ANNEX C: BUS NETWORK DELIVERY MODELS

SYSTRA

IMPROVING REGIONAL BUS SERVICES

BUS MARKET REFORM: NETWORK DELIVERY MODELS

IDENTIFICATION TABLE	
Client/Project owner	England's Economic Heartland
Project	Improving Regional Bus Services
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1. EXECUTIVE SUMMARY

1.1.1 England's Economic Heartland (EEH) presents a unique challenge for bus network design. This polycentric region encompasses diverse areas – cities, bustling towns, quiet rural communities, and major business hubs – all with varying travel patterns and demands. While the region has seen investment in several high-quality corridors, overall bus usage has mirrored national trends, with a significant drop due to COVID-19 and a slow recovery hampered by reduced services and rising operational costs.

1.1.2 This report explores the key trends affecting bus demand in EEH and proposes strategic options for designing an effective and sustainable bus network, as well as utilising non-bus means to complement it.

1.2 Current Situation

- Pre-COVID Situation: The period from 2010 to 2019 saw usage growth in locally-registered bus and coach in Oxfordshire, Milton Keynes, Luton and Central Bedfordshire. This was likely driven by investment programmes in city infrastructure (such as bus stops, bus priority and Park & Ride), targeted fare reduction schemes, service publicity and busways. In more rural areas in EEH, bus usage fell as supported services funding was withdrawn by Government.
- COVID-19 Impact: The pandemic led to a significant decline in bus usage across the region, with rural areas particularly affected.
- Uneven Recovery: Recovery has been uneven, with LTAs implementing effective measures, such as marketing campaigns and fare reductions, witnessing stronger rebounds in bus usage.
- Operational Challenges: Bus operational mileage has decreased in most LTAs decreased since 2010, reflecting reductions in supported services and post-COVID rationalisations. Rising operating costs, driver shortages, and the lack of bus priority measures pose further challenges.

1.3 Our Network Review

1.3.1 The urgent need for a transformative bus and coach system in the EEH is driven by several compelling factors. First and foremost, the region's economic growth and sustainability depend on a reliable, efficient, and inclusive public transport network developed innovatively for all. Second, the increasing population and major plans for jobs and homes necessitate a shift away from private car use to reduce congestion, improve air quality, and mitigate climate change. Third, the COVID-19 pandemic has highlighted the critical role of public transport in ensuring social mobility and economic recovery for those who do not or cannot drive to work, shops or key appointments.

1.3.2 To address these challenges and build a sustainable future, we must invest in a bus and coach system that is:

- Efficient: Simple and optimised routes, frequent services, and modern vehicles to minimize travel times and improve passenger experience.
- Reliable: Punctual services, clear information, and robust infrastructure to enhance passenger confidence and satisfaction.
- Inclusive: Accessible to all, with affordable fares, accessible stops, and assistance for those with disabilities.
- Integrated: Connects smoothly with the rail network, complementing East-West Rail.
- Net zero: Transitioning to electric or hydrogen-powered vehicles and reducing operational emissions to contribute to a cleaner and greener environment.

1.3.3 By examining past trends and exploring various operating models, this report aims to provide actionable insights for policymakers and transport authorities in the region.

1.4 Recommendations

- Embrace a Hybrid Network Model: Implement a combination of ‘bus lines’ (operated by bus or coach) and urban hub-and-spoke networks, tailored to the diverse needs of the region. The proposed 'Heartbeat' network, comprising strategic bus lines connecting key destinations, offers a promising framework for enhancing regional connectivity.
- Leverage Minibuses: Strategically deploy minibuses on routes with lower demand or financial viability to optimise resource allocation and service flexibility.
- Empower Community Buses: Provide increased support and guidance to community bus services, recognizing their role in serving local communities and promoting social cohesion.
- Explore Asset-Free DRT: Consider implementing asset-free Demand Responsive Transport (DRT) solutions, leveraging ride-hailing platforms to expand service coverage, particularly in rural areas, and potentially reducing long-term costs.
- Foster Modal Integration: Enhance collaboration between LTAs and operators to ensure seamless integration of various transport modes, including rail, coach services, and active travel options, promoting multi-modal journeys and improving overall accessibility.
- Embrace Technology: Explore innovative solutions to expand service coverage, reduce costs, enhance efficiency, and use zero-emission vehicles, particularly in suburban areas.
- Autonomous Vehicles: Consider the potential of autonomous vehicles in shaping future transport networks, while also addressing the challenges associated with their integration.

1.5 Conclusion

1.5.1 A well-designed bus and coach network, developed in collaboration with communities and incorporating various operating models and emerging technologies, is key to meeting the diverse transport needs of the EEH and progressing towards net zero carbon for transport. Changing journeys from single-occupancy vehicles to a well-loaded car-share, minibus, bus or coach is a key step in this. Integrating zero-emission vehicles on viable routes and networks brings a further dramatic shift towards net-zero. By embracing innovation and adopting a proactive approach, the EEH can build a resilient and future-ready transport system that serves all its residents and supports continued growth and development.

2. BUS NETWORK DEMAND: KEY TRENDS IN ENGLAND'S ECONOMIC HEARTLAND REGION

2.1 Introduction

2.1.1 The EEH region is characterised by a wide range of population distribution patterns, incorporating rural and peri-urban areas in a poly-centric economy. The overall picture of bus demand over the last 13 years in the EEH area has closely followed the England (outside of London) situation. However, a more granular inspection reveals differences in demographic factors driving demand between different constituent parts of the EEH, as well as differences in transport policy implementation driving different trends in public transport within the region. At the most detailed level, the scale of development planned within the EEH over the next ten years is expected to drive demand that is likely to support stronger service frequencies on key routes.

2.2 Principles to assess network delivery models

2.2.1 In developing and considering the network delivery models, we have considered the four principles below, aligned with EEH's Transport Strategy Principles for the region. Table 1 below identifies outcomes that bus network design can target and methods that bus network design can use:

Four Principles	Outcomes that bus network design can target:	Methods :
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Effect modal shift, both of existing journeys and as a proportion of future journeys, so reducing emissions	1) reducing journey time 2) improving reliability 3) increasing legibility 4) greater regional connections 5) multi-modal connectivity
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Effect both modal shift and enable/ incentivise new journeys	1) reducing journey time 2) improving reliability 3) increasing connectivity 4) increasing legibility 5) safe, inclusive journeys
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Boost agglomeration effects and open- up new locations	1) reducing journey time 2) improving reliability 3) increasing connectivity 4)
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Provide strategic links with (directly or via interchange) with the rest of the UK	1) reducing journey time 2) improving reliability 3) increasing connectivity 4) on-bus

Table 1. Four Principles used to assess Network Delivery Outcomes

2.2.2 Other important methods, such as reductions in ticket pricing, extra driver training, increased car parking prices in town centres and modernisation of the bus fleet (including zero emissions vehicles) are key parts of a package of bus improvements. However, changes like this do not necessarily directly affect the bus network. (Some network route changes may be recommended with introducing zero emissions buses powered by battery, to optimise to battery efficiency and longevity, but should be considered on a case-by-case basis rather than as a strategic model).

2.3 Bus Usage Trends at the EEH regional level

2.3.1 High quality bus network corridors in various locations across England's Economic Heartland kept bus journeys in the EEH region above the annual trend for bus journeys in England's declining bus market (outside London) (see Figure 1). The investment in selected networks and services (infrastructure, fares and network operations) by several LTAs and operators kept usage levels higher than the English average up to 2019. It offset the impact of network cuts on many routes across much of the EEH region, as government subsidy for bus services reduced during the decade from 2010, particularly affecting many of rural and county areas.

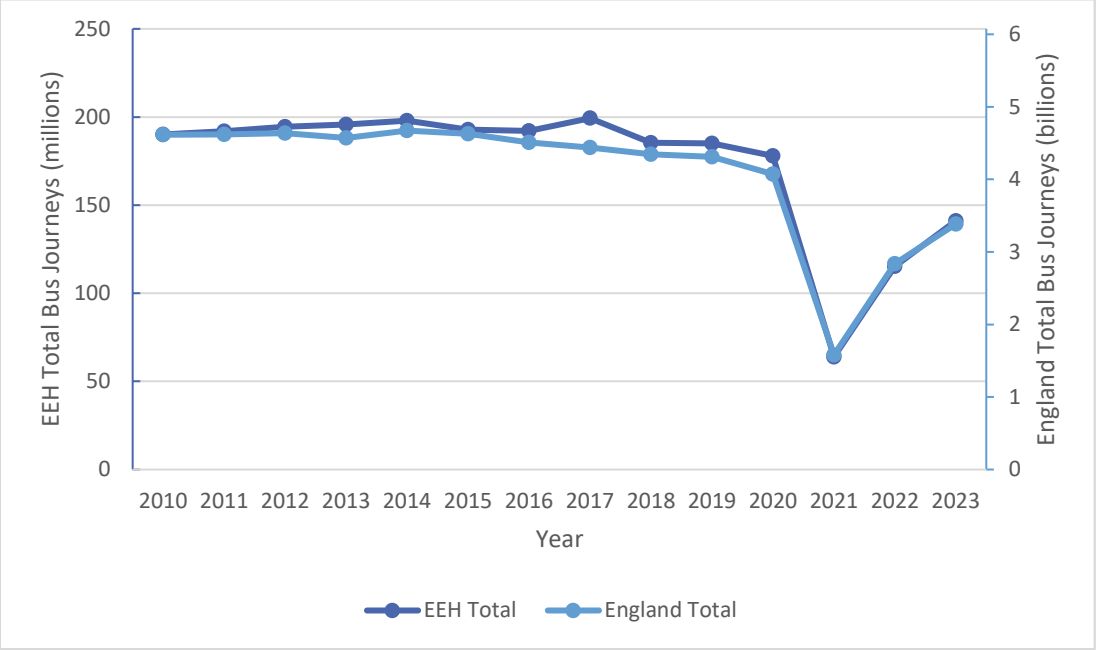

Figure 1. Total bus journeys in EEH region and England overall, from a 2010 base[1]

2.3.2 The onset of COVID-19 resulted in a substantial drop in bus usage, particularly on routes serving more rural areas in England.[2] This returned the level of bus journeys in EEH back to the wider English annual trend, which the region overall followed the England trend in bus usage through to 2023 (the latest data) – a recovery in usage, but not back to pre-COVID-19 levels, alongside continuing reductions in some rural bus services.

2.3.3 It is important to note that this data is the total of all of EEH's LTAs. LTAs within EEH have performed differently. This is discussed in the next section.

2.4 Bus Usage Trends within EEH at the LTA level

2.4.1 Breaking down the analysis of bus travel trends since 2010 by LTA[3] provides some more informative and useful information, which will be helpful in prioritising what interventions are likely to be most effective, based on current local network characteristics. Below we compare trends in different LTAs within EEH and highlight what has led to growth or decline in bus use. Because most of the growth in bus use was negated by COVID-19 and is still rebuilding, we consider the periods 2010 – 2019 (pre-COVID-19) and 2010 – 2023 separately.

Bus usage trends from 2010 to 2019 by LTA

2.4.2 This period saw growth in some areas (resulting in EEH's overall lead in bus journeys compared to England overall), as shown in Figure 2. This was through investment by some

[1] Source: DfT Bus Statistics Data Tables, set BUS01: Bus statistics data tables - GOV.UK (www.gov.uk)
[2] Source: 'The State of County Buses: Recovering Services Post-Pandemic', County Councils Network, 2023
[3] Where there has been a change in an LTA since 2010, for example Northamptonshire, full data for the whole period in an area has sometimes not been available. This is made clear on graphs later in this document.

LTAs and operators in new bus and coach routes on popular services and Park & Ride, bus priority, driving disincentives, fares incentives and busways.

- Oxfordshire saw bus use grow as new high-quality bus services were established linking Oxford with London, Heathrow and Gatwick Airport, other regional towns and cities and on key corridors in Oxford itself, including the long-established Park & Ride service. Oxford continued measures to improve walking and cycling in the city and encourage people not to use cars to travel into the city centre.

- Milton Keynes saw ridership grow on the town's network as fares were reduced during a scheme early in the decade. Although fares were subsequently increased, ridership remained bolstered by this.

- Luton and Central Bedfordshire saw usage grow through use of the Luton – Dunstable Guided Busway. Non-busway routes in Luton did not see usage grow during the period, except for links to Luton Airport. In Central Bedfordshire, Leighton Buzzard retained a strong town network.

- Cambridgeshire and Peterborough – also the location of a guided busway – had relatively lower funding than some LTAs and a substantially larger rural area to serve away from the busway compared to Luton. Bus use (in passenger miles) fell in areas with a substantial supported bus network across EEH, as councils were less able to fund services.

Bus usage trends from 2010 to 2023 by LTA

2.4.3 COVID-19 triggered a substantial decline in usage of bus services in England and EEH, as people travelled less.[4] This is shown in Figure 3. However, those LTAs that have been able to deploy an effective package of further measures via various government grants are experiencing a recovery in bus usage. The strongest recoveries focus more on areas of urban or peri-urban growth, supported by strong and innovative marketing campaigns.

- Oxford has led a recovery by growth the inter-urban and airport bus and coach network, integrating bus into the net zero objectives by making Oxford city's bus network a zero-emission one and launching a multi-operator pass.

- Luton has led a marketing campaign on its bus network, reduced fares to lower than the national level, has launched new evening supported services on existing routes and is also funding 4,800 extra journeys to kick-start higher frequencies. As many of the routes serve Central Bedfordshire, this has had a positive impact on bus usage there. Growth in Luton Airport is also supporting wider growth.

- Central Bedfordshire has benefitted from the marketing on the Luton network and seeing growth return on the Luton – Dunstable Busway.

2.4.4 Areas that have seen reductions in use compared to the English average are those without substantial bus priority or busways, with greater percentages of elderly residents (who have been slow to return to using buses since COVID-19), with large levels of relatively inexpensive parking in towns and/or without the budget for substantial marketing measures.

Growth in EEH (including recovery from COVID-19) has focused on areas that have provided financial support to reduce fares, invested in bus priority in their towns, brought forward major schemes to transform connections (such as busways and longer-distance bus lines) and transformed the infrastructure to bring awareness, trust and pride for the bus.

[4] Source: 'The State of County Buses: Recovering Services Post-Pandemic', County Councils Network, 2023

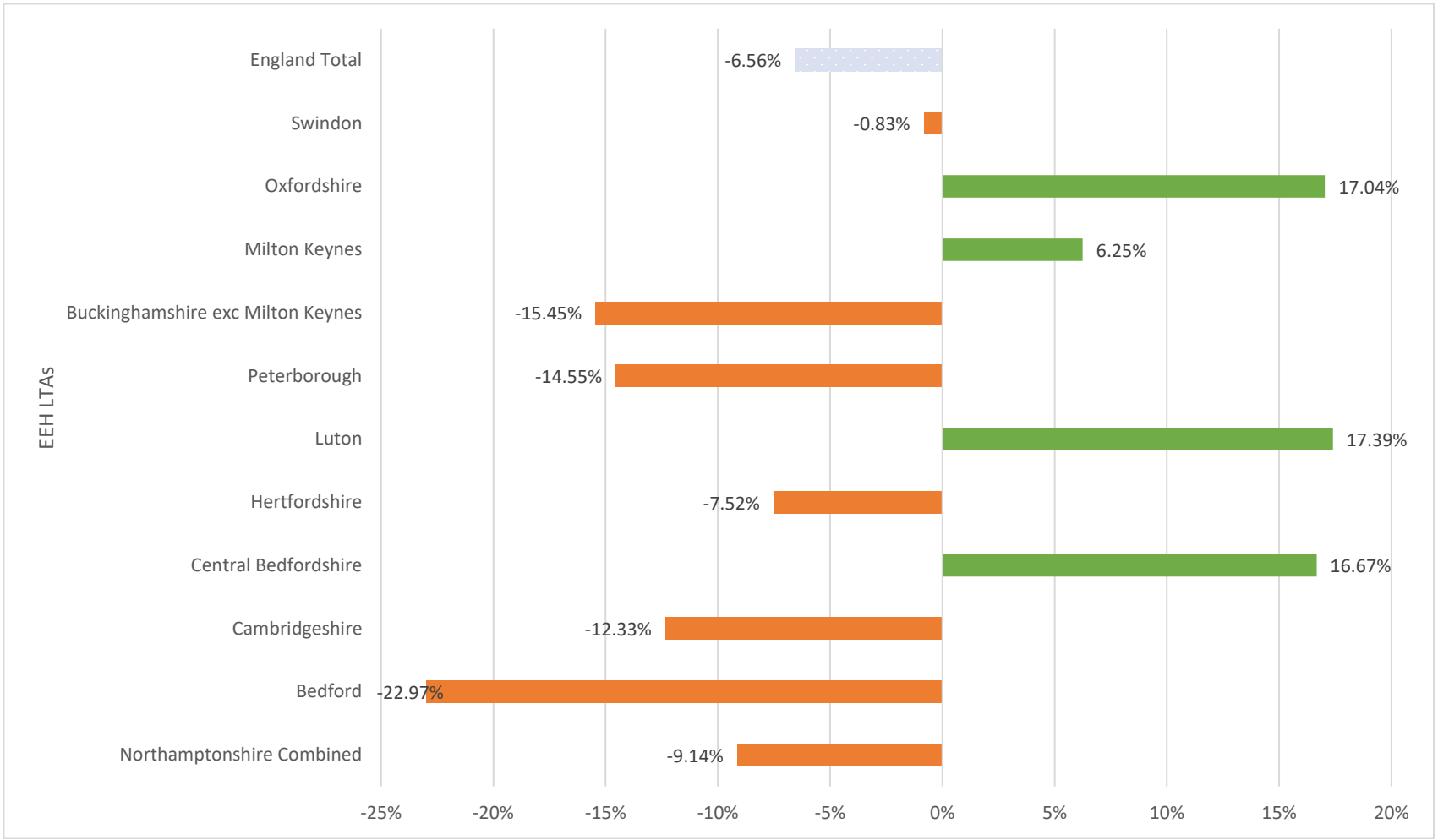

Figure 2. Percentage of Local Bus Passenger Journeys (millions) in 2019 Compared to 2010 Level in EEH Counties or LAs

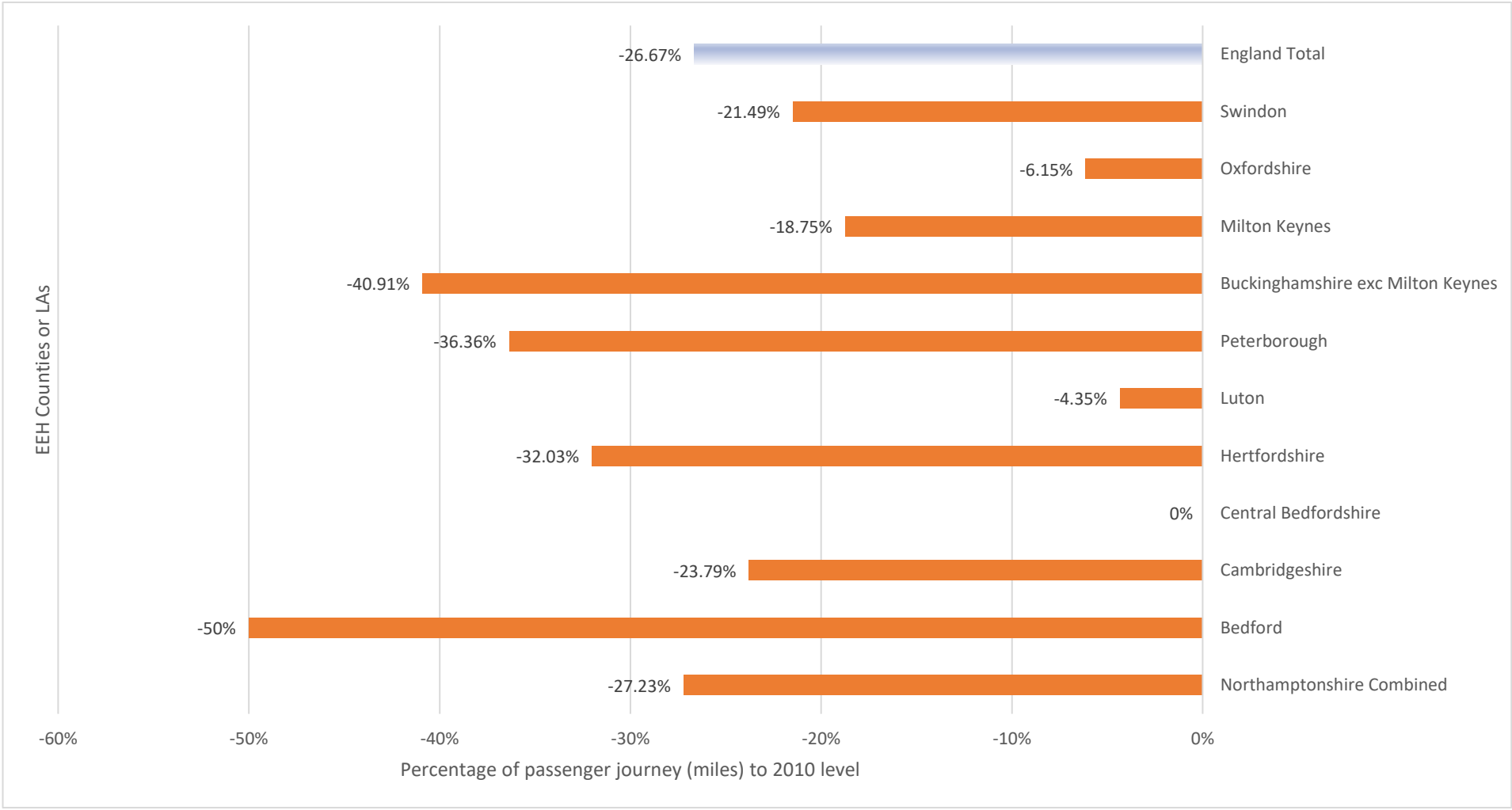

Figure 3. Percentage of Local Bus Passenger Journeys (millions) in 2023 Compared to 2010 Level in EEH Counties or LAs

Bus operational mileage trends from 2010 by LTA

2.4.5 In 2019 (figure 4), most areas in EEH had seen reductions in bus operational mileage compared to 2010. In most places, this was because of reduction in supported services resulting in a reduction in service levels.

2.4.6 In Luton, this also involved mileage reducing through a rationalisation of bus routes as the Luton busway opened, while in Central Bedfordshire the Luton busway had resulted in a growth in bus mileage in the authority and a greater number of buses serving Luton from outside Luton borough.

2.4.7 By 2023 (figure 5), there had been a continuation in the LTAs' trend in reductions in bus operational mileage compared to 2010, often reflective of bus service rationalisations post-COVID. In Milton Keynes, a policy of withdrawal of supported services and replacement by the MK Connect demand responsive transport service resulted in a significant fall in local bus operating mileage in the city in 2021.[5]

2.4.8 In Buckinghamshire, bus operational mileage technically increased by 2023 compared to 2010. This is probably because Wycombe Coachway became a new stop for some coach services registered as local bus services, including the Airline coach services between Oxford and Heathrow and Gatwick airports (in 2021) and the Oxford Tube coach service (in 2023). The increase in operational mileage from these regular coach services (that stop in Buckinghamshire) has made a substantial difference to the total bus mileage in this rural county.

2.4.9 Bus operational mileage in Swindon increased as services on some longer-distance routes, notably the S6 between Swindon and Oxford, increased. Although some services in Swindon reduced in frequency post-COVID, the increase in frequency on the S6 bus has been retained and means Swindon has a higher operational mileage in 2023 compared to 2010.

2.4.10 Bus operational mileage in Bedford increased from 2010 to 2019 as services grew on links between the town, Luton, London Luton Airport and Milton Keynes. However, bus mileage in Bedford has reduced by 2023 compared to 2019.

Since 2010, the rural bus network has declined substantially in terms of network and frequency, reflected by much of the mileage data. Growth has focused more on the routes that have had specific investment over recent years – such as busways and buslines – and consequent new infrastructure.

This should not be taken out of context of the growth in operating costs in recent years, both in terms of fuel and other materials, but also the narrowing staffing pool, with a growth in retirement of an ageing workforce, a loss in number of workers from overseas and a lower wage offer by many operators, compared to logistics and/or other employment options in many areas.

[5] Milton Keynes launches new DRT service - CBW (cbwmagazine.com)

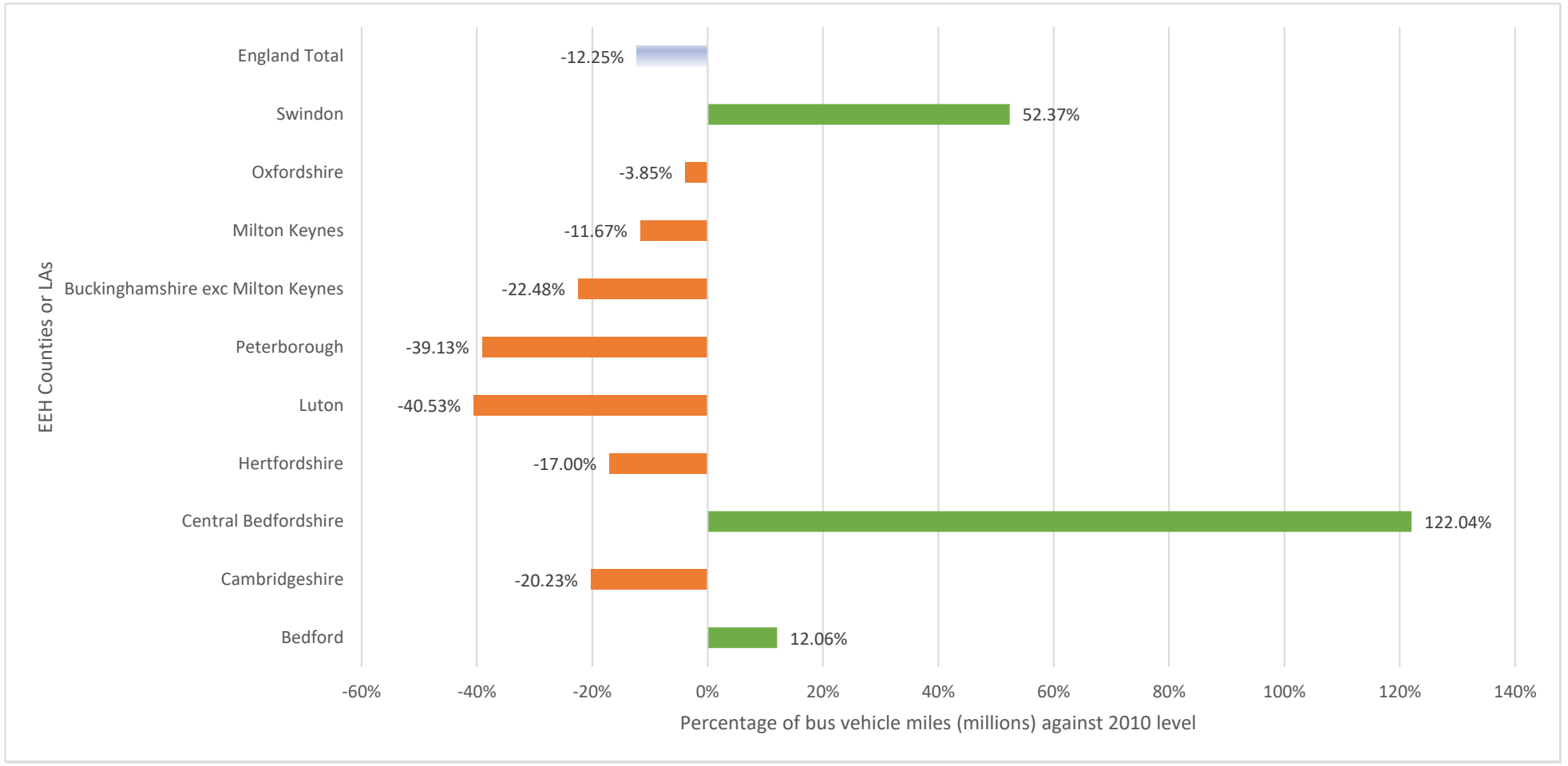

Figure 4. Percentage of Bus Vehicle Miles (millions) in 2019 Compared to 2010 Level in EEH LTAs (Northamptonshire councils were restructured so are not comparable)

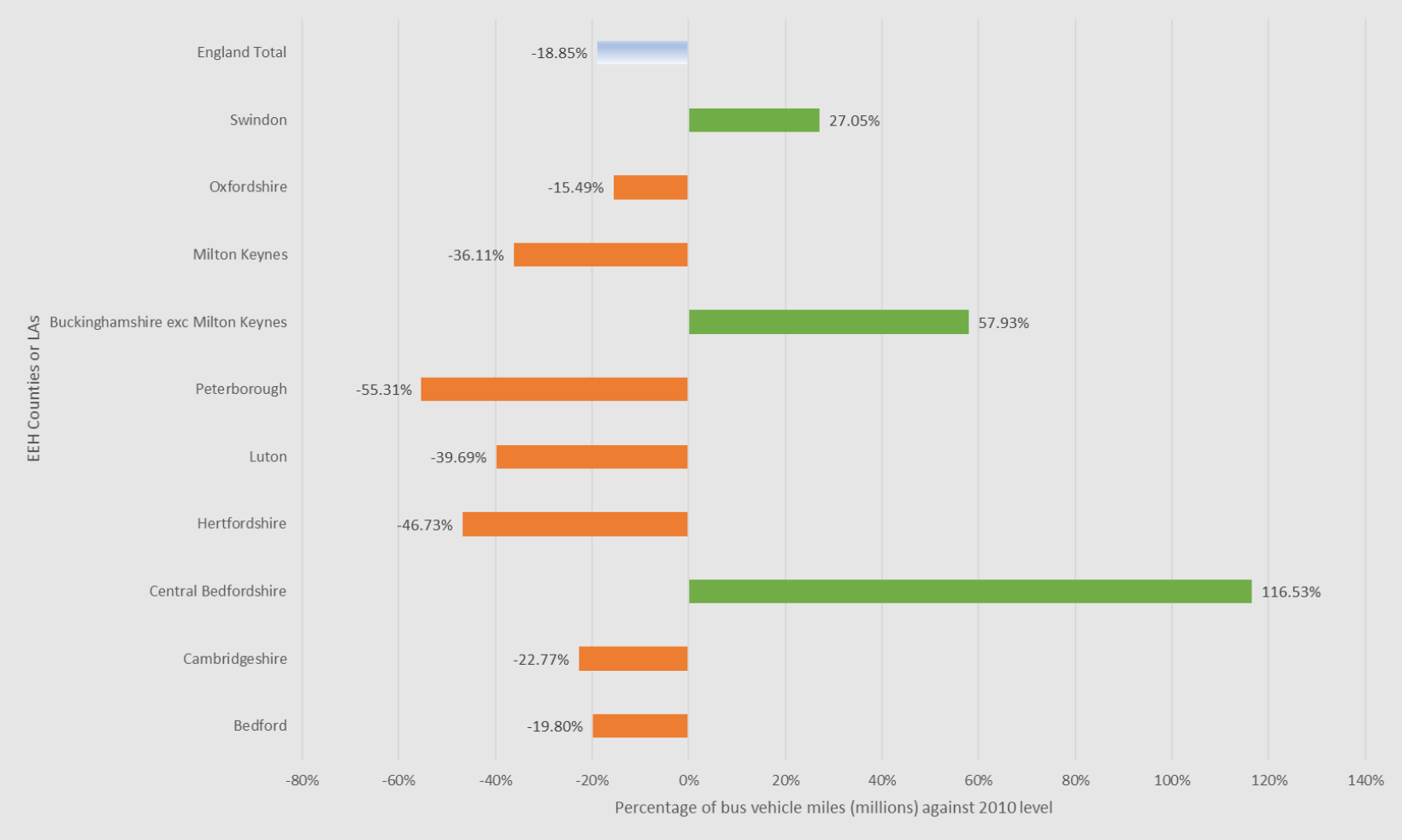

Figure 5. Percentage of Bus Vehicle Miles (millions) in 2023 Compared to 2010 Level in EEH LTAs (Northamptonshire councils were restructured so are not comparable)

2.1 Summary of the Current Situation

2.1.1 Overall, bus use has recovered in EEH where there has been a consolidation of routes towards some key areas (for example the network in Oxford) or on particular routes (in the case of the Luton-Dunstable busway). Because of the consolidation of routes, there has sometimes paradoxically been a drop in bus mileage in these areas. This suggests that the most financially viable investment may be towards services in larger settlements, on bus/coach lines or busways between key towns and Park & Ride.

2.1.2 However, this leaves a substantial area of EEH, including out-of-town business parks, smaller settlements and market towns, without a good bus connection. Larger towns in the EEH region that are yet to consider increasing the cost of long-stay parking or disincentivise long-term parking provision or provide bus priority measures are also likely to lose both bus services and bus use. An LTA needs to make bus and coach use more financially attractive, more reliable and convenient than using the car for an overall door-to-door journey to gain passengers and attract people away from single-occupancy car use.

2.1.3 In the longer term, bus and related measures may be supported by other schemes, including innovative non-bus measures to address people's desire to travel less post-COVID, as well as the new rail network in the region and active travel. Options for these are discussed further in subsequent chapters.

3. NETWORK DESIGN OPTIONS

3.1 Introduction

3.1.1 Given the issues uncovered in the review of regional and LTA bus data, this section reviews possible bus operating models for the region and its LTA, to consider what is most affordable and most feasible, to support better regional public transport connectivity and long term strategy for bus and coach services. .

3.2 Point-to-Point

What is a Point-to-Point Network?

3.2.1 A point-to-point network provides a single service, without interchange, from a point at-or-near the user's location of origin to a point at-or-near their destination. This can be achieved with either a very large number of short, direct services (more reliable as a network), or by long routes that travel via a number of detours.

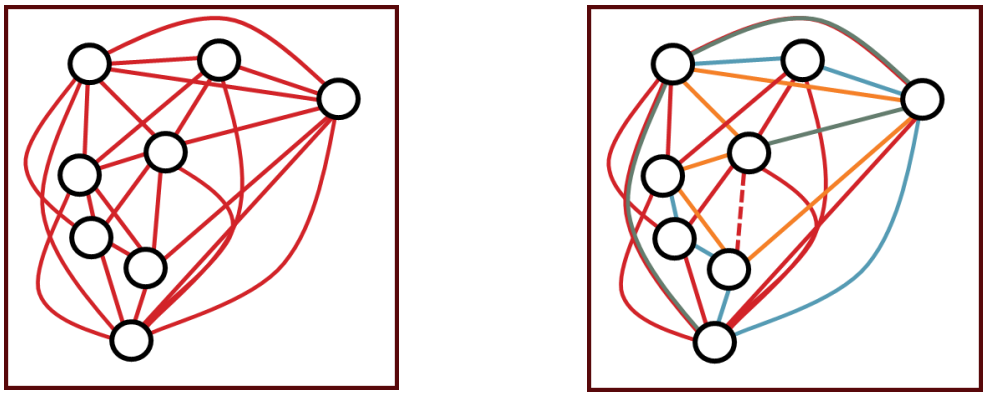

Figure 6. Point-to-point network by multiple short routes (A, all red) vs longer, stopping indirect routes (B)

3.2.2 From the point of view of a user, either is an optimal level of bus network connectivity, but it requires significant revenue and/or subsidy to operate and an example of such a network is absent from EEH. However, a point-to-point network can be used as a conceptual 'baseline'

for comparison with the outputs (positive and negative) of other approaches (or combinations of approaches), so it is included here.

Is a Point-to-Point Network aligned with EEH's Transport Strategy Principles?

3.2.3 The table below outlines how well a point-to-point network aligns with EEH's transport strategy principles.

Four Principles	Point-to-point network outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Offering a point-to-point network will effect modal shift if well implemented, through the choice of connections offered and relatively good journey times (due to no interchange penalties). However, this will involve operating the highest mileage bus network and in parts of EEH bus services are likely to operate with diesel buses for some time, although diesel buses are still more sustainable than car journeys.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	If complemented with good driver training, point-to-point networks can provide an excellent improvement to user quality of life and inclusion. This is due to their intended high coverage and simplicity, although due to the high coverage they do not encourage the use of active modes.	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	A point-to-point network supports the regional economy by providing optimal connections to bus users and potential bus users.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	A point-to-point network provides connections with and some services outside of the region at multiple locations.	

Table 2. Point-to-Point Services

What are the Key Success Factors for Point-to-Point Implementation?

3.2.4 The point-to-point network drives demand through offering direct services between origin and destination; how useful the service is to residents, and therefore how effectively it drives demand depends on the actual total journey time, including on-bus and wait time. Short, direct services will be very effective at driving demand: the closer a network is to A in Figure 6, the more effective the network will be in increasing passenger demand.

3.2.5 As interchange is not facilitated under point-to-point networks, to sustain low total journey time services must operate at high frequency. Short routes, providing broad coverage across the region at high frequency will require a very large number of vehicles. If high frequency services cannot be provided, marketing and schedule awareness needs to receive substantial investment, so users can plan ahead to catch a bus service, which must operate very reliably.

To What Extent is Point-to-Point Appropriate for the EEH Region?

3.2.6 The costs involved in covering a large fleet of vehicles would need to be met through passenger revenue, subsidy or, more likely, a combination of the two. However, the low population density in much of the EEH region means that even if a high frequency, convenient point-to-point network was provided, the increase in demand is in many places unlikely to contribute significantly to the high cost of operating such a network. Most large British cities are not densely-populated enough to create demand to cover point-to-point services.

A point-to-point bus network is not appropriate for a region with relatively small towns and cities and large rural, low-density populations. However, the consideration of how to compete with car by considering the full journey is an important consideration when attempting to effect modal shift. How other approaches pick up key parts of the point-to-point network in terms of connectivity, while potentially providing lower costs and emissions, is important to consider below.

3.3 Hub-and-Spoke

What is a Hub-and-Spoke Network?

3.3.1 A hub-and-spoke network design identifies a central location then links all other points directly to this (and often only this) location.

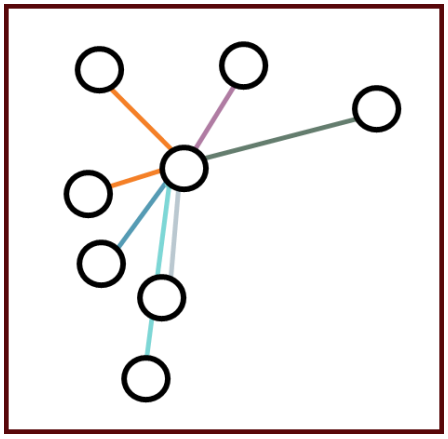

Figure 7. Hub-and-Spoke network concept

3.3.2 Compared with the point-to-point network serving the same locations in Figure 6, the hub-and-spoke network in Figure 7 contains two thirds fewer links, with an even smaller proportion of miles of network. As a result, all other things being equal, this network could be served at three times the frequency of the networks shown in Figure 6, for the same cost. Although the savings in route kilometres (a reasonable proxy for cost) vary depending on the extent of the point-to-point network it is compared to, hub-and-spoke will always be a simpler, and therefore significantly smaller network, offering the opportunity for significantly higher frequency services for a similar cost. However, hub-and-spoke will require travel to a central point to interchange for onward travel, reducing direct links for people.

3.3.3 A hub and spoke network for local bus services has evolved successfully in many larger towns and cities in EEH, although usage levels and viability were hit post COVID. Local bus growth grew in Oxford from 2010 to 2019, as links in the city and to key regional destinations were refined, while overall bus mileage has fallen across Oxfordshire. Aylesbury developed a well-used hub and spoke network pre-COVID, supported by the close proximity of the bus station to the town centre and easy interchange. In general, successful hub and spoke networks, along with LTA policies and quality bus infrastructure, supported the relatively strong rebound

in bus usage on radial urban routes, in towns such as Luton, Oxford and Cambridge, while elsewhere in rural EEH bus mileage reduced.

Is a Hub-and-Spoke Network aligned with EEH's Transport Strategy Principles?

3.3.4 Table 3 outlines how well a hub-and-spoke network aligns with EEH's transport strategy principles.

Four Principles	Hub and spoke network outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Offering a hub-and-spoke network will effect modal shift if well implemented, although 'orbital' journeys in towns and longer cross-country journeys may not be addressed. However, providing a successful hub-and-spoke network will likely shift the highest number of car journeys (particularly stop-start high emission journeys in urban areas) onto bus.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Quality of life improves for travellers on 'radial' routes, to town and city centres and other hubs. However, residents in towns and cities that repurpose their network to a hub and spoke one report dissatisfaction with users who relied on orbital or cross-town journeys on their previous local bus route, as well as short-term confusion as new routes are found.	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	A hub-and-spoke network will improve good connections to hubs such as town centres, although reduce connections to other centres, schools and local facilities outside of the 'hub'. Hospitals also lose direct links in this type of network, although larger hospitals often become a secondary 'hub' for an area.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	A hub-and-spoke network provides more efficient movement of people on what are generally the busiest regional routes (radial routes in urban areas)	

Table 3. Hub-and-Spoke Services

What are the Key Success Factors for Hub-and-Spoke Implementation?

3.3.5 A hub-and-spoke network relies on there being a small number of key destinations (for example city centres or regional hospitals) that can serve as a focus-point for a radial network. The radial network is successful if its market provides a basis to fund high-frequency bus services on routes that are clear (with extensive bus priority), which attract passengers away from car use and establish a preference for bus use at new developments.

3.3.6 Improvements to hub interchanges are essential in hub-and-spoke implementation. In general, bus users prefer one journey and to avoid interchanging at all possible, both in terms of cost (not wishing to pay more than one fare on a journey) and comfort or convenience (not

wishing to leave a seat). To overcome this when offering a hub-and-spoke network, multi-operator travel passes should be provided to lower the cost of a journey with interchange, and clear, secure, inclusive and pleasant interchange facilities should be provided. Where possible, the schedules of key routes should be planned so that a minimum amount of interchange waiting time at the hub is necessary for major cross-region flows of passengers.

3.3.7 Redesigning a town or city bus network to a more hub-and-spoke model requires forward planning and an extensive marketing and awareness campaign, to ensure that changes in bus services are understood and bed down quickly, not driving users away from bus services.

To What Extent is Hub-and-Spoke Appropriate for the EEH Region?

3.3.8 The EEH Region is multi-centred, with significant demand for travel between the major towns and cities and across the more rural areas, not just from the suburbs of locations such as Luton, Milton Keynes, Oxford and Cambridge into their centres. Some single towns and cities have successful local hub-and-spoke networks. However, a single hub-and-spoke model focussing on links only into one, two, or even three or four major town centres would still fail to provide the connectivity across the region on crucial links where rail services are not provided.

A hub and spoke network is relevant for some urban areas in the region, although the 'pure' hub and spoke in the illustration above largely exists at a conceptual level. They are good models where there are clear locations that focus as the main destination for travellers. It needs to be considered that hub and spoke networks by their very nature rely on their being sufficient space in 'hubs' for bus stops and bus lay-over locations, to allow for driver recovery and change-over, in locations of higher land value (for example town centres).

3.4 Heartbeat: Bus and Coach Lines

What is a bus line?

3.4.1 The path a bus takes is usually referred to as a route. Bus routes can often be complex, especially in suburban areas or in rural areas with limited levels of services. An alternative to serving a large number of areas with lower levels of often-indirect service is to use a greater number of 'bus lines'. A 'bus line' is a strategic bus or coach service that connect towns and cities as a strong frequency. These may have limited stops, perhaps acting closer to a train or tram line than a traditional local bus, and connect cities, towns, key interchanges and mobility hubs, from which easy onward connectivity into local area by local buses, DRT, community transport, walking, cycling and 'kiss and ride' is provided.

3.4.2 A regional 'bus lines' approach, considering the offer or rail and links to mobility hubs (including upgraded stops) to provide efficient links to local or rural connections via multimodal trips, including 'mini park and ride' locations, is something that the 'Heartbeat' bus network we have proposed addresses, as outlined in Figure 8 overleaf.

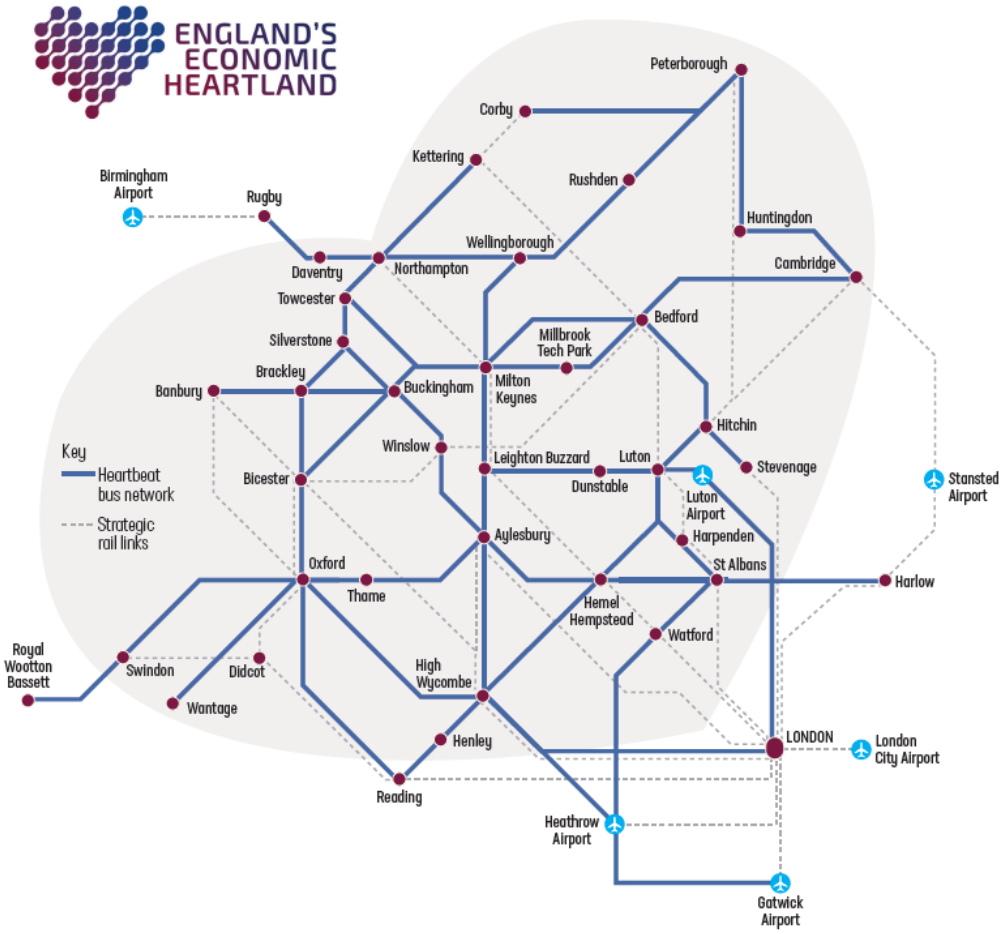

Figure 8. The conceptual 'Heartbeat' network of EEH bus and coach lines

3.4.3 The Heartbeat network builds on a number of regional bus and coach links in EEH, aiming for their expansion and their frequency to increase, using improvements to buses and infrastructure (including mobility hubs and other stops) to make using the network easy, welcoming and enjoyable.

Is a Bus Lines Network aligned with EEH's Transport Strategy Principles?

3.4.4 Table 4 below outlines how well a bus lines network aligns with EEH's transport strategy principles.

Four Principles	Bus lines network outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Offering a bus lines network will effect modal shift if well implemented, switching longer journeys to bus services as well as attracting new users near bus line stops in towns and cities. Focus on a premium-type network (more likely to attract car users) will allow investment into lower emission buses on these routes.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Quality of life improves for travellers on the routes, who wish to travel to the destinations provided. However, residents elsewhere will depend on being able to connect easily with stops on the network.	

Supporting the regional economy by connecting people and businesses to markets and opportunities.	A bus lines network will improve good connections between hubs such as town centres, as well as links to elsewhere in the country previously served by irregular or slow buses.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	A bus lines network provides more efficient movement of people on what are generally the busiest regional routes (key radial routes in urban areas) as well as core connections around the region and beyond.	

Table 4. Bus Lines

What are the Key Success Factors for Bus Lines Implementation?

3.4.5 A Heartbeat network service relies on there being a substantial market at the start and end of the service and there being significant origins and destinations along the route. A service, whether from Peterborough to Northampton, Oxford to Gatwick Airport, or on one of the region's busways, will require attractive bus stops in suburbs and also rural mobility hubs to stop at, in or near key destinations or 'draws'. Compared to local bus services the frequency and location of stops will of an 'express' nature. Modern buses, with the ability to accelerate rapidly using a zero-emission system, will help reduce the time lost to stopping at bus stops and mobility hubs.

3.4.6 For suburban or rural connections, passenger success depends on the bus line service being reliable, regular, direct and high-quality enough to persuade customers that travelling to the boarding point (which may not be in the direction of the destination) is worthwhile, because the service is high enough quality. The journey time must be comparable to other modes and will require investment in bus priority. There must be easy and inclusive access to the stops on the route, with a wide choice of onward travel options (in the case of buses, onward local travel should be incorporated into the one fare).

To What Extent is Bus Lines Appropriate for the EEH Region?

3.4.7 This is appropriate for a pan-regional network and longer-distance services within individual counties and LTAs. It will need to integrate with other measures for local connections (such as a hub and spoke local network, DRT and Community Transport). Mobility hubs (discussed later) are probably key for many stopping locations on bus lines. LTAs that have complemented bus lines with upgraded bus stops, providing information and a corporate style showing LTA 'buy-in' to bus improvements (as with many cities in EEH) are likely to be successful.

The Heartbeat approach is relevant for growing core radial routes in urban areas as well as providing links around the countryside, although a mobility hub approach to rural interchange is likely to be needed to mitigate the limited number of interchange sites. The network should be planned so that interchange between routes is easy and well-timed at hubs and terminals, to allow optimal links across the network.

3.5 Demand Responsive Transport (DRT)

What is a DRT?

3.5.1 Demand Responsive Transport (DRT) is a service that increases accessibility by providing on-demand services from at or near a user's journey origin to at or near their journey (or journey

stage) destination. There are many different forms of DRT, both in booking, operating and charging, which is discussed below.

3.5.2 In past years, DRT has been provided in the form of 'dial a ride' services pre-booked in advance by telephone. More recently a DRT scheme incorporates mobile phone apps, promising much quicker booking and shorter waiting times. Most DRT schemes, such as Milton Keynes - MK Connect, North Hertfordshire- HertsLynx, West Huntingdonshire -Ting, Village Connect - Aylesbury and High Wycombe - PickMeUp, have retained a telephone option.

3.5.3 DRT schemes vary on whether they integrate with local bus ticketing (for example, whether the English National Concessionary Travel Scheme ticket scheme is valid on DRT or whether local multi-ticketing scheme are valid). In EEH, there has recently been a move to level DRT fare structures with those of local bus services and allow ENCTS at hours of operation. This has benefitted customers but increased the operating cost to LTAs of DRT.

3.5.4 DRT schemes normally require subsidy (as with supported bus services in an LTA) and are therefore run by either under contract to a local authority or a corporate sponsor (such as an airport or business park developer). In areas not covered by franchising (where the LTA regulates operations), under law neither DRT services nor supported bus services should not be implemented so to threaten the market of commercial bus routes.

Types of digital DRT

3.5.5 DRT schemes using a mobile phone app and providing a branded service involve agreements between at least three parties: the LTA or sponsor, the digital app software provider, operator or operators of the DRT vehicles (a holder of a Public Service Vehicle licence or Private Hire Vehicle licence, depending on the LTA's requirements) and occasionally a company providing extra advice and back-office support.

3.5.6 Conventional digital DRT schemes have often been 'won' and 'led' by the digital app software provider (such as Via or ioki), which has taken over arranging operation and driver training with the provider of the vehicles, owns the data on passenger demand and agrees a branding strategy with the LTA. This conventional, 'vertical' approach, with both the software and the transport provision being offered by the digital DRT tender winner, was the initial approach to digital DRT. It provides a complete outsource of the process, which is convenient to resource-stretched LTAs, but does not necessarily provide the lowest cost.

3.5.7 Other approaches to digital DRT are now considered, differentiating from this:

- **Asset-free DRT:** Uses ride-hailing apps (e.g. Uber and Lyft) as complete DRT solutions. The software permits shared minicab rides to be discounted, for example using virtual vouchers, and can include subsidies to reduce costs to users who would receive a discounted or free bus ride. Some apps on the market can offer the ride more widely, across local minicab operators, Community Transport providers, NHS non-emergency transport or even bus operators.
- **Elastic DRT:** Integrating ride-hailing with stand-alone (conventional) DRT operators. This allows ride-hailing to activate a minicab offer when conventional DRT operations are ended (for example at night or on Sundays).
- **Flexibly-routed bus routes:** Buses run to timetable but can deviate from a route within defined distance parameters and potentially with a premium journey fee. Performs best when associated with a booking application.
- **DRT and delivery:** Working with a parcel firm or other delivery supplier (such as Amazon), the DRT service also carries parcels (as with Royal Mail Postbuses in the past). The passenger journey would need to be prioritised over the parcel destination, under UK law. This is untried as a method, but software to operate the system is possible, and can reduce the subsidy required for rural DRT. The DfT has expressed an interest to SYSTRA in developing this type of method further in future.

Is a DRT aligned with EEH's Transport Strategy Principles?

3.5.8 The table 5 below outlines how well a DRT network aligns with EEH's transport strategy principles.

Four Principles	DRT outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Zero-emission vehicles have been utilised on many DRT services, reducing carbon emissions. However, DRT needs careful planning and monitoring to ensure a good take-up by users. Many rural schemes report a low level of passenger numbers.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Quality of life improves for travellers on well-operated DRT systems, as their accessibility improves and ability to plan and go is possible.	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	A DRT system will provide new connections for people in the regional economy, in rural and peri-urban areas	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	DRT allows new options for the first and last stages of journeys through the region and to interchanges, although is not a major contributor alone.	

Table 5. DRT Services

What are the Key Success Factors for DRT Implementation?

3.5.9 In the long-term, DRT (like any bus service) needs its usage to grow, its costs minimised, while offer high quality and convenience (compared to before), to reach out to new markets. The reason for investing in DRT must be clear: perhaps to serve a new or growing area, to replace supported bus services, or to provide connections to a destination at times when bus services do not run, to achieve growth and modal shift.

3.5.10 'Innovation for innovations sake' – in this case spending money to replace a poor bus service with DRT - is not preferable if a quality-incentive bus route contract is much less expensive and provides similar links with a better operator. If a DRT service reverts to the LTA's core budget (rather than receiving Government launch funding) will it by that stage show sufficient benefits to be retained by the council or supported by other external funders (such as airports)?

3.5.11 In 2020, a review titled 'Why most DRT/Micro-Transits Fail – What the few survivors tell us about progress' was published reviewing DRT in the UK and Australasia since 1970.[6] The graph overleaf showed the survival pattern of the DRTs under review by 2019. Overall, the study found that high costs and low usage (especially outside of cities) are the main cause of failure for DRT and notes that the longest-lasting services are ones with low costs and simpler service designs, with more in common with community bus services (in chapter 4 of this study) than modern app-based DRT.

[6] 'Why most DRT/Micro-Transits fail – what the survivors tell us about progress,' Graham Currie and Nicholas Fournier (Monash University, Australia & University of California) 483981162.pdf (core.ac.uk)

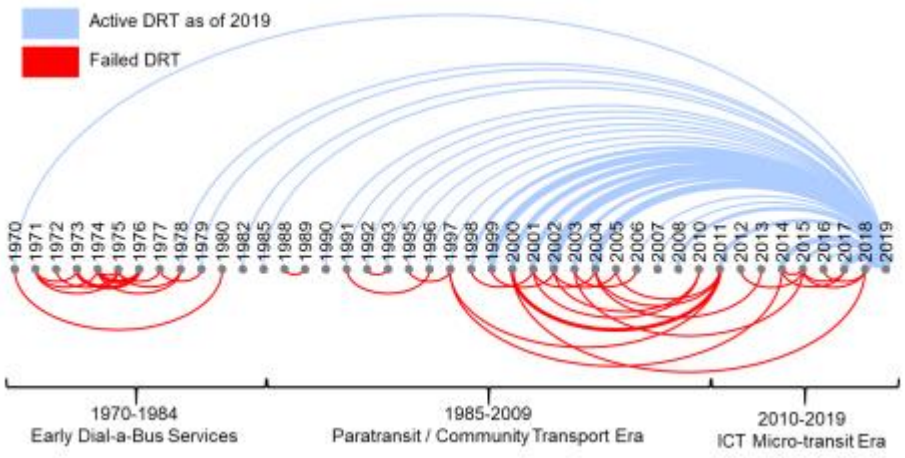

Figure 9. DRT Lifespan for 2020 study – start and end years[7]

To What Extent is DRT Appropriate for the EEH Region?

3.5.12 In an area such as EEH, 'asset-free' DRT (preferably incorporating Community Transport and other passenger services) is overall likely to be the most successful option in terms of viability. This incurs minimal operator costs for the council beyond the software, plus training for drivers and security checks. An operator contract and new vehicle fleet of minibuses is not necessary.

3.5.13 Alternatively, in rural areas, discussions with DRT operators and parcel delivery firms are likely to help reduce costs where a dedicated fleet of minibuses or shared taxis is required. In Essex, a rural DRT operator calculated that an agreement with a home delivery firm would reduce operating costs by at least 25% and could be incorporated with DRT software.

3.5.14 The DRT service should complement rather than undermine the local bus network. Therefore, rural DRT services should not provide long journeys from rural destinations to urban centres when a connection to a local mobility hub (or pleasant interchange facility) will provide the connection with lower carbon emissions. Town DRT services should be founded on serving peri-urban business districts and residential areas unserved by bus routes.

Digital Demand Responsive Transport is a popular form of delivery that can replace supported fixed bus routes effectively. Cost per journey risks being high and the LTA should consider how it will continue to operate DRT in the longer-term once funding reverts to the LTA. This makes innovations such as asset-free DRT or other measures to find efficiencies important.

3.6 Community Bus Services

What are Community Bus Services?

3.6.1 Many areas in EEH have community bus services for people who have difficulty using public transport (whether because of a lack of service in the area or to overcome lack of accessibility for people to local bus services and other public transport). These include door-to-door transport and community bus routes providing key links, for example to shopping centres or hospitals. Depending on the licence under which they operate, they can offer services to specific groups (such as disabled people) or to the wider public, in the DRT-style system or as a fixed network. Most community bus services that operate are very popular among residents. They often depend on a small subscription membership (although the example below does not) as well as a payment for journeys. Some receive partial funding from the LTA for operation.

[7] 'Why most DRT/Micro-Transits fail – what the survivors tell us about progress,' Graham Currie and Nicholas Fournier (Monash University, Australia & University of California) 483981162.pdf (core.ac.uk), page 10

3.6.2 An example in of a local community bus in EEH in the Risborough Area Community Bus, a map of which is below. This operates on a fixed-route basis in general. It was set up in 2006 when a local group conducted a survey of how best to provide bus services to serve the town, as some local bus services were withdrawn. The community bus was set up in the wake of this, largely funded by local donations and driven by a team of volunteers.

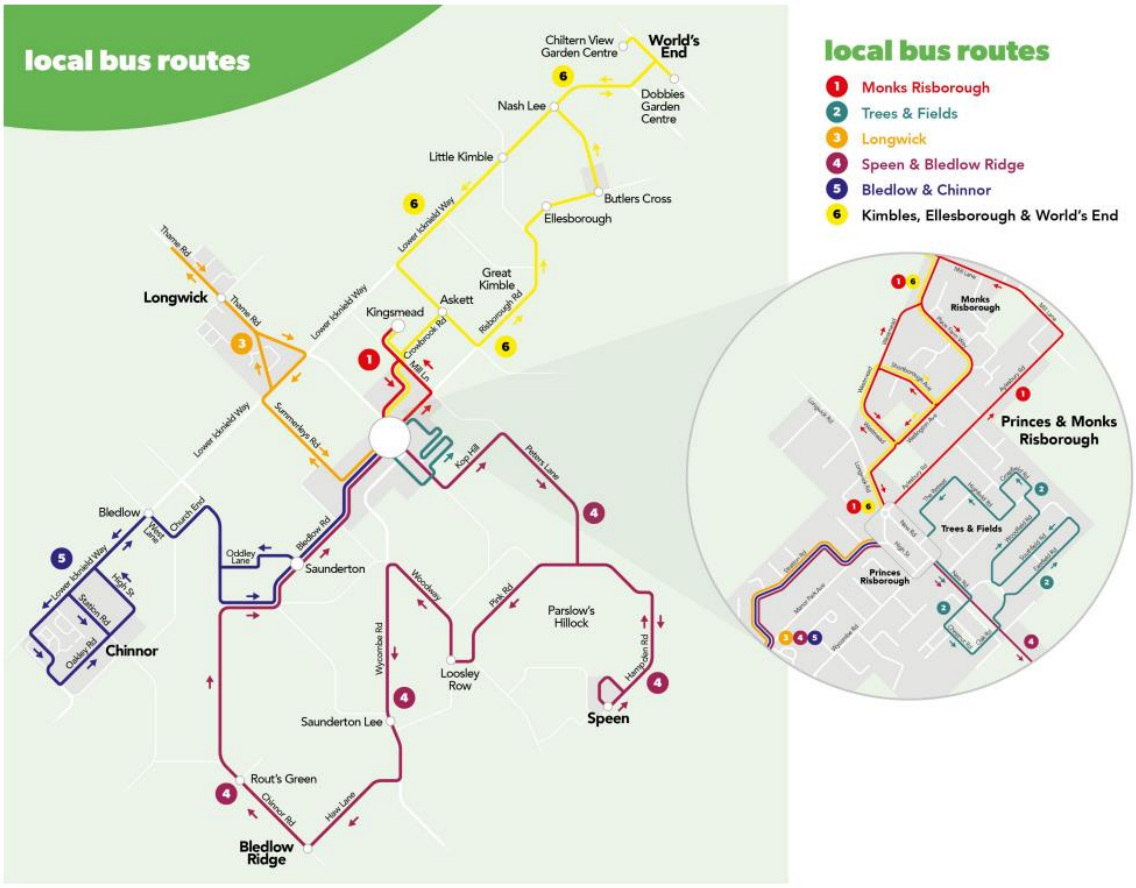

Figure 10. Risborough Area Community Bus map: a fixed-route format community bus

Are Community Bus Services aligned with EEH's Transport Strategy Principles?

3.6.3 Table 6 below outlines how well community bus services align with EEH's transport strategy principles.

Four Principles	Community bus outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Zero-emission vehicles have been utilised on many community bus services, reducing carbon emissions. CT services have a good usage level through 'community buy in'	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Quality of life improves for travellers on well-operated CT systems, as their accessibility improves and ability to plan and go is possible.	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Community bus services (whether in a fixed route or DRT format) tend to operate at limited times of the week and usually rely on volunteer availability to run. This makes them less reliable for businesses.	

Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Community bus services provide connectivity for some other-unserved people in the community, but do not significantly add to strategic connections.	

Table 6. Community Bus Services

What are the Key Success Factors for Community Bus Services Implementation?

3.6.4 A community bus service must build on local support, with the backing of local politicians, to raise awareness of its service and gain donations in order to buy its fleet, as well as compensating volunteers through fares revenue. Community bus services have been started by local entrepreneurs, who have grown the service through their links, or as a more combined community approach. Either way, the service must be 'owned' by the community and used by it, offering useful links at convenient times of the day.

To What Extent are Community Bus Services for the EEH Region?

3.6.5 Community bus services have a strong potential to provide local links where there is a community ability to support and grow usage. It is important that other bus and DRT services that are introduced should not undermine community bus efforts. EEH has a large number of people who wish to volunteer to provide local benefit, and LTAs could publicise greatly how community bus services could be founded. They are not suitable for providing longer-distance strategic journeys (with the exception of lifts to hospitals).

3.6.6 However, if the direction of English law follows that of Scotland, LTAs might have the ability to set up and run their own bus services. This approach has been taken by Highland Council for its supported services (after the council received expensive bids for bus tenders) and has received positive feedback[8]. If the law allows LTAs to run bus services rather than be required to tender routes, LTAs could acquire minibuses and look to volunteers to help operate a small number of strategic local routes in rural areas of EEH or elsewhere where there is a lack of quality tender competition for supported services. Funding for community bus services is possible via Section 106 and CIL.

Community bus services are popular in many of their locations and garner support and pride, especially as many of those who operate them come from the community it sits in and feel a sense of ownership. However, the service that can be offered is often limited compared to a wider DRT, because of the limits in number of staff and funds. Where there is an enthusiasm for a community bus service, this is an excellent way of addressing the mobility issues of many of the community, but it not a regular connection for business.

3.7 Minibuses

What about Minibuses?

3.7.1 Minibuses are lower in size, lower in fuel operating costs and slightly less onerous in terms of licencing for operation, meaning a potentially larger driver market, especially when operated under a Section 22 community bus permit. Community bus permits are issued by the Department for Transport to bodies that operate vehicles without a view to profit (for example, a council or a voluntary sector body) and are concerned for the social and welfare needs of one or more communities that want to run a local bus service on a non-profit-making basis. Vehicles being used under a Section 22 community bus permit can carry members of the general public.

[8] Highland Council buses | Public transport in Highland | The Highland Council

3.7.2 Even when operated as commercial vehicles, the lower operating costs are significant. This means that routes, whether regional or local, that risk a slow take-up in business, can operate services with a smaller bus. Being prepared to incorporate high-quality minibuses into a wider fleet (where there are smaller number of bus users) also increases the supply of and reduces the cost required for new DRT vehicles for schemes in the area.

Is a Minibus fleet aligned with EEH's Transport Strategy Principles?

3.7.3 The table 7 below outlines how well incorporating minibuses into a rural fleet aligns with EEH's transport strategy principles

Four Principles	Minibus network outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Minibuses are lower emission vehicles as they are smaller than buses. On routes (particularly supported services) they transport people more efficiently.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Quality of life improves for travellers on well-operated integrated minibus and bus systems, as their accessibility improves and ability to plan and go is possible.	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Incorporating minibuses allows a wider network to be operated by supported services, serving more places and making more connections.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Incorporating minibuses allows a wider network to be operated by supported services and commercial operators, serving more places and making more connections. It also allows the option of low frequency inter-urban bus routes to be operated at higher frequencies.	

Table 7. Minibus Services

What are the Key Success Factors for Minibus Implementation?

3.7.4 To succeed, a policy of encouraging a minibus bus network must address firstly services that have low levels of bus occupancy (generally supported services) and investigate whether specifying a minibus service will reduce costs for the LTA and improve quality for users. Secondly, on more established routes that currently operate at a low frequency, a policy of considering conversion to minibus services and increasing the service frequency should be considered. This follows the example from the change in the Exeter bus network in the 1980s, which is often considered a success at the time.[9]

To What Extent is Minibus Implementation Appropriate for the EEH Region?

3.7.5 Incorporating minibus routes into the network, whether using tendered or local-authority owned fleets, is appropriate for EEH. It could help restore the viability of lesser-used routes, while allowing established, low frequency routes to operate at a higher frequency. It will also complement DRT fleets, ensuring that minibuses are not a 'one-off' high-risk acquisition for DRT.

Minibuses incorporated into the wider commercial and supported services fleet operating in an area can reduce the price of tenders and make higher frequencies

[9] dl-interview-harry-blundred-09-17.pdf (transportinvestment.co.uk)

more viable, as part of a longer-term strategy to encourage bus use and grow the network.

3.8 Modal integration

What is Modal Integration?

3.8.1 Modal integration refers to how the bus network in the region can benefit from integrating through measures such as:

- Multi-operator ticketing (where there is an EP) or area ticketing (where there is franchising), or mobility-as-a-service
- Co-ordination of schedules both on bus routes and to link with rail and coach services
- Co-ordinating and removing duplication within the bus network's routes
- Integrating both scheduling and routings with the rail network and coach network, particularly as East-West Rail is rolled-out
- Planning interchanges as transport hubs
- Integrating mobility hubs and using these as locations to promote active travel
- Working with planning and development agencies to integrate sustainable transport
- Promoting bus priority where there is congestion and threats to reliability

Is a Modal Integration aligned with EEH's Transport Strategy Principles?

3.8.2 The table 8 below outlines how well modal integration aligns with EEH's transport strategy principles

Four Principles	Modal integration outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Promotes people to use sustainable transport and plan/pay for journeys easily	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Improves integration, makes journeys simpler and eases connectivity	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Widens access to all parts of the economy via the most efficient non-car method	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Provides integration into the regional and national networks easily, quickly and comprehensively.	

Table 8. Modal Integration

What are the Key Success Factors for Modal Integration Implementation?

3.8.3 Operators and LTAs need to work together intensively to integrate their services. Planners should be engaged early to ensure that funding and infrastructure for sustainable transport is prioritised. People should be proud of their transport network and prepared to rely on it.

To What Extent is Modal Integration Appropriate for the EEH Region?

3.8.4 Modal integration is essential for the EEH region. EEH has a role in allowing LTAs to work together across borders and provide support. In general, wider integration can bring economies of scale in both acquisition and operation.

Measures to ensure modal integration are essential in raising bus usage, as part of the wider sustainable transport network, across the region.

3.9 Summary of bus network design elements in the context of EEH

Table 9. Summary of bus network design scoring

FOUR PRINCIPLES & COST	POINT-TO-POINT	HUB-AND-SPOKE	BUS LINES	DEMAND RESPONSIVE TRANSPORT	COMMUNITY BUS	MINIBUS FLEET	MODAL INTEGRATION
Net-zero carbon objective							
Improving quality of life and inclusion							
Supporting the regional economy							
Connecting the region with further afield							
Indicative cost (red = high) per journey to LTA							

4. RECOMMENDATIONS FOR BUS NETWORK DESIGN AND FINANCE

4.1 Recommended options at this stage

4.1.1 Across the LTAs in EEH, it is clear that there is no one solution for bus network design. A combination of bus lines and a hub-and-spoke network (in cities and large towns) support the regional economy, provide connectivity and promote net zero via modal shift and in some locations through a transition to zero emission buses. In some places in EEH, a bus lines network already operates at a regular frequency with minimal subsidy or profit and we have identified an EEH 'Heartbeat' network inspired by coach and bus lines routes.

4.1.2 Combining the Heartbeat bus lines network with minibus-fleet approach, where financial viability of bus or coach services is questionable, may be a strong option. What seems essential is modal integration measures, which in the medium-term to long-term are relatively low impact and generally lower cost, specifically allowing good interchange from local areas onto a bus lines or Heartbeat network.

4.1.3 The wider community benefits of a community bus fleet merit greater support and guidance. However, the long-term viability of some locations for digital DRT is noted and if a council wishes to pursue a DRT scheme, in the longer term financially an 'asset-free' scheme may be more viable, unless a minibus network is already operating.

4.2 'Heartbeat' Regional Bus and Coach Network

4.2.1 Heartbeat is the proposed creation of a regional network of bus and coach lines that connects hubs and key destinations within EEH, providing for cross-LTA journeys and integrating with the existing local networks within the LTAs. It does not replace successful existing routes, but provides for improved reliability, speed, frequency, comfort on the existing routes, as well as where feasible providing the links that have been identified as missing in previous EEH studies, particularly the connectivity studies and Regional Bus Study.

4.2.2 The bus and coach lines network we propose generally falls within the 'Heartbeat' concept mentioned before, although there are other bus lines routes that run exclusively within an LTA and so have not been given the title 'Heartbeat'.

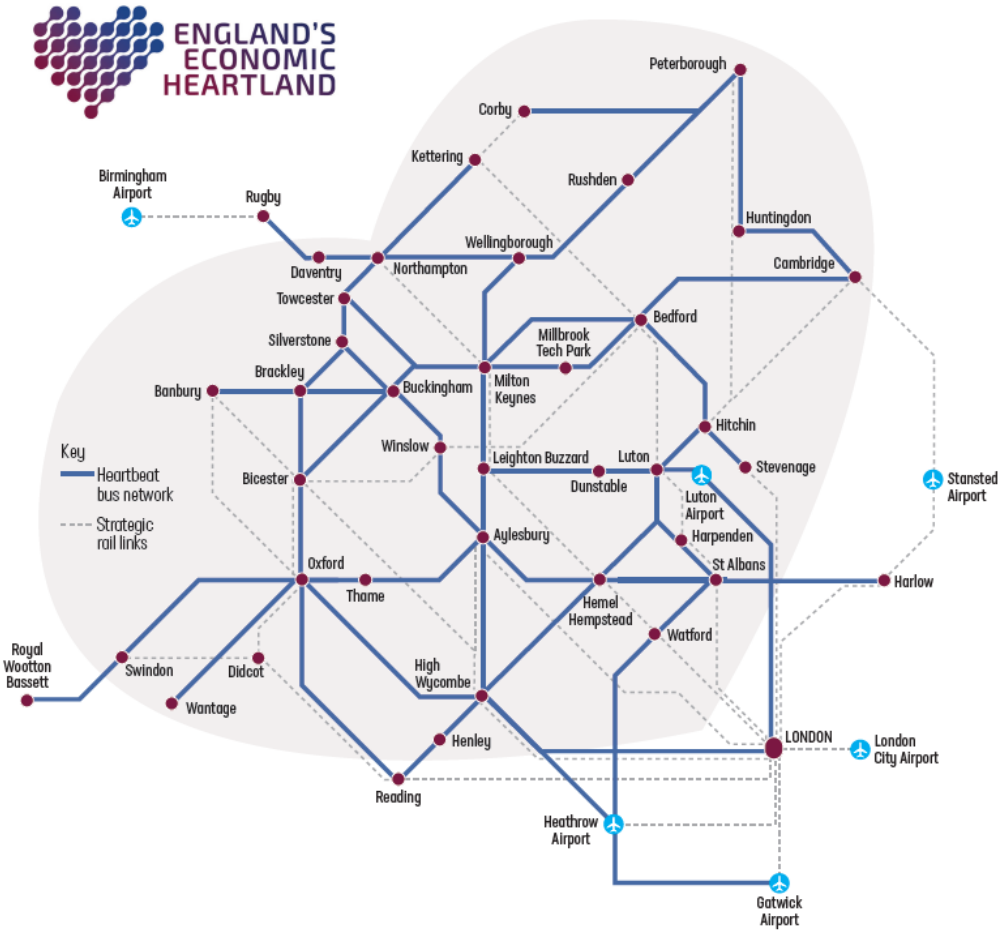

Figure 11. The conceptual 'Heartbeat' network of EEH bus and coach lines

4.2.3 EEH has multiple needs from a regional bus network. EEH is partly made of towns around the London boundary; stand-alone settlements in the form of Swindon, Oxford, Luton, Milton Keynes, Northampton, Peterborough and Cambridge; and partly highly rural regions in places providing home to significant destinations such as Silverstone, Millbrook Technology Park and Harwell Science and Innovation Campus. In addition, EEH contains London Luton Airport, borders Heathrow and Stansted airports, and is within easy distance of Gatwick, Birmingham and East Midlands airports. While an international, integrated region, it also takes advantage of its proximity to London – many EEH residents work in businesses in the city, EEH draws business benefit from the global status of London, and London is a unique cultural, sports and educational destination for visits.

4.2.4 Heartbeat's bus and coach services therefore fall into three categories, complementing rail:

- Higher-frequency short bus routes linking residents to major centres and major business destinations
- Lower frequency services at around every 30 minutes, operating reliably all day and linking hubs in the region, scheduled with other routes for a 'pulse' arrival and departure to optimise interchange at hubs throughout the region
- Coach services, providing longer-distance services linking major centres and airports within and around the region, again with interchange optimised at regional hubs

4.2.5 It should be noted that less frequent National Express and Megabus coach services also provide links around the region (for example from Cambridge and Peterborough to Luton Airport or from Swindon to London). However, although they are important services to the

destinations, we have not included them in the network and maps, as they operate relatively infrequently and often require pre-booking, unlike the rest of the Heartbeat network.

4.2.6 In addition, the Oxford – Buckingham - Milton Keynes bus route is not included in our Heartbeat network, as this runs hourly and may be less commercially viable with East – West Rail. We have proposed regular Buckingham – Milton Keynes coach services via other routes.

4.3 Investing in the bus network

4.3.1 The proposed Heartbeat bus line network builds on and rationalizes the existing networks, with the objective of raising economic benefits at minimal financial cost. It will do this by co-ordinating the private, public and voluntary sectors with a new timetable, to deliver a more extensive and self-sustaining service.

4.3.2 Existing profitable (or at least minimally-subidised) private sector based bus lines routes still lie at the centre of the proposed Heartbeat network. These services make up the busiest routes either serving town centres from their hinterlands or providing longer distance inter-urban services or links to airports. They would need to serve high-quality hubs.

4.3.3 These hubs would be augmented by our "spoke" system serving suburbs, rural communities and periurban areas. We propose that these spokes would be made up of a combination of the existing local commercial services, subsidised private sector services and a combination of voluntary (community transport) based schemes and the asset free DRT services (including local private sector mini-cabs etc).

4.3.4 We would aim where socially justifiable, for a minimum half hourly service for our spoke system, to provide a regular link and not too long a wait until the next service. However, this may lead to an increased funding requirement. To bridge the gap, we should work with the private operators to identify (and test in independent modelling) the financial implications of route extensions, enhancements and potential reductions in services.

4.3.5 This will show the most operationally challenging (costly) areas of the proposed network. Networks can be fine-tuned after these discussions but remaining gaps can then be filled by a mix of private sector (where their fleets and operating schedules most easily support the routes), community transport mini-bus teams (enabled as regulations permit to call at scheduled stops) and DRT teams, as well as utilising other revenue raising measures such as bus-side advertising.

4.3.6 The desired outcome would be a reduction in financial costs but an improvement in total ridership, and network coverage. The key will be in the replacement of large capacity buses with smaller mini-buses and taxi services, with less onerous regulatory requirements, licencing and staffing costs. The staffing costs will also be reduced by the involvement of the voluntary sector. However, some funding is likely to be needed for new mini-buses etc. for community and dial a ride sectors. However, this an area where corporate sponsorship (for example from key local businesses and facilities such as regional airports) and local funding raising efforts can support calls on the public purse.

4.3.7 Further funding areas could include development gain, for example including a requirement to support the running (or partial running) of a bus service from new housing developments, as well as hypothecated money from the local taxes, or increased parking charges etc.

4.4 Conclusion

4.4.1 A bus network developed with the community to optimise benefits from operation and minimise costs is possible in EEH. In the case of non-urban radial routes, this is in the Heartbeat network, with consideration of minibuses on strategically key routes which risk low financial viability, or where higher frequencies on existing bus routes may wish to be considered. Combining with this is the importance of planned scheduled for interchange and mobility hub development and design, whether as stand alone projects, in developments or

via Section 106s. Community bus services are an excellent option for both support for some areas of the community, as well as side-benefits such as community cohesion. When community bus services are not operating, an asset-free DRT arrangement might be considered to expand the timeframe of rural connectivity, potentially sharing the community bus (subject to legal arrangements).

4.4.2 Detailed network development of bus routes and related systems is necessary to understand the financial support for each route, whether a launch fund is required or whether a more permanent supportive funding source is required for an individual route.

4.4.3 However, in the post-COVID environment when new technologies are offering new ways for non-car connectivity, it is important to consider how else EEH may be linked. This is in the next section.

5. INTEGRATING INTERCHANGE

5.1 Introduction

5.1.1 Interchanges in the form of mobility hubs are a concept being actively explored by EEH with its LTAs. A mobility hub in is a centralised location that provides a variety of transport options in one place. These hubs aim to improve accessibility, reduce reliance on private cars, and promote sustainable travel.

5.1.2 Key features of mobility hubs often include:

- Multiple transport options: These can include bus stops, train stations, bike-sharing stations, car-sharing services, electric vehicle charging points, and even e-scooter rental stations.
- Integrated ticketing and payment systems: This makes it easier for users to manage their travel needs and pay for different modes of transport.
- Public spaces and amenities: Mobility hubs may also include public spaces, such as seating areas, cafes, or retail outlets, to enhance the overall experience.

5.1.3 Benefits of mobility hubs include:

1. Improved accessibility: By offering a range of transportation options, mobility hubs make it easier for people to get around, especially those who may not have access to a private car.
2. Reduced reliance on private cars: By promoting the use of public transport, bike-sharing, and other sustainable modes of transportation, mobility hubs can help to reduce traffic congestion and air pollution.
3. Enhanced connectivity: Mobility hubs can help to connect different communities and improve access to jobs, education, and healthcare.
4. Stimulation of local economies: By attracting visitors and encouraging spending, mobility hubs can contribute to the economic vitality of local areas.

5.1.4 This section looks at mobility hubs in general and then at some of the aspects of mobility hubs that might complement and add passengers to a bus service.

5.2 Mobility hubs

5.2.1 Mobility hubs are infrastructure facilities that provide connection points between sustainable methods of transport, often in prominent location where other interactions (such as parcel collections and drop offs) can take place. Mobility hubs have been reviewed previously by

EEH[10] and an analysis into the viability of types of location for mobility hubs is under way separately as part of this project. What an individual mobility hub is and how it is used varies – for example a hub at the centre of a 'hub and spoke' bus network will be in a town centre or possible a hospital and very large, busy and possible 'retro-fitted' in with the streets. In a rural area, it is likely to serve less frequent bus services (they are important stops on a Heartbeat-type network), integrated with cycling, community transport, DRT, parcel pick up and local amenities, for example.

Are Mobility Hubs aligned with EEH's Transport Strategy Principles?

5.2.2 The table below outlines how well mobility hub rollout aligns with EEH's transport strategy principles

Four Principles	Mobility hub outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Mobility hubs facilitate multimodal interchange and connect sustainable journeys making car travel less necessary. They provide more efficient parcel collection.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Offers services to a wider community – many of whom may not own a car – while reducing vehicle journeys	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Provides good connectivity where available.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Mobility hubs large and small are major supporters of modal shift and more efficient logistics,	

Table 10. Mobility Hubs

What are the Key Success Factors for Mobility Hubs?

5.2.3 A mobility hub should allow interchange to be a smooth, easy, safe and pleasant place. It should be a place of multiple modes, where journeys change. It can also be a place to pick up and drop off parcels and other consignments and potentially drone arrival points. It should be a place to inspire new activities and new journey choices.

5.2.4 A mobility hub must be a pleasant and attractive public space, well designed and pleasant and attractive to spend time in, with plenty of information available. They should be located in useful places for journeys, but this should also consider repurposing car parks that are not making money, or other council or private assets that would benefit financially from this repurpose.

5.2.5 A mobility hub can also be a park and ride location, where bus, coach and parcel pick up might be provided, as well as a car park. Park and Ride is useful in helping radial bus routes be viable and providing extra connectivity onto bus lines.

[10] https://www.englandseconomicheartland.com/news/englands-economic-heartland-spearheading-mobility-hubs-support-for-local-authorities/

To What Extent are Mobility Hubs Appropriate for the EEH Region?

5.2.6 Mobility hubs are a key part of our recommendations for bus improvements in the region, as locations for bus lines to connect with more local services. They are very appropriate for the EEH region. We are currently undertaking work to assess how they might be best rolled out in terms of gaining finance in the region.

Mobility hubs are infrastructure facilities that promote sustainable transport by connecting various modes of transport, enabling parcel services, and encouraging modal shift. They play a crucial role in achieving net-zero carbon emissions, improving quality of life, supporting the regional economy, and facilitating the efficient movement of people and goods. Their success depends on creating pleasant public spaces, strategic placement, and integration with other transport modes.

5.3 Car Clubs

What are Car Clubs?

5.3.1 Car clubs can be operated by large, multinational firms or smaller local businesses or communities. Car clubs provide modern, lower-emission vehicles that can be booked for use by any member of the car club, in a similar way to a car hire vehicle. A car club vehicle is intended for use for only a few hours, otherwise the cost starts to rise, whereas a car hire vehicle is priced so that longer-term hires are expected.

5.3.2 The benefit for sustainable transport is that a car club user (who has given up or reduced the number of cars they own) may consider other travel options before booking a car, although they still retain some of the mobility offered by car ownership.

5.3.3 Car clubs have faced insurance cost concerns over recent years, and many have closed, although recent government measures may help car clubs operate viably again.

Are car clubs aligned with EEH's Transport Strategy Principles?

5.3.4 The table below outlines how well modal integration aligns with EEH's transport strategy principles

Four Principles	Car clubs outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Car clubs 'nudge' users into considering other lower carbon modes of transport before using a car and paying for a hire	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Offers car mobility to a wider community – many of whom may not own a car – while 'nudging' them towards sustainable and active travel	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Provides good connectivity where available. Car club spaces could be located near mobility hubs to integrate with other modes of transport.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way	Car clubs are less suitable for longer-distance journeys or international trips, although their existence will reduce the overall number of cars on the road, enabling more efficient movement	

which lessens its environmental impact.		

Table 11. Car Clubs

What are the Key Success Factors for Car Clubs Implementation?

5.3.5 There must be sufficient membership levels of the car club for it to be financially viable. There must also be a parking space available for sufficient numbers of cars for the level of membership in the town. This must be in a relatively safe location and it will result in the removal of a permanent public parking space, which risks unpopularity.

To What Extent Car Clubs Appropriate for the EEH Region?

5.3.6 Car clubs are present in some EEH cities. They are likely to be popular in locations with people willing to share cars. However, main car club firms are unlikely to wish to try establishing in some smaller towns. LTAs could try working with major developers in future years to 'pump prime' a car club in and around new developments, if this is the best way of providing connectivity to an area and reducing dependency on car ownership.

Car clubs offer modern, lower-emission vehicles that can be booked for short-term use, encouraging members to consider alternative transport options and reducing car ownership. While car clubs can benefit sustainable transport goals and improve connectivity, their success depends on factors like sufficient membership and parking availability.

5.4 LiftShare and HomeRun (and alternative suppliers)

What is LiftShare and HomeRun?

5.4.1 LiftShare and HomeRun (and alternative suppliers) are providers of an app that allows lift sharing to be advertised. In the case of LiftShare, this is a public app with over 700,000 users in the UK. In the case of HomeRun, this is a private app set up by schools to help parents create multimodal travel sharing (whether by car, cycling or walking) to and from the school gate. As schools do with HomeRun, employers can commission LiftShare's parent company to create employer-only lift sharing systems.

5.4.2 LiftShare and HomeRun pick-up and drop-off locations could be integrated with mobility hubs, to consolidate trips and allow access to more long-distance lift sharing.

Is lift sharing aligned with EEH's Transport Strategy Principles?

5.4.3 The table below outlines how well modal integration aligns with EEH's transport strategy principles

Four Principles	Lift sharing outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Passengers 'combining' a car journey dramatically reduces carbon emissions	
Improving quality of life and wellbeing through a safe and inclusive transport system	Allows wider availability of transport to the community	

accessible to all which emphasises sustainable and active travel.		
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Although lift sharing is available for whatever lift is offered by a driver, this tends to be for longer-distance journeys or ones often served by good public transport.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Lift sharing is likely to have a relatively limited impact on movement of people and goods unless its level transforms. However, adult lift sharing tends to be for longer journeys currently, helping wider connectivity.	

Table 12. Lift Sharing

What are the Key Success Factors for Lift Sharing Implementation?

5.4.4 Many more users need to sign up and offer lift shares, so many more potential journeys (both long distance and shorter distance) are offered that are not available by public transport. LiftShare estimates that in the UK, its membership needs to grow from 700,000 to 2,000,000 to be able to offer lifts on an ad hoc basis.

5.4.5 An option to encourage lift sharing may be to introduce 'high occupancy vehicle' lanes in towns with lower level of bus services and wide roads, or on busy dual carriageways. This would encourage drivers to find people to share their car with in order to enjoy a faster journey.

To What Extent LiftShare / HomeRun Appropriate for the EEH Region?

5.4.6 HomeRun (school lift sharing app) is very appropriate for much of the EEH region, as school lift sharing of journeys outside of the walking/cycling range would reduce the level of traffic on the road during term-time. However, LiftShare is currently only appropriate for a limited number of journeys and does not give a 'turn up and go' offer. A major campaign to persuade drivers to offer LifeShare journeys and save on petrol might be worth considering, where bus and services do not offer a large number of destinations but there is still reasonable population density. Companies should be encouraged to offer lift sharing schemes, whether private or public.

Lift sharing could reduce the level of car journeys made, but is limited in its offer. Working to promote school lift sharing or company lift sharing has many benefits however.

5.5 Pedal & Post in Towns and Cities

5.5.1 Just as mobility hubs are locations for pick-up post left by delivery vans, pedal and post allows people cycling in areas of operation to combine their onward cycle journey with making local last-leg journeys on from the mobility hub. This is allocated through an app, in which local people or businesses in areas of operation request a delivery to be made.

5.5.2 It provides an incentive for people to try cycling to-from the bus network while earning money. Pedal & Post is currently in operation in Oxford and equivalent services could be made viable in other local towns if cyclists signed up and the critical mass for such a scheme was reached.

Is Pedal & Post aligned with EEH's Transport Strategy Principles?

5.5.3 The table below outlines how well this type of service aligns with EEH's transport strategy principles

Four Principles	Cycle delivery outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Cycle delivery is zero carbon or very low carbon (with a battery cycle), unlike delivery vans.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Offers services to a wider community – many of whom may not own a car – while reducing vehicle journeys	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Provides good connectivity where available. Rural parts of the region may be unserved by this, which is geared around towns and cities	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Cycle delivery will reduce the overall number of vans on the road, enabling more efficient movement	

Table 13. Pedal & Post

What are the Key Success Factors for Pedal & Post?

5.5.4 A substantial number of cyclists willing to work for Pedal & Post must be available. There must be sufficient numbers of people willing to use the service through successful publicity and marketing. Ideally, larger parcel firms must be willing to use Pedal & Post for the 'final mile' of delivery.

To What Extent is Pedal & Post for the EEH Region?

5.5.5 In many of the towns and cities in EEH, pedal & post is very appropriate, both in terms of parcel travel time and in terms of growing cyclist numbers.

Pedal & Post combines cycling with local deliveries, incentivizing cycling while reducing carbon emissions and vehicle journeys. It is particularly suitable for towns and cities within EEH due to growing cyclist numbers and its potential for efficient parcel delivery.

5.6 Mobility-as-a-Service

5.6.1 Mobility-as-a-Service (MaaS) requires the integration of fares and ticketing systems across multiple modes (including active travel such as cycle hire), together with an accurate, up-to-date journey planning and booking system. This is – to some extent – being implemented in a number of places worldwide. It performs best where connections between services can be managed very effectively, where there are as few as possible stakeholders in fares and timetable design and as few people to contact for updates as possible. Areas with bus franchising and good relationships with operators tend to be optimal.

5.6.2 MaaS integrates with a mobility hubs system because of the multiple types of mobility that exist and are interlinked through the system.

Is MaaS aligned with EEH's Transport Strategy Principles?

5.6.3 The table below outlines how well MaaS aligns with EEH's transport strategy principles

Four Principles	Mobility hub outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	MaaS makes investigating, planning and booking sustainable transport within the area of service easier. This is likely to grow sustainable transport use.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Offers services to a wider community – many of whom may not own a car – while reducing vehicle journeys.	
Supporting the regional economy by connecting people and businesses to markets and opportunities.	Improves and eases connectivity for people and businesses around the region.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Integrated multi-modal offers will mean people travel more efficiently, improving the movement of people and goods.	

Table 14. Mobility-as-a-Service

What are the Key Success Factors for Mobility-as-a-Service?

5.6.4 Mobility-as-a-Service (MaaS) success hinges on several key factors. Firstly, a user-centric approach is vital. This entails providing seamless, convenient, and personalized travel experiences that cater to diverse user needs and preferences. A well-designed MaaS platform should offer a variety of transport modes, real-time information, and easy payment options, all integrated into a single interface. Building trust and encouraging user adoption requires clear communication, transparent pricing, and reliable service.

5.6.5 Secondly, collaboration and integration are crucial. MaaS necessitates strong partnerships between transport providers, technology companies, and public authorities. Open data sharing, standardized APIs, and interoperable systems are essential for seamless integration of various transport modes and services. Moreover, MaaS should complement existing public transport networks and support sustainable mobility goals, such as reducing congestion and emissions. Successful MaaS implementations will require a supportive regulatory framework that fosters innovation and competition while ensuring safety and accessibility for all users.

To What Extent is MaaS Appropriate for the EEH Region?

5.6.6 Mobility-as-a-Service (MaaS) holds considerable potential for the multiple Local Transport Authorities (LTAs) within England's Economic Heartland, but its appropriateness and success hinge on careful consideration of the region's unique characteristics and challenges.

5.6.7 Potential benefits of MaaS include improved connectivity, as MaaS can address the region's varied transport needs, particularly in rural areas with limited public transport options, by integrating various modes like buses, trains, taxis, and even bike-sharing into a single

platform, enhancing accessibility and convenience for residents. By encouraging the use of shared and public transport options, MaaS can contribute to reducing traffic congestion and carbon emissions, aligning with the region's sustainability goals. MaaS offers a user-centric approach, providing personalized travel planning, real-time information, and simplified payment options, potentially increasing public transport usage and satisfaction. The data generated through MaaS platforms can provide valuable insights into travel patterns and demand, enabling LTAs to make informed decisions regarding infrastructure investments and service optimizations.

5.6.8 However, the presence of multiple LTAs necessitates effective coordination and collaboration to ensure seamless integration of transport services and data sharing across the region. MaaS requires robust digital infrastructure and reliable connectivity throughout the region, particularly in rural areas. Investments in technology and infrastructure may be necessary to support MaaS implementation. User adoption is crucial for MaaS success. Public awareness campaigns and clear communication about the benefits of MaaS are essential to encourage its use. MaaS solutions should be designed to ensure equitable access for all residents, including those with disabilities, low incomes, or limited digital literacy.

5.6.9 A phased approach, starting with pilot projects in specific areas or use cases, can help test and refine MaaS solutions before wider deployment. With careful planning and execution, MaaS has the potential to significantly improve transport options in England's Economic Heartland.

Mobility-as-a-Service (MaaS) integrates various transport modes into a single platform, offering users streamlined journey planning and payment. It's particularly effective where transport connections are well-managed and stakeholders are coordinated, making it promising for regions with bus franchising and collaborative operators.

5.7 Autonomous Vehicles

5.7.1 Autonomous vehicles are now reaching the stage at which the vehicle takes full responsibility for a journey, without a human person ultimately in control. If a delivery vehicle or a bus or DRT vehicle can be run autonomously, this potentially reduces their operational cost. However, requirements and customer demand are likely to retain a need for a responsible human on board (as the Docklands Light Railway has while it operates itself), except possible for very small buses in private areas. Fully autonomous vehicles are considered most likely to operate widely in the logistics field at first, although within EEH there have been autonomous passenger services in operation – with autonomous buses at Harwell in Oxfordshire and autonomous taxis in Milton Keynes.

Are Autonomous Vehicles aligned with EEH's Transport Strategy Principles?

5.7.2 The table below outlines how well MaaS aligns with EEH's transport strategy principles

Four Principles	Mobility hub outcomes:	Red-Amber-Green rating
Achieving net zero carbon emissions from transport no later than 2050, with an ambition to reach this by 2040	Autonomous vehicles open up new opportunities to run a greater number of services at lower cost. This is good for transport provision, although means more vehicles ultimately producing carbon.	
Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.	Autonomous vehicles do not change the current situation overall.	

Supporting the regional economy by connecting people and businesses to markets and opportunities.	Improves, lowers the costs and expands links for both public transport and logistics.	
Ensuring the Heartland works for the UK by enabling the efficient movement of people and goods through the region and to/from international gateways, in a way which lessens its environmental impact.	Autonomous vehicles may travel more safely and more efficiently, meaning faster and better outcomes here.	

Table 15. Autonomous Vehicles

What are the Key Success Factors for Autonomous Vehicles?

5.7.3 The success of autonomous vehicles relies on several crucial factors. First, technological advancements are paramount, encompassing robust perception systems, advanced decision-making, and fail-safe mechanisms. Second, regulation and public acceptance necessitate clear guidelines and addressing public concerns. Third, infrastructure and connectivity need enhancement, including intelligent transportation systems and reliable high-speed networks. Lastly, cost-effective production and new business models are essential for economic viability. Additionally, cybersecurity and ethical considerations must be prioritized. Addressing these factors will pave the way for the widespread adoption of autonomous vehicles and their potential benefits.

To What Extent are Autonomous Vehicles Appropriate for the EEH Region?

5.7.4 Autonomous vehicles (AVs) present significant opportunities for England's Economic Heartland, particularly in enhancing rural connectivity, reducing congestion, increasing accessibility, and stimulating economic growth. These benefits could be realized through improved access to essential services, optimized traffic flow, and increased mobility for the elderly and disabled. Additionally, the development and deployment of AVs could spur innovation and create new jobs in the region.

5.7.5 However, the successful integration of AVs faces challenges. The region's mixed urban-rural landscape necessitates adaptable navigation systems, while existing infrastructure may require upgrades. Moreover, gaining public trust and addressing concerns about safety and job displacement are critical. To maximize the benefits of AVs, a strategic approach is needed, focusing on targeted deployment, infrastructure investment, public engagement, and collaboration between stakeholders. While AVs offer great promise, a careful and phased implementation is crucial for their successful incorporation into the region's transport system.

Autonomous vehicles are nearing full automation, potentially reducing operational costs but likely requiring a human onboard initially. While they offer benefits such as improved connectivity and reduced congestion, their success depends on technological advancements, clear regulations, and addressing public concerns. A strategic, phased implementation is crucial for their successful integration.

5.7.6 Using the criteria in Chapter 3, the table below summarises the benefits of the non-bus opportunities. This is an approach 'in theory', noting that several of the techniques are not openly available or licenced yet.

5.8 SUMMARY OF NON-BUS OPPORTUNITIES SCORING

Table 16. Summary of measure integrating interchange

FOUR PRINCIPLES & COST	MOBILITY HUBS	CAR CLUBS	LIFT-SHARE & HOMERUN	PEDAL & POST	MAAS	AUTONOMOUS VEHICLES
Net-zero carbon objective						
Improving quality of life and inclusion						
Supporting the regional economy						
Connecting the region with further afield						
Indicative cost (red = high) per journey to LTA						Substantial capital cost

6. CONCLUSION AND NEXT STEPS

6.1.1 The intricate interplay of factors influencing bus demand in England's Economic Heartland necessitates a multifaceted approach to network design. While the 'Heartbeat' network, along with strategically deployed minibuses, forms a robust backbone for regional connectivity, the integration of diverse modes such as community buses, asset-free DRT, and even emerging technologies like drone delivery and autonomous vehicles, is crucial for a truly comprehensive and sustainable transport system, providing viable local links within LTAs.

6.1.2 The success of these initiatives hinges on effective collaboration, public engagement, and careful consideration of the region's unique characteristics. By embracing innovation and fostering a holistic approach, the EEH can pave the way for a resilient and adaptable transport network that caters to the evolving needs of its communities while championing environmental sustainability.

6.2 Next Steps

6.2.1 By embarking on these next steps, EEH, partner authorities and our region's bus operators can build a public transport network that is not only efficient and sustainable but also empowers its communities and fosters a thriving regional economy:

- Supporting LTAs through change: EEH will support its LTAs to identify the most appropriate network model mix for their area and where desired help LTAs that wish to combine to achieve optimal network models and efficiency
- Further development of the 'Heartbeat' concept to create a regional bus network: Prioritise the development of the business cases for the proposed 'Heartbeat' bus lines network, focusing on key regional corridors and hubs for links with 'last mile' transport. Work with LTAs to integrate the 'Heartbeat' concept into BSIPs to enable implementation, following its approval by the EEH Board.
- Strategic minibus deployment: Explore the use of low/zero emission minibuses on routes with lower demand or financial viability, ensuring optimal resource allocation and service flexibility, speeding the delivery of networks.
- Community bus empowerment: Strengthen support and guidance for community bus services, recognizing their vital role in addressing local transport needs and fostering community cohesion. Gather information on successful community transport to see if these models could work in other parts of EEH, potentially replacing supported local bus.
- Embrace asset-free DRT: Consider adopting asset-free DRT solutions in areas where local bus and community bus services are not feasible, expanding service coverage and reducing long-term financial burden. Review case studies of successful DRT across the region, considering the impact on passengers but also the long-term viability on LTA budgets after the end of government grants.
- Foster modal integration: Enhance collaboration between LTAs and operators to ensure seamless integration of various transport modes and data sharing. Investigate the options to implement mobility hubs with private financing, recognising the limited levels of public finance available.