Midlands Connect
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Midlands
Alternative Futures

January 2020

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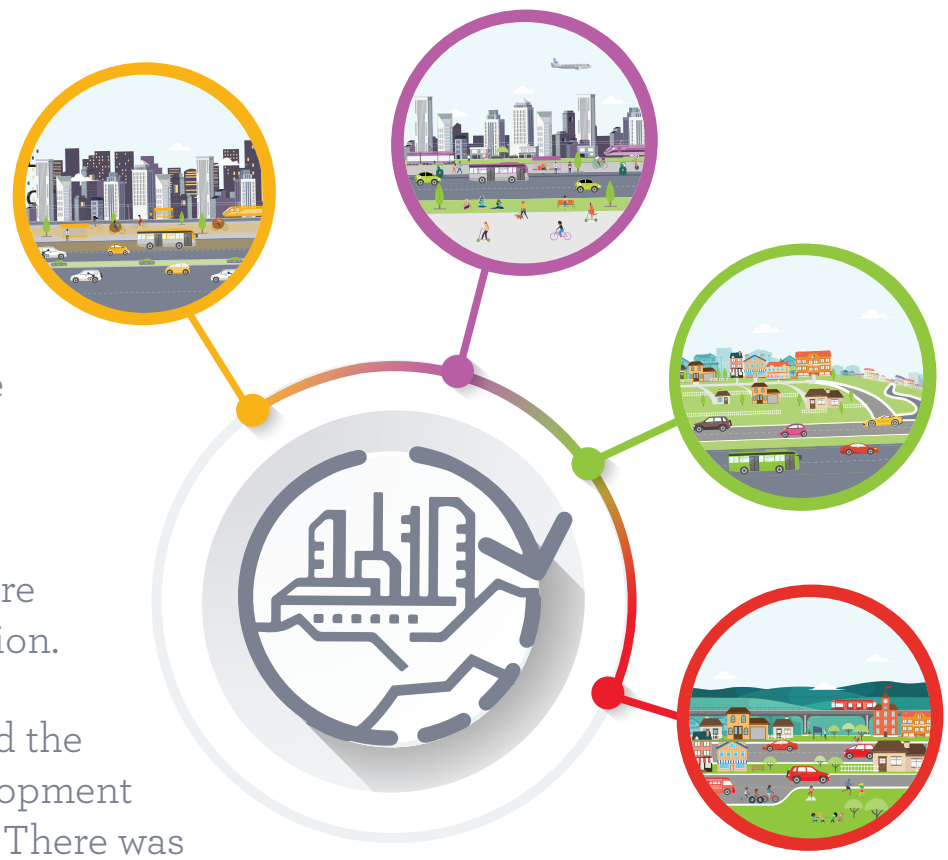
Study Overview

Forecasting Alternative Futures



This study considers the potential future transport demand in the Midlands over the next 50 years (to 2068). Midlands Connect will use these to inform policy decisions and to help to plan for the future transport infrastructure needs of the region.

A diverse group of stakeholders explored the key uncertainties in the long-term development of society, the economy and technology. There was then a discussion around how these might play out in the Midlands.

Four distinct alternative futures were identified along with a comparator scenario based on national policy guidance and projections. A bespoke model of land-use, the economy, travel behaviour and the transport system of the Midlands was used to test the response of transport demand to changes in:

- The amount and distribution of growth in population, employment and leisure activity.
- The evolution of mobility through new technology, behavioural change and new business models, such as those common in the gig economy.
- The cost and attractiveness of travel due to policy trends and infrastructure investment.

Forecasts of the level and distribution of transport demand within and between the urban centres and districts of the Midlands were developed for each scenario.

This Report

The remainder of this report is split into six sections:

- **Scenario Development:** The process through which the alternative future scenarios were identified.
- **Scenario Definitions:** The key features of each alternative and the comparator scenario.
- **Evolution of Mobility:** How future mobility change might play out in each alternative future.
- **Alternative Futures:** Summaries of the future socioeconomic and transport outcomes of each scenario.
- **Scenario Comparison:** A look at the similarities and differences between each scenario.
- **What next?** How Midlands Connect is building this Scenario Planning approach into their plans.

Scenario Development

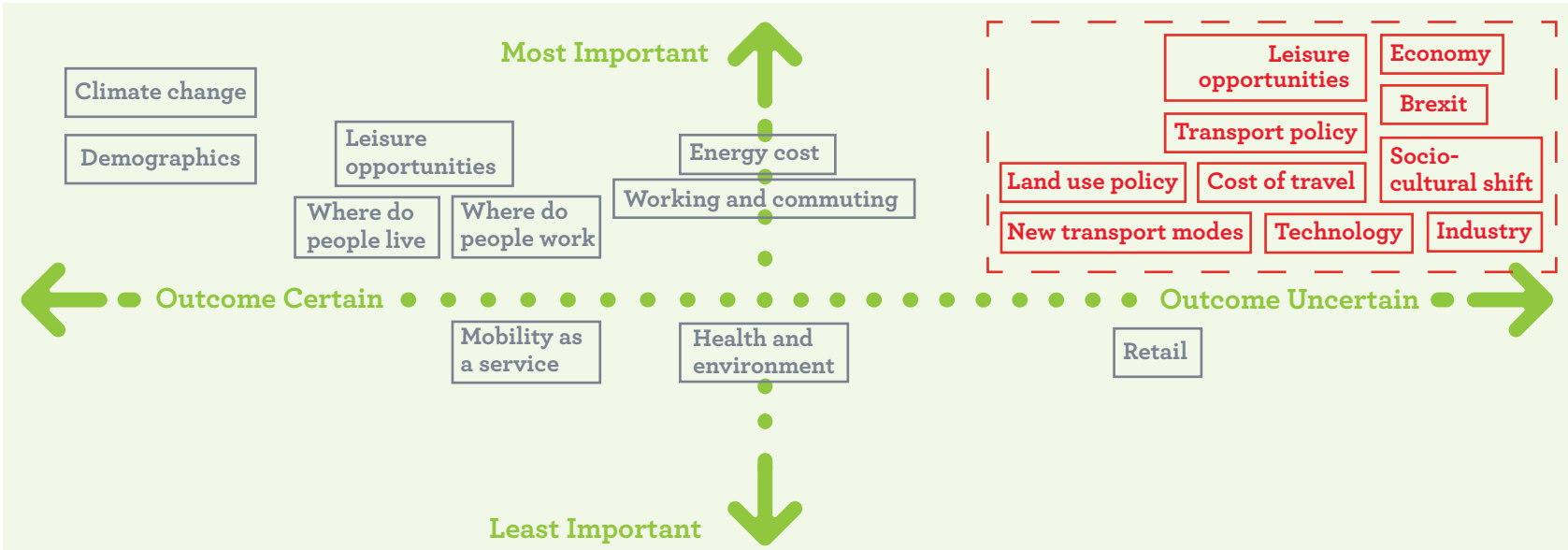
Workshops drew out what stakeholders know about the region to identify key uncertainties in how it might evolve over the next 50 years. The uncertainties were captured in four scenarios, and a coherent set of assumptions on how growth and change might play out. The scenarios were then tested in a land-use and transport model to look at how they will impact on overall transport demand.

Stakeholder Workshops

10 organisations representing widespread stakeholder types **attended workshops.** These were designed to draw out knowledge and views on how the Midlands might evolve given various socio-economic, political and geographic constraints.

Drivers of Future Travel Demand

Attendees of the workshop identified the drivers of change of future transport demand that would be most important in the Midlands. The following drivers were explored and then defined in terms of their importance and uncertainty.



Shortlisted Drivers

The nine drivers in the top right quadrant represent those which are considered both most important and most uncertain in outcome. These nine drivers were taken forward as the basis for the differences between the alternative future scenarios. The other drivers (less important and/or more certain) will still feature but be common between the future scenarios.

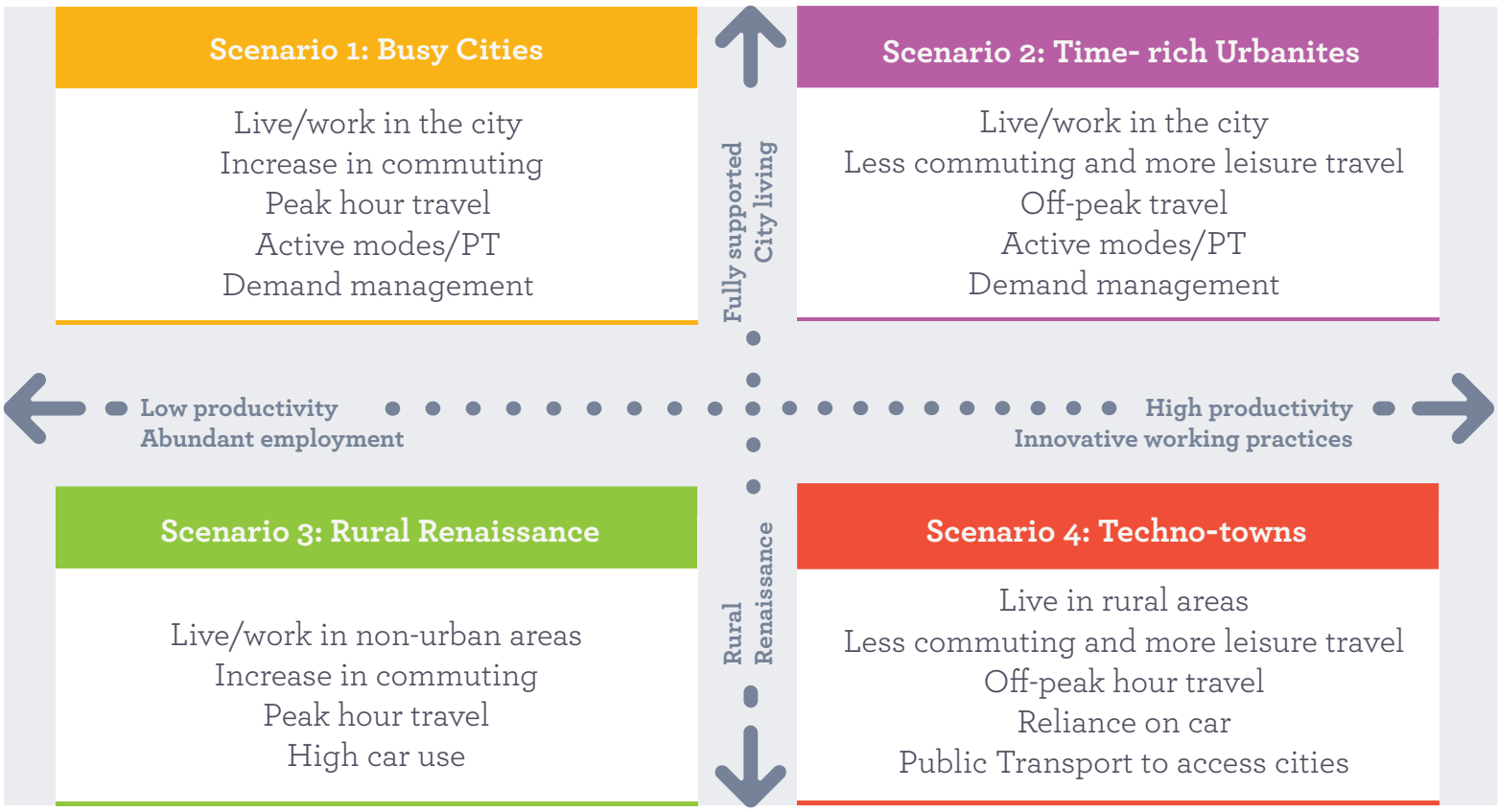
Scenario Definition

The nine most important and uncertain drivers of future transport demand were condensed into two key dimensions – the 'axes of uncertainty':

- Axis 1 represents: **economy, industry and socio-cultural shift**.
  In one extreme, high productivity driven by automation and innovative business models and working practices. In the other extreme, traditional models of business and industry continue with an abundance of work available to all.
- Axis 2 represents: **land-use, transport policy and cost of travel.**
  In one extreme, investment in urban services encourages city-living with an emphasis on walking, cycling and public transport. In the other extreme, increased rural housing is supported by investment in infrastructure connecting rural areas to economic centres.

New technology and new mobility impacts were also assessed as likely to play out differently for each alternative scenario.

Four scenarios were defined representing the four combinations of the two axes of uncertainty:



Scenario Impacts

Four levers are used to model the differences between the scenarios:

- **Growth:** Growth in population and employment to reflect the productivity and working patterns of the economy, and the focus on urban/rural development.
- **Time of travel:** The split between peak and off-peak travel to reflect the sectors where employment growth occurs and traditional vs. flexible working time practices.
- **Travel choices:** The changes in travel and mode choices resulting from transport interventions supporting varying levels of urban vs. rural and car vs. public transport.
- **New Technology:** The impact of technology/new transport modes.

Reference Scenario

Trend-based Comparator

A reference scenario was created based on Government forecasts (NTEM). A reference scenario was created based on Government forecasts (NTEM) extrapolated to a future year of 2068 (a 50 year planning horizon). These are trend-based and do not account for disruptive change, such as major shifts in technology, behaviours or regional policy. This provides a 'business as usual' scenario, that we have used as a comparator, to benchmark the alternative future scenarios against.

Changes over the next 50 years

The reference scenario has steady growth in population and employment with similar growth rates in the urban and rural areas. All of the districts which contain a city have been defined as city regions, and remaining districts have been defined as other areas. Car trips are expected to grow faster than public transport. The proportion of travel in the peak is forecasted to remain constant.

Population

City Region:
5.6m (^23%)

Other:
6.3 m (^23%)

Employment

City Region:
2.3 m (^18%)

Other:
2.7 m (^14%)

Car Travel

Trips by car per day:
23 m (^34%)

Car vehicle trips:
18 m (^34%)

Peak Travel

Trips in peaks:
14 m (^25%)

Peak share:
45% (no change on 2018)

Values for 2068, change in brackets compared to 2018, daily trips for car and peak travel.

There are 28 million daily trips forecasted for 2068 (up from 22 million in 2018), 40% are expected to be within urban areas, 40% within non-urban areas, and the remaining 20% between urban and non-urban areas.

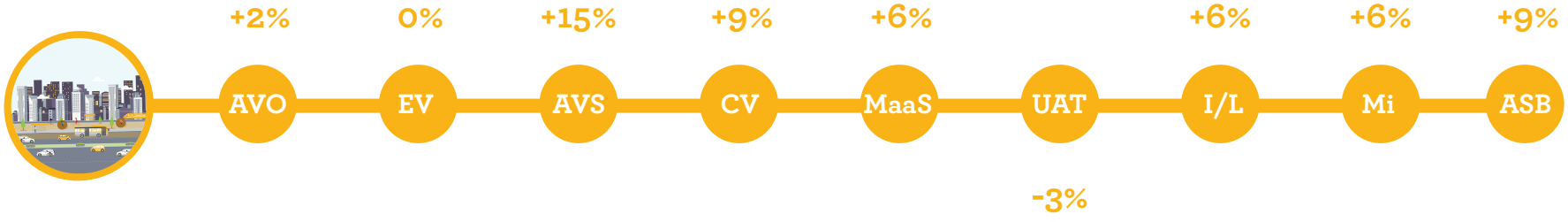
Evolution of Mobility

New transport technologies and business models will influence the way we travel in the future. We have identified nine transport technologies which we expect to materially influence car and non-car travel in the Midlands.

The table below illustrates the nine technology changes and gives an overview of the impact they would have on accessibility and demand.

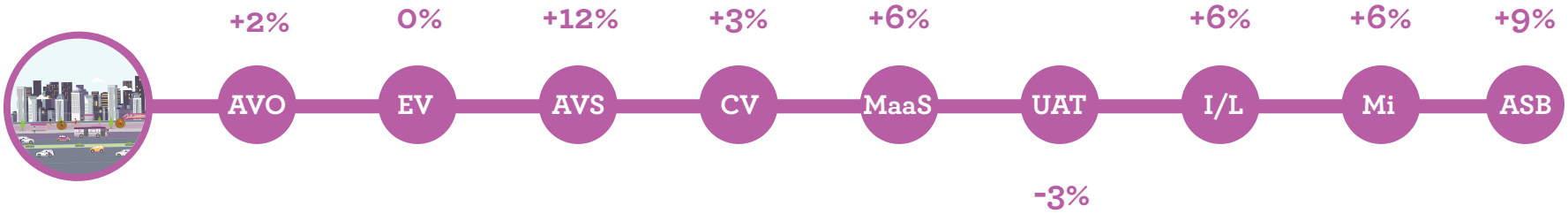
Transport Technology	Overview	Potential numbers of trips affected
Autonomous Vehicles - owned (AVO)	Transition of private vehicles to private autonomous vehicles will increase congestion due to dead running (when a vehicle travels with no occupants to get to parking/waiting a facility), however more people will have access to a privately owned vehicle therefore the net impact on demand is positive.	High
Electric Vehicles (EV)	Transition of private vehicles to electric power will reduce vehicle running costs, but these vehicles will have higher capital costs. This will result in a net zero impact on demand - but improving air quality.	High
Autonomous Vehicles - shared (AVS)	Transition to shared vehicle use, likely to increase trip demand if cheaper/more convenient than alternatives	Medium
Connected Vehicles (CV)	Connectivity added to private and public transport vehicles, likely to lead to more efficient trip routings and time savings.	High
Mobility as a Service (MaaS)	Private and public transport services priced together in a package, likely to increase demand if effectively developed and well priced	Medium
Urban air taxis (UAT)	Potential new transport mode which allows people to travel short distances within cities by air, this would be a premium service targeted at a limited market of demand.	Low
Improved first mile/last mile connections (I/L)	Improvements to last mile connectivity are likely to increase demand for non-car modes by improving accessibility. Improvements to last mile connectivity to and from public transport corridors is likely to increase demand for non-car modes by improving accessibility.	Medium
Micromobility (Mi)	Bike, scooter and small electric vehicles are likely to abstract some demand from short trips by other modes	Medium
Autonomous shared buses (ASB)	Improvements to services and potential cost reductions are likely to increase demand	Medium

The impact that these technologies will have will depend on the economic, land-use and transport policies of each of the scenarios. We have assessed the impact of each of the nine transport technologies on demand under each of the scenarios. This is based on a meta-analysis of currently available independent published evidence on the likely effects of each technology. The figures below illustrate the estimated impact of each of the new technologies on travel demand. The impacts estimated for each of these scenarios have been fed into our modelling framework, alongside the other change levers.



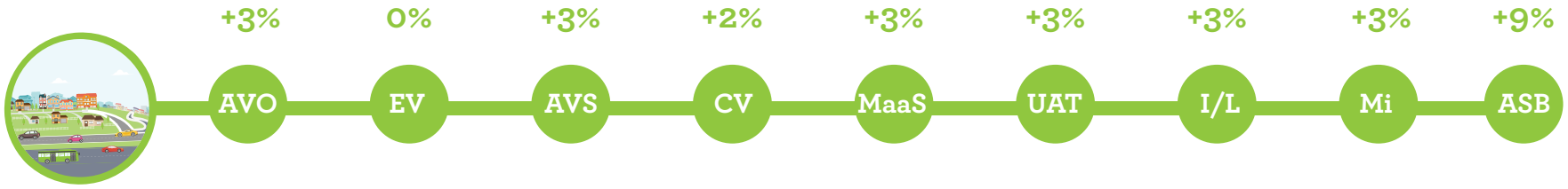
Scenario 1: Busy Cities

Urban peak congestion and road pricing encourages more efficient road travel in shared autonomous vehicles. Density of travel demand maximises the benefits of all shared mobility.



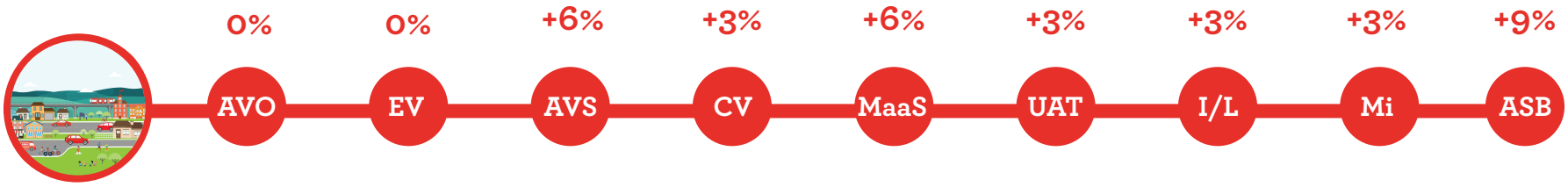
Scenario 2: Time-rich Urbanites

Urban travel suited well to shared autonomous vehicles and other shared mobility; but overall impact lower than Scenario 1 because of more flexible travel times and lower peak demand.



Scenario 3: Rural Renaissance

Distributed rural demand and rural road network limits the potential use and efficiency gains of shared autonomous vehicles and other shared mobility.



Scenario 4: Techno-towns

Moderate efficiency benefits for rural – urban trips from autonomous vehicles, last mile connections and shared mobility.

Scenario 1:

Busy Cities

Investment in urban services encourages city-living with an emphasis on walking, cycling and public transport. Traditional models of business and industry continue, with an abundance of work available to all.

Home and workplace

Fully supported urban living results in higher urban migration and development, leading to more people living, working and travelling within the cities.

Transport infrastructure

Increased pressure on transport services within urban areas. Demand management promotes the use of public transport over car trips. Mode shift to public transport and active travel.

Commuting patterns

Higher employment levels leading to increases in commuting journeys during the peak.
A decrease in off peak trips where society has less leisure time

How We Get Here

- Strong employment law and regulation of technology to ensure a well utilised workforce.
- There is a socio-cultural shift towards a fairer society with opportunity for all.
- Regional planners push towards urban densification and stronger greenfield development control.
- City authorities support urban living with investment in schools, healthcare and other services, coupled with emphasis on cycling, walking and public transport, making city centres attractive to a wide variety of people and families.

Population

City Region:
5.8m ▲4%
Other:
6.1 m ▼-3%

Employment

City Region:
3.2 m ▲39%
Other:
2.2 m ▼-19%

Car Travel

Trips by car per day:
25 m ▲9%
Car vehicle trips
12 m ▼-29%

Peak Travel

Trips in peaks:
16 m ▲14%
Peak share:
46% ▲3%

▼▲ Percentage difference compared to the reference case in 2068: (daily trips for car and peak travel)

Mode shift to public transport and active modes

Demand management encourages mode shift to public transport and active modes, particularly for shorter journeys within urban areas. Within this scenario, new technologies are expected to lead to a 6% increase in car trips and a 7% increase in trips by other modes as a result of new technologies.

Where is future travel?

+33%

Trips within urban areas

-10%

Trips within the other areas

+8%

Trips between urban and other areas

More trips in the peak

Higher employment levels in established industries, with commuting mostly during the peak. This puts increased pressure on the already constrained peak time transport network.

Key implications for the Midlands Connect Strategy

- More peak trips on motorway networks approaching larger city areas.
- Potential capacity constraints on rail networks approaching cities.
- Increased pressure on Major Road Network in cities.
- Sustained growth in freight, particularly on roads, due to the protection of blue-collar industries.
- Potential congestion on networks approaching larger cities and within the cities.
- Collaborative working to ensure that MC strategy and local policies to manage the additional demand align with each other.

Scenario 2:
Time-Rich Urbanites

Investment in urban services encourages city-living with an emphasis on walking, cycling and public transport. High productivity driven by automation and innovative business models and working practices.

Home and workplace

Fully supported urban living results in higher urban migration and development, leading to more people living, working and travelling within the cities.

Transport infrastructure

Demand management encourages mode shift away from cars and onto public transport and active modes.

Commuting patterns

Shift to highly productive industries such as technology companies and start-ups within the gig economy. These companies promote flexible working and reduced working hours. This leads to a reduction in commuting travel in the peak, and an increase in leisure trips during the off-peak.

How We Get Here

- Society fully embraces technology and innovations in business practice and employment.
- Specialisation in labour markets and new working practices drives high productivity and less working hours.
- Regional planners push towards urban densification and stronger greenfield development control.
- City authorities support urban living with investment in schools, healthcare and other services, coupled with emphasis on cycling, walking and public transport, making city centres attractive to a wide variety of people and families.

Population

City Region:
6.1 m ▲8%

Other:
5.8 m ▼-7%

Employment

City Region:
2.0 m ▼-12%

Other:
1.9 m ▼-31%

Car Travel

Trips by car per day:
21 m ▼-8%

Car vehicle trips
14 m ▼-20%

Peak Travel

Trips in peaks:
11 m ▼-22%

Peak share:
38% ▼-16%

▼▲ Percentage difference compared to the reference case in 2068: (daily trips for car and peak travel)

Higher share of public transport, walking, cycling, and car sharing

Mode shift from car to public transport and active modes, as a result of demand management and investment in public transport. Within this scenario, new technologies are expected to lead to a 4% increase in car trips and a 5% increase in trips by other

Where is future travel?

+6%

Trips within urban areas

-20%

Trips within the other areas

-9%

Trips between urban and other areas

Less travel during peak times

The highly productive economy requires fewer working hours, which leads to less travel to work. In addition to this the encouragement of flexible working and shorter working hours leads to less commuting travel in the peak and more leisure travel.

Key implications for the Midlands Connect Strategy

- Less overall demand for car travel means lower investment needed on the Major and Strategic Road Networks.
- Fast intercity rail services needed to support business trips for the types of industries growing.
- Connections to airports even more important to support exports in the growing 'knowledge economies'.
- Technology plays a key role in supporting this kind of economy. Keeping up and making provision for latest technological advancements becomes necessary.
- Connections to leisure facilities, tourist spots along with the cultural heritage and experience sites become important due to people being time-rich.

Scenario 3:
Rural Renaissance

Increased rural housing is supported by investment in infrastructure connecting rural areas to economic centres. Traditional models of business and industry continue, with an abundance of work available to all.

Home and workplace

A rural renaissance leads to more people living, working and travelling outside of the cities.

Transport infrastructure

Focus on facilitating travel within, and between, rural areas, mostly by car. Modest infrastructure spend will be used to maintain the current transport infrastructure, with targeted investments as needed.

Commuting patterns

High levels of employment result in an increase in peak journeys within and between non-urban areas.

How We Get Here

- There is a socio-cultural shift towards a fairer society with opportunity for all.
- Strong employment law and regulation of technology to ensure a well utilised workforce.
- People look outside cities and towards towns and villages for a better quality of life.
- Planning authorities relax rural development controls and target infrastructure investment to provide better accessibility across the region.

Population

City Region:
5.1 m ▼-9%
Other:
6.8 m ▲8%

Employment

City Region:
2.0 m ▼-14%
Other:
3.5 m ▲28%

Car Travel

Trips by car per day:
24 m ▲5%
Car vehicle trips:
24 m ▲37%

Peak Travel

Trips in peaks:
15 m ▲7%
Peak share:
46% ▲2%

▼▲ Percentage difference compared to the reference case in 2068: (daily trips for car and peak travel)

Targeted infrastructure investments

There is growth in car trips due to the rural renaissance, and car dependency in these areas. This leads to targeted investment in transport infrastructure to accommodate this increase in demand. Within this scenario, new technologies are expected to lead to a 1% increase in car trips and a 2% increase in trips by other modes.

Where is future travel?

-15%

Trips within urban areas

+25%

Trips within the other areas

+3%

Trips between urban and other areas

Growth in Peak Trips

There is a high level of growth in peak trips between rural areas owing to the increased level of employment. There is a high level of growth in peak trips, focused on rural travel by car.

Key implications for the Midlands Connect Strategy

- Investment needed in the parts of the Major Road Network which links towns to each other and to city areas.
- Measures to link the growing towns to each other and their widening journey to work area by rail, such as the reintroduction of rural commuter railways.
- Even bigger need to support the strengthening of the strategic regional corridors such ad A46, A5 and A50/A500 which provide crucial east-west connections.
- Opportunities to explore the possibility of utilising Inland Waterways for freight movement.
- Investment in measures and technologies that can help in reducing the cost of travel such as smart ticketing across public transport and other MaaS options.

Scenario 4:
Techno-towns

Increased rural housing is supported by investment in infrastructure connecting rural areas to economic centres. High productivity driven by automation and innovative business models and working practices.

Home and workplace

A rural renaissance leads to more people living, working and travelling outside of the cities.

Transport infrastructure

There is a decrease in active travel because car reliance is high, and journeys are potentially longer distance. This will require investment to provide the necessary infrastructure.

Commuting patterns

Low levels of employment result in a reduction in peak journeys within and to/from non-urban areas. More flexible working patterns increases the amount of leisure time and subsequent leisure trips.

How We Get Here

- Society fully embraces technology and innovations in business practice and employment.
- Specialisation in labour markets and new working practices drives high productivity and less working hours.
- People look outside cities and towards towns and villages for a better quality of life.
- Planning authorities relax rural development controls and target infrastructure investment to provide better connectivity between town and city.

Population

City Region:
5.4m ▼-5%
Other:
6.5 m ▲4%

Employment

City Region:
2.0 m ▼-14%
Other:
2.1 m ▼-22%

Car Travel

Trips by car per day:
21 m ▼-7%
Car vehicle trips:
15 m ▼-14%

Peak Travel

Trips in peaks:
11 m ▼-17%
Peak share:
40% ▼-11%

▼▲ Percentage difference compared to the reference case in 2068: (daily trips for car and peak travel)

Mode shift away from car usage and new mobility options lead to more car sharing.

Investment in transport infrastructure, such as park and ride, encourages mode shift away from car. New technology including shared AVs reduces the number of car trips.

-8%

Trips within urban areas

-7%

Trips within the other areas

-7%

Trips between urban and other areas

A reduction in Peak Trips

The highly productive economy requires fewer working hours, which leads to less travel to work. In addition to this the encouragement of flexible working and shorter working hours leads to less commuting travel in the peak and more leisure travel.

Key implications for the Midlands Connect Strategy

- Investment will be required in digital infrastructure to enable future transport technologies to be available in rural areas.
- Need for investment in high quality high speed rail networks which connect towns and cities together.
- Strengthening connectivity of rural areas with airports for both passenger and freight transportation.
- Connections to leisure facilities, tourist spots along with cultural heritage and experience sites become important due to people being time-rich.
- In rural areas smart ticketing across public transport and other MaaS options will provide an improved service to customers.

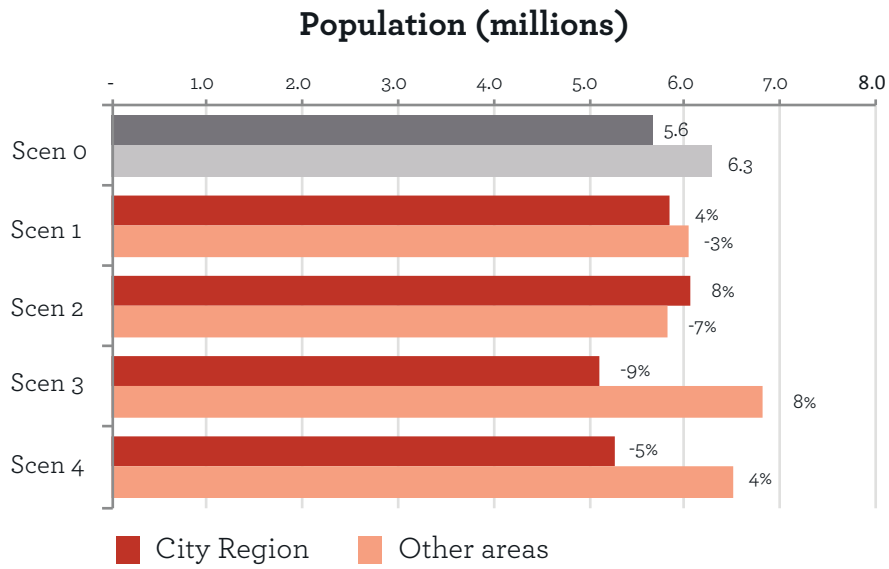
Scenario Comparison

The analysis below compares the four scenarios with the reference scenario.

This analysis shows how the impact on the transport network and regional land use will vary depending on the alternative future. The level of change from the reference case (in which the current trend continues) can be significant - varying between -30% to +40% depending on the indicator.

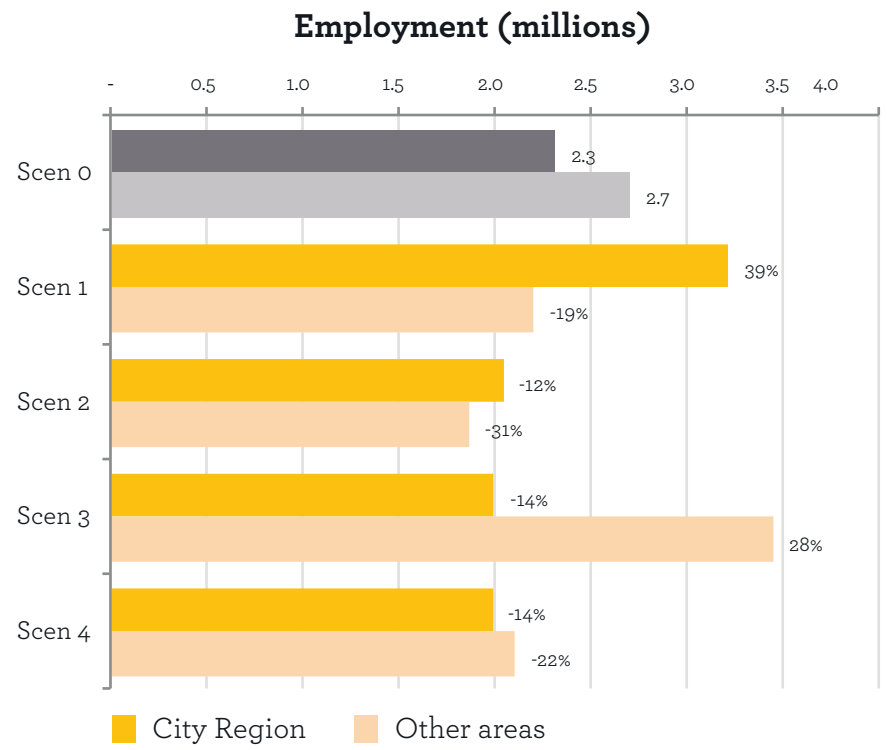
Population

- Total regional population is the same in all scenarios.
- Scenario 2 shows the largest swing to urban living.
- Scenario 3 shows the largest swing to rural living.



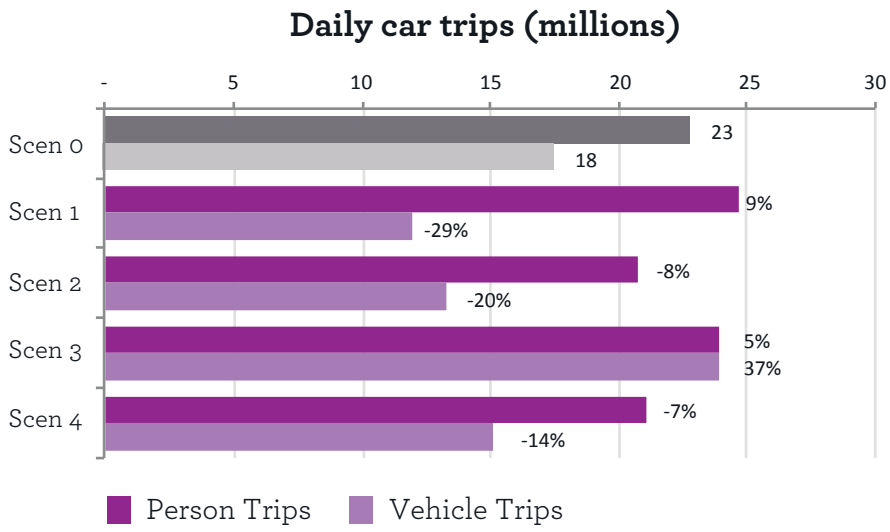
Employment

- Scenarios 2 and 4 reflect economies with high levels of productivity, but have lower full time employment than the reference scenario.
- Scenario 1 shows an increase in urban employment, whilst scenario 3 shows an increase in non-urban areas.



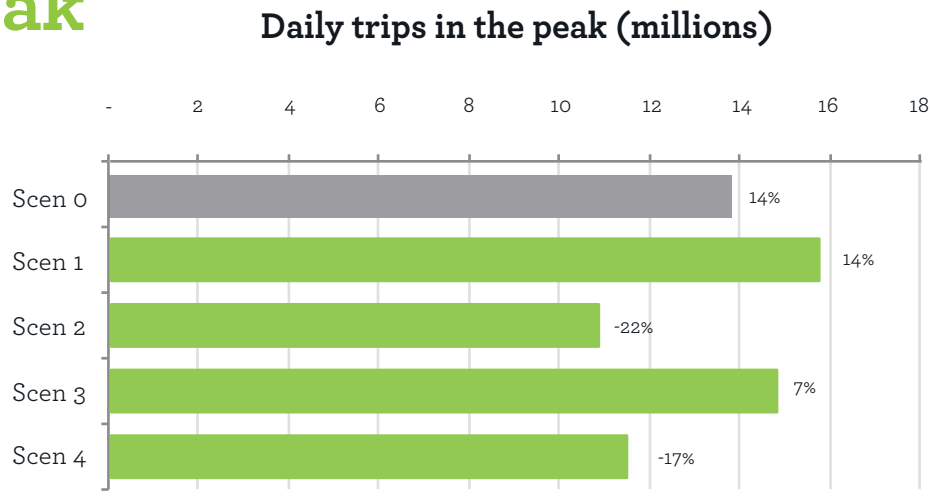
Car Trips

- The total number of trips, and specifically trips by car is expected to increase in a low productivity economy (1 and 3), and reduce in the high productivity economies (2 and 4).
- The number of vehicles on the road is expected to reduce in all scenarios apart from scenario 3 , due to an increase in car sharing, enabled by new technologies.



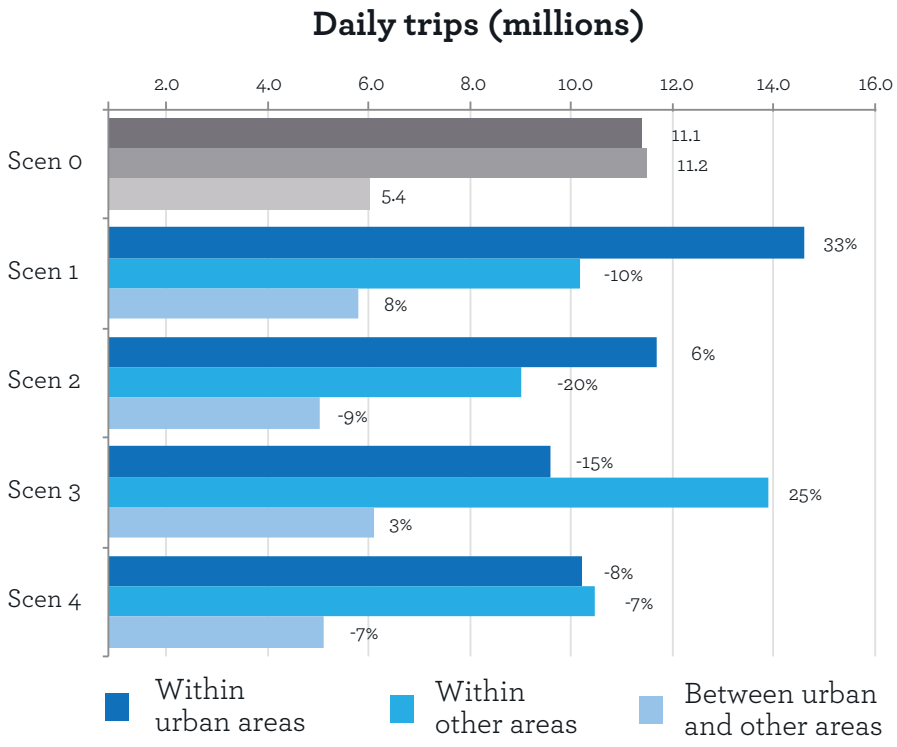
Trips in the Peak

- Scenarios 2 and 4 show a reduction in trips in the peak.
- Scenarios 1 and 3, where the economy has low productivity shows a small increase in the number of trips in the peak.



Distribution of trips

- Scenario 1 shows a large increase in the number of trips within urban areas. This will need to be supported by transport infrastructure.
- Scenario 3 shows a large increase in trips within non-urban areas. This demand should be served by the existing road capacity, however some targeted investments may be needed in key locations.
- Scenarios 2 and 4 show generally less trip making which would reduce pressure on the transport network compared to the reference scenario.



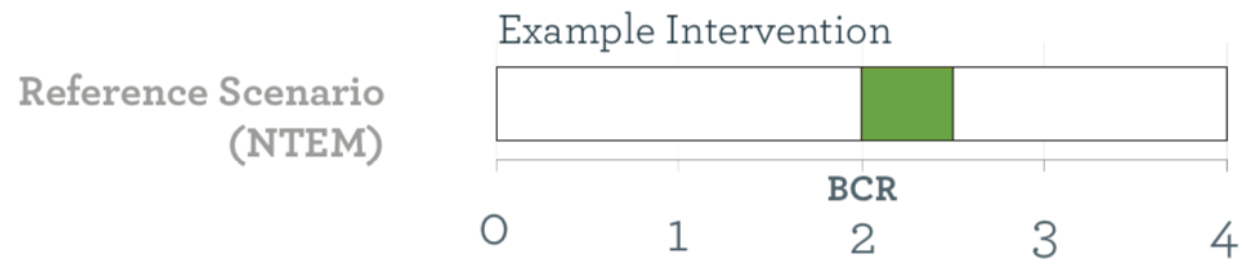
What next?

The alternative scenarios illustrate how the level and distribution of transport demand is likely to change under four plausible yet distinct versions of the future for the Midlands.

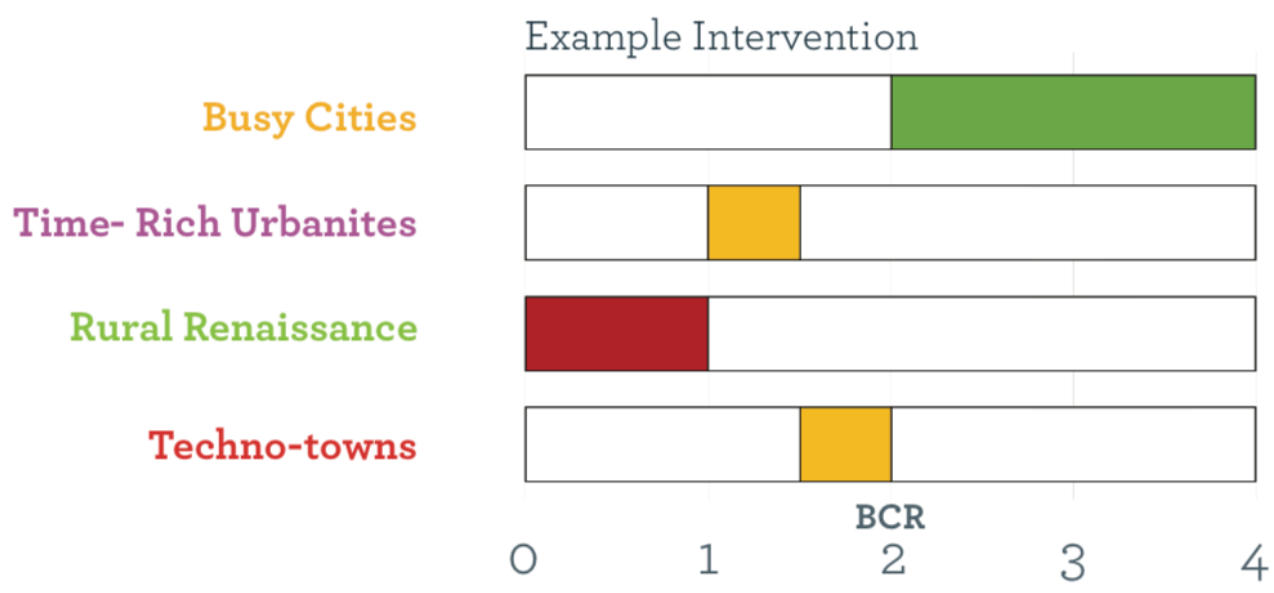
Midlands Connect will use the scenarios to test and refine its transport strategies and plans in various ways:

- To influence the debate on the future of transport in the Midlands and the types of interventions needed in different futures.
- To explore how the coming disruptive change in mobility from technology will impact on the existing transport systems in the Midlands.
- To provide guidance and benchmarks for developing assumptions for the future growth of the region.
- To design transport interventions (policies and investment) that deliver value-for-money across a broad range of future outcomes in wider society (see below).

National policy guidance previously required the value-for-money appraisal of transport interventions in a single future scenario (e.g. based on prescribed inputs such as NTEM). The example intervention below has a benefit-cost-ratio of 2.5 - indicating high value for money.



There is now a move in policy guidance towards more robust appraisal using a spectrum of alternative futures - such as we have developed for the Midlands.



In the multi-scenario appraisal, the example intervention performs poorly in three of the alternative futures - indicating that there is considerable uncertainty around achieving value-for-money and that the intervention should be rethought.

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