educational courses are becoming increasingly popular, and web based NHS diagnosis services have also recently been implemented. Both of these, along with other variables, will affect how users choose where, and when, to access transport services.

Focus on: Drones

368. Online shopping is becoming increasingly significant in recent years, reshaping how we view the high-street. Airports may become a hub for delivery drones and logistics, past the traditional parameters and restrictions of air travel.
369. Through the utilisation of new innovations in nanotechnology, biotechnology and information technology, new forms of transport could emerge. Innovations in new materials and the understanding of aerodynamics mean that drones and other small-scale, air based transportation may become an economically feasible opportunity.
370. Project Wing, part of the Google X research and development facility, is currently investigating drones as a way to transport goods to consumers. Similarly, Amazon Prime Air intends to develop drones as a way to deliver goods up to 5lbs in weight within 30 minutes flight time, and below an altitude of 400ft¹⁸⁸.
371. Drones also offer an opportunity to expand and improve the use of consolidation centres on the edge of urban areas, opening up new models for freight and logistics in densely populated areas.
372. Some of the relevant concepts and opportunities are highlighted in Table 28.

Table 28: Measures that may Reduce the Need to Travel

Concept	Potential implications for 2040 Strategy	Risk associated with innovation
IoT embedded in homes and physical objects: Sensors which enable physical objects to be connected to the internet, and by extension users who are not in close proximity to the object	Positive overall, although it may have a disruptive effect on the economy in the short term as shopping and other leisure activities can be undertaken at home instead of in urban areas. Security will play an important role here, to protect personal information stored through devices in the home	Explore with caution

¹⁸⁸ Amazon. (2015). Amazon Prime Air. Retrieved on 10/12/2015 from <http://www.amazon.com/b?ie=UTF8&node=8037720011>

Concept	Potential implications for 2040 Strategy	Risk associated with innovation
Creative spaces in urban areas to facilitate business opportunities outside of traditional offices	Positive overall for city region residents and visitors as it enables more flexible working arrangements, with the potential to offer a better work-life balance	Safe
Logistics that utilise new technologies, for example: drones and consolidation centres on the edge of urban areas	Potentially positive overall, as it allows consumers quicker/easier access to their online purchases and may remove some freight vehicles from the road. Fuel and material choices will affect environmental impact	Explore with caution
Changes in work/leisure patterns: travel times becoming more dispersed and changing traditional notions of "peak travel" due to more home working and shopping	Positive overall, but may affect public transport operations if the spread of travelling is no longer largely over peak hours. Smaller on demand services may become more effective.	Explore

Implication for 2040 Strategy

Reducing the need to travel could have positive effects on congestion, journey times and safety, during both peak and off-peak hours. Many of the potential solutions will be market led and TfGM will need to help support businesses and organisations who wish to adopt a more flexible approach to working and employee engagement, and also new technologies which utilise autonomous systems. Policies and regulations will need to be developed to ensure strict guidelines are set to protect residents' safety

Reducing transport's impact on the environment

373. Finite resources, limited capacity for infrastructure expansion in the regional centre, and a growing population will put pressures on multiple aspects of the transport network in the next twenty five years. Alternatives in fuel, and how consumers choose to travel, represent possible ways to alleviate pressures on the transport system.
374. Encouraging consumers to choose more sustainable transport options, which have positive benefits on their finances, health and productive use of time will increasingly become a focus as the population increases in size and the number of elderly residents increases.

375. Metroshuttle takes advantage of a hybrid fuel system in the city centre, Bolton and Stockport (with some electric vehicles in the city centre), reducing emissions considerably. Buses that utilise cleaner fuel choices can be implemented across the network as part of future reforms, and autonomous technology can aid efficient fuel usage across the network.

Focus on: Alternative fuel for trains

376. Current fuel choices for trains in the UK are limited to diesel and electricity in locations where lines have been electrified. Electrified lines are more efficient, with faster trains operating quicker, and with a lower impact on air quality and carbon emissions.
377. Hydrogen, nuclear, and air propelled trains will provide a greater number of choices and opportunities for Greater Manchester over time. This technology, particularly when combined with autonomous vehicle technology and signals, could create an efficient system with a lower environmental impact in future.

Case Study: Hyperloop¹⁸⁹



Hyperloop is a mass transit system designed to connect urban areas fewer than 900 miles apart. The transportation method consists of steel tubes, or pods that move within a reduced pressure, or no pressure, environment i.e. a tube. As of 2015, different designs are being developed, with projected passenger speeds of between 598mph and 760mph aiming to be reached initially. The early cost projections for Hyperloop differ significantly, with one estimation of \$6 billion being considered excessively low. Space X has set a competition, culminating in 2016, to private companies and public organisations to develop the technology required to make this transport method feasible.

¹⁸⁹ Hyperloop Transportation Technologies (n.d) *Transportation at rocket speed*. Retrieved on 04/11/15 from <http://hyperlooptransp.com/>

Focus on: Alternative energy generation

- 378. New forms of energy generation could also utilise the constantly growing and most extensive resource Greater Manchester has: pedestrians.
- 379. Energy from footfall can be used to power stations/Metrolink stops, and can feed back into the grid. This technology is currently being trialled in train stations, sports stadiums, schools and Heathrow Airport, with the intention to roll out other pilots globally¹⁹⁰.
- 380. Energy generation from footfall makes the most of day to day movements by pedestrians across Greater Manchester, making the area more self-sufficient. Long term costs for powering rail, Metrolink and bus stations could be reduced over time, and some areas with high footfall can become partially self-sustainable throughout certain periods of the day¹⁹¹.
- 381. Data on each step made across the network can also be collected, which is relayed and analysed to help provide more understanding regarding number of consumers in the area, and how businesses and organisations can react to different levels of people moving through a space at different times.
- 382. Other ultra-low emission transport methods are also becoming increasingly popular, such as electric and plug-in electric cars that can be owned and operated through a sharing scheme, or by an individual.

Focus on: Bicycle sharing schemes

- 383. Bicycle sharing schemes have become significantly more popular in urban areas over the last decade, and Smart bicycle sharing schemes are the latest evolution of this trend¹⁹². Technological developments, in docking and telematics, have made cycle sharing schemes more attractive to cities and their residents. Traditionally, technological aspects of cycle sharing have made these schemes costly to implement, run or maintain. However, new advances are changing this, enabling sustainable sharing systems to be implemented.
- 384. Public-private partnerships are a popular means of funding bicycle sharing schemes, with this model being utilised in London, Germany, Canada and the Netherlands. Adding bicycle sharing facilities would support TfGM's intentions for providing a first mile-last mile service to transport users.

¹⁹⁰ Pavegen (2014) Projects. Retrieved on 03/11/15 from <http://www.pavegen.com/projects>

¹⁹¹ Pavegen (2014) Projects. Retrieved on 03/11/15 from <http://www.pavegen.com/projects>

¹⁹² Cichosz, M. (2013) IT solutions in logistics of smart bike-sharing systems in urban transport. *Management*, 17, 272-283

385. Smart bicycle sharing opportunities allow for the gathering of data from users, to help plan and efficiently control traffic management. The addition of terminals built into the bicycle racks, which are then able to relay useful information to consumers. For example: weather reports; Greater Manchester maps; information on spaces available at the destination, would be a positive way of giving the consumer information back in return for the data they submit to us.
386. Electric bicycles would provide transport opportunities for commuters living between 5km and 20km away from their work destination. With the ability to travel at speeds of up to 20kph, journey time differences between electric bikes and car are minimised¹⁹³.
387. Currently 20.8% of car journeys commuting from Greater Manchester into the city centre are between 10km and 20km, 32.3% of commuter car journeys from Greater Manchester to the city centre are between 5km and 10km, and 12.9% of commuter car journeys from Greater Manchester to the city centre are less than 5km¹⁹⁴. These journeys represent a potential market for electric bicycles across Greater Manchester.
388. Dedicated cycle lanes, with cycle highways outside of dense urban areas, would allow for an increase in bicycle usage across Greater Manchester. The expansion of cycle hubs near interchange points would also facilitate an increase in bicycle use.

Case Study: Poland

A cycle hire scheme was co-funded in Krakow in 2008 in partnership with the European Union. Twelve stations with 100 bicycles were initially funded as part of a “sustainable public transport solution” with BikeOne, a private Polish company¹⁹⁵. Five years later the bicycle hire schemes have spread over the rest of Poland, with Warsaw providing 166 locations for rent and return, and 2,500 bikes are available for public use. Money has been saved in this scheme by eliminating the GPS transmitters in the bikes, instead relying on data collected from the start and end point of the hire. Another unique aspect of the Polish scheme is the ability to lock bikes to other bikes if there are no lock ups available. Users then call a specific phone number to state that the bike has been returned.

A few relevant concepts and opportunities that may impact the economy, environment and residents quality of life have been listed in Table 29.

¹⁹³ Umwelt Bundesamt (2014) *Electric bikes: get things rolling*. Dessau-Rosslau: Federal Environment Agency

¹⁹⁴ Office of National Statistics (2011) Census data

¹⁹⁵ Cichosz, M. (2013) IT solutions in logistics of smart bike-sharing systems in urban transport. *Management*, 17, 272-283

Table 29: Measures with Environmental Implications

Concept	Potential implications for 2040 Strategy	Risk associated with innovation
Alternative fuel choices - BEV/PHEV/Hydrogen Fuel Cell	Positive overall, however consideration must be given to the potential shelf life of new fuel opportunities	Explore with caution
Promotional campaigns to alter mode choice using applications	Positive overall if it has an impact on travel behaviour. How the campaigns are promoted and managed will be key here.	Explore
Ultra Low Emission Zones: Areas which only allow the use of vehicles with low emissions pollution	Positive for environment and quality of life. When implemented elsewhere ULEZ have also had a positive effect on the economy	Safe
Applications that allow active travellers to compete against each other in Greater Manchester - number of miles walked/cycled etc.	Positive for quality of life as it enables city region residents and visitors to engage in enjoyable activities while travelling, and can offer nudges for users to more sustainable modes.	Safe

Implication for 2040 Strategy

A key ambition in Greater Manchester is to improve the air quality for residents and visitors. To ensure goals and aims are met, TfGM will need to continue to work towards creating an environment that supports and positively promotes the use of low emission vehicles, electric vehicles and active travel.

Policy and Governance



Policy and Governance: Summary of Trends and Implications

Opportunity to better connect with customers

- Devolution provides the opportunity to better connect with communities and individuals in the planning and delivery of new infrastructure and services – new mechanisms for engagement on transport issues may need to be developed

Greater autonomy for GM over decision-making and funding

- A move towards greater autonomy for Greater Manchester over decision-making and funding provides opportunities for transport to be planned at the appropriate spatial scale and more joined up with the delivery of other public services

Introduction

1. Greater Manchester (GM) is at the forefront of developing new systems of local government to identify and meet local priorities. Robust and accountable governance structures and the capacity for wider policy decision-making will strengthen our ability to deliver a customer-focused transport system over the next 25 years. We require increased devolution from central government to give much greater autonomy over decision-making and funding.
2. GM is currently below the UK average in terms of both productivity and pay rates. To create a high-wage, high-productivity economy and make a greater contribution to UK economic growth, we need to help residents become more self-sufficient and businesses more productive. By improving air quality, reducing congestion and supporting active travel we can help residents become fitter, healthier, more economically active and less reliant on public services, so that they are better able to contribute to, and enjoy the benefits of, a more prosperous GM. To manage the transition in a way that maximises our strengths and takes account of local circumstances, GM requires more local decision-making and more targeted transport investment; focused on both growing the overall GM economy, but also improving access to economic opportunity for more deprived groups.
3. As public sector funding pressures continue into the future, we will need to develop innovative approaches to service provision and funding, working with both the private sector and local communities.

4. As some public services move towards being planned and delivered at different spatial levels, we need to ensure that local knowledge and understanding is not lost, through effective engagement with local communities and districts. New models of engagement will need to be developed, using technology and social media where appropriate, to ensure a good understanding of the needs of local communities.

The Manchester Independent Economic Review & Greater Manchester Strategy

5. The Manchester Independent Economic Review (MIER) conducted in 2009 concluded that GM has the potential to become an economic powerhouse, but punches below its weight in terms of its contribution to the UK economy.¹⁹⁶
6. MIER established that GM is held back by low productivity that stems from persistent worklessness in many of its most deprived communities, but most importantly, MIER clearly demonstrated the value of focussing on the holistic economic needs of GM, and the importance of determining clear priorities across regeneration, housing and transport activities, rather than within these traditionally individual areas of public service delivery. Thus delivering fully integrated solutions that offer the maximum scope for private sector investment and reduced levels of deprivation while ensuring good value for money.
7. The Greater Manchester Strategy (GMS), published in response to MIER, set out a series of strategic priorities for action across GM, focused on its dual aims of securing sustainable economic growth and ensuring residents are able to benefit from, and contribute towards, that growth¹⁹⁷.
8. The GMS paved the way for the creation of the Greater Manchester Combined Authority, and these strengthened governance arrangements provided a basis for collaboration and allowed for the effective alignment of decision making and delivery in key areas such as economic development, regeneration, planning, transport, housing, inward investment, business support, marketing and tourism, and employment and skills.
9. Following the current refresh of the GMS¹⁹⁸, TfGM will need to ensure that the GM Transport Strategy continues to support the future strategic ambitions of the city region.

The Greater Manchester Agreement

¹⁹⁶ Manchester Independent Economic Review Panel. (6th April 2009). *Manchester Independent Economic Review*. New Economy

¹⁹⁷ AGMA. (August 2009). *Prosperity for all: The Greater Manchester Strategy 2009*. AGMA

¹⁹⁸ https://www.greatermanchester-ca.gov.uk/info/20123/the_strategy_refresh

10. The ground-breaking agreement signed between GM and the government in November 2014¹⁹⁹ set in motion the devolution of a broad set of powers and responsibilities to the city region including health and social care, business support, spatial planning and, critically for TfGM, transport.
11. Central to the agreement is the creation of the first directly elected metro-wide Mayor outside of London. This follows the recognition that as powers are devolved, strong leadership and further strengthened models of accountability will be required.
12. It means Greater Manchester will have the right tools to fulfil its ambitious vision to develop GM's full potential as a modern, vibrant and prosperous city-region that can compete on an international stage.
13. In relation to transport, it gives TfGM the ability to transform transport connectivity across all modes, giving residents and businesses the infrastructure and services they need for the city region to thrive and flourish.
14. An example of the potential to transform transport connectivity is the set of provisions that the Bus Services Bill (DfT, 2016²⁰⁰) allows for in different areas of England. If enacted, the Bill will enable a range of options for bus service delivery to be explored for Greater Manchester.

Mayoral Combined Authority Model

15. The new proposed model of governance for GM combines the benefits of a central, high profile, leadership figure, directly accountable to the electorate, within a strong combined authority with executive powers, comprising the mayor and the ten district leaders.
16. This sets it apart from the 'two-tier' London model where the mayor has great autonomy over a range of policy areas with an elected assembly to provide oversight and challenge. A further distinction is the separation of the GLA from the 33 local London boroughs.
17. The GM mayoral combined authority provides a more cohesive model by combining city region and district leadership in one strong executive body.

Oversight and Scrutiny

18. Robust oversight and scrutiny is vital to any system of governance and the current intention is use the existing scrutiny pool of local members and independent, non-executive members to scrutinise decisions, add value and hold the executive to account.

¹⁹⁹ HM Treasury. (03/11/2014). *Greater Manchester Agreement: Devolution to the Greater Manchester Combined Authority and transition to a directly elected mayor*. HM Treasury & GMCA

²⁰⁰ <https://www.gov.uk/government/publications/bus-services-bill-overview>.

19. The Centre for Public Scrutiny (CfPS) argue that further devolution in place-based finance needs new accountability systems in place to allow central government and the public to scrutinise and have reassurance that devolved budgets are being spent wisely ²⁰¹.
20. The CfPS makes the case for devolved city regions to have powerful, independent, local Public Accounts Committees (PACs) composed of councillors and non-executive members from partner agencies with oversight over all public expenditure in the local area.
21. They envisage PACs having powers to access information held by anybody involved in public service delivery and to require members and officers to attend meetings to give evidence.

Engagement and participation in the policy process

22. Devolution brings decision-making closer to the people. If we want to deliver a truly customer focused transport system it is vital that we engage local people, communities, and our partners across the sectors in transport decision-making.
23. Decentralisation of power and a directly elected mayor can raise the profile of decision-making and increase public participation. Advances in technology and social media are providing new channels of communication through which to interact with local people and businesses in new and innovative ways, enabling us to capture this enthusiasm for participatory democracy.
24. A crowd sourcing project called Changing London was established prior to the London Mayoral election in 2016 to encourage Londoners to share their visions for the capital and provide ideas for London's next mayor using an online blog²⁰². The premise being that people who have experience of an issue are best placed to advise on how it might be resolved. Social media can aid us in incorporating that wisdom into the policy-making process better than ever before.
25. While public consultation and opinion gathering will continue to be important, increased digitalisation and availability of data already allows us to build intricate pictures of how people move around and ascertain what influences their transport choices.

²⁰¹ Crowe, J. (2013). *A Local Public Accounts Committee for every place: a proposal from CfPS*. Retrieved on 06/11/2015 from <http://www.cfps.org.uk/publications?item=11575&offset=0>

²⁰² Howard, E. (20/05/2015). Cities have it all to play for. But will elected mayors give power to the people? *The Guardian*. Retrieved on 09/11/2015 from <http://www.theguardian.com/society/2015/may/20/cities-mayors-power-people-george-osborne-devolution>

26. The use of personal data requires consent and robust data security is necessary to maintain public confidence, and while there are often concerns voiced about data privacy, 57% of respondents to a recent survey stated they would be open to sharing personal data to improve transport services²⁰³. Input from the business community will be essential if we are to design a transport network to successfully connect employers with talent and skills and achieve our ambitious aims for job creation and economic growth.
27. Attitudes indicate that businesses do not feel they have been consulted on devolution with small businesses in particular feeling marginalised. However, there is general support for the transfer of power to the city region level and this perhaps highlights optimism amongst local business leaders that devolution will enable them to have greater influence over decisions in future²⁰⁴.
28. It is imperative, therefore, that there are mechanisms for businesses to contribute to transport strategy either directly, or through representative bodies such as Chambers of Commerce and Local Enterprise Partnerships. Appointing business leaders as independent, non-executive members of the scrutiny pool may be another way of capitalising on the great experience and skills within GM's businesses.

Implication for 2040 Strategy

Devolution provides the opportunity to better connect with communities and individuals in the planning and delivery of new infrastructure and services – new mechanisms for engagement on transport issues may need to be developed.

Transport for the North and the Northern Powerhouse

29. In June 2014 the then Chancellor, the Rt Hon George Osborne MP, announced plans to build a Northern Powerhouse. The vision was for a super-productive network of modern city regions, combining the strengths of the North's cities, to create a unified northern economy able to compete globally.
30. Central to the vision is the transformation the North's connectivity through a range of transport measures. It is estimated that if the 'transformational' Northern Powerhouse vision is achieved, through a better connected North, GVA

²⁰³ Schartau, P & Wockatz, P. (October 2015). *Intelligent Mobility: Traveller Needs and UK Capability Study*. Transport Systems Catapult

²⁰⁴ Clarke, E & Jeffrey, S. (November 2015). *Firm Views. The business take on devolution*. Centre for Cities

31. is projected to be £97 billion higher than the North's existing output of £290 billion per year²⁰⁵.
32. To develop a Northern Transport Strategy, Transport for the North (TfN) has been created to bring together local transport authorities in the North. GM is at the heart of the Northern Powerhouse and TfGM is already playing a leading role in the development of TfN as TfN aims to be constituted as a statutory body in 2017.
33. As powers are transferred to TfN, TfGM must continue to be a strong voice for GM, shaping and responding to the Northern Transport Strategy, so that GM can capitalise on the benefits of a better connected Northern England and play its part in rebalancing the UK's economy.

Implications for Transport Strategy

Integrated decision-making

34. By devolving a range of powers to a mayoral combined authority, strategic decisions about the transport network can be made in the context of other policy areas, ensuring that transport is not developed in isolation and supports GM's wider aims and objectives. In this way we can create an integrated decision-making process to support the delivery of a fully integrated transport network.

Housing

35. GM will need at least 200,000 new homes by 2040 to support anticipated economic and population growth²⁰⁶. That housing must be built in the right locations where it can be served by public transport, making use of existing capacity or where new services can be easily provided. The Greater Manchester Spatial Framework (GMSF) currently in development²⁰⁷ is a joint plan to manage the supply of land for jobs and new homes across Greater Manchester. The GMSF will be key to the integration of transport, housing and wider development strategies.
36. Housing planned with employment and key local facilities within walking and cycling distance can support low carbon lifestyles and reduce congestion. Developing urban centres and residential areas with attractive streets and public spaces, that are easy to walk and cycle will make GM a more attractive place to live and encourage more active travel to support our health improvement objectives.

²⁰⁵ TfN. (30/06/2016). Northern Powerhouse Independent Economic Review. TfN

²⁰⁶ GMCA. (November 2015). *GM Spatial Framework: Strategic Options Background Paper 3, Objectively Assessed Housing Need*. GMCA

²⁰⁷ <https://www.greatermanchester-ca.gov.uk/GMSF>

Skills

37. To help bridge the skills gap in England the Government aims to create three million new apprenticeships by 2020²⁰⁸. To support this GM is looking to increase the number of 16-24 apprenticeship starts by 10% a year every year until at least 2017/18²⁰⁹. Transport can support this by ensuring that apprentices can access their places of work and education using a robust, reliable transport system that gets them there on time; by providing affordable transport with simple integrated ticketing; and more directly, by offering targeted concessionary travel and employing apprentices within the transport sector.

Health

38. The health of our population will become an even higher priority in future, a future where by 2040, at least one in four people will be over the age of 60.
39. People will be working for longer and older people will be more likely to want access to a range of work and leisure opportunities. At the same time, access to healthcare and services for elderly people will become even more critical and such services must be accessible by non-car modes, or delivered directly to those unable to travel.
40. The challenge for GM to integrate health and social care starts now and transport will have a key role to play. By encouraging active travel through infrastructure investment, incentives and training, we can keep people active for longer. By improving transport accessibility we can preserve people's independence. By delivering an efficient, seamless, reliable transport network we can support carers and healthcare professionals.

Devolved Funding

41. Devolution of power and funding must go hand-in-hand. If we are to capitalise on the fantastic opportunities that devolution offers then it is imperative that we have long-term certainty of funding so that we can adequately plan for the future.
42. Stop-start funding can truncate transport planning and create a patchwork of disjointed transport projects in response to specific schemes and funding controlled from Whitehall.
43. Ring-fenced funding limits decision-making and is a mechanism for centralised control. If devolution is to be successful we must have the freedom to direct resources to meet our local priorities. This is particularly pertinent at time of increased budgetary pressures.
44. Devolved budgets with long-term, multi-year settlements and are key then to allow us to plan for 2040 and beyond.

²⁰⁸ Department for Business, Innovation and Skills, (07/12/2015), *English Apprenticeships: Our 2020 Vision*. Department for Business, Innovation and Skills

²⁰⁹ New Economy. (July 2014). *Greater Manchester Apprenticeship Hub Delivery Plan*. New Economy

45. New forms of governance will allow more innovative funding arrangements. Pooling funds from various sources within a combined investment fund can lead to a more cohesive approach to policy delivery.
46. It also provides for new financial mechanisms such as supplementary business rates. Plans to devolve control of business rates²¹⁰ will allow the GMCA to fund improvements to transport and infrastructure and benefit from the economic growth it helps to create. In London a levy of 2p on non-domestic properties with a rateable value of over £55,000 was introduced to help fund the Crossrail project²¹¹.

Implication for 2040 Strategy

A move towards greater autonomy for Greater Manchester over decision-making and funding provides opportunities for transport to be planned at the appropriate spatial scale and more joined up with the delivery of other public services.

²¹⁰ HM Treasury. (November 2015). *Spending Review 2015*. HM Treasury

²¹¹ London.gov.uk. *Mayoral Community Infrastructure Levy*. Retrieved on 11/12/2015 from <https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/mayoral-community-infrastructure-levy>



tfgm.com/2040