England's Economic Heartland

Peterborough-Northampton-Oxford Connectivity Study

Phase 2 Report

Version 2.0

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steer wsp

Contents

Part 1
Introduction

Context & Background

The Ambition

England's Economic Heartland (EEH) is an economic powerhouse, home to world-leading universities and innovators. It is blessed with a **natural, historic and built environment that makes it an attractive place to live and work.** EEH aims to harness these attributes to the benefit of both existing communities and future generations.

***Connecting People, Transforming Journeys* - EEH's Transport Strategy - emphasises that investment in the transport system will continue to be essential in order to enable economic growth in a sustainable way.** At the same time, changes must be made to the way in which investments are planned, developed and delivered.

Lack of capacity within our current transport system acts as a constraint on growth and reduces resilience and reliability, all of which impacts productivity. Lack of choice in travel options also act as a constraint for those seeking to access jobs, homes, services and amenities. The environmental impact of our transport system is unacceptable, with carbon emissions significantly above the national average and growing faster.

The Vision

Connecting People, Transforming Journeys provides the step-change in approach required to seize the opportunity to deliver a transport system that supports a green economic recovery and enables growth, whilst preserving and enhancing the natural, historic and built environment.

The overarching vision is: ***"To support sustainable growth and improve quality of life and wellbeing through a world-class, decarbonised transport system which harnesses the region's global expertise in technology and innovation to unlock new opportunities for residents and businesses, in a way that benefits the UK as a whole."***

This ambition requires a shared commitment between the partners in the region and national government, and bold decision making that puts people and the environment at its centre. It looks to realise synergies with other policy areas which have a major impact on the way people travel, including spatial planning and the provision of wider infrastructure and services such as digital, utilities, education and health.

The Key Principles

Connecting People, Transforming Journeys sets the policy framework, supported by an initial investment pipeline, that will deliver the ambition. It is guided by four key principles:

- **Principle 1:** Achieving net Zero no later than 2050, with an ambition to reach this by 2040.
- **Principle 2:** Improving quality of life and wellbeing through a safe and inclusive transport system accessible to all which emphasises sustainable and active travel.
- **Principle 3:** Supporting the regional economy by connecting people and businesses to markets and opportunities.
- **Principle 4:** Efficient movement of people and goods through the region and to international gateways.

Context & Background

Project Aims

Steer and WSP have been commissioned by EEH to **undertake a Connectivity Study of the Peterborough-Northampton-Oxford Corridor.** The *Connectivity Study* aims to identify a preferred package of multi-modal interventions that deliver the required connectivity outcomes that help achieve EEH's objectives identified within the *Connecting People, Transforming Journeys* - EEH's Transport Strategy.

Methodology

This study is being undertaken in four phases:

- Phase 1: Methodology Development
- Phase 2: Setting the Scene
- Phase 3: Producing Recommendations
- Phase 4: Final Package of Interventions

This report focuses on Phase 2 which includes a summary of the findings of the first four steps of the Department for Transports (DfT's) *Transport Appraisal Process*, shown below.

Understanding the policy context, the current and future community and connectivity issues and opportunities within the study area is a vital first step. This information will assist in the **identification of multi-modal intervention packages which seek to address the underlying causes of the identified challenges**, whilst also providing opportunities for existing and future communities.

Our approach to gathering evidence to establish the need for intervention, identify study objectives and critical success factors has been guided by the key principles identified within the EEH's Transport Strategy - net zero carbon, economic, quality of life, wellbeing, inclusive access, sustainable and active travel connectivity and freight.

Consistent with *Connecting People, Transforming Journeys* 'whole system approach', this Phase 2 report summarises our **people, place** and **connectivity** evidence base to demonstrate the existing and growing complex challenges facing the corridor along with a clear set of critical success factors and objectives to address the identified problems.

The study recognises that strategic infrastructure issues (and solutions) extend beyond a single area and adopts a cross-boarder, strategic approach to assessing connectivity and movement. The study goes beyond more localised approaches to addressing transport issues, like Local Transport Plans, to identify strategic interventions that meet the ambitions of the study area. This reflects EEH's function as a Strategic Transport Body which has the aim of ensuring that regional investment in transport is 'joined up'.

Step 1: Understanding the Current Situation	Step 2: Understanding the Future Situation	Step 3: Establishing the Need for Intervention	Step 4a: Identify Intervention Specific Objectives
•Policy context •People •Place •Connectivity •Movement patterns •Issues and opportunities	•Planned growth •Committed transport improvements •Forecast changes in travel demand	•Key issues and opportunities •Underlying causes and drivers •The case for intervention •Critical success factors	•Objectives

Study Area

The Peterborough-Northampton-Oxford corridor study area, as presented on page 7, extends from Oxford (south-west) to Peterborough (north-east). The corridor is strategically located to the north-west of London and is an important contributor to the success of the sub-region.

The study area **includes the primary urban conurbations** of Peterborough, Northampton, Oxford, Bicester, Brackley, Buckingham, Wellingborough, Kettering, Corby, Rushden, and Whittlesey, **spanning multiple local authorities**.

The study area also **encompasses regional and national significant road and rail links,** including the M1, M40, A1, A43, A41, A14, and A34 and the Oxford to Bicester Line, Chiltern Main Line, Cherwell Valley Line, East Coast Mainline, Ely to Peterborough Line, Northampton Loop, Oakham to Kettering Line, West Coast Main Line and the Midland Main Line.

A number of large urban areas and international gateways are situated on the edge of the study area (Milton Keynes, Birmingham, Birmingham Airport). Whilst these are not the focus of this study, they may influence future decision-making on the extent of the transport interventions within the study area.

The Peterborough-Northampton-Oxford corridor is an attractive place to live, **exhibiting diverse social characteristics, a strong economy and with relatively good transport connectivity**.

However, the nature of the corridor results in complex social, economic and connectivity challenges to be addressed and opportunities to be maximised:

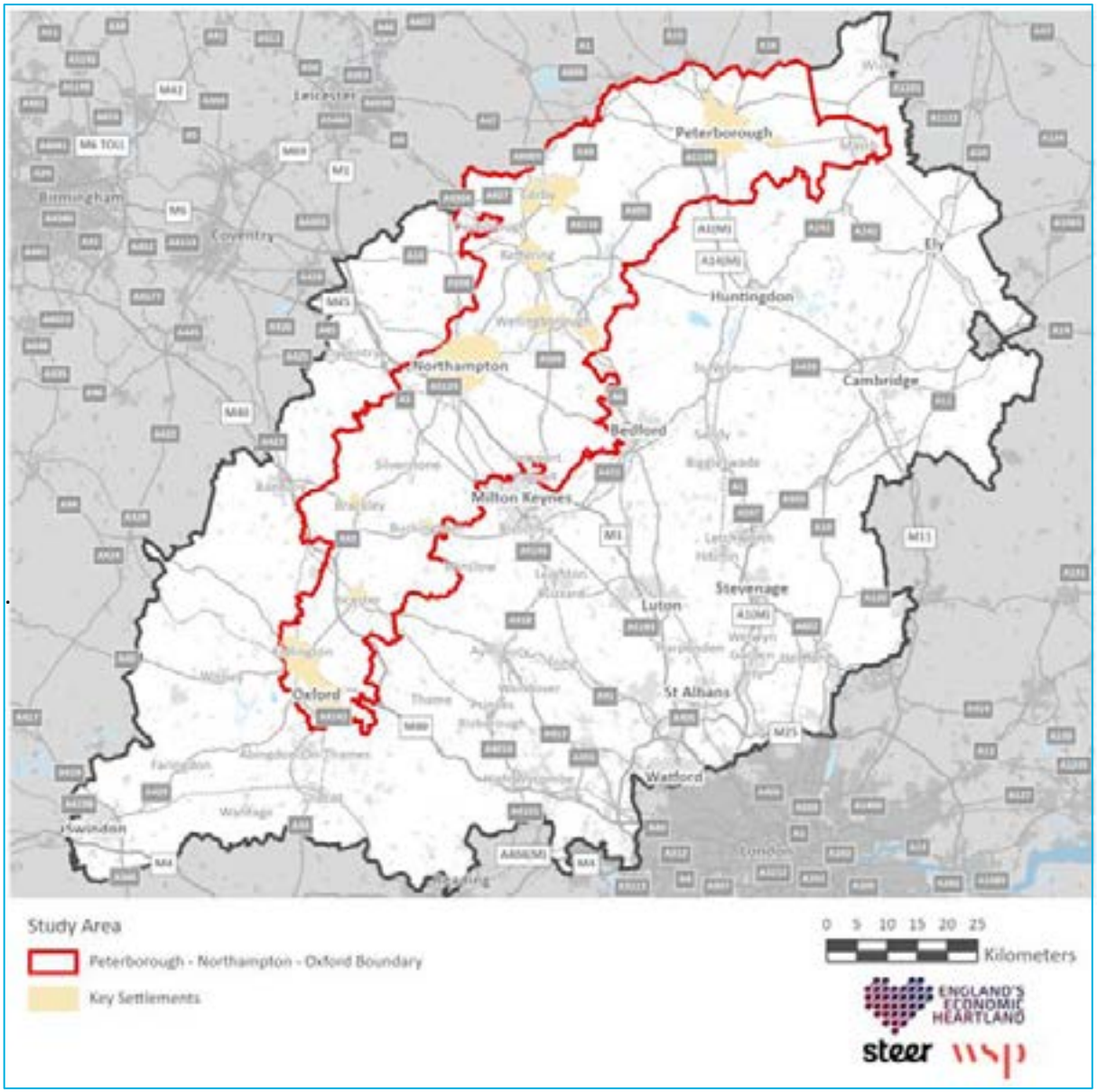
Leveling Up: the study area has varying levels of deprivation, which results in a complex mix of differing needs and challenges. Packages of multi-modal interventions can play a vital role in delivering an affordable and accessible transport network. Thereby reducing barriers to employment, education and training, healthcare, social, leisure, physical and cultural activities.

Decarbonisation: EEH are committed to tackling the decarbonisation of the transport system by bringing all greenhouse gas emission to net zero by 2050, with an ambition to reach this by 2040. The study area exhibits a complex pattern of intra and inter-urban movements dominated by private vehicle, thereby to achieve this target a substantial behavioural shift in the way existing residents in the study area access jobs, services and amenities is required.

Connectivity: despite supporting a dense network of highways and rail links, rural areas in the centre of the corridor cannot access key services and facilities within 30-minutes travel by foot and public transport.

Housing and employment growth forecast based on data provided by local authorities.

Study Area



It should be noted that in April 2021 North Northamptonshire Council and West Northamptonshire Council became a unitary authorities. North Northamptonshire Council has replaced Corby Borough Council, East Northamptonshire Council, Kettering Borough Council and the Borough Council of Wellingborough. West Northamptonshire Council replaced Daventry District Council, Northampton Borough Council and South Northamptonshire Council. Historic data is not available for these two new unitary authorities. Data is not yet available for the two new unitary authorities, as such this report makes reference to the historic geographies of these areas.

Study Area

Where People Live

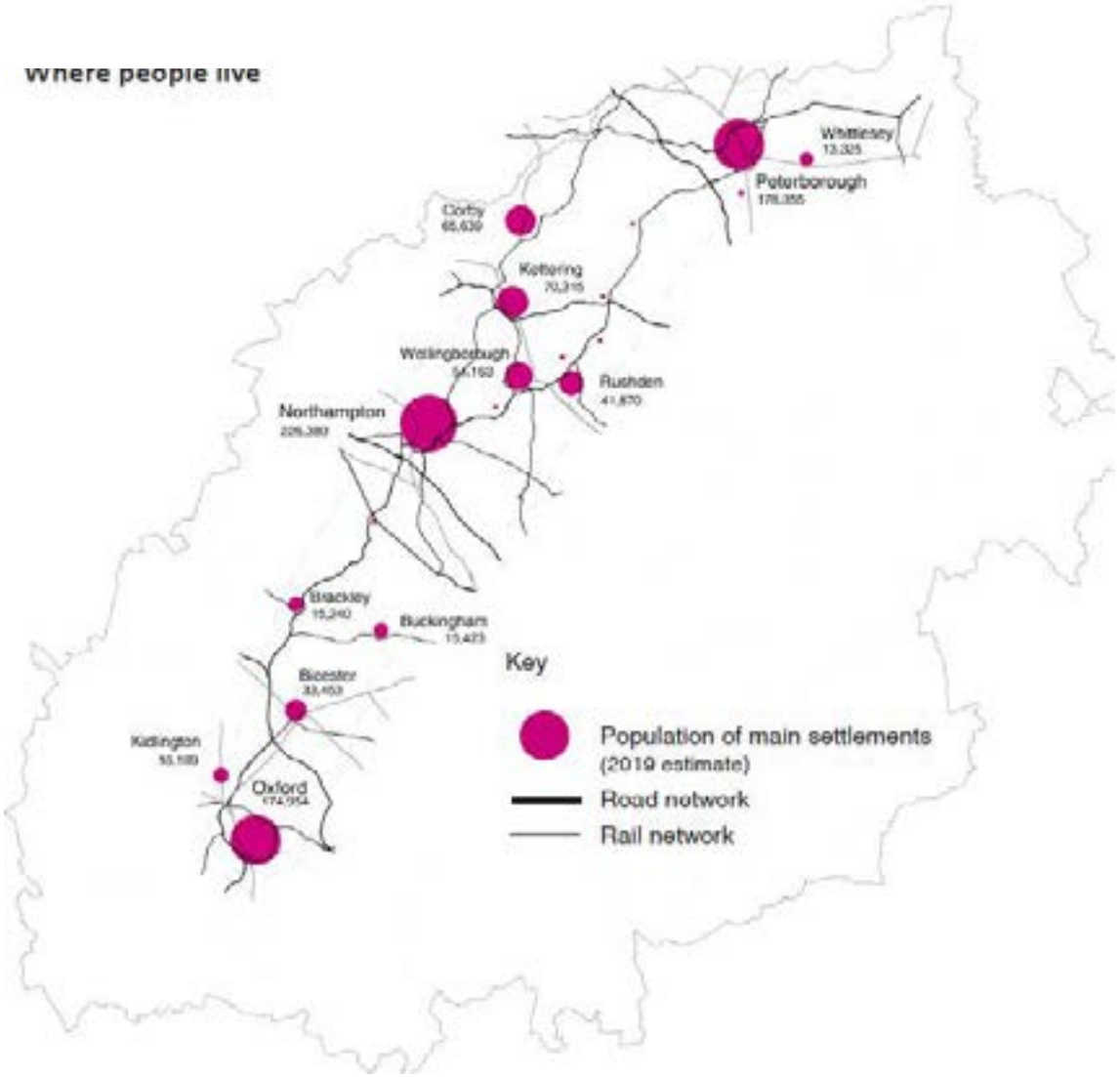
The drawing alongside shows the distribution of population across the study area for all settlements with at least 5,000 inhabitants. Across the wider EEH area around 75% of residents live within settlements of at least 5000 people - and this pattern is broadly reflected within this corridor.

Of this population 64% live in the three main city-scaled settlements of Oxford, Northampton and Peterborough with access to a full range of services within the urban area.

A further 30% live in the larger towns with a population of 30,000 and upwards where most day-to-day needs can be met locally.

This leaves around 6% of the population who live in smaller, less self-contained settlements where travel to nearby towns many necessary to access key services and opportunities.

Data Source: Fifth Studio



Study Area

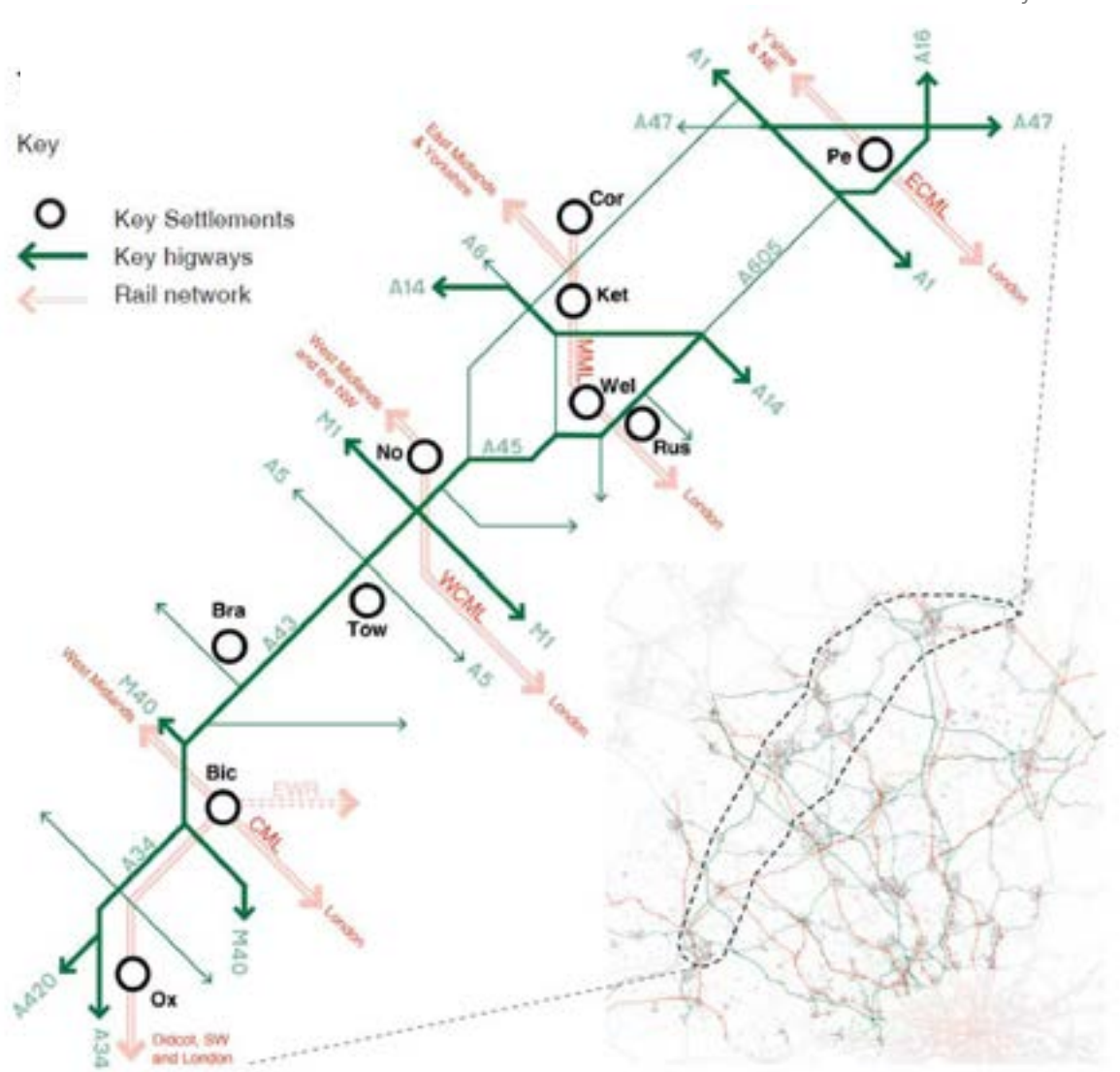
Transport Network

In terms of transport infrastructure, the study area is defined by a continuous highway connection comprising the A34, A43, A45 and the A605 that together link and bypass the three largest settlements. They intersect with four significant strategic routes that cross the study area: the M40, M1, A14 and A1.

In contrast there is currently little continuity along the corridor in terms of public transport connectivity, with no direct rail connections between four rail lines that radiate from London and cut across the corridor (Chiltern Main Line, Northampton loop of the West Coast Main Line, the Midland Main Line and the East Coast Main Line).

However, potential measures linked to East West Rail or to enable trains to run between Stamford and Corby might have the potential to improve connectivity within the corridor, via parallel routes just outside the study area. Further bus and active Connections from settlements will also be required for full connectivity.

Data Source: Fifth Studio



Key Settlements

The corridor includes a number of key settlements. These settlements play an important Economic role within the corridor and wider EEH Area by having a significant residential population and/ or employment offering.

Within the Oxford-Northampton-Peterborough corridor, the largest settlement is the town of Northampton with a total of 226,380 residents and 123,407 jobs.

Other notable settlements include Peterborough with 178,315 residents and 90,970 jobs and Oxford with 174,954 residents and 120,915 jobs.

There are also a number of market towns within the corridor such as Bicester, Wellingborough, Kettering, Rushden, Corby, Brackley, Buckingham and Whittlesey.

The evidence demonstrates that there are several key settlements with considerable population numbers in the corridor. Transport interventions are needed in order to better serve these communities and encourage a shift to active and sustainable modes.

Data Source: 2019 Mid year Population Estimates and ONS Employment in the UK: September 2019

Settlement	Population (2019)	Economically Active (2019)	Total jobs (2019)
Northampton	226,380	158,398	123,407
Oxford	174,954	133,665	120,915
Peterborough	178,355	117,215	90,970
Kettering	70,315	45,971	35,426
Corby	65,639	41,489	29,038
Wellingborough	54,163	36,323	27,530
Rushden	41,870	27,067	12,022
Bicester	33,453	24,534	17,187
Kidlington	16,189	11,565	9,164
Brackley	15,240	9,376	6,038
Buckingham	15,423	9,506	5,146
Whittlesey	13,325	9,249	2,693
Settlement Total	905,304	625,454	479,536
EEH Total	6,009,982	2,593,334	2,354,203
England and Wales Total	59,439,840	28,659,869	36,414,207

**Settlements are defined by All LSOAs within 25% of the given area's Built Urban Area (BUA) Profile. An expansion factor (2011 population by LSOA: 2011 BUA population census data) was applied to Population and Economic Activity to manage discrepancies between LSOA BUA population and actual BUA population.*

Policy Context

Overview

This section sets out the current economic, environmental and transport policies relevant to this study and the corridor itself.

National Policy

National transport policy has historically been focused on delivering the infrastructure required to meet future travel demands and to enable economic growth. More recently, policy has made a focus on sustainable modes and reducing carbon emissions.

National Planning Policy Framework (2019) - This sets out the Government's planning policies for England and how they should be applied. At the heart of the NPPF is the presumption in favour of sustainable development which needs to be applied in plan-making and decision-taking. The NPFF recognises that there are three separate, but inter-linked, pillars to sustainability – economic, social and environmental.

Clean Air Strategy, DEFRA (2019) - confirms the Government's commitment to encouraging travel by low emission modes of travel, including public transport (bus, light rail, rail) and active modes as these modes are less polluting than private cars.

The Clean Growth Strategy, DEFRA, (2018) - transport interventions in the study area that accelerate the shift to low-carbon transport, including low emission public transport vehicles, walking and cycling will support the ambitions of The Clean Growth Strategy.

Transport Decarbonisation Plans, DfT (2021) - sets out the Government's commitments and the actions needed to decarbonise the entire transport system in the UK. It includes our pathway to net zero transport in the UK the wider benefits net zero transport can deliver the principles that underpin our approach to delivering net zero transport.

UK National Bus Strategy, DfT (2021) - sets out the vision and opportunity to deliver better bus services for passengers across England, through ambitious and far-reaching reform of how services are planned and delivered. Bus services are to be transformed with simpler fares, thousands of new buses, improved routes and higher frequencies.

Road Investment Strategy 2 (2020) - Outlines Highways England's (now National Highways) future road investment projects with a strategic vision of using new technologies to promote sustainable and safe use of strategic roadways for all user including Buses, HGVs and active travel, instead of standard cars.

Gear Change, DfT (2020) - sets out the Government's bold future vision for walking and cycling to become the natural first choice for many journeys, with over half of all journeys in our towns and cities being cycled or walked by 2030. In February 2020, the Transport Secretary announced £5 billion in funding to overhaul bus and cycle links for every region outside London.

The Road to Zero, DfT (2018) - identifies that buses are critical to the Government's objectives to encourage modal shift to more sustainable and less polluting modes of travel and supports and the introduction of zero-emission buses through funding opportunities to improve the efficiency of the UK's bus fleet.

Future of Mobility: Urban Strategy, DfT (2019) - transport interventions in the study area that deliver new modes of transport and or new mobility systems that encourage walking and cycling for short journeys, provide efficient and low emission mass transit, improve public transport reliability, responsiveness, accessibility, affordability and safety, reduce congestion and support the transition to a low carbon future support the principles of the Future of Mobility: Urban Strategy.

Policy Context

National Policy (cont.)

Route Services Strategic Plan, Network Rail (2018) - plays a vital role in the success of Network Rail achieving its vision for its passengers and freight users. Route Services consists of six primary functions (business services, commercial and procurement, IT services, asset information services, engineering services and supply chain operations) supporting safety, customer and community, customer experience, people, service delivery and sustainable growth objectives.

Rail Network Enhancements Pipeline, DfT (2018) - sets out an approach that applies for rail enhancements within England and Wales. It represents a rolling programme of investment into new or improved infrastructure that enable service changes and other benefits to passengers, freight users and the economy. The investments will enhance the capability of the railway, typically adding increased or new capacity or providing technical improvements to the way the railway runs.

Digital

In the digital connectivity arena, the pace of technology development leads to order-of-magnitude changes in broadband speeds and usage over the course of a relatively few years, and there is a fast-changing landscape in EEH as there is in the UK as a whole. Substantial improvements in fixed and mobile connectivity are being driven by a combination of commercial roll-outs and policy action.

In terms of fixed broadband, the coverage of superfast services (offering 30Mbps+ download speeds) is now nearly ubiquitous across the UK. The focus has shifted to the roll-out of gigabit-capable services offering 1,000Mbps+ download speeds.

The largest players in this are BT Openreach which is rolling out Fibre-to-the-Premises (FTTP) services, and Virgin Media which is upgrading its existing cable network to gigabit-capable DOCSIS 3.1 technology and is also using FTTP to extend its footprint.

In addition, there has been a welcome increase in the number of independent fibre network operators over the last few years; in EEH these include CityFibre, Gigaclear, Tove Valley Broadband, Glide, and Hyperoptic.

Recognising that such commercial roll-outs are likely to leave harder-to-reach premises unable to access gigabit services, the Government has established the £5 billion Project Gigabit which plans to subsidise coverage for the 'final 20%' of premises, and its initial procurements for subsidised roll-outs are getting underway.

The EEH area will be addressed through five separate Regional Supplier procurement lots. The Government's aim is to achieve gigabit coverage for 85% of UK premises by 2025 and to push towards 100% nationwide coverage as soon as possible.

For mobile connectivity, the UK's four mobile network operators are currently rolling out 5G services, which offer higher speeds and lower latency and which are expected to have a variety of applications from health care to agriculture to advanced manufacturing.

It is not yet certain how far these commercial roll-outs will extend, but EE has recently stated that it expects their 5G services to cover half of the UK population by early 2023, and 90% of the UK landmass by 2028. In parallel, the publicly-subsidised £1 billion Shared Rural Network initiative between the Government and the mobile operators is seeking to address areas of the UK where 4G coverage is currently non-existent or partial.

Policy Context

Regional Policy

EEH Connectivity Studies, EEH (2022) - the connectivity studies will turn EEH's transport strategy's vision into actions, identifying the investment required to cut emissions while supporting economic growth along this corridor.

Connecting People, Transforming Journeys, EEH (2021) - provides the EEH region and Government with an evidence-based, vision-led framework focused on enabling economic growth in a way that delivers a net zero transport system by as early as 2040. Enabling growth in a way that improves the environment requires a fundamental switch in the way the region's transport system is planned and delivered.

Passenger Rail Study, EEH (2020) – Phase 1 of the study provided a baseline assessment of existing rail networks and levels of service across the EEH region. A number of nodes were identified in the EEH region and generalised journey times were calculated thus highlighting some key connectivity gaps that exist across the Heartland. In response to this, Phase 2 of the study identified aspirational service levels for priority journey pairs where analysis demonstrated stronger connectivity by rail would generate a significant return on investment.

Pathways to Decarbonisation, EEH (2020) - considered the proposed pathway to decarbonisation to help inform the Connecting People, Transforming Journeys Transport Strategy. A total of five pathways (with associated assumptions) were modelled and in consideration of the outcomes, EEH identified two preferred pathways: Highly Connected Future (increased use of digital communications and embedded technologies in the transport network) and Policy-Led Behaviour Shift (achieved through road pricing and education measures).

EEH Freight Study, EEH (2019) – defines a clear starting point for freight sub-nationally, analyses the implications of future scenario changes and identifies how EEH can capitalise on opportunities and mitigate risk. The study assists in planning the most efficient ways of providing access to goods that unlocks economic potential, protects the environment and communities, and future-proofs networks to accommodate growth and improve efficiency.

Local Enterprise Partnerships

SEMLEP Strategic Economic Plan (2017) - The South East Midlands' (SEM) SEP sets out strategic investments and future actions needed to grow SEM's economy to its full potential. To realise this potential the SEM LEP recognises that strategic pieces of transport infrastructure, and transport connections into them, need to be built alongside world-class broadband and wireless networks.

OxLEP Strategic Economic Plan (2016) - the Oxford Local Enterprise Partnership's (LEP) Strategic Economic Plan (SEP) identifies potential opportunities and prospects of Oxfordshire and manages the county's strong economic growth to ensure sustainability and inclusivity. The LEP has three priority areas driving dynamic economic growth: place-making (provide a quality environment), productivity (delivery and attract skills across sectors) and connectivity (allow people to move freely and connect easily).

Policy Context

Local Policy

The Peterborough – Northampton – Oxford corridor encompasses multiple local authorities, all of whom have their own Local Transport Plans (LTP) setting out their transport objectives, policies and strategies.

Furthermore, each district within the study area has a Local Plan which sets out the future land use and planning policies for the area over a set time period.

A number of local authorities in the corridor have, or are the process of developing, Local Cycling and Walking Infrastructure Plans (LCWIP). These are detailed plans that identify where walking and cycling improvements are needed at a local level.

This Connectivity Study will undertake a holistic approach, identifying multi-modal intervention packages that support both strategic and local infrastructure priorities, whilst helping to achieve local objectives.

Local planning policy documents relevant to this study are identified opposite. Noting that draft documents, or documents out for consultation are not listed. The "Oxfordshire Strategic vision" and "Oxfordshire Local Transport and Connectivity plan" are currently in production and outline policies relevant to this connectivity study.

- *Northamptonshire Transportation Plan (2012)*
- *Northamptonshire Bus Strategy (2018)*
- *Northamptonshire Cycling Strategy (2013)*
- *Northamptonshire Highway Management Strategy (2013)*
- *Northamptonshire Rail Strategy (2013)*
- *Northamptonshire Walking Strategy (2013)*
- *Northamptonshire Highway Development Management Strategy (2013)*
- *Northamptonshire Major Roads Strategy (2013)*
- *Northamptonshire Freight Strategy (2013)*
- *North Northamptonshire Investment Framework (2019)*
- *Buckinghamshire Local transport Plan 4*
- *Connecting Oxfordshire Volume 1 Local Transport Plan 2015-2031*
- *Connecting Oxfordshire Volume 2 Local Transport Plan 2015-2031 – Bus Strategy*
- *Connecting Oxfordshire Volume 3 Local Transport Plan 2015-2031 – Rail Strategy*
- *Connecting Oxfordshire Volume 2 Local Transport Plan 2015-2031 – Active Healthy Strategy*
- *Connecting Oxfordshire Volume 2 Local Transport Plan 2015-2031 – Freight Strategy*
- *Oxford Local Walking and Cycling Infrastructure Plan*
- *Bicester Local Walking and Cycling Infrastructure Plan*
- *Peterborough City Council Local Cycling and Walking Infrastructure Plan*
- *The Cambridgeshire & Peterborough Combined Authority Local Transport Plan (2020)*

Report Structure

Part 2 Understanding the Study Area

Using the adopted people, place and connectivity approach, this chapter demonstrates the social and economic diversity of the study area and the challenges and opportunities this creates. It also sets out the key environmental issues, the current travel patterns, behaviours and levels of service provided by the existing transport networks.

This chapter seeks to establish the underlying drivers and the scale of the existing issues, in order to identify the key challenges and the opportunities that multi-modal intervention packages could deliver.

Part 3 Future Context

This chapter sets out the scale of the growth challenge within the study area. It sets out the potential implications of planned growth if transport interventions are not provided that address the existing issues identified in Part 2, that will undermine the ability for the study area to deliver the required connectivity outcomes that help achieve EEH's objectives, identified within *Connecting People, Transforming Journeys.*

Part 4 Need for Intervention

This chapter summarises the case for intervention based upon an understanding of the aforementioned policy context, the study area today (Part 2), the scale of the growth challenge (Part 3) and the underlying drivers and causes of the identified issues. It provides a Strengths, Weaknesses, Opportunities and Constraints (SWOC) analysis of the study area before outlining the Critical Success Factors (CSF) that will be used to determine the success of potential intervention packages.

Part 5 Infrastructure and Mobility Scenarios

This chapter sets out the approach to scenario planning in this study and details the different infrastructure planning scenarios that have been identified as options for addressing the need for intervention. It then outlines how elements of each of these infrastructure planning scenarios have been brought together to develop an optimal scenario to guide long list development.

Part 6 Next Steps

This section sets out the next steps with the study.

Part 2

Understanding the Study Area

Overview

Background

In order to understand the study area, a 'whole system approach' has been adopted to gain an understanding of the existing communities and businesses, the natural and historic environment and the levels of connectivity provided by the existing transport and digital infrastructure assets.

This section summarises the existing **people, place and connectivity** evidence base. It demonstrates the social and economic diversity and the existing connectivity levels of service of the study area and the challenges and opportunities this creates.

This section seeks to establish the **underlying drivers** and **the scale** of the existing issues, in order to establish the need for intervention, study objectives and Critical Success Factors.

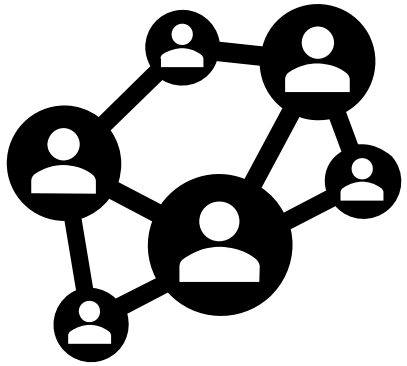
People

The people evidence base presents a set of demographic data to gain an insight into the existing community characteristics of the study area, their needs, and how these can be supported through enhanced connectivity.

Place

The place-based evidence provides an insight into to the existing environmental and settlement characteristics of the study area. By identifying existing environmental constraints and opportunities the location and scale of issues including air quality, safety and carbon emissions are better understood.

Connectivity



The connectivity evidence presents a set of transport network, modal and movement data to gain an insight into to the current pattern of travel, connectivity challenges and opportunities within the study area.

Part 2a

People

Population

Resident Population

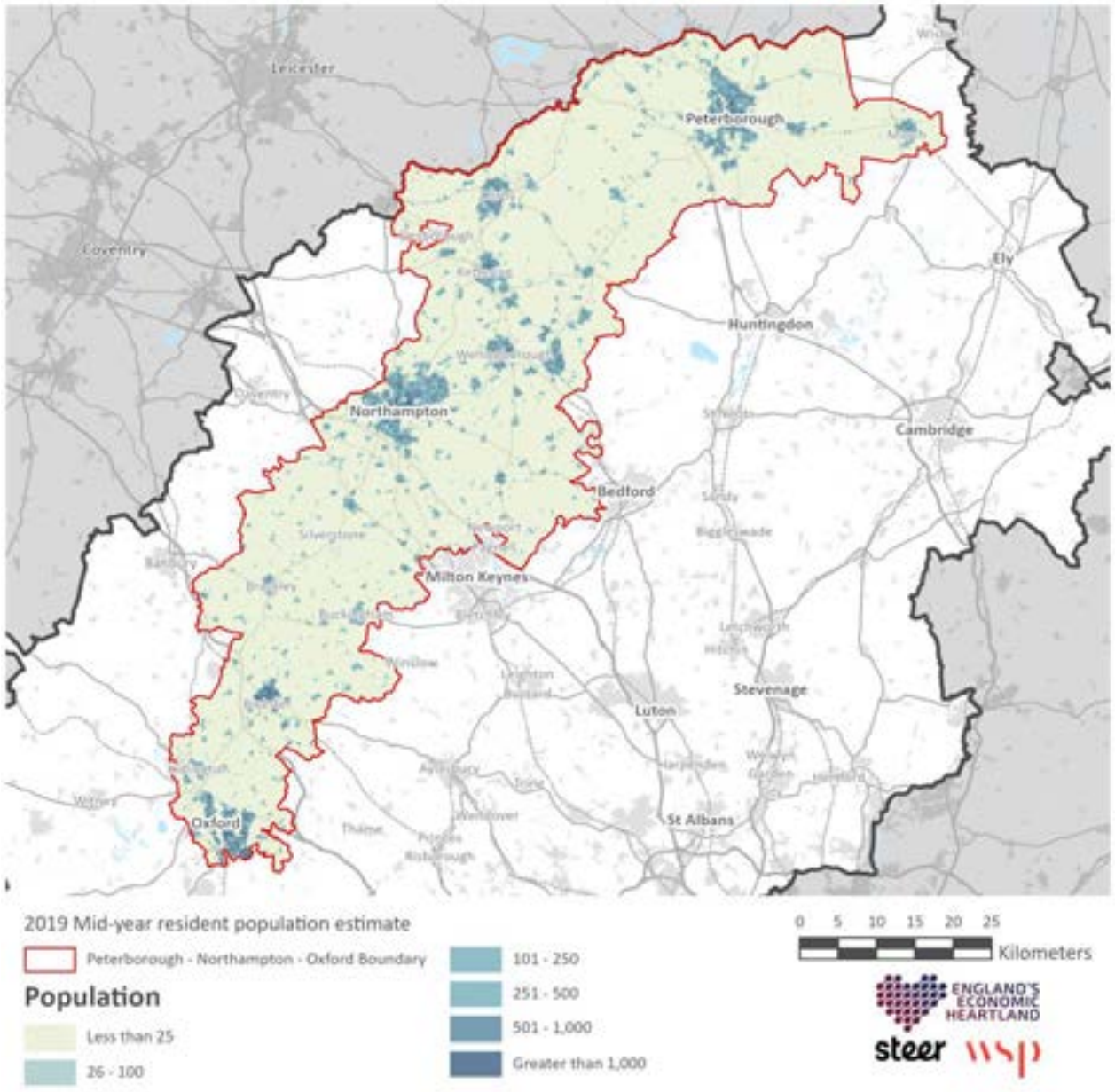
The population of the Peterborough – Northampton – Oxford corridor was approximately 1.2 million in mid-2019 (ONS). The population of the study area is predominantly located in a series of large and mid-sized cities and towns.

The most significant population clusters (Hexcells[1] with greater than 1,000 residents) are Oxford, Northampton, and Peterborough. Other noticeable clusters are present in Bicester, Banbury, Brackley, Buckingham, Wellingborough, Kettering, March and Corby. There are other minor clusters located in Rushden, Whittlesey, Oudle, Irthlingborough, and Newport Pagnell.

The more densely populated areas are generally located around the three largest settlements; Oxford, Northampton, and Peterborough, especially to the north-east of Northampton where many of the mid-sized towns are located.

To maximise the societal benefits to the existing residential population, interventions will need to deliver sustainable connectivity between the population centres as well as support the surrounding rural communities.

Data Source: 2019 Mid Year Population Estimates.



[1]*Mosaic Data is held at full-postcode level (one geographic point feature per postcode) which has been aggregated to a regular tessellated grid of hexagons ("hexcells"). Each hex cell has the same area, allowing the population data within a hex cell to be directly comparable to every other hex cell. Blank areas of the map are characterised by uninhabited hexcells (due to local features, such as a lake, park or field).*

Population

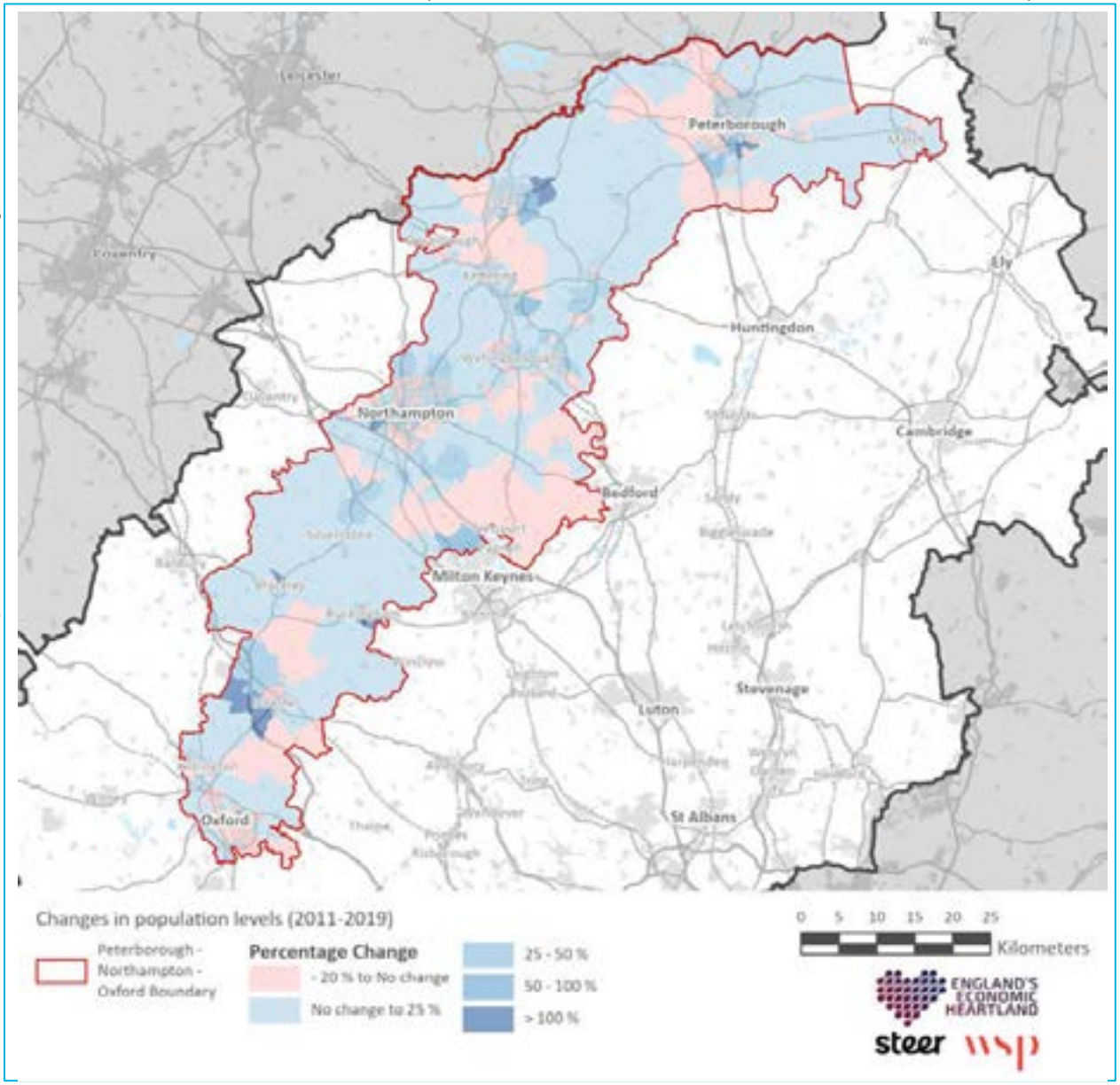
Population Growth (Historic)

The resident population of the corridor grew by 7.5% between 2011 and 2019, from 1.13 million to 1.21 million residents (ONS).

The largest population growth in the corridor has been seen in the towns of Corby and Brackley, with the resident population of these settlements growing by 18% and 17% respectively. The population growth in the three largest urban settlements in the corridor (Northampton, Oxford, and Peterborough) has been less consistent, with varying levels of growth. Oxford's population has grown by just over 1%, Northampton's by 6%, and Peterborough's by 12%. The resident population fell in a number of areas throughout the corridor. The majority of these areas with a decrease in population were more rural. Bicester saw an overall 1% decrease in population and was the only urban settlement to see an overall percentage decrease. Corby has been identified as the fastest growing town outside of London.[1]

The study area population is growing. Transport improvements will need to support this growing population and the need for sustainable short, medium and longer distance travel, including to local services and amenities.

Data Source: 2019 Mid Year Population Estimates, 2011 Census – KS101EW Usual Resident Population



[1]www.economist.com/britain/2019/04/27/how-corby-became-englands-fastest-growing-town

Community Characteristics

Mosaic Groups

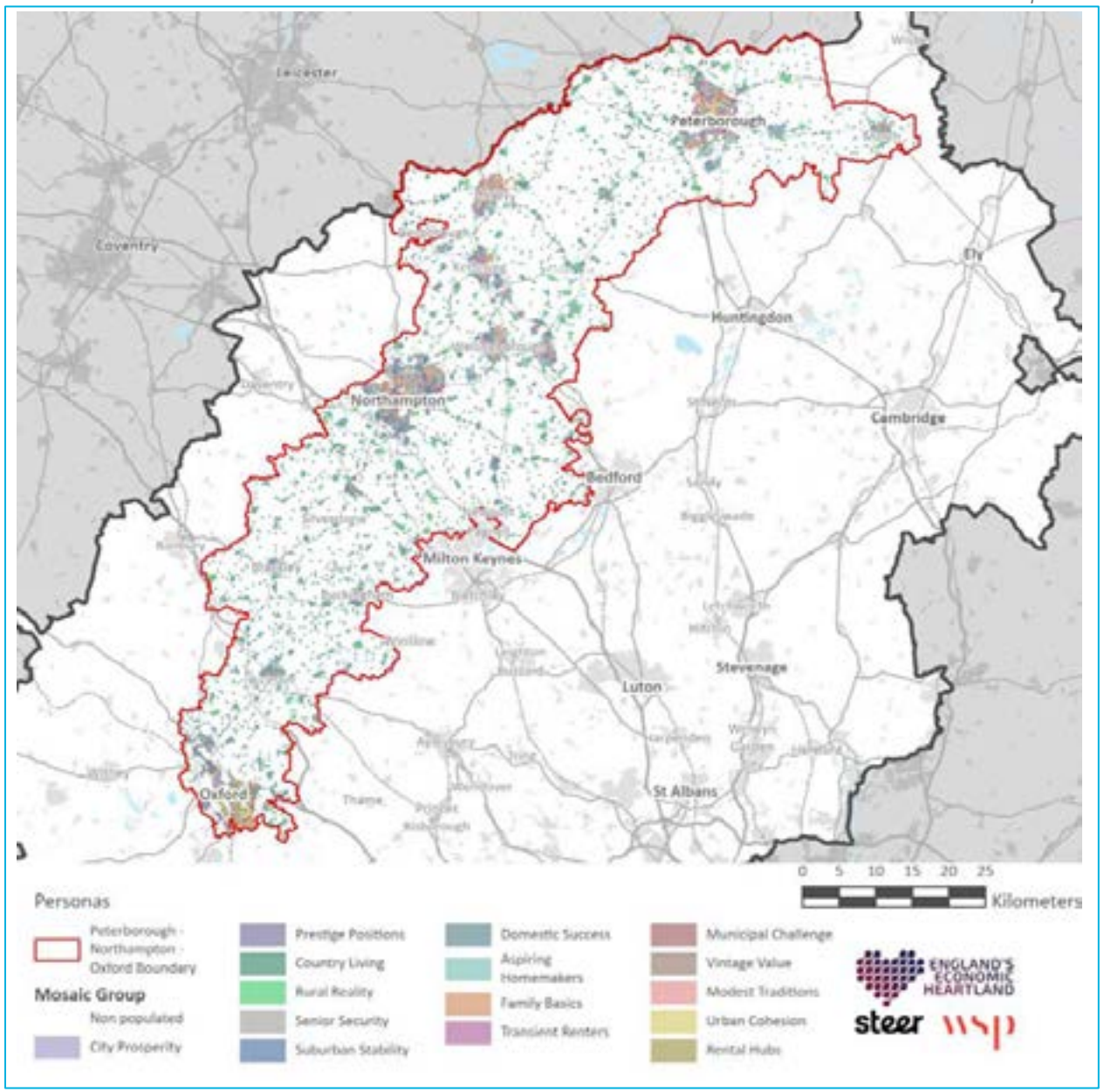
Populations across any given area can vary significantly in terms of the socio-economic attributes. Experian's Mosaic Data has been used to demonstrate the dominant types of people who live in the corridor. The data segments the population into 15 broad persona groups (detailed in Appendix A), which can subsequently provide valuable insights into how certain types of people may relate to transport interventions, whether they are policy, service or infrastructure focussed.

Oxford is characterised by City Prosperity to the north, and Urban Cohesion, Rental Hubs, and Family Basics in the centre and south. Northampton has a high proportion of Senior Security, and Corby is dominated by Family Basics.

The remaining urban areas are comprised of clusters of Family Basics, Suburban Stability, and Aspiring Homeowners, especially on the outskirts. Transient Renters and Urban Cohesion are the noticeable characteristics in the town and city centres.

The rural areas are predominantly characterised by Country Living or Rural Reality.

Data Source: Experian



Community Characteristics

Propensity to Travel (By Mode)

As a part of EEH's First Mile Last Mile Strategy a propensity framework was developed using Experian Mosaic data. Using this framework a number of key desirable characteristics of mobility have been associated with each persona group. For instance, 'Family Basics' place a high value on cost, and as such, are likely to have a higher propensity to take-up lower cost modes. Alternatively, individuals in areas characterised by 'Prestige Positions' and 'City Prosperity' tend to place a higher value on comfort, as such, these groups tend to have a lower propensity to cycle or use bus services.

These characteristics have been used to establish the propensity of each persona to use different modes of transport, as shown in the table opposite (a score of 1 indicates a low propensity to use that mode of transport and a score of 5 indicates a high propensity).

The propensity scoring is informed by the project teams' professional judgement and interpretation of the Mosaic Data at the time of writing this report.

The evidence provided demonstrates there are a wide range of communities living across the study area. Therefore. the maximise societal benefits, transport investment needs to be tailored to the characteristics of the community.

Data Source: WSP

	Mode	City Prosperity	Prestige Positions	Country Living	Rural Reality	Senior Security	Suburban Stability	Domestic Success	Aspiring Homemakers	Family Basics	Transient Renters	Municipal Challenge	Vintage Value	Modest Traditions	Urban Cohesion	Rental Hubs
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
On foot	On foot	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cycling	Cycling (SP & O)	3	4	5	4	4	5	4	5	5	4	4	4	4	4	4
	Cycling (P & O)	2	2	4	2	2	3	3	3	3	3	2	2	2	2	2
	Cycling (SP & S)	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
	Cycling (P & S)	2	2	3	4	2	2	3	2	2	2	2	2	3	2	2
E-Scooter* (kick-scooter)	E-Scooter (P & O)	2	3	4	4	3	4	3	4	4	3	3	3	2	2	3
	E-Scooter (P & S)	1	2	3	3	1	2	2	1	2	1	2	1	3	1	1
Motorcycle	Motorcycle (PTW - O)	2	1	1	1	1	3	2	3	3	2	2	1	1	2	2
	Motorcycle (PTW - S)	1	1	2	2	1	1	2	1	1	1	1	1	2	1	1
	Motorcycle (PTW - Taxi)	1	1	2	2	1	2	1	1	2	1	2	1	2	1	1
Car	Car (Sole Use)	5	3	1	1	3	3	2	3	3	3	3	3	1	4	3
	Car (Sole Use & S - P2P)	3	3	2	4	4	1	3	2	1	2	4	4	4	3	3
	Car (Sole Use & S - Ride Share)	4	4	4	4	4	4	5	4	4	4	4	4	5	4	4
	Car (S - Car Club)	3	3	2	4	4	2	3	2	2	3	3	4	4	3	2
Traditional & Emerging Taxi	Traditional and Emerging Taxi	4	4	3	3	3	3	4	4	3	4	4	3	3	3	4
Ride-hailing (sole use)	Ride-Hailing (Sole Use)	3	2	1	1	2	2	2	2	2	3	3	2	1	3	3
Ride-hailing (shared use) – shared taxi	Ride Hailing (S - Taxi)	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4
Ride-hailing (shared use) – DDRT	Ride Hailing (S - DDRT)	4	5	4	5	5	4	5	5	4	5	5	5	5	5	5
Traditional Bus	Traditional Bus	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1
Bus Rapid Transit	Bus Rapid Transit	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Light Rail	Light Rail	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

SP – Self Powered
P – Powered
O - Owned

S - Shared
PTW – Powered Two Wheeler
DDRT – Digital / Dynamic Demand Responsive Transport

Employment

Workplace Population

The workplace population of the Peterborough-Northampton-Oxford corridor was approximately 634,000 in 2019 (ONS).

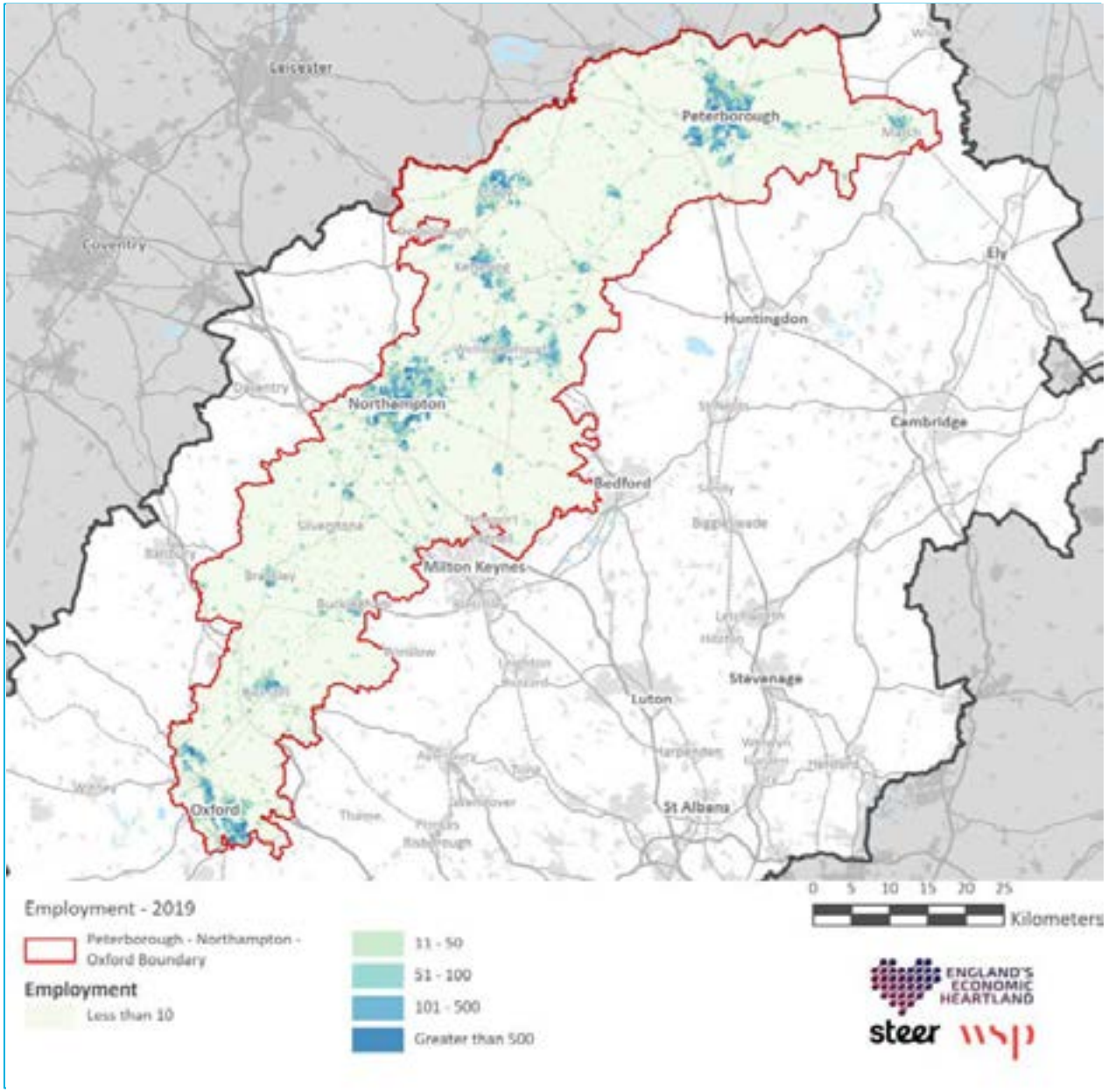
The workplace population is concentrated around Northampton (134,626 jobs), Oxford (114,411 jobs), and Peterborough (87,782 jobs).

High levels of employment are also observed within medium sized towns such as Kettering (34,015 jobs), Wellingborough (30,702 jobs), Corby (27,248 jobs). There are also high levels of employment within smaller settlements such as Bicester (17,772 jobs) and Kidlington (12,123 jobs).

There are pockets of high employment within more rural areas of the corridor (hexcells with more than 500 jobs), including Silverstone Park and Olney Town Centre. Areas within and surrounding Oxford should be considered in future developments with the presence of two universities and several large employment areas.

Jobs are predominantly located in the urban centres of the corridor, with clusters in rural areas. It is necessary to improve transport links from all parts of the corridor to key employment centres, so there is equal opportunity to unlock the economic benefits.

Data Source: ONS 2019 Mid-Year Population Estimates



Employment

Average Earnings

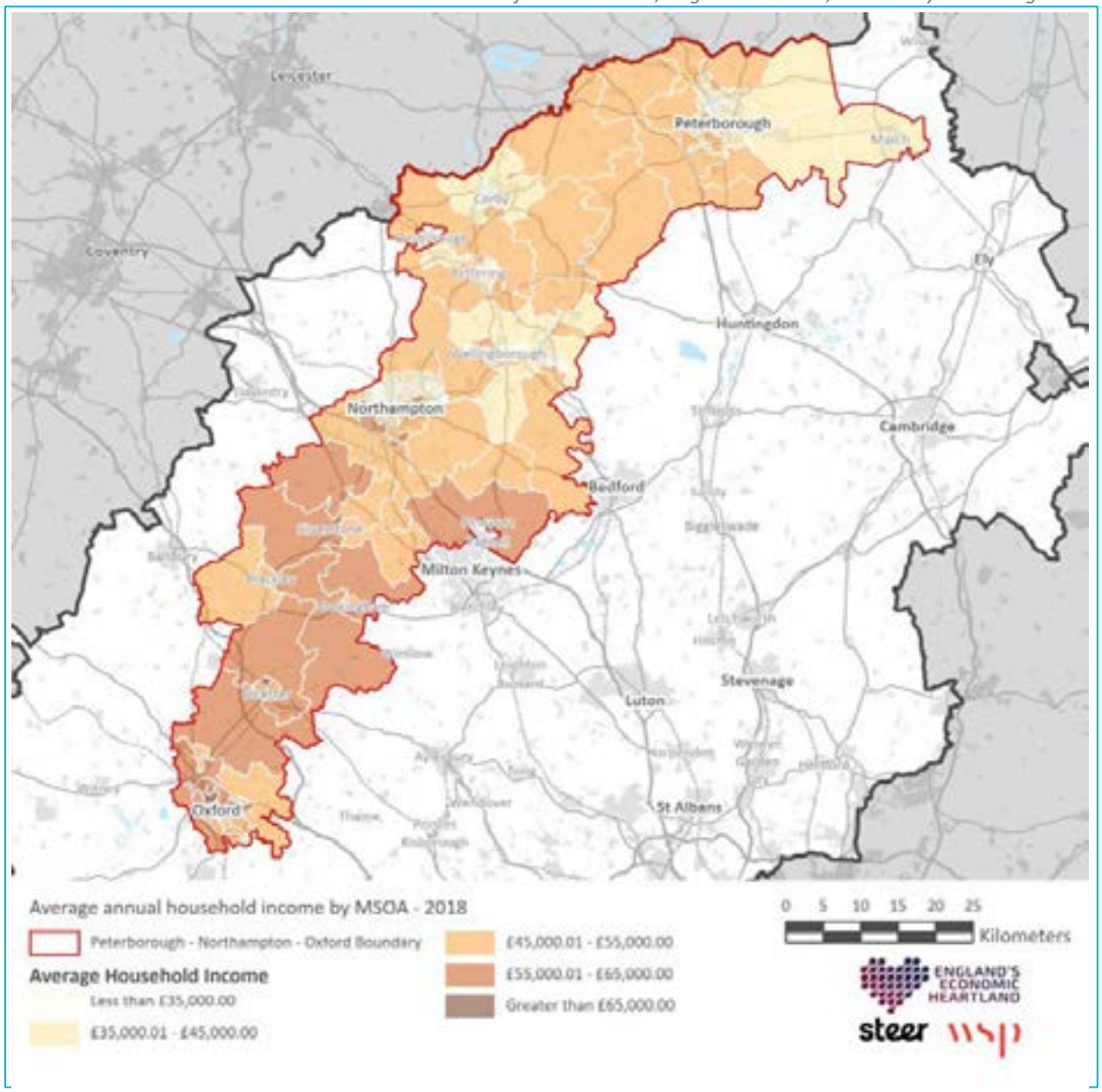
In 2018 the average household income of the Peterborough – Northampton - Oxford corridor was £44,727 (ONS)

The plan opposite shows the average yearly household income ranges from less than £35,000 to greater than £65,000 throughout the corridor. It is evident that there are higher levels of income on average in the south/ south-east of the corridor compared with the central and northern areas of the corridor.

The areas with the highest average yearly household income (greater than £65,000) include a central area of Oxford and Bicester. There are also areas in all the large urban settlements where earnings are less than £35,000 per year. This is particularly evident in areas in Peterborough, Corby, Wellingborough, Rushden, Kettering and Northampton.

It is important that any transport interventions reflect the economic profile of residents living and working in a particular area. The geographical disparity between the north and south of the corridor should be addressed through improved transport links, unlocking the high economic activity in the south of the corridor for the other areas.

Data Source: Income Estimates for Small areas, England & Wales, Financial year ending 2018



Transport Poverty

Indices of Multiple Deprivation (IMD)

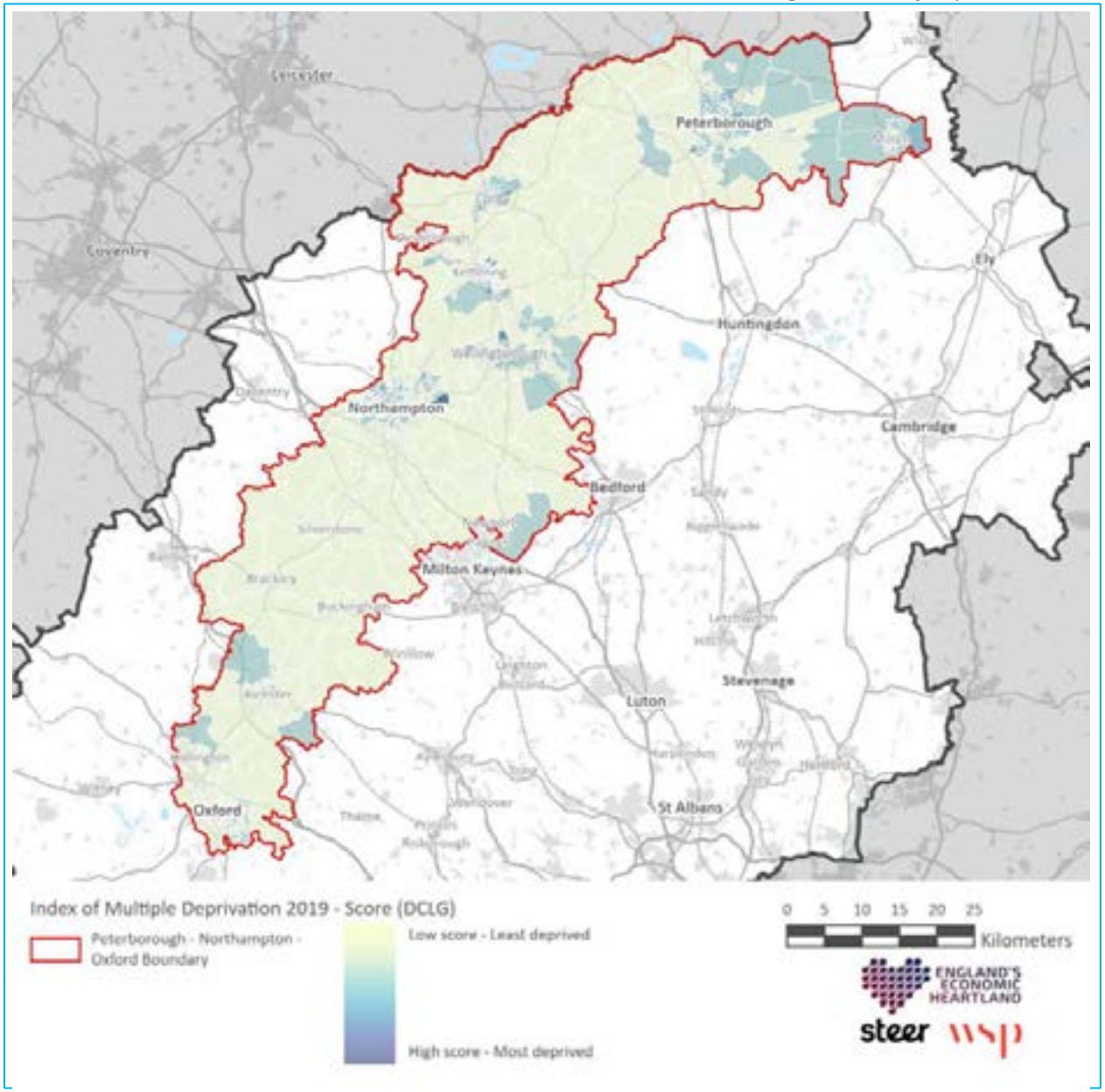
The IMD includes various factors influencing the level of deprivation in an area, including income, employment, education, health, and the living environment. Deciles are calculated by ranking the 32,844 neighbourhoods in England from most deprived to least deprived and dividing them into 10 equal groups.

The corridor includes LSOAs that fall into the most and least deprived categories. Most deprived areas are found in all three of the major urban settlements, although at a much higher density in Peterborough and Northampton compared to Oxford. The north and centre of Oxford have low levels of deprivation.

There is a clear urban/ rural divide, with rural areas on average having much lower levels of deprivation compared to urban areas.

It is evident that the levels of deprivation varies hugely within the corridor, aligning with other socio-economic factors such as average income. Transport poverty contributes to the lack of social mobility in deprived areas, but improved transport links could act as an opportunity for these areas to harness the social/ economic activity in the least deprived areas.

Data Source: English Indices of Deprivation 2019



Transport Poverty

Car Ownership

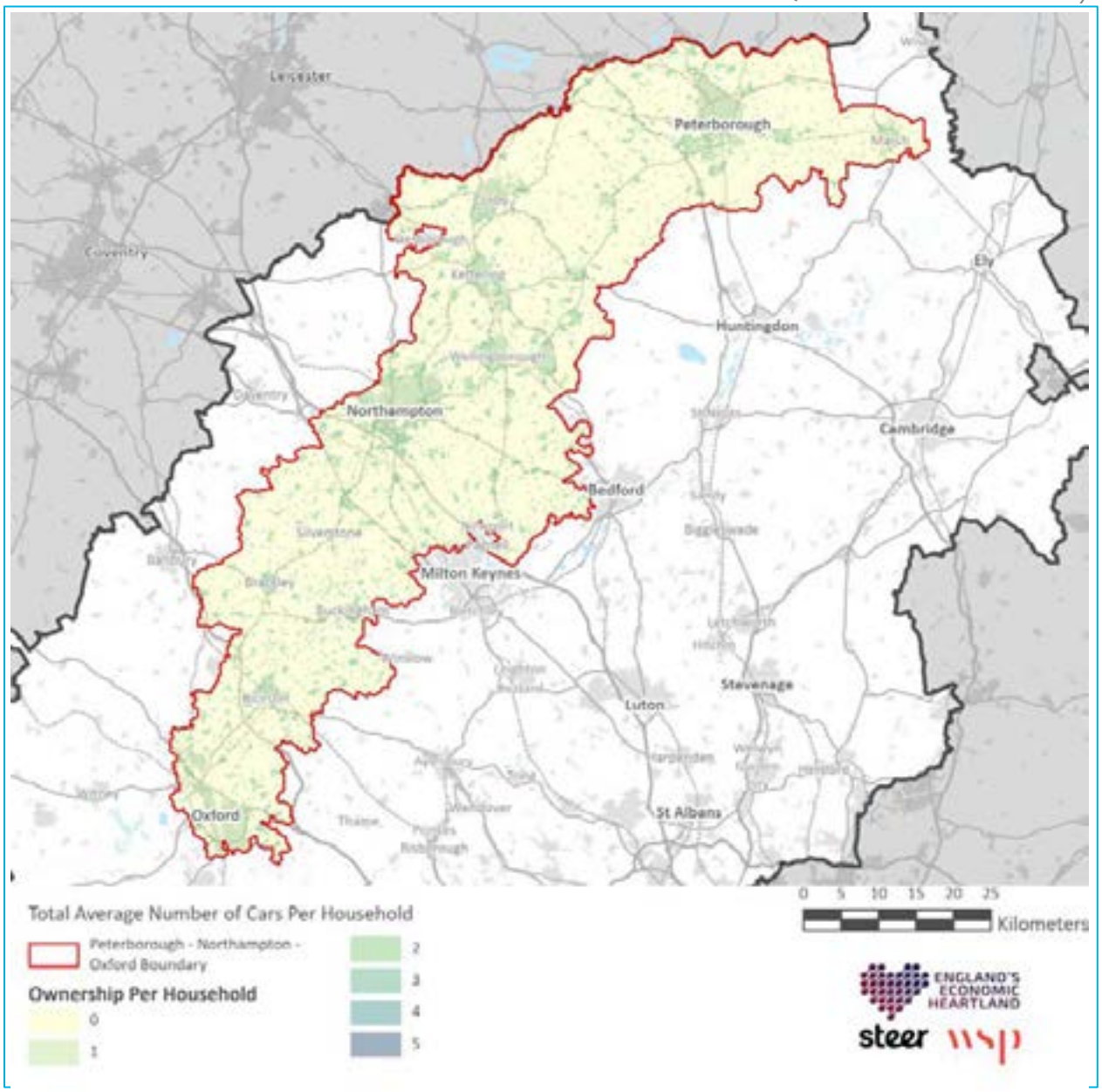
Average car and van availability per household provides an indication of an area's reliance upon the private car for transportation as well its overall economic prosperity. **In 2011 households in the Peterborough – Northampton - Oxford corridor had access to an average of 1.27 cars or vans.**

Average car and van availability per household is generally higher in rural parts of the corridor, with average access to **1.54 cars or vans outside of the urban settlements**. Across the main urban settlements in the corridor, households had access to an average of **1.13 cars or vans.**

Of the urban settlements, the highest availability of cars and vans per household was recorded in Brackley. On average each household in Brackley has access to **1.55 cars or vans,** slightly above the average rural rate.

The evidence demonstrates that there are high levels of multiple car ownership per household across the study area. Therefore, there are opportunities to reduce second car ownership in areas where attractive public and active transport options already exist. In all other areas car ownership will only reduce if active and public transport can offer a viable alternative to the private car.

Data Source:2011 Census - QS416EW Car or Van Availability



Health & Wellbeing

Health & Disability Decile

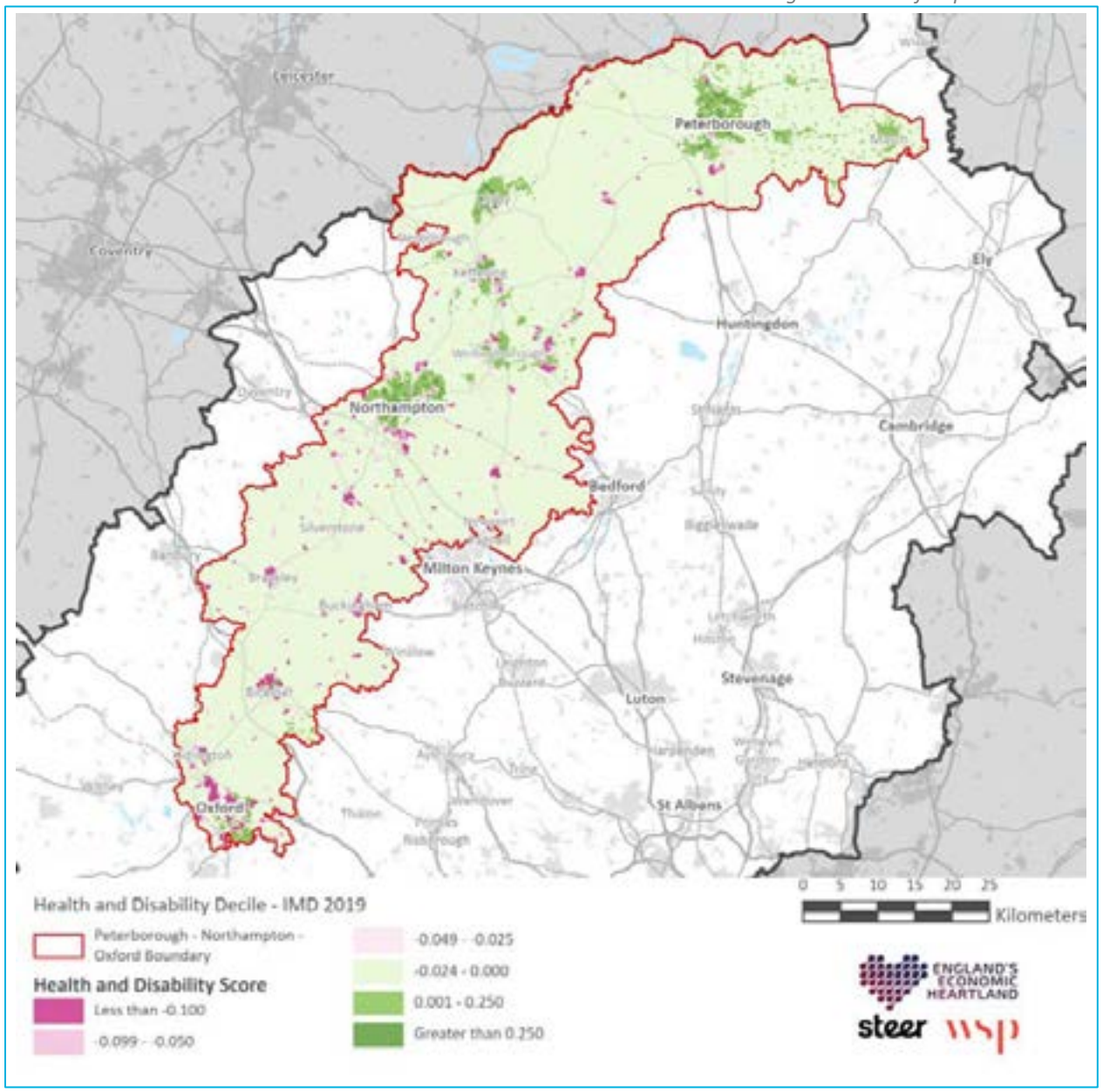
The UK is currently facing several public health issues linked to several factors such as physical inactivity and poor air quality.

The lowest levels of health and disability deprivation within the corridor (less than –0.100) are seen in areas of Oxford, Bicester, Brackley, Buckingham, and some more rural areas. Areas with relatively high levels of health and disability deprivation (greater than 0.250) are located in Northampton, Peterborough, Corby, Kettering, Wellingborough, and March.

There is a clear divide between the north and south of the corridor, with lower Health and Disability scores located to the south of the corridor.

The Health Impact Assessment indicates that the decarbonisation of the transport system and improvements to public transport are likely to result in positive health outcomes. Active modes of travel should be encouraged for end-to-end journeys where possible or first-mile/last-mile modes as a part of a longer trip by public transport. This should be especially targeted in urban areas where there tends to be higher levels of inactivity, and more potential for active travel schemes.

Data Source: English Indices of Deprivation 2019



Health & Wellbeing

Road Safety

The plan opposite shows the location of personal injury accidents (PIA) recorded on Motorways, A-Roads and B-Roads in the Peterborough-Northampton-Oxford corridor between January 2012 and December 2018.

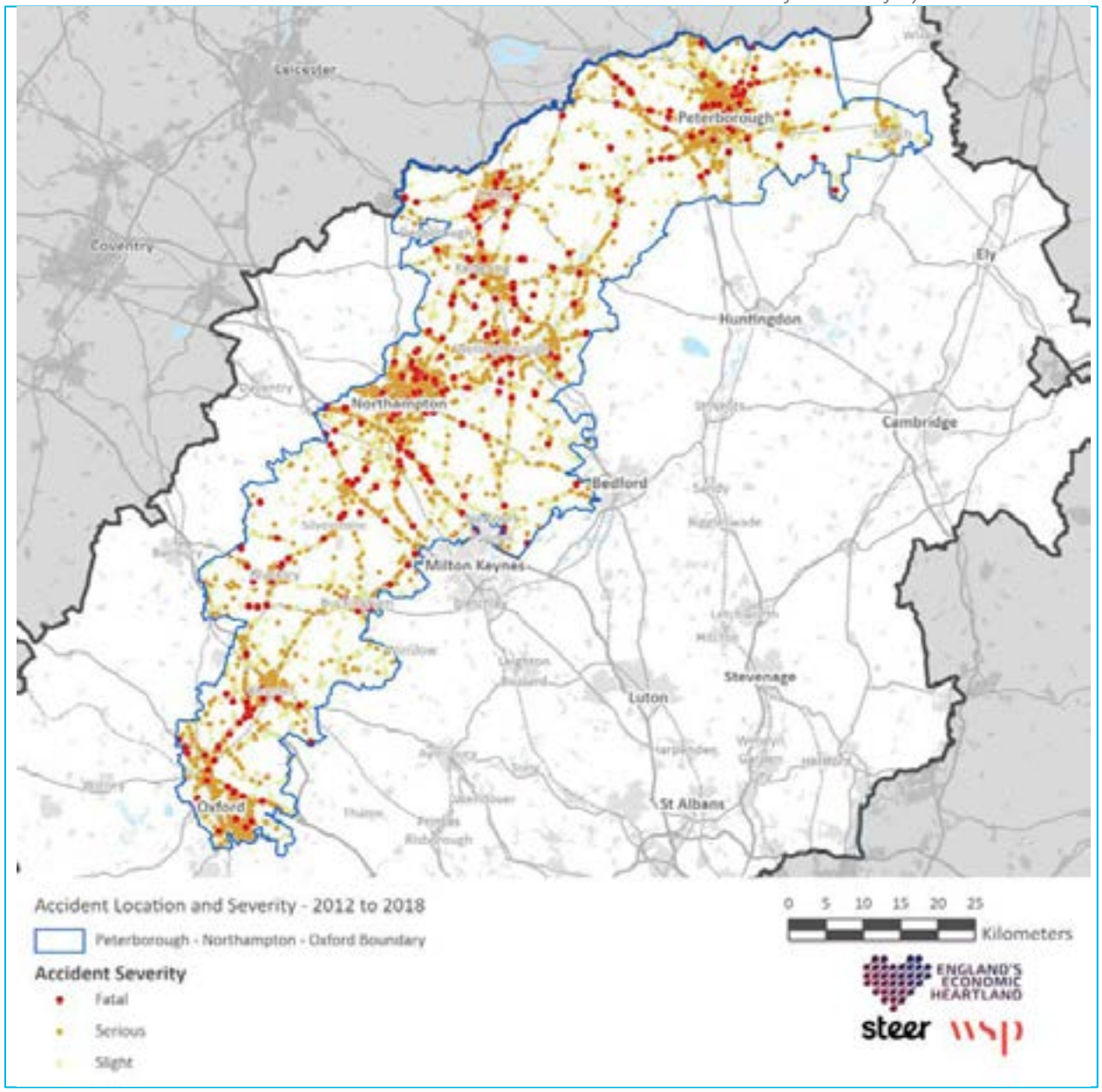
The volume of PIA generally increases in urban areas, with the highest concentration of PIA occurring in settlements such as Oxford, Northampton, Peterborough, Kettering, Wellingborough, Bicester and Corby. This increased concentration of accidents in urban areas is likely to reflect the presence of more junctions and intersections and a higher number of vulnerable road users.

Outside of the main urban settlements there are numerous locations within the corridor where a high number of fatal accidents have occurred. This includes:

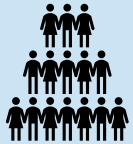
- The A34 between Oxford and Bicester on approach to the junction with the M40.
- The M1 south of Northampton.
- Southwestern section of Oakley Road in Corby.

There is potential to minimise this high level of accidents through a reduction of traffic in urban environments and delivery of highway improvement schemes at accident hotspots.

Data Source: DfT Road Safety Data 2012 - 2019



Summary

Theme	Issues & Opportunities
 POPULATION	**Issues** • **Spatial distribution –** the existing population is predominantly located in a series of large and mid-sized cities/ towns throughout the corridor – the most significant clusters being Peterborough, Northampton and Oxford. **Opportunities** • **Population levels –** the corridor has seen large growth, especially in the market towns over the past 10 years. With a total population of more than 1.2 million people, there is a large market which will directly benefit from enhanced corridor connectivity.
 COMMUNITY	**Issues** • **Social Diversity -** the study area includes a range of persona types, each of which demand different desirable characteristics of mobility. **Opportunities** • **Inclusive Transport -** the evidence demonstrates that there is an opportunity to implement packages of multi-modal transport interventions that appeal across socio-demographic profiles.
 EMPLOYMENT	**Issues** • **Income disparity -** there is a disparity in the corridor in terms of average earnings, with the southern section having a much higher average income in comparison with the north of the corridor. **Opportunities** • **Inclusive Transport –** improved transport links in the corridor should provide for better opportunities for lower income groups to access the full range of jobs, education and key services across the corridor.
 DEPRIVATION	**Issues** • **Car ownership -** there are relatively high levels of car ownership throughout the corridor (with the exception of Northampton and Oxford) which leads to increased pollution / congestion levels and an increased number of traffic accidents. **Opportunities** • **Levelling up –** inclusive transport connectivity can be provided between homes, jobs, and services to enable all members of society to access the full range of opportunities provided in the study area.
 HEALTH & WELLBEING	**Issues** • **Deprivation -** the study area has a diverse range of health deprivation, with high levels of health and disability deprivation in the northern areas of the corridor, which contributes to national public health issues. **Opportunities** • **Healthy Movement -** the evidence supports the need to invest in improved active and sustainable transport infrastructure to increase physical activity levels, improve health and mental health and reduce social isolation and loneliness.

Part 2b

Place

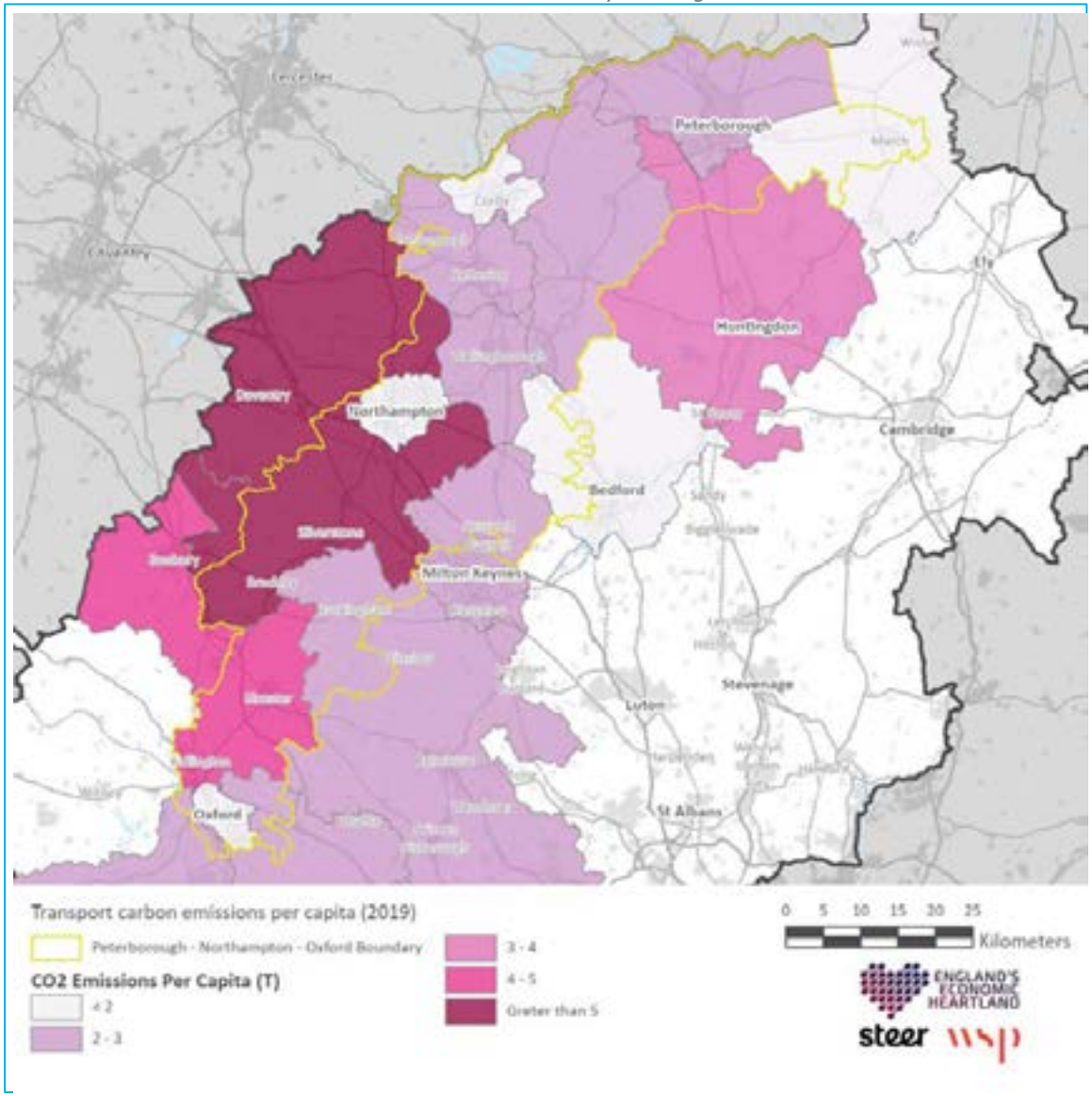
Environment

To address the UK's GHG emissions the Government has set a legally binding target of reaching net zero carbon emissions by 2050, with a closer reduction of 78% by 2035. To assess progress against this, it is important to understand the total carbon emissions of the corridor. **In 2019, the total amount of CO_2 emissions from transport[1] by districts in the study area was 7,280 kT. This makes up roughly 58% of all the CO_2 emissions within the EEH region.**

In 2019 the average transport carbon emission per capita within the corridor was 2.32 Tonnes. This compares with an average of 1.66 Tonnes for the UK as a whole and an average of 2.16 Tonnes for the EEH. Areas that recorded above average carbon emissions per capita include Cherwell, Daventry, East Northamptonshire, Huntingdonshire, Kettering, South Northamptonshire and South Oxfordshire. It should be noted that the area does include a high density of Strategic Road Network and associated vehicle trips passing across the corridor, contributing to carbon emissions. The urban areas of Peterborough, Northampton and Oxford have lower than average carbon emissions per capita, with Oxford having the lowest at 0.76 Tonnes, due mostly to higher active travel usage. Major roads & Motorways have the largest share, with 70% of all carbon in the corridor.

The evidence presented and the supporting EEH documentation (*Pathways to Decarbonisation*) indicates an opportunity to support behavioural shift towards sustainable modes, combined with a stronger / more reliable digital future to reduce the need to travel and create a cleaner vehicle fleet.

Data Source: UK Local Authority and Regional Carbon Dioxide Emissions 2019



[1] *Transport refers to the transport system as a whole and includes carbon emissions from diesel railways, road transport (A roads), road transport (minor roads), road transport (motorways) and transport other. It should be noted carbon emissions from international aviation and shipping are not included. However domestic aviation (i.e. flights taking off and landing within the UK) and shipping are included.*

Environment

Flood Risk

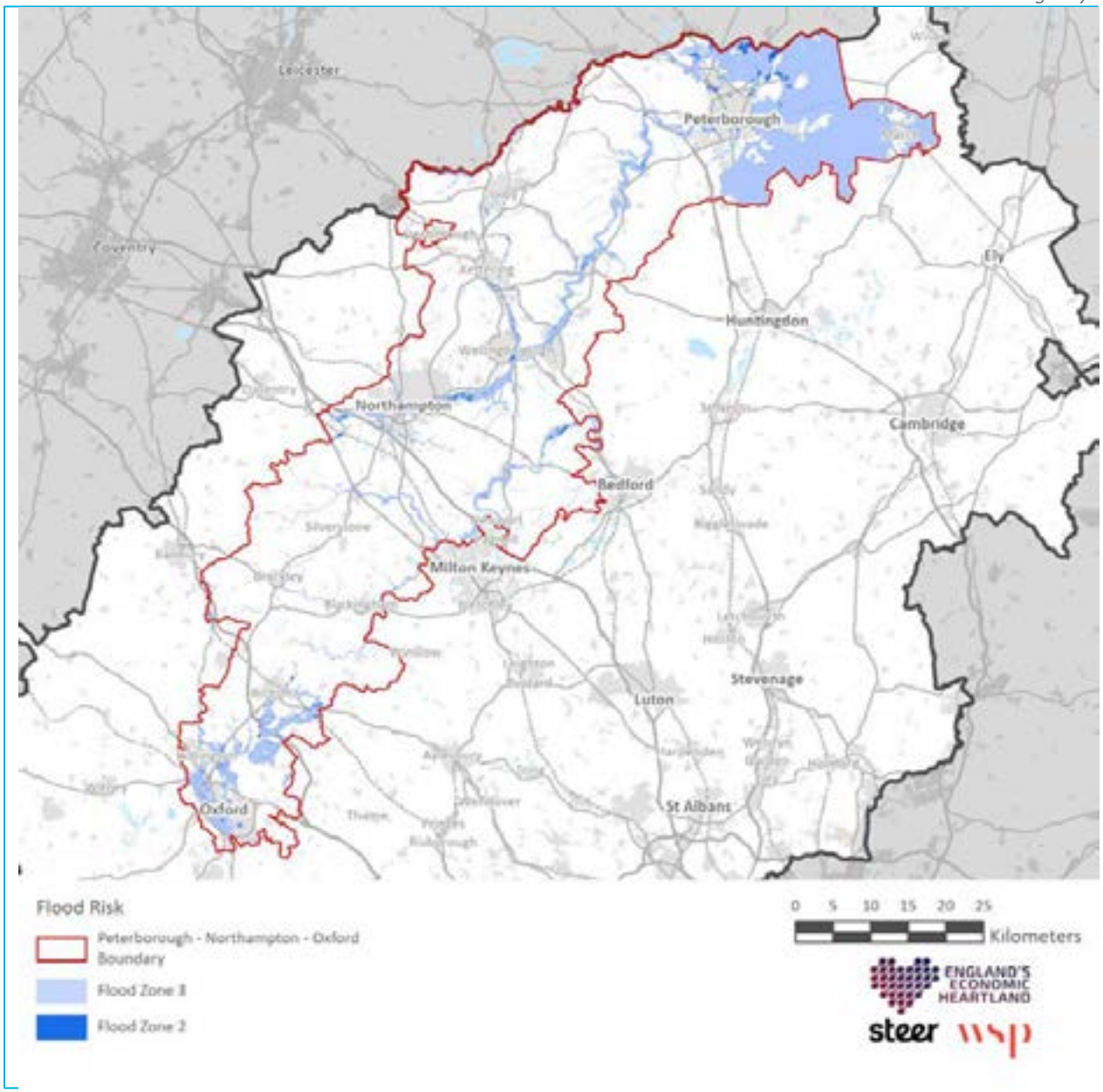
Areas of the corridor fall into Flood Zone 2 (1 in 1000 or greater annual probability of flooding) or Flood Zone 3 (1 in 100 or greater annual probability of flooding).

The northern part of the corridor, especially the land surrounding Peterborough is very susceptible to flooding and predominantly categorised as a Flood Zone 3.

The River Nene, the River Thames and the River Cherwell are the main rivers than run through the corridor. The River Nene runs from Peterborough to Northampton, and also poses risks to Wellingborough. The River Thames runs through Oxford, causing most of the West of Oxford to be in Flood Zone 3. The River Cherwell extends north from the east of Oxford past Kidlington, also increasing flood risk.

Recent severe weather has increased the threat of flooding, and there is a consensus in the scientific community that climate change will only increase threats of extreme weather, further worsening the problem. **The delivery of large-scale transport infrastructure may be challenging due to possible flood risk throughout the corridor and must be future proofed from severe weather events. Planned infrastructure will also need to work around planned flood defense / mitigation plans.**

Data Source: Environmental Agency



Environment

Landscape

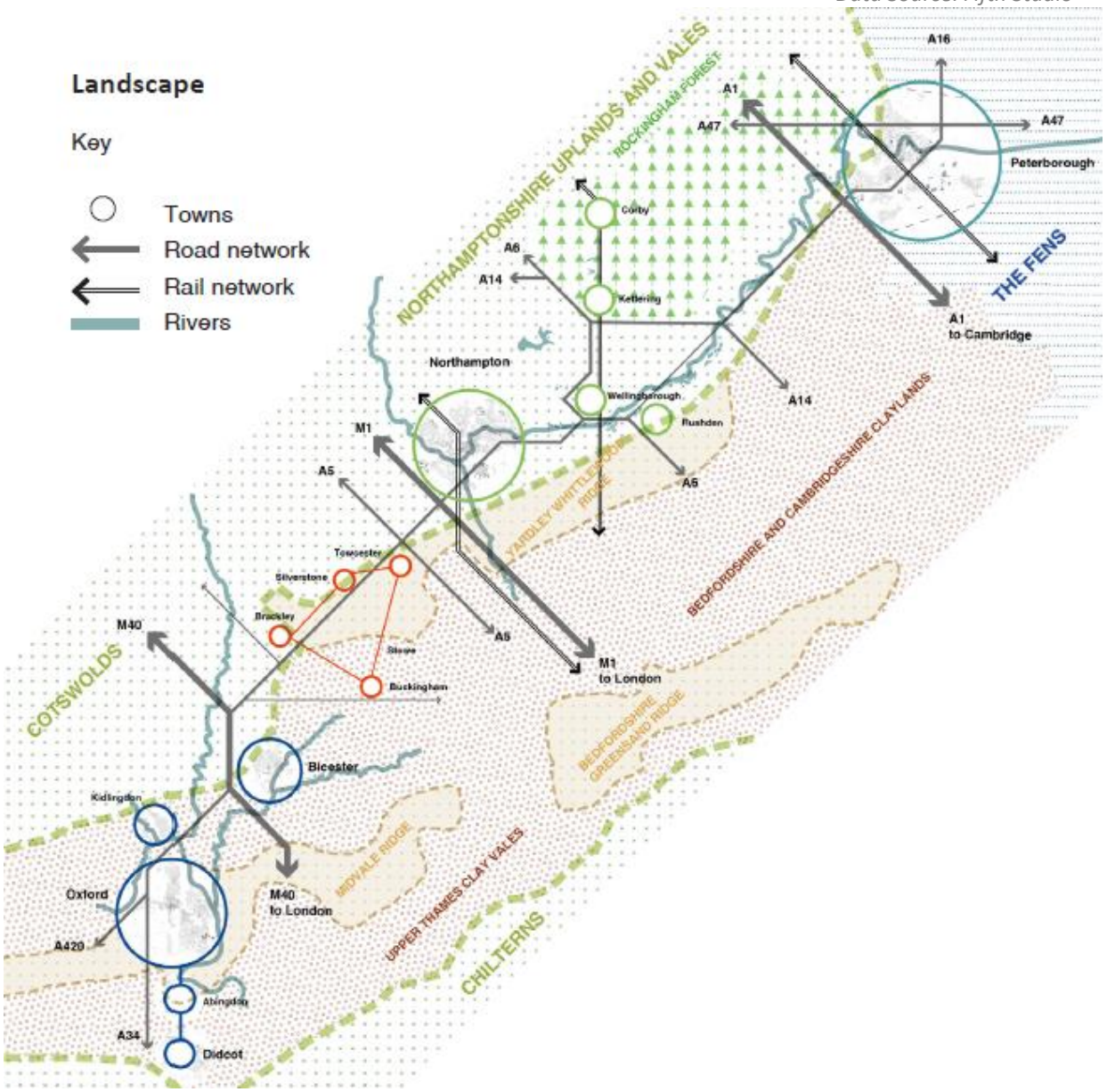
The study area tracks the edge between a broad clay vale running SW to NE across the country and the higher ground of the Cotswolds/Northamptonshire Heights.

From here, the rivers Cherwell and Ray head south from the rolling, pastoral landscapes north of Brackley down to Oxford and the Thames Valley which characterizes the western end of the corridor.

In the other direction, the river Nene flows, via Northampton, parallel to the highway that is central to the study corridor, past Wellingborough and Peterborough to the fens beyond. This exerts a powerful influence on the character of the settlements along the way.

North and East of Kettering and Corby, the woods of Rockingham Forest contrast with Wellingborough watery landscape of flooded gravel pits and waterways along the Nene Valley.

Data Source: Fifth Studio



Environment

Protected areas

Heritage

In total, there are **524 grade I listed buildings** and 9,798 listed buildings within the corridor. There are a number of listed buildings throughout the corridor, although there are more listed buildings in urban areas renown for world heritage such as Oxford, in comparison with more industrial/ modern settlements such as Northampton and Peterborough.

Ecology

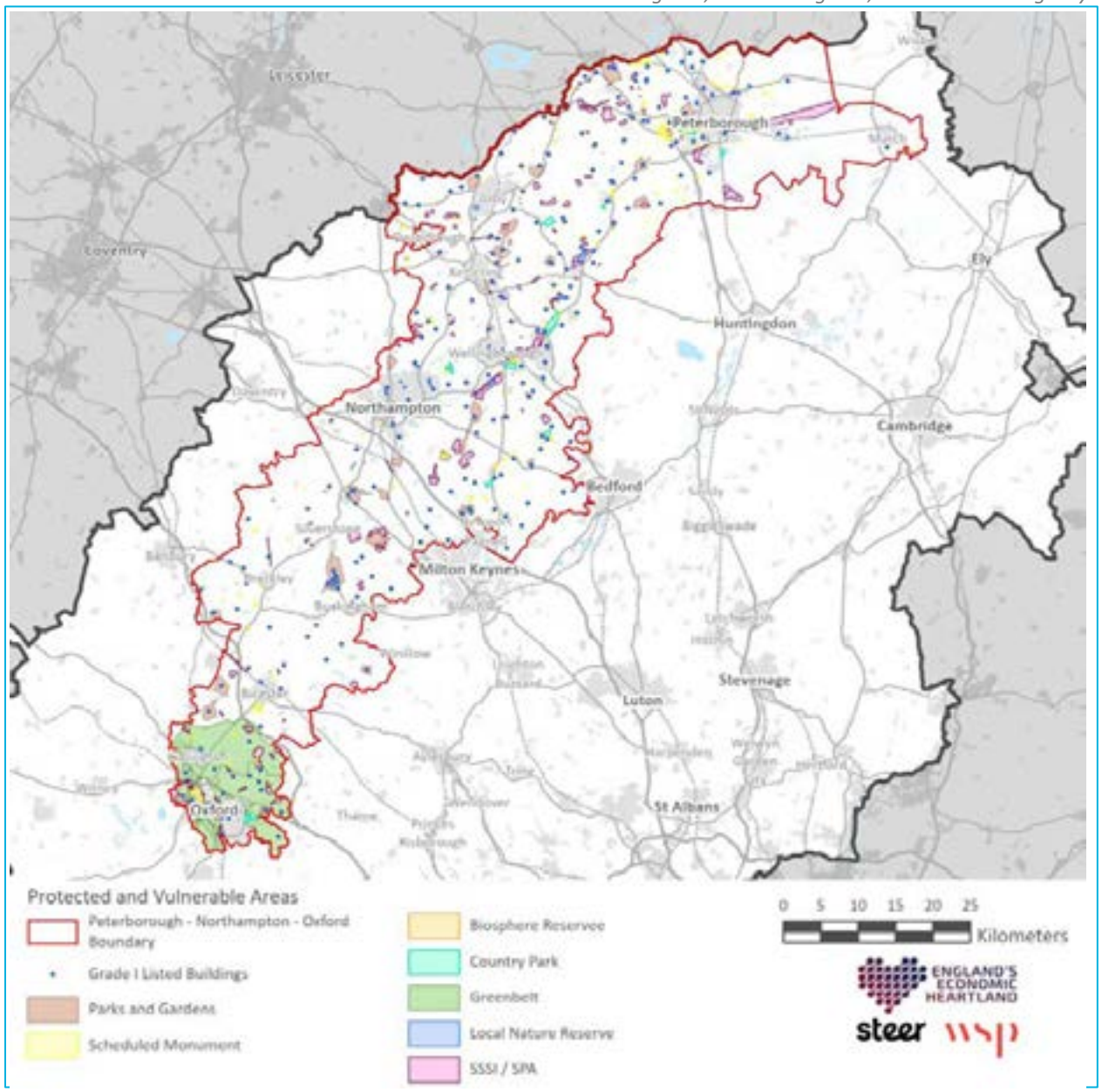
There are a number of parks and gardens throughout the corridor such as Silverstone Circuit, Boughton House and Burghley Park. There is also a high density of country parks located around Wellingborough and Rushden.

Green Belt

A large area of Greenbelt surrounds Oxford. This may cause an issue for future infrastructure projects as achieving plannign permission for protected land can be difficult.

There are numerous protected areas and other heritage and ecological constraints in the corridor. These constraints should be taken into consideration at the option identification stage.

Data Source: Natural England, Historic England, Environmental Agency



Economy

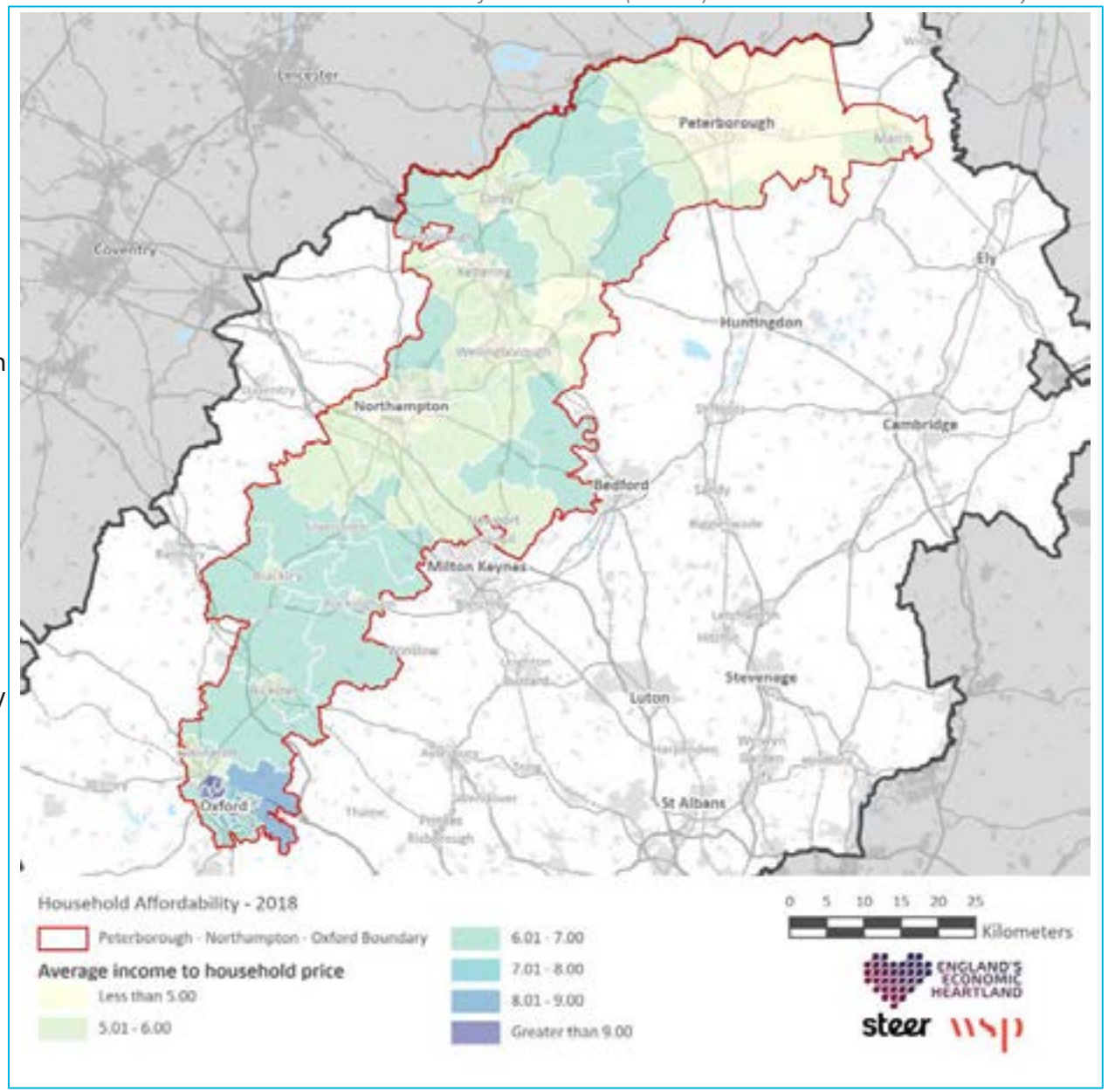
Housing Affordability

In 2018, the average house in the Pe~~t~~-No-Ox corridor cost £272,400, while the average household income was £44,720, resulting in a corridor-wide affordability ratio of 6.09. There is noticeable north-south disparity in the corridor, with Oxford and the south of the corridor being much less affordable than the centre and north of the corridor.

Oxford has a notable cluster of central areas with the highest affordability ratio of greater than 9. The Oxford Built Up Area (BUA) has an average affordability ratio of 8.60. Oxford has an average annual income of £51.4k, but house prices average £442k which causes this unaffordability.

In comparison, much of Peterborough, Northampton and the central/ north area of the corridor are much more affordable. There are several areas with ratios of less than 5, especially outside Peterborough and Wellingborough. This is due to much lower house prices linked to lower wages. Peterborough's average income is £39,193 but average house price is £183,996. **To address housing affordability issues in the corridor, inclusive transport connections must be provided between areas of high and low affordability.**
Developing affordable housing can also promote less travel & sustainable modes.

Data Source: House Price Statistics for Small areas (HPSSAs) – Dataset 2: Median Price Paid by MSOA



Environment

Air Quality

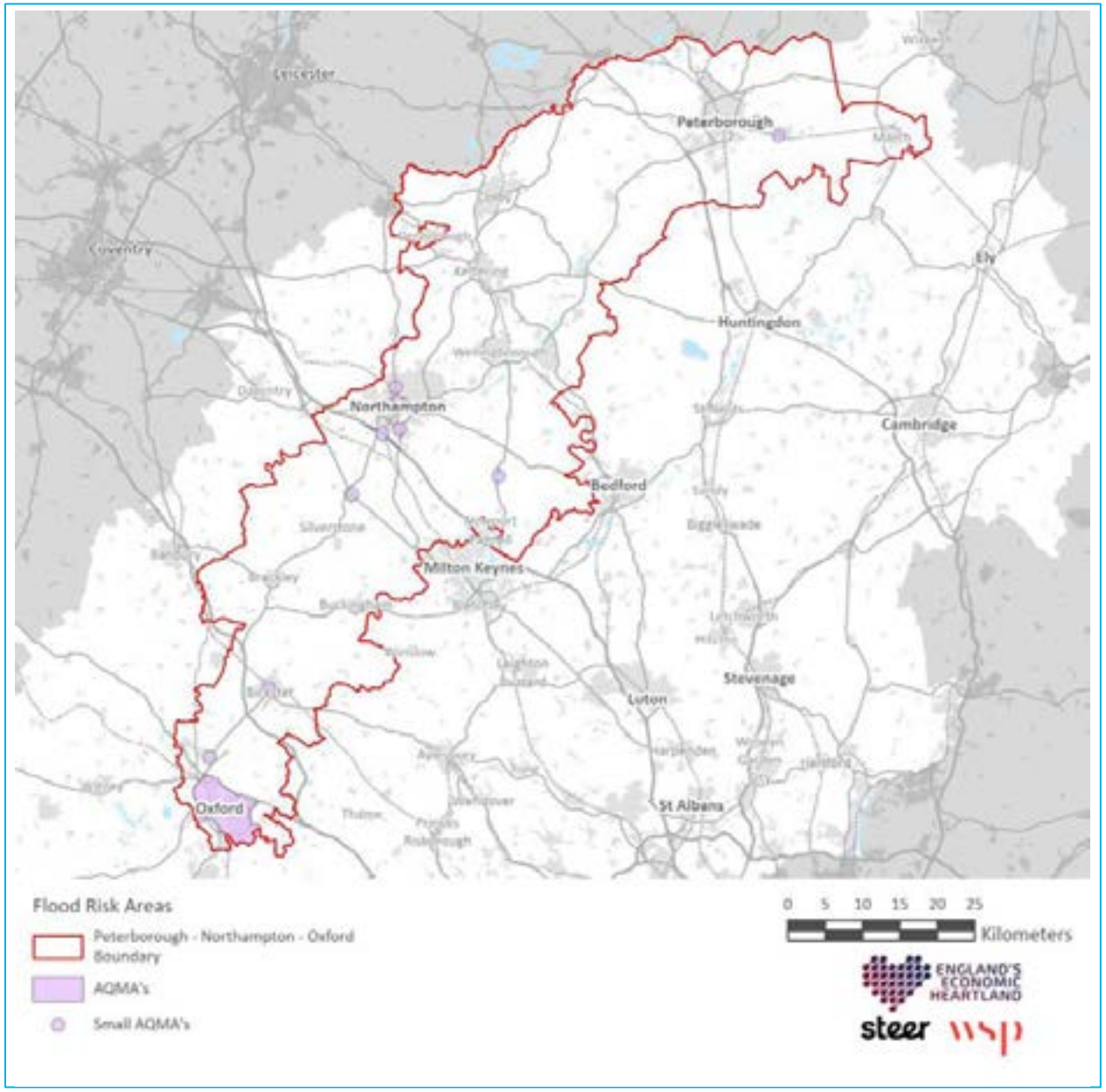
In 2017 total CO2 emissions in the Heartland stood at 28,834kt in 2017, equivalent to 8% of the UK total. In addition, CO2 emissions have fallen at a slower rate than the national average – 17.4% compared to 21.7% between 2012-2017.

Areas of poor air quality can be identified from the location of Air Quality Management Area (AQMAs), which are typically located where large inter-urban corridors and strategic roads pass through urban areas (for example, Northampton, where the M1 intersects the A43, and Bicester, where the M40 intersects the A41.

The largest AQMA in the corridor is 'The City of Oxford', established in 2010 due to an excessive annual mean of nitrogen dioxide (NO_2). There are also several small AQMA's in Northampton, especially in the town centre. Other small AQMA's are located in Kidlington, Bicester, Towcester, Olney and Whittlesey.

The evidence shows that there are opportunities to invest in transport measures that help deliver improved air quality. Ultra-low and zero-emission propulsion technologies therefore have an important role to play in improving air quality.

Data Source: DEFRA AQMAs



Economy

Industry Split

The EEH region is the heart of UK's academic and commercial research sector. The region is characterised by a unique combination of scientific and cultural assets, resulting in a highly skilled workforce in the areas of innovation and technology. The area is within the Oxford-Cambridge ARC, with its network of high-performance industry including Life Sciences, Space, Aviation, Digital & Creative, Advanced Manufacturing, Future Transport and Future Energy sectors.

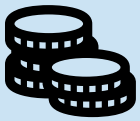
The industry split across the corridor reflects this, as education and health are the largest employers in the corridor. Transport and storage is the industry with the highest proportion of jobs at 33%. This is likely due to the central location of the corridor within the EEH region and urban settlements which act as ideal distribution hubs, such as Northampton. Prominent industry hubs within the corridor include:

- The University of Oxford: one of the world leaders in science and technology;
- Silverstone: the heart of the UK's High Performance Technology Network;
- Oxford Science Park: One of the multiple science parks in the EEH region, contributing to a current Gross Value Added (GVA) of £111bn by the science parks in the EEH.
- Northampton Waterside Enterprise Zone: targets high performance technology and now includes the University of Northampton campus.

Data Source: Business Register and Employment Survey

Industry	Study Area		EEH Region		England	
	Number	%	Number	%	Number	%
Transport & Storage	46,369	*8%*	141,395	*6%*	2,598,000	*9%*
Education	73,964	*12%*	252,828	*10%*	3,924,000	*13%*
Public Admin & Defence	19,836	*3%*	67,940	*3%*	2,627,000	*9%*
Agriculture, Forestry & Fishing	814	*0%*	2,943	*0%*	2,771,000	*9%*
Wholesale	34,066	*6%*	127,742	*5%*	2,660,000	*9%*
Health	74,899	*12%*	274,416	*11%*	2,400,000	*8%*
Financial and Insurance	16,970	*3%*	64,263	*3%*	2,300,000	*8%*
Manufacturing	51,754	*9%*	195,814	*8%*	1,472,000	*5%*
Retail	56,969	*9%*	223,791	*9%*	1,293,000	*4%*
Arts, Entertainment and Recreation	25,545	*4%*	109,810	*4%*	1,466,000	*5%*
Accommodation and Food Service Activities	35,789	*6%*	157,975	*6%*	1,351,000	*4%*
Motor Trades	11,423	*2%*	52,590	*2%*	1,160,000	*4%*
Mining, Quarrying & Utilities	4,637	*1%*	21,163	*1%*	1,315,000	*4%*
Property	8,068	*1%*	38,698	*2%*	569,000	*2%*
Construction	26,089	*4%*	127,617	*5%*	1,049,000	*3%*
Business Admin & Support Services	52,373	*9%*	271,397	*11%*	519,000	*2%*
Information and Communications	18,513	*3%*	111,935	*4%*	388,000	*1%*
Professional, Scientific and Technical Activities	43728	*7%*	275,264	*11%*	214,000	*1%*
TOTAL	**601,806**	***100%***	**2,517,581**	***100%***	**30,076,000**	***100%***

Summary

Theme	Issues & Opportunities
 ECONOMY	**Issues** • **Workforce –** there are a number of sectors the corridor contributes to, particularly healthcare, education, and transportation and storage. • **Corridor inequality -** there is disparity within the corridor in terms of housing affordability, due to much higher house prices in Oxford and the surrounding area. **Opportunities** • **Transport –** the high proportion of jobs in transport and storage, coupled with the high-tech industries within the corridor means that the corridor can be at the forefront for technological transportation solutions. • **Connectivity –** increased transport connectivity in the corridor means the workforce population can access higher income jobs and more affordable homes.
 ENVIRONMENT	**Issues** • **Air quality -** the study area contains a number of AQMAs along the key transport links and within the key settlement of Oxford. • **Flood risk -** there are a number of areas in the corridor that are in a Flood Zone 3, and therefore are at high risk of flooding, particularly around Peterborough/ the north of the corridor, and areas surrounding Oxford. • **Heritage protection -** there are a total of 524 grade I listed buildings in the corridor, with a number of areas dedicated to scheduled monuments. This will restrict areas of future transport development. • **Storage / Distribution -** The development of new sites for the storage / Distribution industry may be affected due to ecologically protected area. **Opportunities** • **Active travel –** with the presence of the green belt in Oxford and other protection areas, there is opportunity for attractive walking and cycling spaces / routes along with green corridors to promote sustainable active travel within the corridor. • **Decarbonisation –** there are currently varying levels of CO2 emissions throughout the corridor, but the use of sustainable travel behaviours, hybrid working and increased movement of freight by rail can help to promote a decarbonised corridor throughout by 2050.

Part 2c
Connectivity

Networks – Digital Connectivity

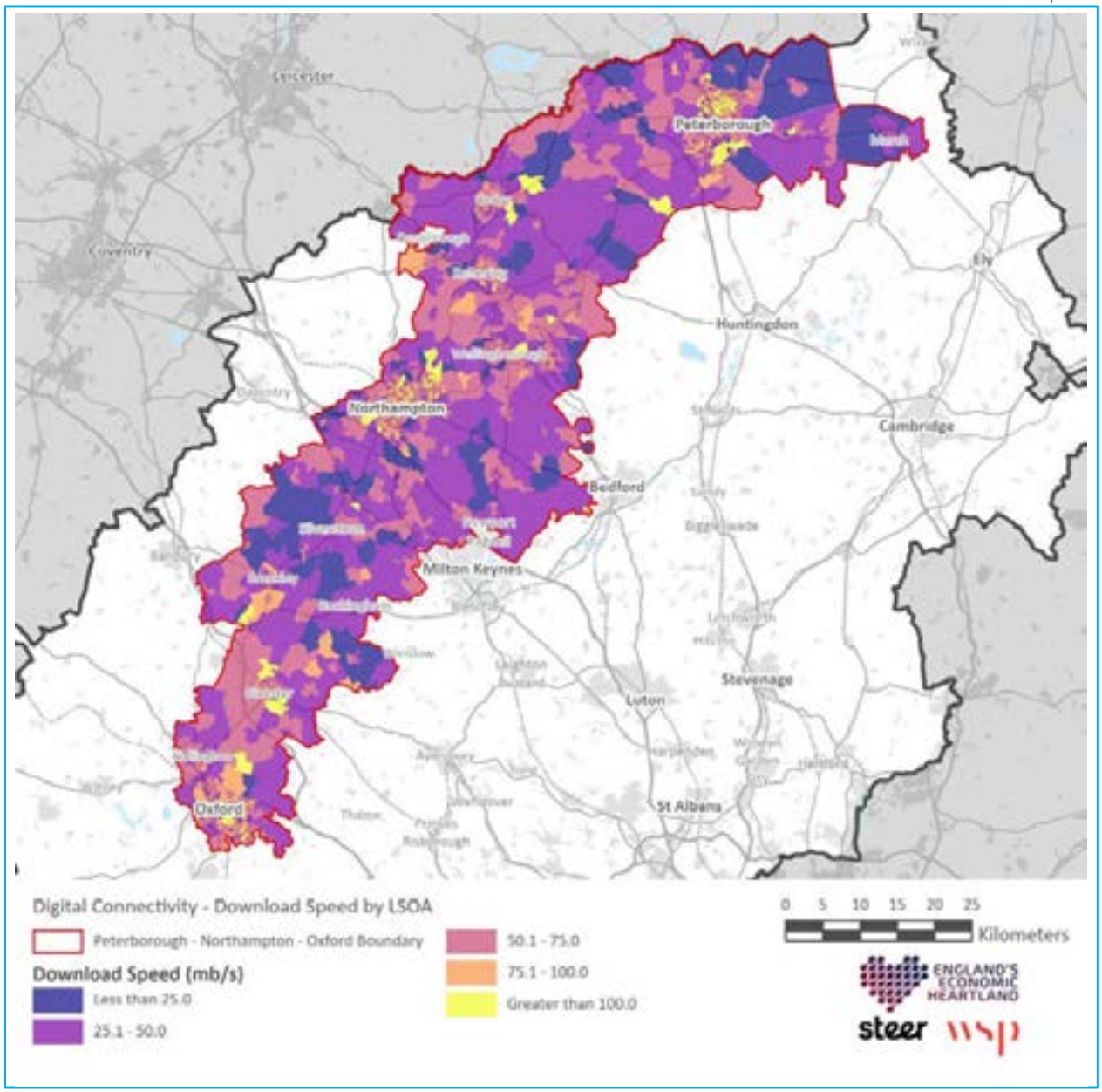
The plan shows the distribution of digital connectivity in the form of average download speed per LSOA. When assessing the average download speed per LSOA, it demonstrates that in general rural areas have lower download speeds as compared to urban areas.

Areas with high speeds exceeding 100 mb/s are predominantly found in and around urban settlements such as Oxford, Bicester, Northampton and Peterborough. On the contrary rural areas have lower download speeds, with the corridor between Bicester and Northampton featuring several LSOA area less than 25mb/s.

The EEH WFH Propensity & Capacity Release Model estimates potential for a 10-14% reduction in traffic congestion for the corridor, based on a continuation of those currently working from home continuing to do so 2 days a week.

Analysis of working patterns in the corridor has identified that a large proportion of people from rural areas work from home. However, the evidence demonstrates that digital connectivity is worse in rural areas – with lower download speeds. Improved digital connectivity will both incentivize and facilitate more agile working, which will reduce the need to travel to work (trips which are often undertaken by car). Workplace culture will also have an impact on working arrangements.

Data Source: OFCOM Connected Nations 2020 report



Networks – Mobile Connectivity

The outdoor geographic coverage of 4G mobile (from all 4 operators) is now high across the EEH area, ranging from 90.39% of landmass in South Oxfordshire to 99.98% in Oxford. The £1bn Shared Rural Network initiative will improve this further.

However, indoor coverage is significantly lower than outdoor coverage. The proportion of premises with indoor 4G coverage from all 4 operators ranges from 52.8% in West Oxfordshire to 99.5% in Watford.

5G roll-outs are still at an early stage (see EE example opposite), and indoor coverage for 5G is more challenging than for 4G, because 5G deployments typically use higher frequencies. However, we should see 5G coverage improve substantially over the next few years (e.g. EE is aiming for 90% UK landmass coverage by 2028).

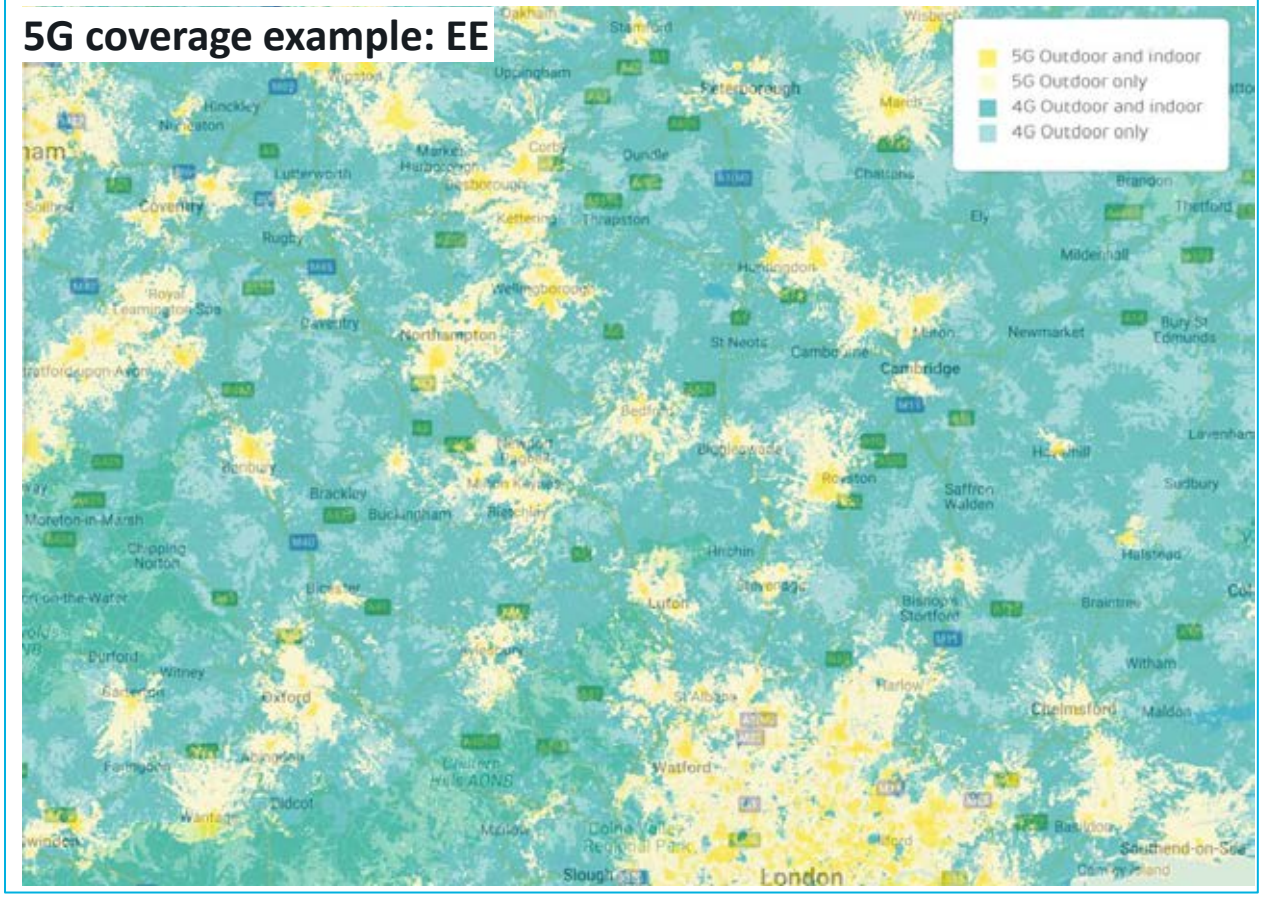
5G offers substantial performance improvements vs 4G (higher speeds, lower latency, handling higher densities of devices, and offering more flexibly tailored services for specific use cases), and is seen as a potentially transformative tech for various industries.

Constraints on 5G availability/quality (which will typically remain much better in dense urban areas) may start to impact business location decisions, and hence commuting patterns, in coming years.

Data Sources: Shared Rural Network; EE coverage checker (Feb 2022)

4G geographic outdoor coverage

5G coverage example: EE



Networks – Active Modes

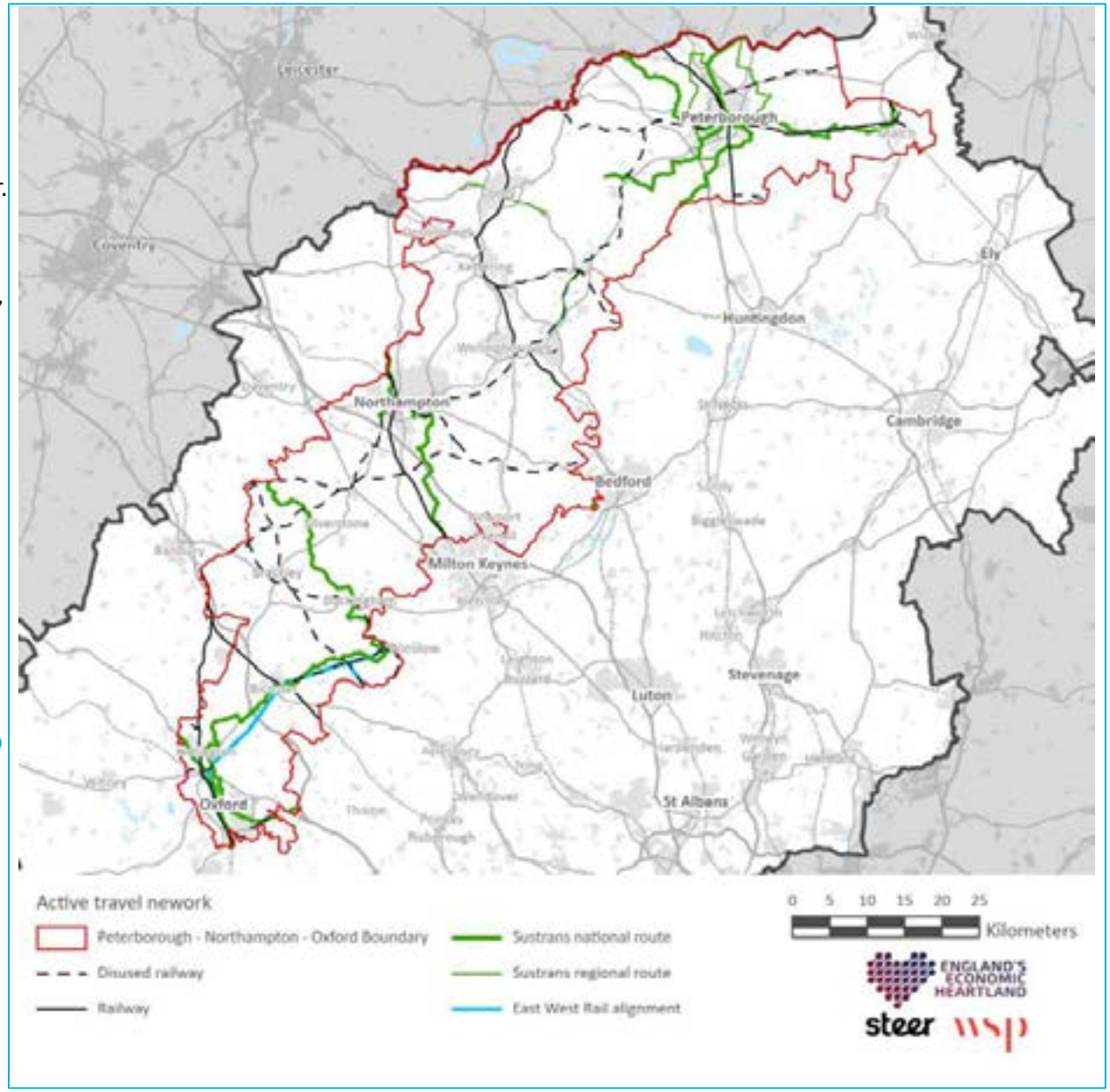
Active Travel Network

The distribution of active travel infrastructure throughout the corridor varies. The plan opposite shows the Sustrans National Cycle Routes and nature trails run through the corridor. These routes provide strategic connectivity between settlements on foot and cycle. The routes are comprised of a mix of on-carriageway, segregated and shared-use sections. In addition to the national and regional routes shown opposite, there are a large number of local cycle routes that provide intra-urban connectivity.

The evidence indicates that there is a lack of strategic active travel infrastructure between several of the key urban areas in the corridor that are within cycling distance (e.g. between Corby, Kettering). To improve the active travel network, there are opportunities to convert disused rail lines into active travel routes. The Future Greenways project and Ise Valley plan to provide improved active travel possibilities within this area.

The delivery of Local Cycling and Walking Infrastructure Plans (LCWIPs) are a key part of improving active travel networks, which will link to existing Sustrans routes and public transport to make a more integrated transport network.

Data Source: SUSTRANS



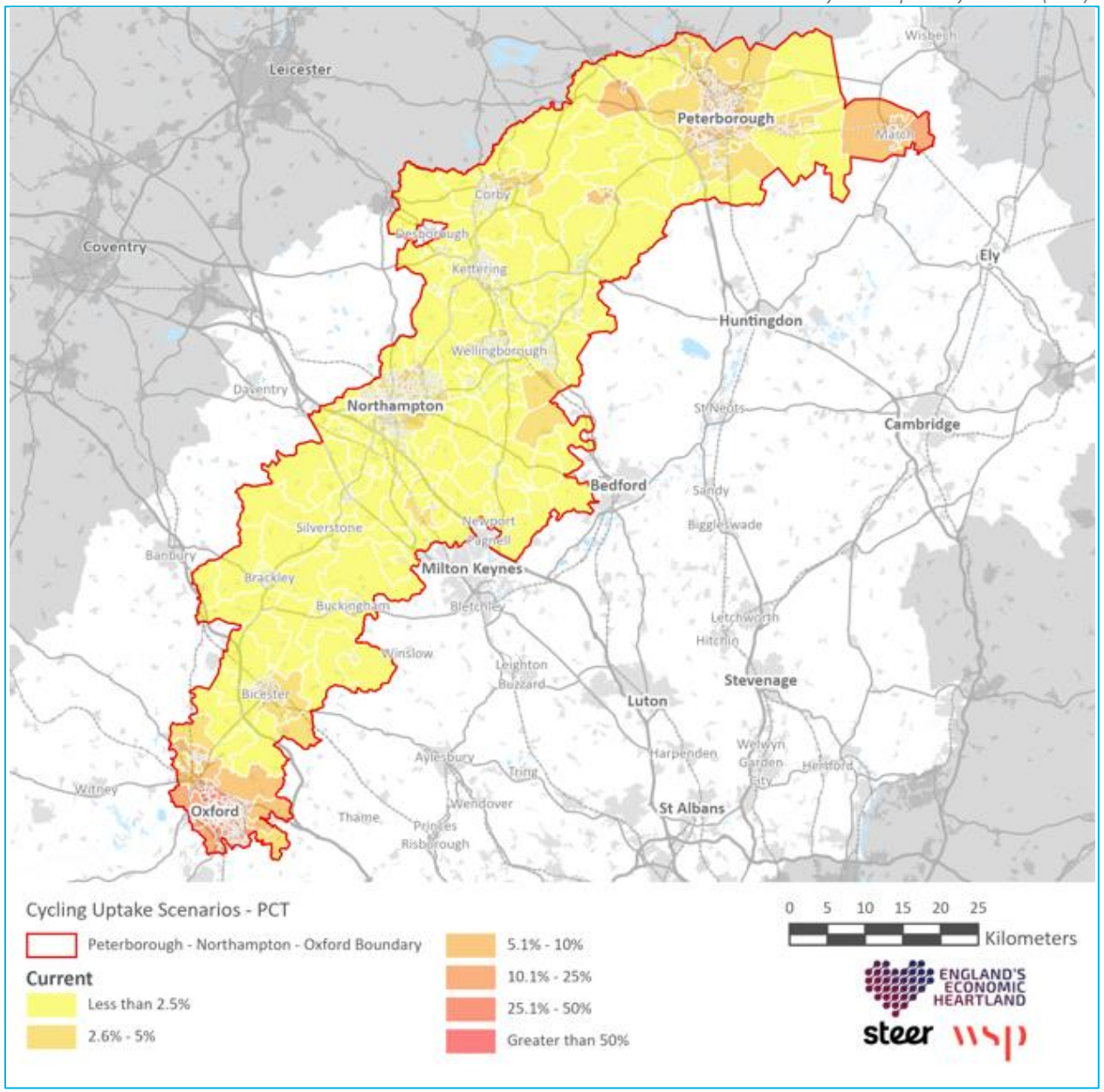
Cycling Propensity

There are a myriad of benefits to using cycling as a mode of travel, including health benefits, reduced pollution and decreased travel times.

The plan opposite shows percentage of all forecasted journeys to work (JtW) undertaken by bicycle (as per the 2011 Census). This provides an insight into the existing propensity of the population to cycle to work. The Cycling Propensity Toolkit (CPT) has considered the cycling JtW mode share in a number of future scenarios where the population acquires a different propensity to travel. This suggests that if the population of the corridor acquired the same propensity to cycle as that of the Dutch population, the JtW cycle mode share would increase to >10% in all areas across the corridor, with the largest propensities in urban areas. The outputs of this analysis is attached in Appendix B. It should be noted that whilst the CPT focuses on commuting journeys, similar propensities are likely to be observed for other journey purposes.

A high propensity to cycle is unlikely to translate into a high journey to work mode share if there is not the cycling infrastructure to support these trips. As such continuous high quality active travel infrastructure can be provided to promote increased uptake. Wellingborough - Rushden offer a good opportunity for infrastructure improvement.

Data Source: Cycle Propensity Toolkit (CPT)



Networks – Active Modes

Micro-mobility

Micro-mobility involves transportation using lightweight personal vehicles such as e-bikes and e-scooters. Shared / public micro-mobility schemes have become a new first mile/last mile active travel option. Shared mobility schemes operating across the corridor are listed below:

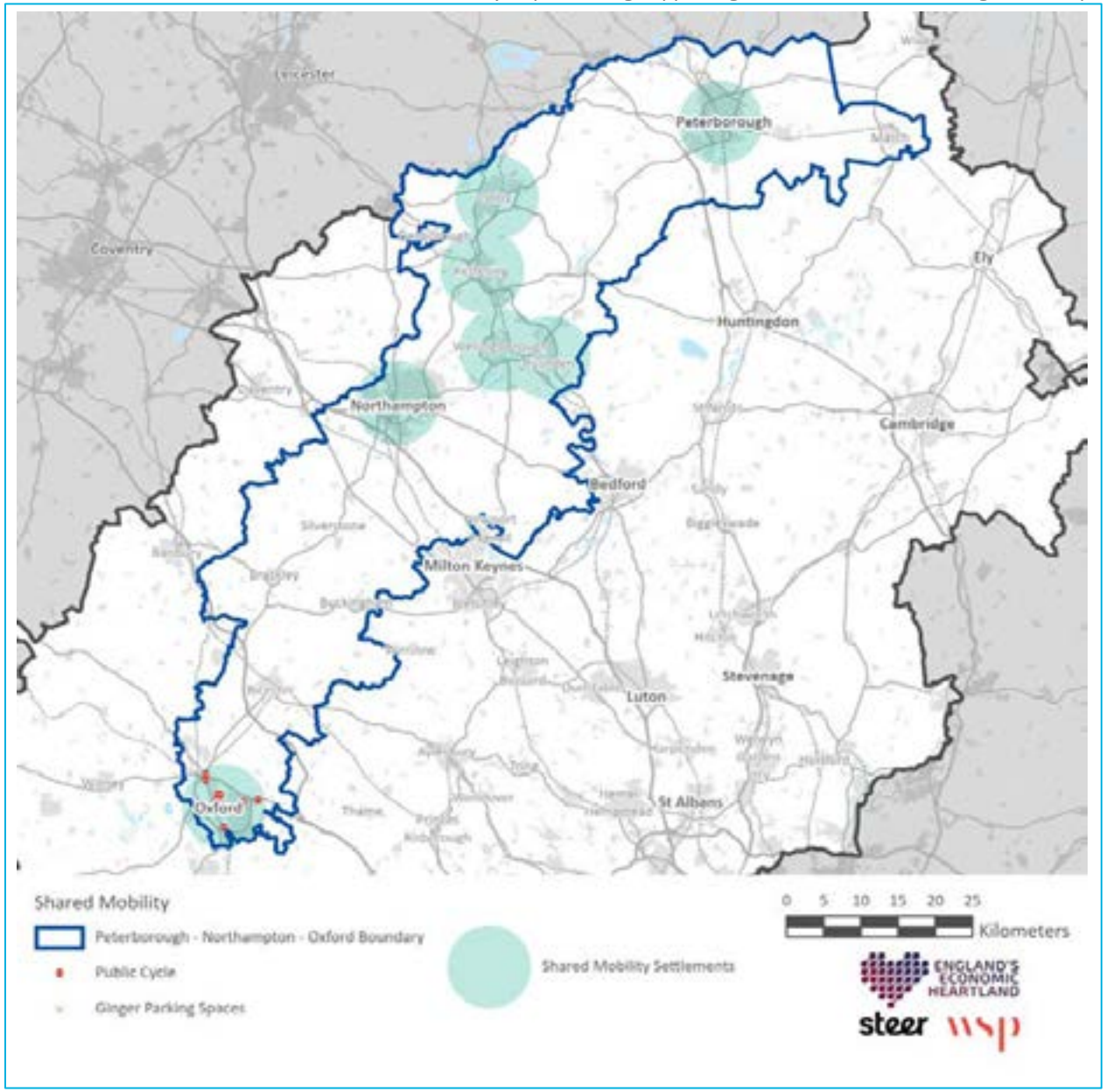
Oxford: Docked cycle hire scheme operated by Donkey Republic.

E-scooter schemes operated by Voi.

Northampton: An on-street e-scooter rental service is currently being trialled in Northamptonshire. The scheme launched in Northampton in 2020 and has since launched in Kettering, Corby and in Wellingborough and Rushden / Higham Ferrers in 2021. The trial will run until September in Northampton and Kettering and until November 2021 in the other towns.

Micro-mobility solutions can form the first / last mile of a longer journey undertaken by passenger transport thereby supporting a holistic transport network. Micro-mobility schemes are more viable in urban areas where there is a critical density that ensures commercial viability.

Data Source: Voi, Donkey Republic, Zag, Zipp, Ginger, Santander, BikeSharingWorldMap



Networks – Active Modes

Catchments (E-Bikes)

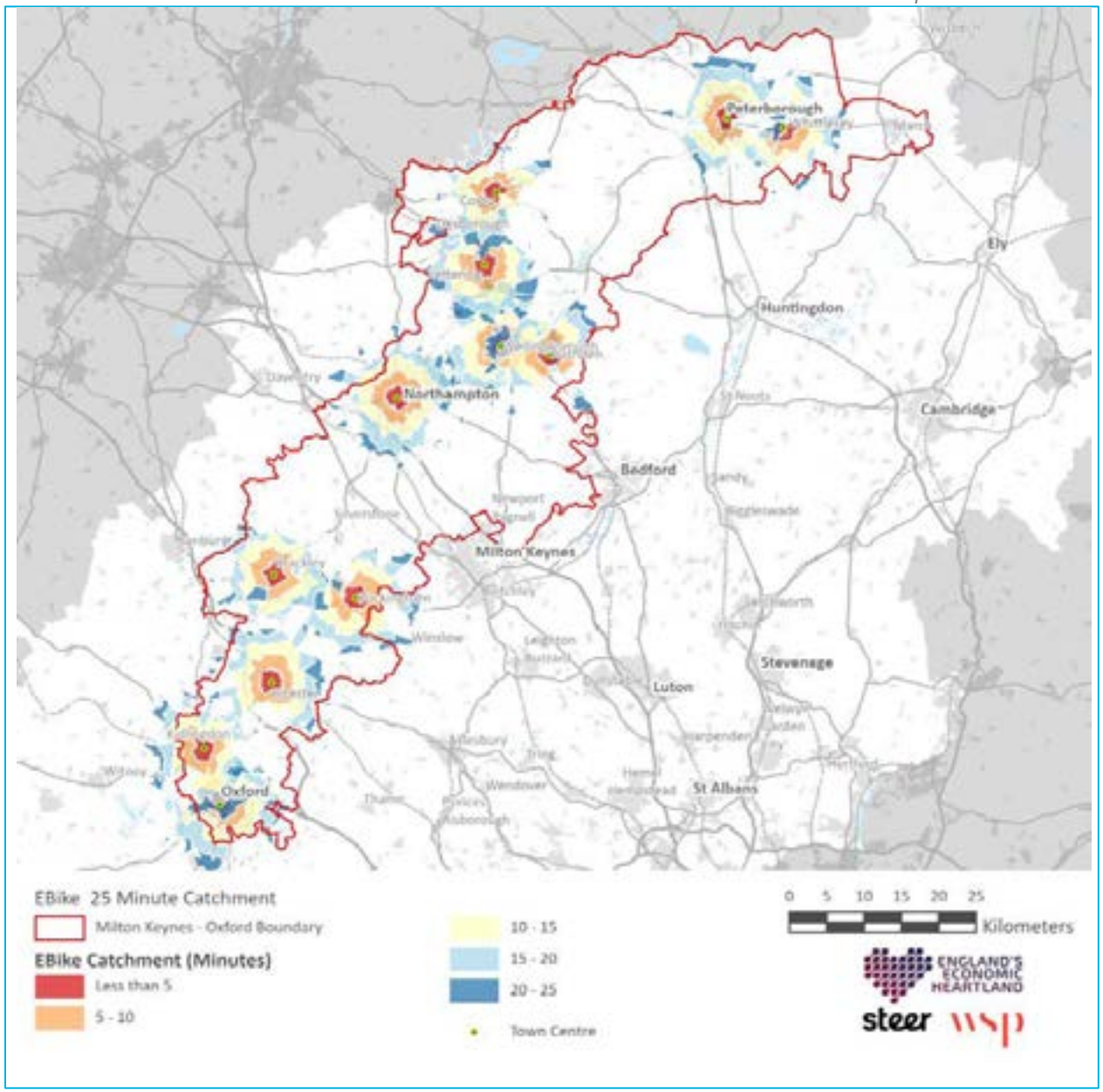
E-bikes are electrically assisted pedal bicycles which can travel up to 25km/h. This makes them an attractive option for commuting compared to push bikes.

The plan opposite shows the potential for E-bikes to support connectivity within urban areas, whilst also providing some opportunity for inter-urban travel. Separate catchments by settlement can be seen in Appendix C. Notable opportunities for E-bike commuting can be seen between:

- Oxford and Kidlington
- Bicester and Kidlington
- Brackley and Buckingham
- Rushden and Wellingborough
- Northampton and Wellingborough
- Corby, Kettering & Wellingborough
- Peterborough and Whittlesey

Mode shift to e-bikes will only be possible through the delivery of attractive infrastructure (routes and charging points) both within and between urban areas. E-bikes are likely to encourage people to travel further than they would if they used a traditional push bike, presenting the option of attracting active travel for rural areas. E-bikes offer an excellent option for local and inter-settlement movements, In contrast E-scooters can offer local Intra-Settlement Movement.

Data Source: Open Route Services



Networks – Public Transport

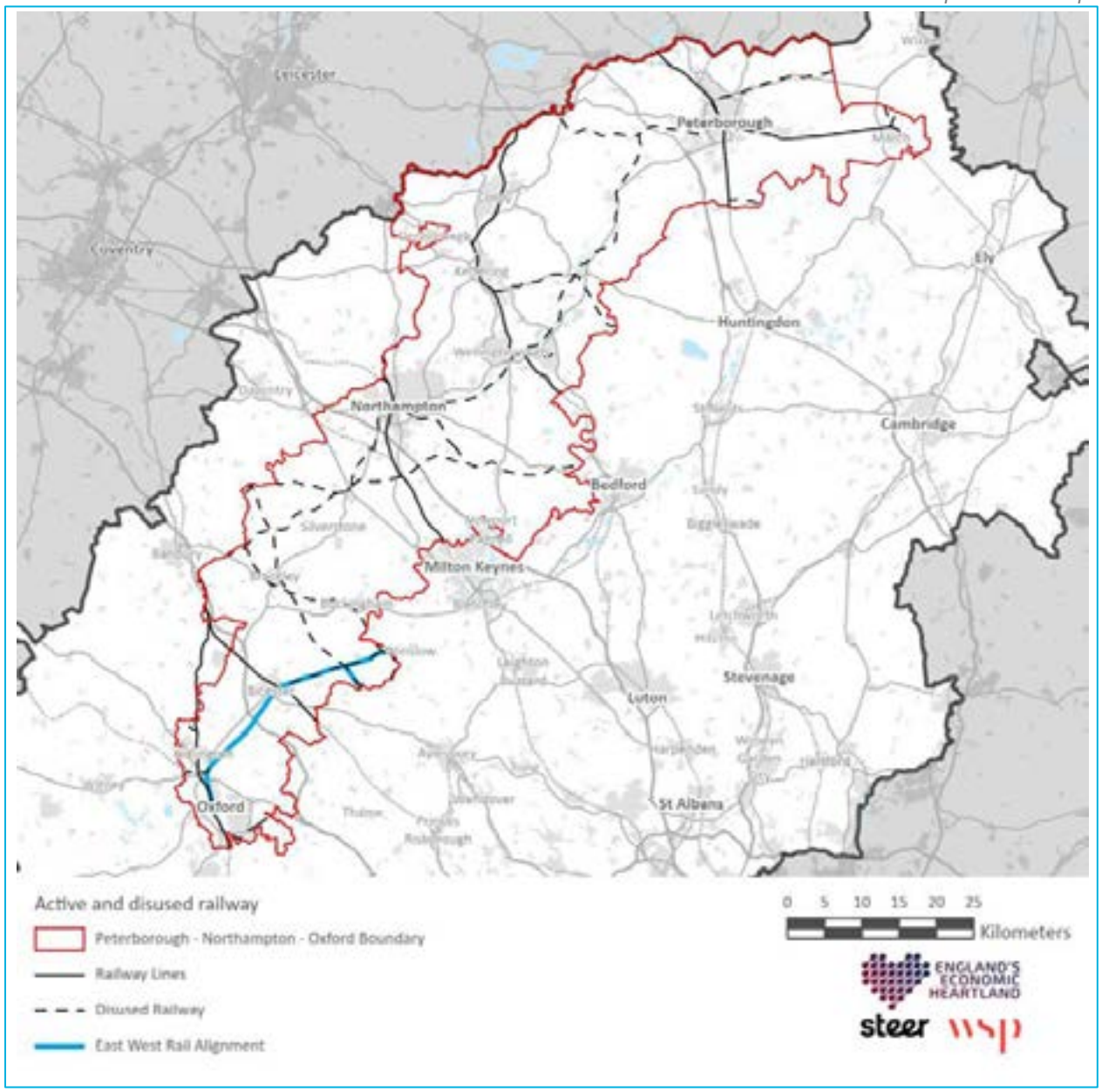
Network Overview - Rail

Within the corridor, several rail lines exist for both passengers and freight, which provide connectivity to locations within and beyond the study area. The main rail lines within the corridor are:

- **Cherwell Valley Line –** connecting Oxford, Oxford Parkway and Bicester to London and the Midlands.
- **Midlands Main Line –** connecting Kettering, Wellingborough and Corby to the midlands and London.
- **East Coast Main Line –** connecting Peterborough to the midlands, Cambridge and London.
- **High Speed 2 (HS2)** will help release capacity for rail line heading towards the Midlands.

Currently there are no direct rail connections between Oxford, Northampton and Peterborough. However, as part of EEH's Passenger Rail Study, a Northern arc rail link connecting Peterborough - Northampton - Oxford has been identified. This rail route could utilise existing and disused railways and help improve the east-west sustainable transport links in the corridor.

Data Source: Open Street Map



Networks – Public Transport

Network Overview – Station usage

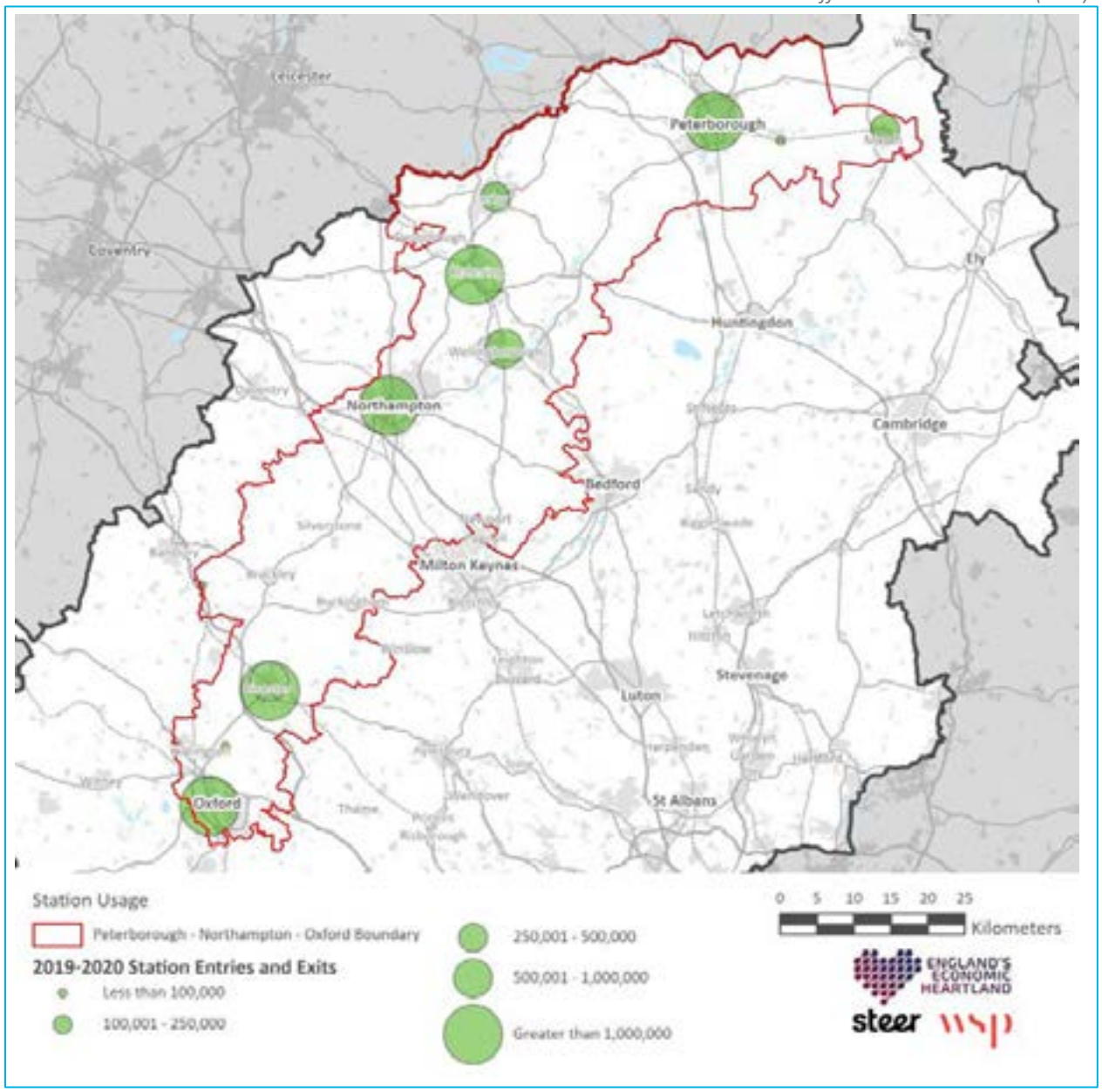
A total of 22,746,794 station entries and exits took place in 2019-2020. The most used station in the corridor is Oxford railway station with a total of 8.7 million entries and exits, representing 38.26% of the total usage.

The least used stations within the corridor can be found within smaller settlements in rural areas. The least used station is Islip with 34,168 entries and exits. In total, all stations outside urban areas represent 0.5% of usage.

The maximum number of stations served within the corridor by one of the rail lines is 3 (Ely to Peterborough and Oxford to Bicester Lines). The high number of individual services and low number of stations served is indicative of the lack of stations and services, and hence poor inter-urban rail connections within the corridor. Future Rail developments can help increase station usage, with emphasis on the Welland Valley rail.

It is important that a range of sustainable and attractive modes of transport connect rail stations with residential areas, employment areas and town centres. This will maximise opportunities for residents, workers and visitors to travel by rail. This may also increase the attractiveness of less well used rail stations.

Data Source: Office For Rail and Road (ORR)



Networks – Public Transport

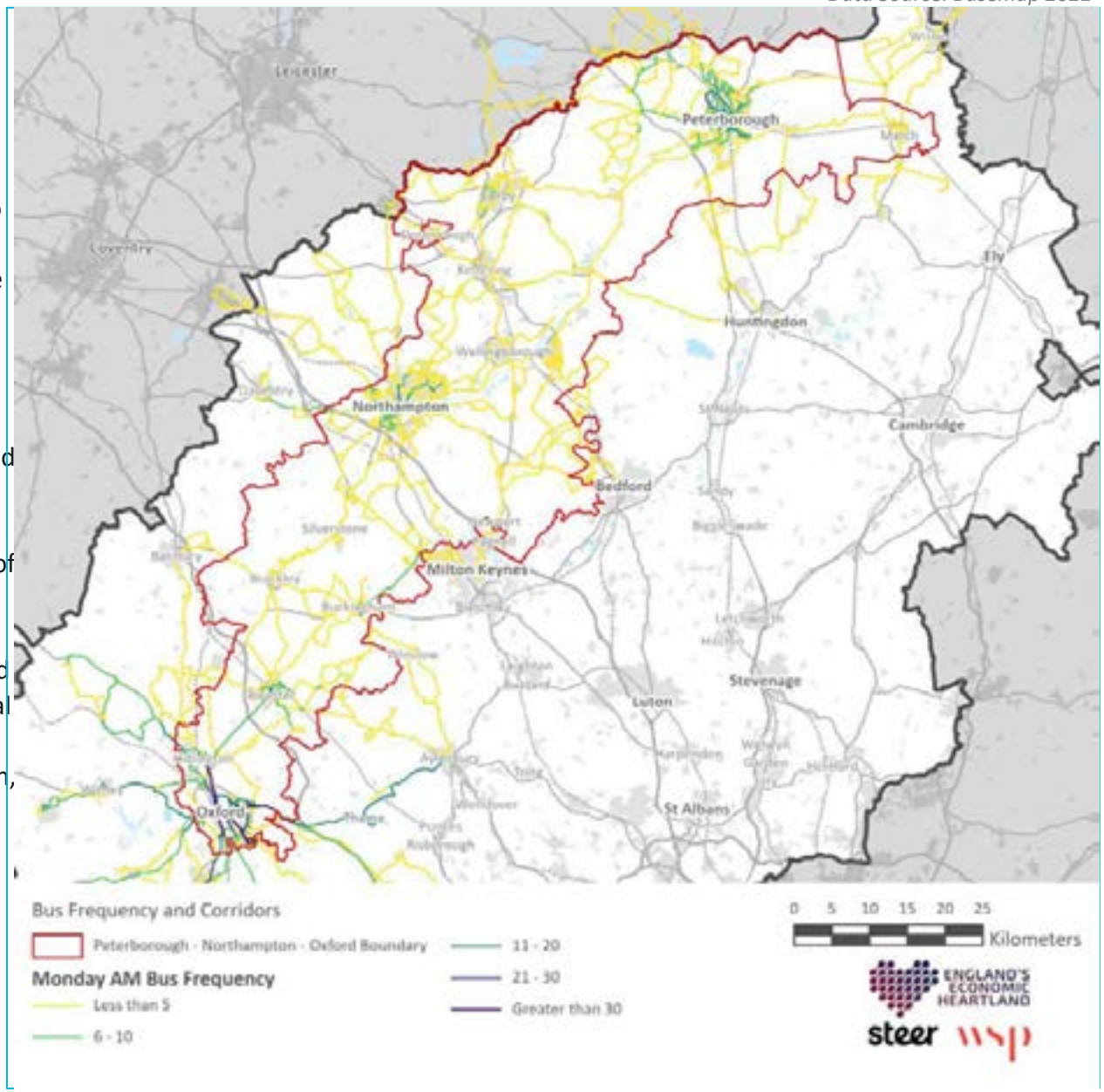
Network Overview - Bus

Buses represent a more sustainable alternative to the private car within the corridor.

The plan opposite shows the number of local bus services (two-way total) on links between the key settlements during the morning peak hour (0700 to 0859) on a Monday in 2019. High frequency local bus services serve the major towns and cities in the corridor (notably Oxford, Bicester, Northampton, Corby and Peterborough). Relatively few high frequency local bus services connect towns and cities in the corridor (notable exceptions to this include Oxford and Bicester, Corby and Kettering and Kettering and Rushden). There is a lack of high frequency local bus services along the A43 corridor, which provides access to the key employment site of Silverstone. Other noticeable links without high frequency local bus services are Wellingborough-Northampton-Rushden, Northampton-Kettering and Wellingborough-Kettering. There are few direct local bus or coach services between the largest settlements in the study area: Oxford, Northampton, and Peterborough with interchange generally required at intermediate locations including Corby and Milton Keynes.

Improved bus and coach connectivity would support reductions in car use, associated congestion and pollution, while also increasing access to economic opportunity throughout the corridor.

Data Source: Basemap 2021



Networks – Public Transport

Access to Services

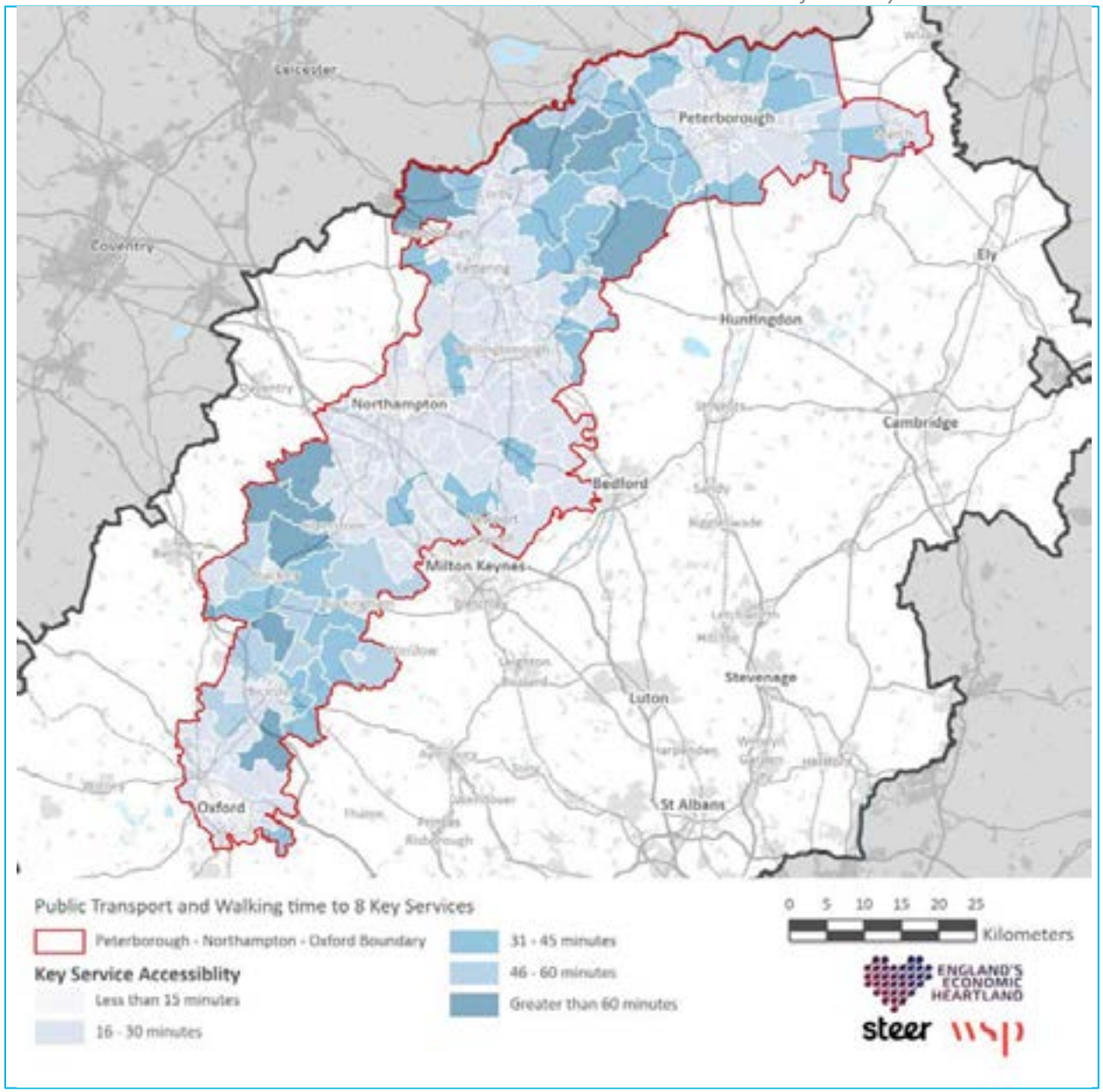
Having easy access to required services and amenities within a close distance for walking and public transportation, can help promote sustainable travel patterns and reduce single occupancy car trips.

The plan shows the minimum average accessibility by walking and public transport to 8 key services and facilities: Medium sized employment centres; Primary Schools; Secondary schools; Further education colleges; GPs; Hospitals; supermarkets; and Town centres.

The distribution of accessibility shows a clear pattern of rural / urban divide as well as differences based on levels of transport provision / infrastructure. The two areas of poor accessibility can be found in between Oxford and Northampton and again between Kettering and Peterborough.

The evidence shows that urban areas are more likely to have better accessibility to key services than rural areas. Improving public transport provision can improve access to services for settlements located just outside of urban areas. It will be vital for future planning and transport interventions to be aligned in order to make accessibility to services as efficient as possible.

Data Source: DfT Journey Time Statistics 2016



Networks – Road

Network Overview

To understand the performance of the local and strategic road network through the corridor and identify existing pinch points, **the percentage change in speed between the AM / PM peak hour and free flow conditions (85th percentile) has been reviewed.**

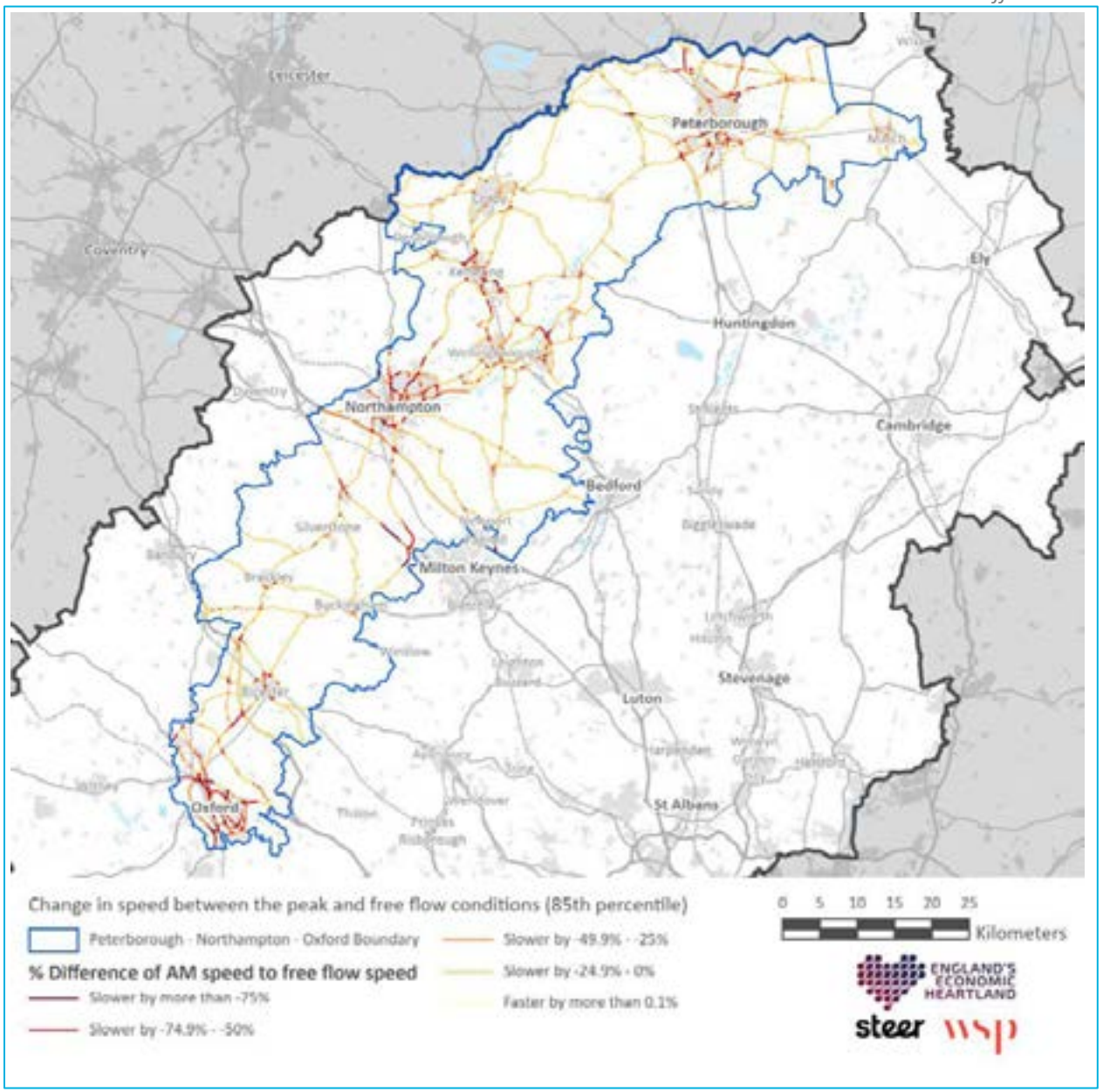
AM Peak Network Speeds

Compared to free flow conditions, AM peak hour (08:00 to 09:00) speeds are generally more than 50% slower in urban areas and between 0% and 25% slower in rural areas indicating congestion. Examples of pinch points on the local and strategic highway network include:

- A34 between Bicester and Oxford
- A43 between Northampton and Kettering
- A5 between Milton Keynes and Towcester
- A1139 in Peterborough
- A45 south of Irthlingborough

The evidence indicates that there are no direct strategic road connections between Peterborough, Northampton and Oxford and that much of the existing road infrastructure relies on existing settlements, thereby increasing congestion issues for major urban areas.

Data Source: TrafficMaster



Networks – Road

Network Overview

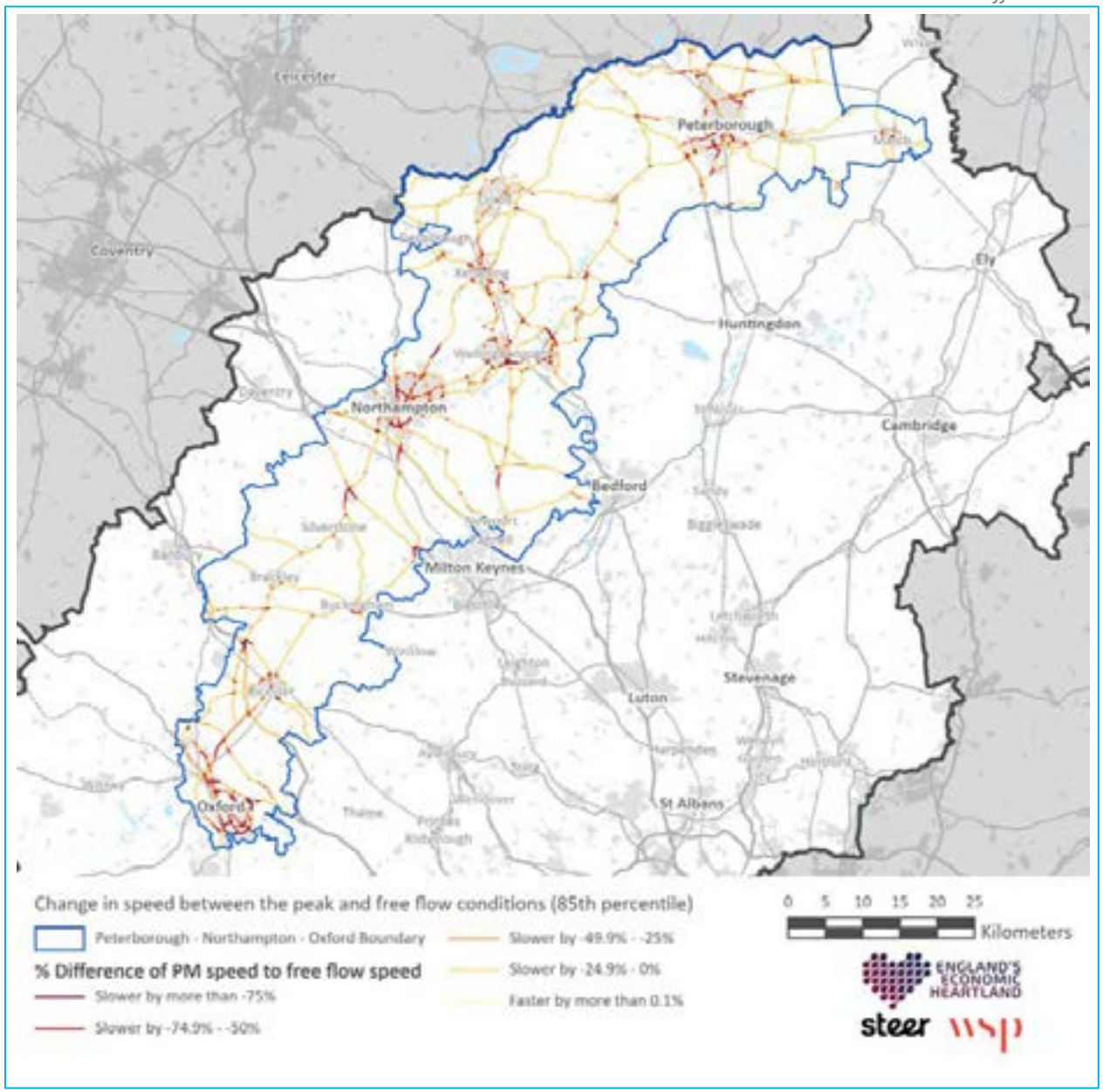
Again, compared to free flow conditions, PM peak hour (17:00 to 18:00) speeds are generally more than 50% slower in urban areas and between 0% and 25% slower in rural areas; however, the speed reduction impact is slightly less when compared to the AM peak hour, indicating peak spreading. Pinch points on the local and strategic highway network include:

- Junction 10 of the M40
- The A5/ A43 junction in Towcester.

The evidence indicates that the key highway links throughout the corridor are typically congested, resulting in increased journey times, lack of journey time reliability, reduced productivity, and knock on environmental and community issues.

Several highways' improvements schemes have been identified to alleviate congestion such as the A1139 University Centre Access in Peterborough and A43 Northampton – Kettering Phase Three. Future Highway developments are important for future growth within the corridor, for both people and freight movements. However, the importance of sustainable travel modes such as active travel and public transport should be prioritised to reach a net zero corridor by 2050 and reduce overall congestion on the network.

Data Source: TrafficMaster



Networks – Road

Freight Movements

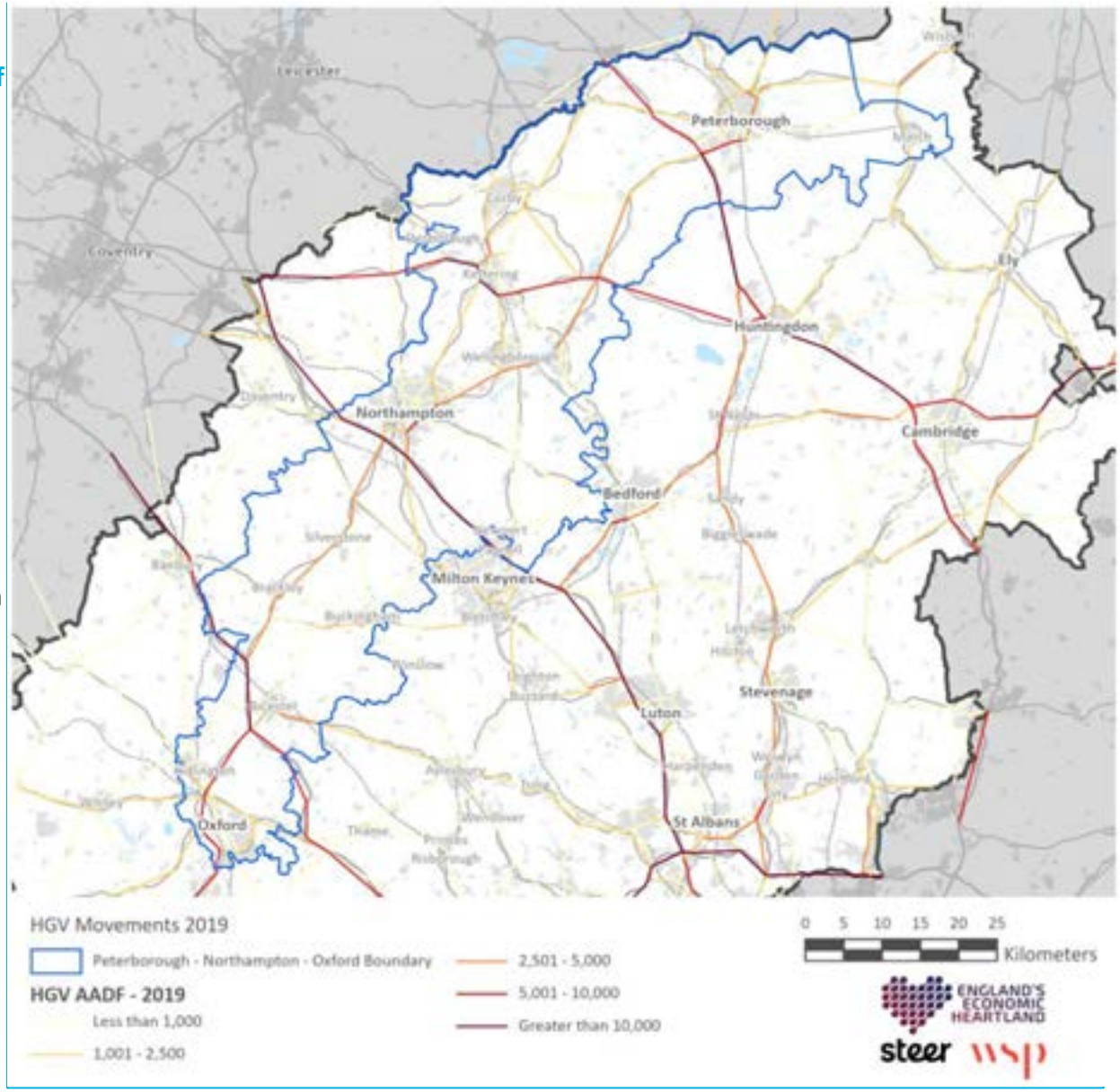
Road haulage is essential to growth and success of businesses across the corridor, with this corridor employing 33% of the transportation and storage sector. However, it is important that any adverse impacts on the environment and local communities are minimised as much as possible.

Freight movements - Average Annual Daily Flows (AADF) of Heavy Goods Vehicles (HGVs) - on motorways and A-roads across the corridor indicates that the highest HGV flows occur along north-south routes - particularly the A34, M40, M1 and A1. The A14 is the only east-west route that runs through a small section of corridor with high freight movement. As shown previously, these links experience congestion within the peak hours which may impact upon business productivity.

Due to its geographical centrality, there are a number of distribution centres/ operators (such as Clipper Logistics and Travis Perkins) who operate from Northampton, Corby and the surrounding area. A rail freight interchange near Northampton (Rail Central) is under consideration.

Transport interventions should explore HGV management and identify opportunities for non-road-based freight options. New technologies should also be explored to help decarbonise HGV fleets, as well as explore moving freight to electrified rail.

Data Source: UK Government - GB Road Traffic Counts



Networks – Road

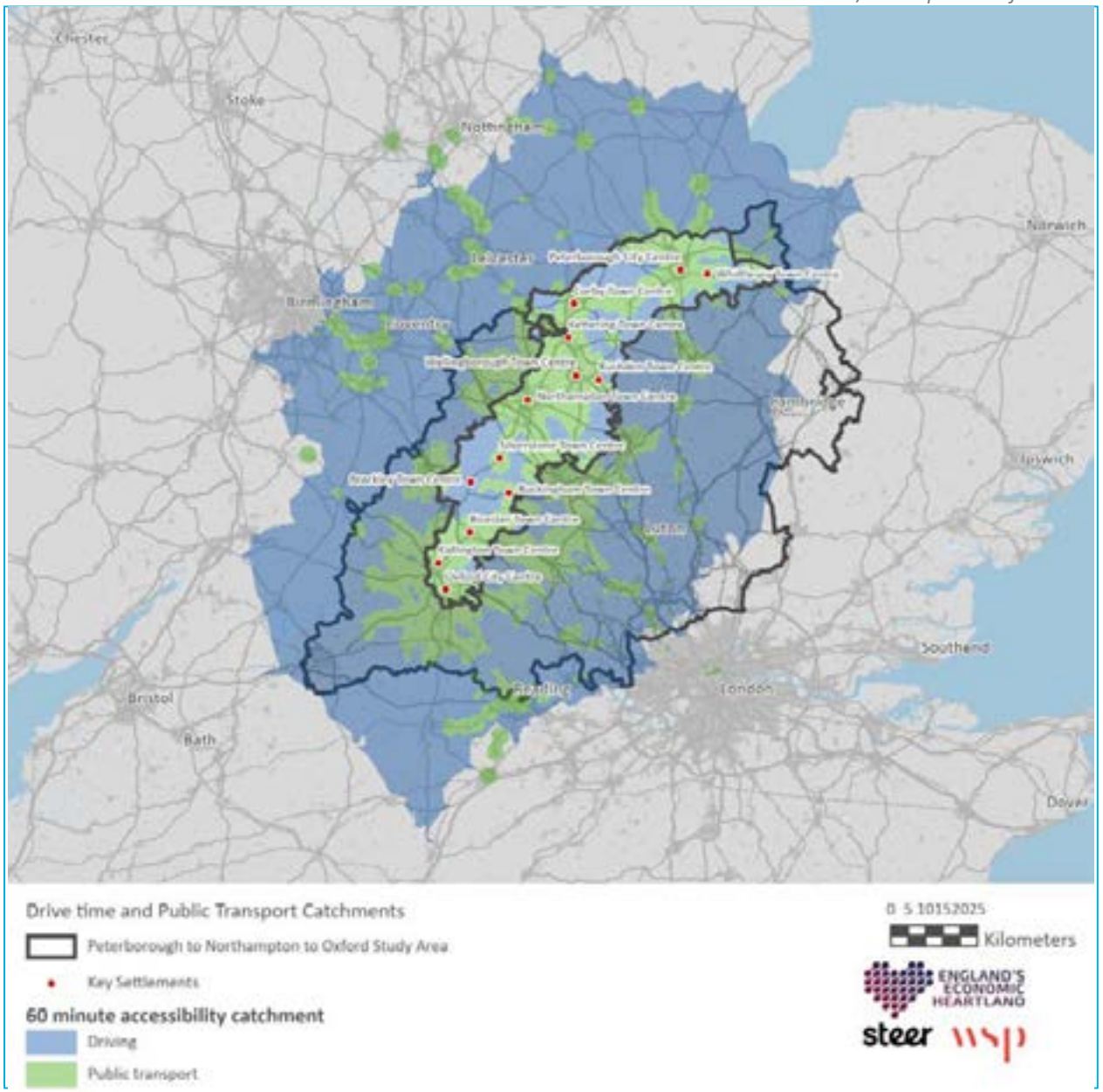
Catchment

In order for public transport to be a realistic alternative to private car travel it must provide a similar level of accessibility. The plan opposite indicates the combined 60-minute AM peak public transport and car driver catchments for travel towards several select Centres of Strategic Importance (CoSI): Peterborough, Corby, Kettering, Northampton, Oxford, Peterborough, Silverstone Park and Wellingborough. Separate catchments by CoSI are provided in Appendix B.

The entirety of the corridor, and a significant area beyond, can access one or more CoSI within a 60- minute drive. However, only 63% of the corridor can access one or more CoSI within a 60-minute journey via public transport. Accessibility of CoSI from rural areas by public transport is constrained, most noticeably in rural areas between Oxford and Northampton.

Transport interventions should seek to promote public transport in urban areas where it offers a realistic alternative to the private car. Transport interventions will need to deliver connectivity between the key service centres and surrounding rural communities.

Data Source: TRACC / ESRI Speed Profile Data



Networks – Road

Electric Vehicles & Infrastructure

Electric vehicles (EV) are a key component in reaching a net zero corridor by 2050.

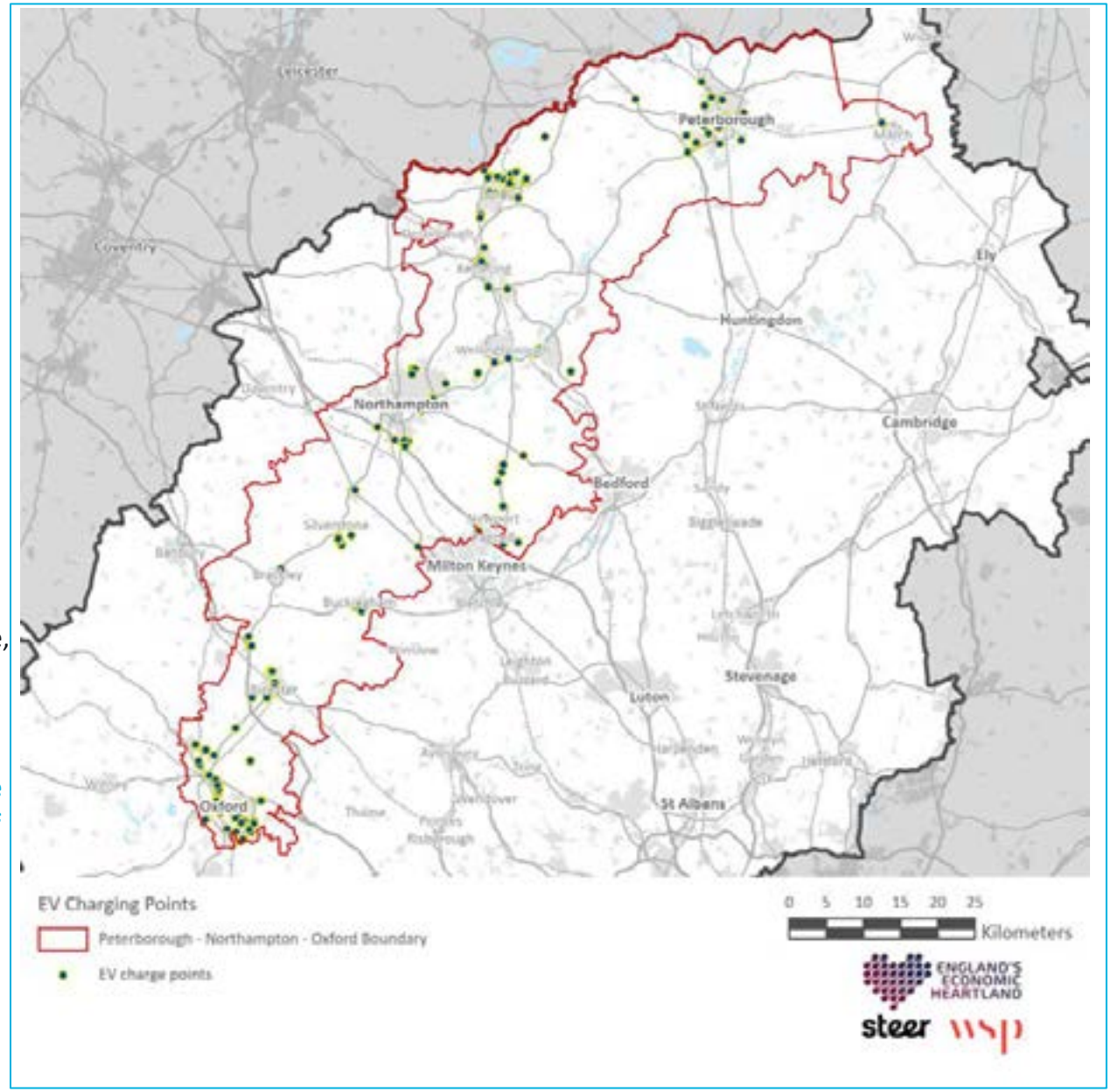
The plan highlights the distribution of non-residential Electric Vehicle Charge points (EVCP) within the corridor. A total of **291 non-residential EVCPs** exist within the corridor ranging from public to private usage.

The distribution of EVCP points shows a clear urban/ rural divide in terms of provision. Oxford has the highest number of EV charging points, with Peterborough and Corby also showing a high number. Northampton has comparatively few with these other urban settlements, and those that it does have are located on the periphery of the town.

Notable rural clusters of EVCPs are at Silverstone, Olney, and on motorways and A roads, such as the M1 south of Northampton.

To help facilitate the transition to EV, transport interventions should consider how EVCP can be best delivered in residential areas where no-off street parking is available and less populated rural areas where EVCP may not be commercially viable. Consideration must also be given to capacity of the national grid to accommodate an increase in EVCP as well as the provision of EVCP for buses and, as technology progresses, HGVs.

Data Source: National Charge Point Registry (NCPR) 2021



Travel Patterns & Behaviour

Origin-Destination

Movements between the major settlements in the corridor highlight the most important commuter patterns. The total amount of movements within the corridor is 310,589. out of all movements, 68% involve commuting between settlements.

Out of the movements within settlements, The largest amount of commuting takes place in Northampton with 61150 internal trips (20% of the corridor total.) The highest movement between settlements is between Kidlington and Oxford with a total of 3301 trips in total. There is also significant movement between the settlements of Northampton, Wellingborough, Kettering and Corby, which are all within close proximity.

The total amount of movements between the key settlements of Oxford, Northampton and Peterborough are low – for example there are only 102 trips between Northampton and Peterborough.

This evidence indicates that there is poor connectivity between the key longer distance settlements in the corridor. Improved connectivity, would have the potential to stimulate economic growth in the region.

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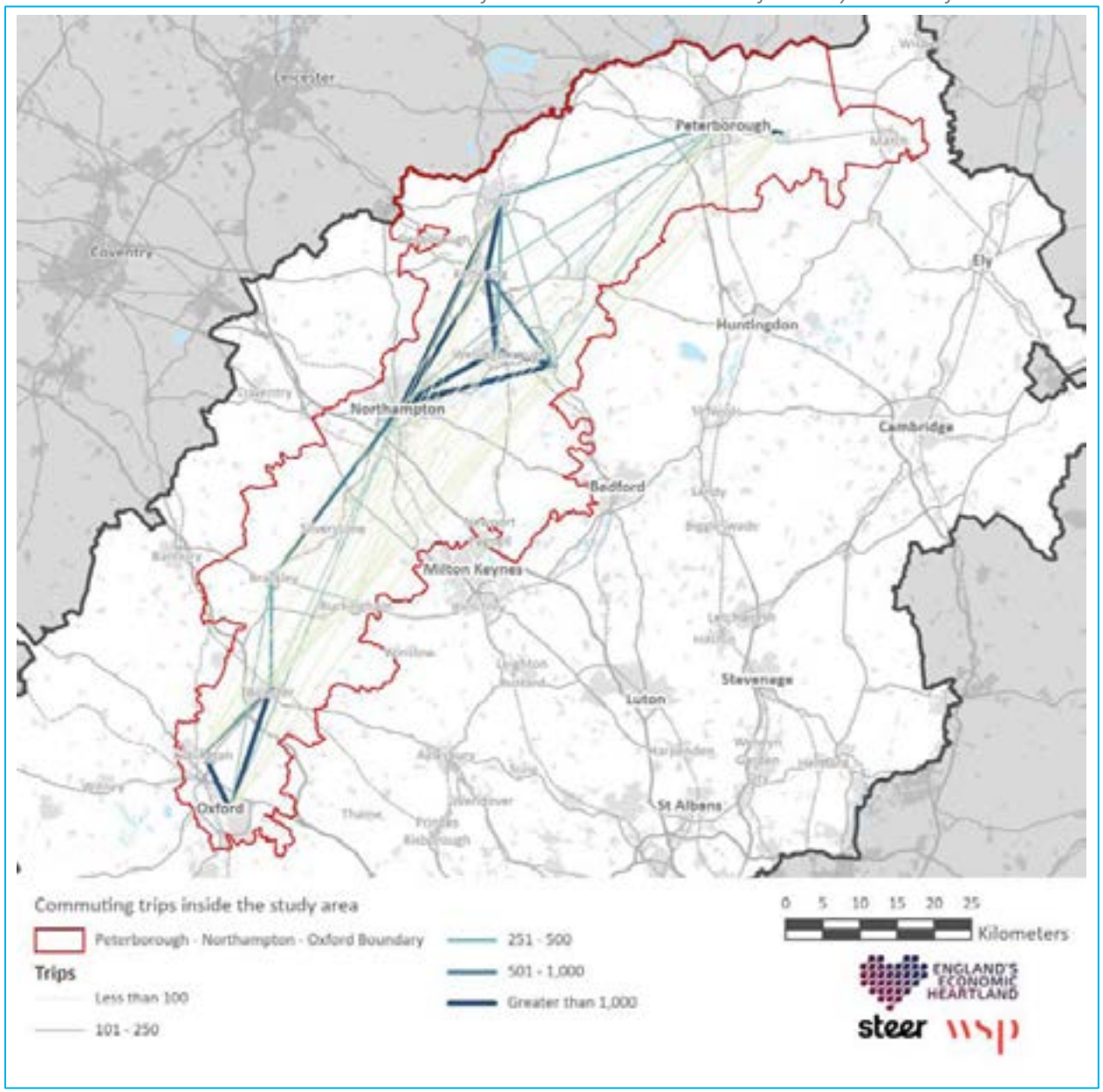
Data Source: 2011 Census – WU03EW Location of Usual Residence and Place of Work by Method of travel to work



Travel Patterns & Behaviour

Origin-Destination

Data Source: 2011 Census – WU03EW Location of Usual Residence and Place of Work by Method of travel to work

Major Urban Settlement	Bicester	Brackley	Buckingham	Corby	Kettering	Kidlington	Northampton	Oxford	Peterborough	Rushden	Wellingborough	Whittlesey	Rural Areas	London	Coridor Total	EEH	EEH Excluding Corridor	England and Wales
Bicester	5252	143	21	0	2	637	47	2375	2	0	1	0	2793	467	11273	13836	2563	639
Brackley	272	1826	57	6	9	69	242	209	1	2	14	0	1045	141	3752	5340	1588	390
Buckingham	79	49	433	0	1	14	30	49	1	1	0	0	742	85	1399	2454	1055	100
Corby	2	3	0	12201	1848	0	874	4	142	83	266	2	4124	299	19549	22194	2645	916
Kettering	8	5	0	1662	11901	3	1982	5	110	282	1132	0	3203	413	20293	22051	1758	1280
Kidlington	279	19	5	0	1	1836	1	3301	3	0	0	0	1813	85	7258	7648	390	305
Northampton	69	286	18	337	1296	34	61150	97	102	397	1630	0	7009	1765	72425	82033	9608	3748
Oxford	393	39	9	4	2	954	47	38232	3	1	4	0	4420	1833	44108	51033	6925	2446
Peterborough	2	0	0	235	69	0	110	4	36597	75	33	471	7323	1292	44919	48922	4003	4646
Rushden	2	7	0	128	554	1	1354	2	73	3381	1212	3	2171	228	8888	11556	2668	399
Wellingborough	12	14	1	168	871	4	2779	6	36	548	6306	0	2960	511	13705	18485	4780	794
Whittlesey	0	0	0	11	2	0	6	0	1771	0	3	885	881	67	3559	4215	656	273
Rural Areas	1833	1036	724	2474	4936	1241	15357	7451	15855	2453	5560	541						
London	104	19	27	45	121	2	810	1356	546	89	259	4						
Corridor Total	8203	3427	1268	17226	21492	4793	83979	51735	54696	7223	16161	1902						
EEH	10969	4608	1841	18456	24165	8107	94188	76176	59452	7865	20270	2137						
EEH Excluding Corridor	2766	1181	573	1230	2673	3314	10209	24441	4756	642	4109	235						
England and Wales	530	413	33	1504	1879	732	7359	4518	12661	227	1152	187						

- **Rural Areas:** This area surrounds all MSOAs of the corridor outside of the main settlements identified.
- **England and Wales:** This area includes all data from England and Wales.

Travel Patterns & Behaviour

Mode Share by Settlements

The table in this slide demonstrates how different modes of transport are utilised in the various built-up urban areas in the corridor.

When assessing movements for the major urban areas, car driving is the dominant mode across the corridor with 59% of all movements from settlements being made by private car. Public Transport makes up 10% of all commuter movements between the built-up urban areas in the corridor. Active travel makes up 18% of all commuter movements between the built-up urban areas in the corridor. Only 4% of residents living in the built up urban areas worked from home (noting that this is pre-COVID-19). The settlements with the highest journey to work public transport mode share are Oxford (19%) and Kidlington (18%). Oxford also had the highest journey to work active travel mode share (35%). This is more than double the amount of any other built-up urban area in the corridor. Further detail on travel patterns and behaviour in the corridor is provided in **Appendix E**.

The evidence demonstrates that there is a disparity in the journey to work mode share between settlements. The evidence also indicates that commuter trips are car dominated and as there is an opportunity for mode shift. There is considerable variation in public and active travel mode shares between settlements. The reason for this will be explored in more detail as a part of the development of a long list of interventions.

Data Source: 2011 Census – QS701EW Method of travel to Work

	Car/Van (Driver)	Car/Van (Pass.)	Bus	Train	Cycling	Walking	Work From Home
Bicester BUA	11444 66%	1080 6%	728 4%	559 3%	777 4%	1931 11%	763 4%
Brackley BUA	5263 74%	296 4%	88 1%	89 1%	78 1%	873 12%	418 6%
Buckingham BUA	2170 69%	143 5%	94 3%	74 2%	41 1%	423 12%	185 6%
Corby BUA	17475 66%	3145 12%	1769 7%	260 1%	795 3%	2437 9%	644 2%
Kettering BUA	18572 67%	1935 7%	824 3%	534 2%	625 2%	3906 14%	1120 4%
Kidlington BUA	5486 58%	457 5%	1662 18%	70 1%	572 6%	744 8%	462 5%
Northampton BUA	67129 66%	7673 8%	7330 7%	1798 2%	2731 3%	11458 11%	3838 4%
Oxford BUA	22948 35%	2192 3%	11068 17%	1453 2%	11652 18%	11713 18%	4022 6%
Peterborough BUA	36669 58%	6348 10%	5579 9%	1546 2%	4108 7%	6593 10%	2077 3%
Rushden BUA	10792 76%	869 6%	221 2%	179 1%	181 1%	1442 10%	587 4%
Wellingborough BUA	15415 69%	2039 9%	605 3%	537 2%	419 2%	2675 12%	781 3%
Whittlesey BUA	3859 72%	345 6%	217 4%	77 1%	236 4%	403 8%	204 4%
Corridor Total	**327,095** 62%	**32,145** 6%	**31,960** 6%	**8,804** 2%	**24,306** 5%	**50,617** 10%	**52,722** 10%
EEH Total	**1,433,810** 62%	**111,900** 5%	**97,426** 4%	**117,264** 5%	**82,195** 4%	**204,767** 9%	**257,013** 11%
England and Wales Total*	**15,264,527** 61%	**1,347,280** 5%	**1,949,442** 8%	**1,371,025** 5%	**762,334** 3%	**2,846,588** 11%	**1,422,708** 6%

**Total Excludes Metro, Underground, Tram and other transport types*

Summary

Theme	Issues & Opportunities
 ROADS	**Issues** • **Pinch points –** Many of the key road networks within the corridor experience heavy congestion at vital junctions. • **HGVs –** High HGV flows along the main corridor roads puts pressure on the corridor network. **Opportunities** • **Connectivity –** Drivetime catchments highlight that the corridor is at least 60 minutes of driving from many key urban areas as well as the majority of the EEH region as a whole.
 PUBLIC TRANSPORT	**Issues** • **Bus –** There is a strong urban / rural divide with bus use, which may be a representation of inadequate infrastructure in rural areas. • **Rail –** An absence of rail connections between key settlements in the corridor such as Oxford, Northampton and Peterborough restricts opportunities to undertake long distance journeys by public transport. **Opportunities** • **Bus –** Bus services are the most utilised mode of public transport in the local area so further bus services and infrastructure should be promoted. • **Rail –** The 'Northern Arc' rail link is a proposed concept that would connect Peterborough, Northampton and Oxford and has the potential to increase rail patronage in the corridor by producing faster and more direct services. • **Mobility hubs –** Using rural mobility hubs, public transport options can be combined with active travel.
 ACTIVE MODES	**Issues** • **Catchments –** Opportunities for active travel commuting differ throughout different parts of the corridor due to levels of active travel infrastructure as well as commuting distances. **Opportunities** • **New Infrastructure –** New cycling and walking infrastructure can help promote active travel take up. • **E-bikes / Shared mobility –** Shared mobility scheme trials such as E-scooters offer greater opportunities for active travel.
 Travel Patterns & Behaviour	**Issues** • **Car –** The majority of trips within the corridor are made by private car travel, with limited car sharing. • **Distance –** There are limited commuting trips between the urban areas in the corridor, with most commuting trips being completed within singular urban areas. **Opportunities** • **Future Developments–** New public transport and active travel initiatives can help promote sustainable travel behaviours.

Part 2d

Stakeholder Engagement

Stakeholder Engagement

Steering Group

Two Steering Group Workshops have been held on the study to gain insight into the corridor, the studies Critical Success Factors and infrastructure priorities. A summary of the key issues and opportunities identified from the first steering group workshop is provided below.

Key Corridors:

- A34 around Oxford and Chilton to Bicester
- M4 – M40
- Rail – Didcot to Oxford capacity, Oxford to Banbury and Oxford to Bicester
- Culham Science Vale
- A41 Bicester
- A40 to Oxford
- A422 Banbury to Brackley
- M40 Junction 9 and Junction 10
- Links to Heyford
- A421
- A4421
- A4095
- A43 – South of Northampton link to the M40
- Milton Keynes to Northampton road and rail links
- Northampton to Daventry (A45), Kettering (A43), Wellingborough (A45, A605)
- A605
- A6
- East Coast Main Line to East-west Rail at Sandy/St Neots
- Freight corridor – Felixstowe to Nuneaton
- A47 to the East of Peterborough

Strategic Trip Attractors:

- **Oxfordshire:** Harwell Campus, Culham Science Centre, Oxford University, Oxford Science Park, Oxford Hospitals, Milton Park, North Oxford Business Park, Cotswold and Saltcross Garden Villages, Park and Ride Sites, Oxford Airport, Logistics Centres at Bicester and Banbury;
- **Northamptonshire:** Northampton Gateway Rail Freight, University, Northampton and Kettering Hospitals, Brixworth High Performance Engineering, Rushden Lakes, Nene Valley (leisure);
- **Peterborough:** University and Hospitals

Issues and Opportunities

A summary of the key issues and opportunities were identified by stakeholders under the EEH Transport Strategy principles:

Issues in achieving Principle 1: Net-zero carbon emissions from transport no later than 2050.

- East Northamptonshire and Wellingborough high reliance on car
- High reliance on road based connections encourage car travel
- Rural areas have high car dependency
- Pockets of deprivation with limited public transport access

Opportunities

- Car clubs and car shared outside of urban areas
- Delivery of Local Cycling and Walking Plans
- Good coverage of superfast broadband in Oxfordshire
- 5G roll-out progress
- Northampton-Bedford rail connection?
- Northampton-Market Harborough rail connection
- Capitalise on e-scooter trails
- Low car dependency in Oxford
- Take up of EV's in Peterborough
- Increased digital/home working
- Hydrogen fuel
- Connectivity to East-west rail
- Better access to stations
- EV infrastructure roll-out

Stakeholder Engagement

Issues in achieving Principle 2: Improving quality of life and wellbeing through an inclusive and accessible transport system which emphasises sustainable and active travel.

- Areas of high deprivation
- Lack of integration between modes
- Lack of high quality, segregated cycle infrastructure between settlements
- Limited sustainable modes in rural areas and to key destinations
- Air quality
- High levels of car use in Northampton urban area

Opportunities

- E-bikes and e-scooters increase journey distances
- Greenway networks
- Low traffic neighbourhoods
- E-bike cargo deliveries – increasing in Oxford
- Better integration of bikes and train services
- Funding for EV charging points
- Local Cycling and Walking Plans
- Opportunities for improved sustainable travel in Northampton
- Segregated cycle infrastructure alongside busy roads (A45, A605 Northampton to Peterborough)
- ISE Valley active travel link from Wellingborough to Corby
- Northampton to Market Harborough rail connection
- Active travel link – Corby-Oundle-Peterborough
- Oxford, Northampton, Peterborough have high proportions of bus and train use, but low in East Northamptonshire, Kettering and Daventry
- Bus franchising in Cambridgeshire and Peterborough Combined Authority
- Wisbech Rail scheme
- Demand Responsive transport in Huntingdonshire
- Road space reallocation to active modes

Issues in achieving Principle 3: Supporting the regional economy by connecting people and businesses to markets and opportunities.

- Parts of the corridor not served by rail – Oundle, Towcester and Brackley
- No east-west rail connections
- Public transport connections Northampton to Peterborough are slow
- A45 congestion and junction capacity a key issue for Northampton
- A43 south of Northampton junction capacity remains an issue
- Silverstone access
- Changing function of town centres
- Lack of public transport access to business parks in out of town/rural locations

Opportunities

- Mobility Hubs – shared working spaces at transport hubs or co-located housing and employment sites
- Northampton to Market Harborough rail line to provide links to Kettering and Corby
- A45 as a SMART Expressway
- Better rail services for Corby, Kettering and Wellingborough
- High performance technology cluster at Silverstone, University and Northampton Enterprise Zone
- Major employment centres at Peterborough, Northampton and Oxford
- Express Coach services
- Strategic rail freight interchanges
- East-west rail freight movements
- Access to Peterborough University

Stakeholder Engagement

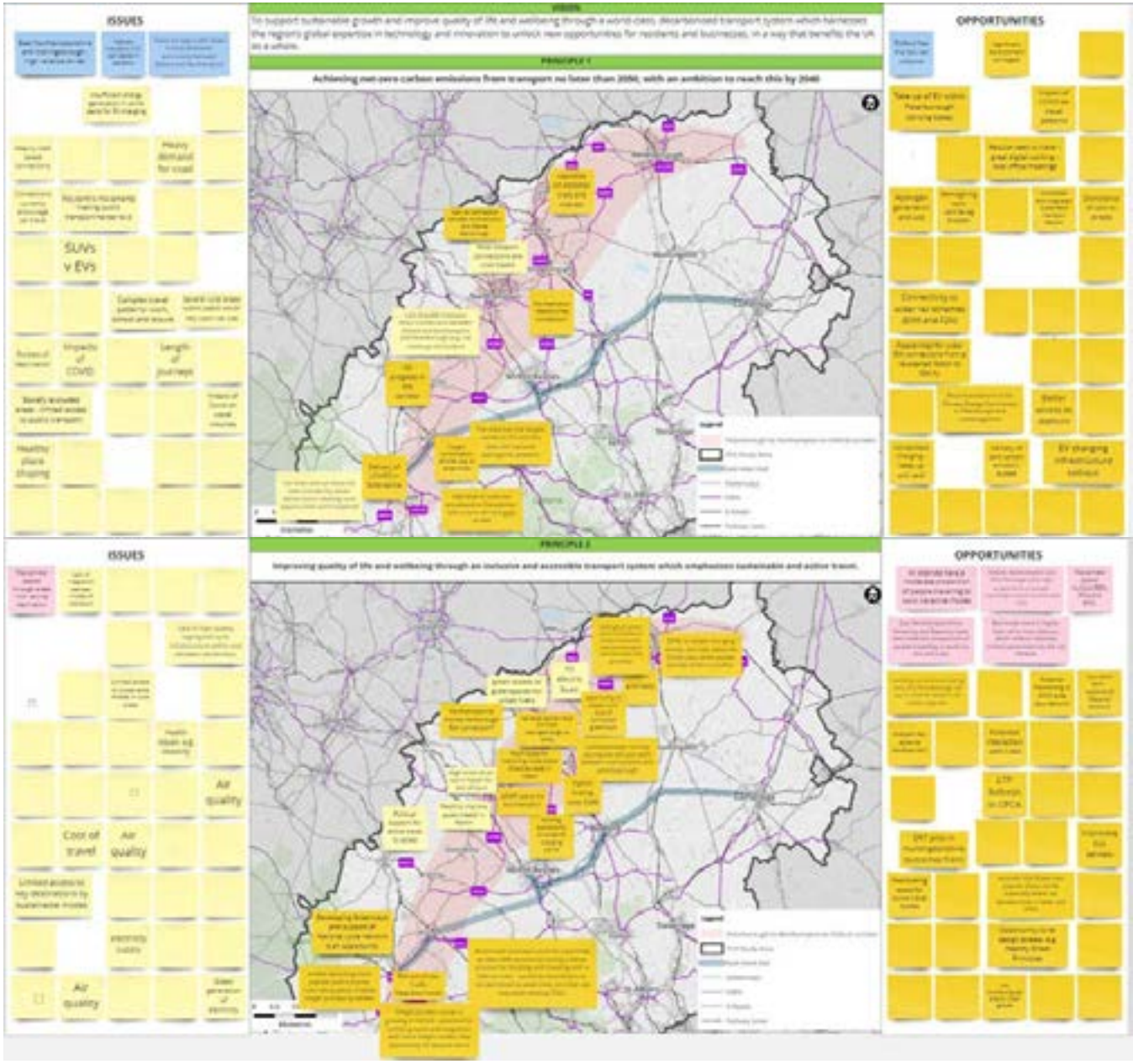
Data Source: Steering Group 1 Miroboard

Issues in achieving Principle 4: Ensuring the Heartland works for the UK by ensuring the efficient movement of people and good through the region and to international gateways.

- HGV and agricultural movements in the Fens
- Local authority collaboration
- Road based distribution industries
- Lack of lorry parking facilities
- A34 corridor and M40 Junctions 9 and 10
- HGV traffic on inappropriate routes and weight restrictions not enforced

Opportunities

- Rail/Road freight interchanges on East-west Rail and/or Chiltern Line
- Cycle courier services
- East-west freight capacity to Haven ports;
- Better major and strategic road information co-ordinated across the network
- Proposed rail freight interchanges in Cherwell and Northampton;
- Improved mainline services
- HS2 and East-west rail
- Drone deliveries
- Green power supplies



Stakeholder Engagement

Stakeholder Group

A Stakeholder Workshop has been held on the study to gain insight into key issues and opportunities the study needs to address. A summary of the key findings under the Transport Strategy principles:

Issues in achieving Principle 1: Net-zero carbon emissions from transport no later than 2050.

- Low number of rail stations with existing ones having poor access
- Congestion at pinch points
- Rail freight use is limited and end to end corridor connectivity is poor unless East-west rail connects to radial lines
- No zero-carbon HGV's
- Strategic routes routing through/close to existing communities resulting in mix of local and strategic vehicle movements
- Poor EV infrastructure
- Limited public transport coverage

Opportunities

- Gigabit coverage to hard to reach places and digital connectivity to reduce travel demand
- East-west Rail link to eastern ports
- HS2 release of rail capacity on West Coast Main Line
- More facilities located within existing settlements
- Roll-out of EV charging infrastructure
- Plan for new places to support public transport and active travel.

Issues in achieving Principle 2: Improving quality of life and wellbeing through an inclusive and accessible transport system which emphasises sustainable and active travel.

- Air quality
- Lack of data/access to public transport information and active travel routes
- EV driving is cheap so encourage car travel

Opportunities

- Reduce community severance with the provision of high-quality crossings
- 5G connectivity
- Future developments linked to active travel options
- Radial Park and Rides
- Cycle routes alongside main corridors
- Incentivise active travel
- Promote rental e-bikes

Issues in achieving Principle 3: Supporting the regional economy by connecting people and businesses to markets and opportunities.

- High freight flows on the A605
- Lack of parking in places like Milton Keynes
- Reluctance of some employers to support remote working
- Insufficient inter-modal freight terminals
- Trade-off between public transport journey times and accessibility

Opportunities

- Extend East-West rail to link to other locations
- Wider use of Park and Ride in Northampton
- Digital connectivity
- Rail connectivity – East-west rail and West Coast Main line, Felixstowe to Corby
- Strategic Rail Freight Interchange in Marston Vale
- East facing chord at Manton Junction to enable direct rail connectivity from Bedford, Wellingborough, Kettering, Corby to Stamford and Peterborough
- Zero-Carbon logistic hubs
- Better roadside technology to manage traffic flows
- Rural community hubs
- Zero-carbon new developments
- Route guidance for freight movements

Stakeholder Engagement

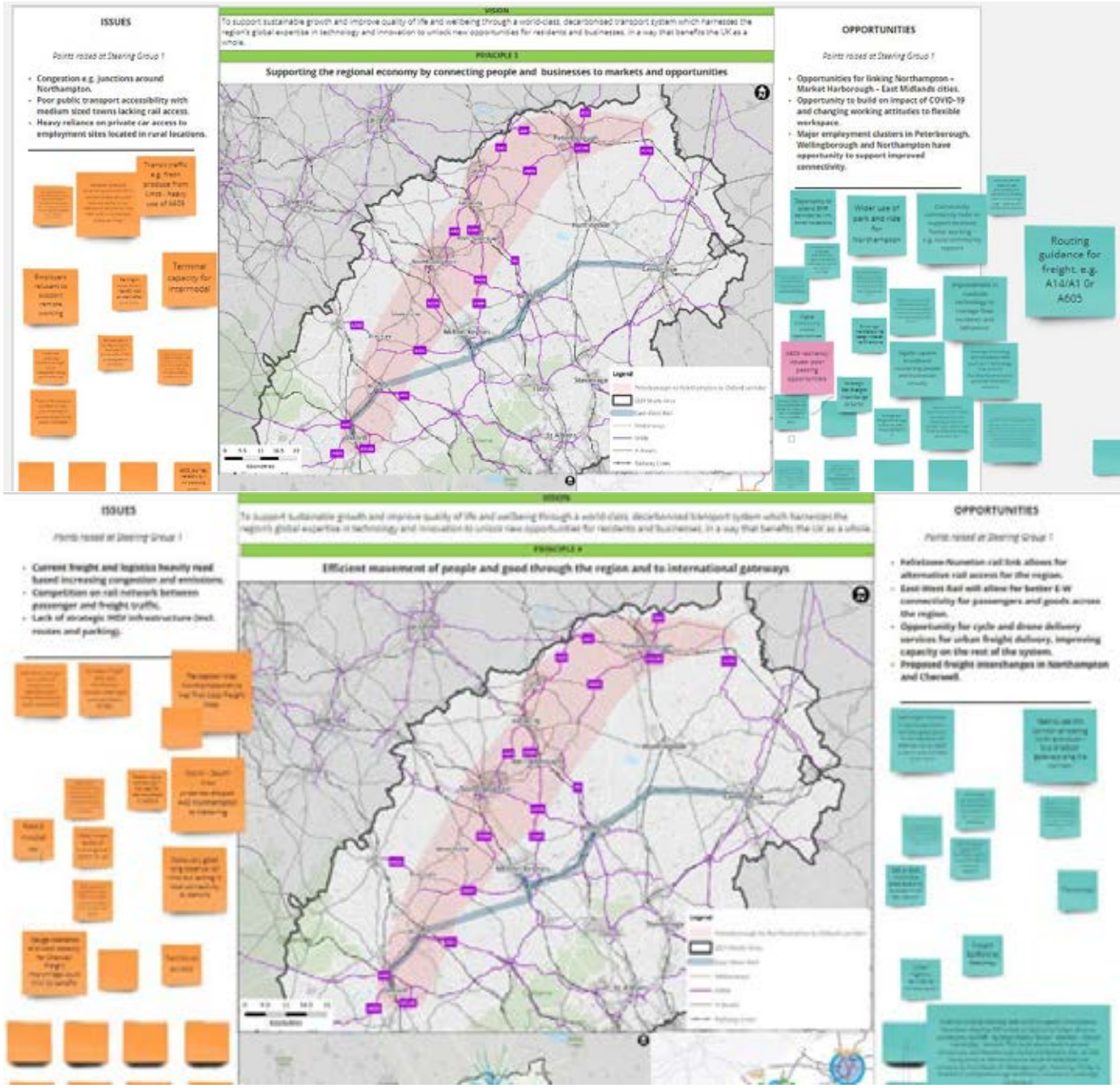
Data Source: Stakeholder Group 1 Miroboard

Issues in achieving Principle 4: Ensuring the Heartland works for the UK by ensuring the efficient movement of people and good through the region and to international gateways.

- East-west routing is challenging compared to north-south movements
- Lack of local connectivity to stations
- A43 Northampton to Kettering
- Digital connectivity
- Strategic freight sites face local pushback

Opportunities

- New rail freight terminals – Corby, Stewartby
- Bus priority into popular destinations
- Harnessing expertise of F1 sectors and Cranfield
- Urban logistic hubs in Northampton



Call for Evidence

Call For Evidence

A Call for Evidence was held in June 2021 for the Peterborough – Northampton – Oxford corridor study area. The call for evidence was made public on the EEH website and promoted amongst stakeholders with an interest in the study but not involved in either the steering or stakeholder groups.

This opportunity allowed external organisations to outline key issues in the study area and identify potential interventions. Stakeholders were asked to responded to four unique questions surrounding the study area.

It should be noted that a disproportionate number of responses from residents referred to connectivity in and around Northampton. This is likely to be associated with the Call for Evidence being publicised in the Northampton Chronicle.

A summary of the responses to these questions is provided below. A full, more detailed, list of interventions identified by respondents as a part of the call for evidence will be included in the long list of options

Question 1: Key Themes

What are the over-arching themes the connectivity study should look to consider when developing a package of potential measures?

- Improving public transport and other no-car modes journey time to facilitate a reduction in car trips.
- Ensure sustainable travel is an attractive, cost effective alternative to the private car.
- Better active travel provision and improved first/ last mile provision.
- Decarbonising the transport system, whilst supporting the freight and logistics industry.
- Consideration all trip types: not just for work-related/ commuting trips, but also leisure/ tourism/ culture/ education/ healthcare.
- Economic growth, jobs, and connectivity can act as a catalyst for regeneration.
- A transport system that is accessible for all.
- Network congestion and delay.

Question 2: Key movements

Based on your experience, what are the key journeys being made in the study area?

- The A43 corridor connecting to Oxford.
- Movements between the M1 and the M40.
- Key movements into and out of Northampton, with the Urban area acting as a hub for regional trips to Brackley, Silverstone, Northampton Gate way, Wellingborough, Kettering and Corby.
- HGV freight movements along the "Knowledge Spine" surrounding Northamptonshire and Peterborough.
- Movements between Brackley, Silverstone Park and Towcester.

Call for Evidence

Question 3: Opportunities and Challenges

What are the key connectivity opportunities and challenges in the study area?

Opportunities

- Improving public transport through the northern arc rail proposal, extended direct services on East West Rail and improvements to local and longer distance bus services.
- Reopening of disused rail lines for new public transport services and/or active travel routes.
- Embedding new travel behaviours in new developments.
- New Active travel infrastructure and provision to help improve first-mile / Last-mile movements.
- Encourage modal shift to rail freight.
- Provision of more HGV parking and welfare facilities.

Challenges

- Congestion remains an issues throughout the corridor, causing unreliable journey times and increases in carbon emissions (notably with stop-starting of HGVs.)
- New transport schemes can be difficult to implement due to funding concerns, environmental impacts and political opposition.

Question 4: Interventions

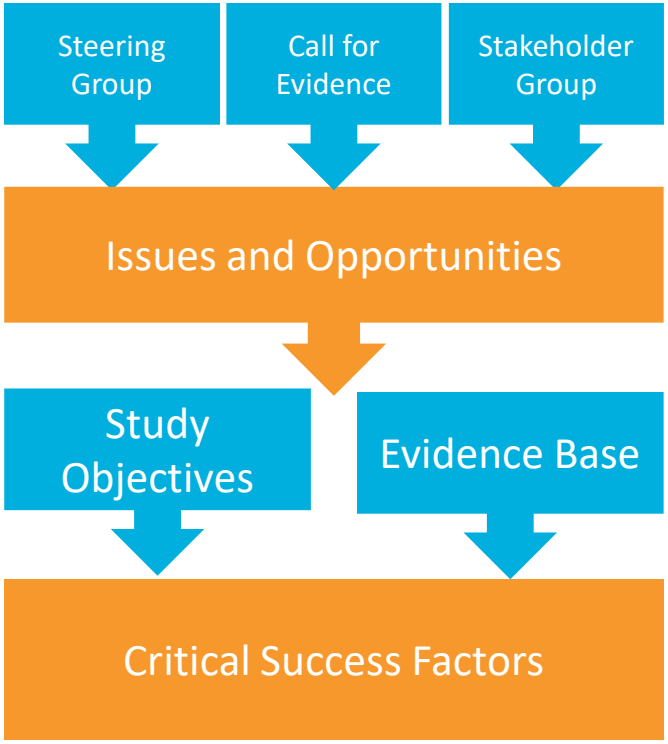
What interventions do you think the study should consider?

The interventions identified by respondents focus on improvements to rail and local bus services. A summary of the key themes and high level interventions identified by respondents is provided below.

- Implementation of the proposed northern arc rail line project.
- Northampton-Wellingborough rail
- Oxford-Northampton rail (or via direct extended East West Rail service)
- Chord from Harringworth on the Midland Main Line to Luffenham facilitating through passenger trains from Kettering and Corby to Peterborough.
- A west-to-north chord at St Neots from EWR to the East Coast Main Line, which can also be used for freight.
- Welland Valley Rail (Kettering-Corby-Peterborough-Wisbech)
- Northampton-East Midlands Rail (also known as Northampton-Market Harborough) with possibility of a station at Brixworth and a parkway where the line meets the A14 parkway .
- Improvements to local/ bus connectivity to Northampton rail station.
- Converting disused railway from Yarwell Junction (near Peterborough) through to Rugby into a 'Heart of England' cycleway.

Summary

The feedback received from the Steering Groups, Stakeholder workshops and Call for Evidence have been used to gain an understanding of the connectivity issues and opportunities within the study area which has helped inform the development of the evidence base, which has in turn informed the development of the study objectives and Critical Success Factors (Part 4 Need for Intervention).



EEH Principle	Issues Summary	Opportunities Summary
Achieving Net Zero	• High carbon emissions in East Northamptonshire, Daventry and South Northamptonshire • High car dependency due to dominant highway connectivity	• Good levels of EV take-up • Active travel projects underway – E-Scooters, active travel infrastructure, cargo bikes • Superfast broadband roll-out and 5G • Hybrid working – reduced travel demand • East-West Rail and new rail connections Northampton to Bedford and Market Harborough
Sustainable and active travel	• Pockets of deprivation in the corridor • Poor air quality due to high car use • Public health concerns – Northampton • Inconsistent political support for active travel. • Lack of multi-modal integration	• East-West rail – multi-modal longer distance trips • LCWIPS and active travel infrastructure delivery • E-bikes and E-scooters • E-cycle courier services (Oxford) • Low Traffic Neighbourhoods • Segregated cycle infrastructure on key corridors
Connecting people and businesses to opportunities	• Pinch point road congestion – Northampton • Poor public transport accessibility in medium sized towns • Slow public transport connections – Northampton to Peterborough • Lack of rail connectivity – Oundle, Towcester, Brackley • Rural employment centres	• Hybrid working and changing travel habitats • Flexible workspaces • Improved connectivity to strategic centres – Peterborough, Wellingborough, Northampton • Mobility Hubs with shared working spaces • Better rail links and services
Efficient Movement of People and Goods	• Freight movement heavily road based; • Passenger and freight competition on the rail network • Lack of HGV routes and parking • A34 and M40 Junctions 9 and 10 • HGV's on inappropriate routes	• Felixstowe-Nuneaton rail link – alternative rail access • Cycle and drone deliveries for urban centres • Rail Freight Interchangers – Northampton and Cherwell

Part 2e

Summary

Overview

People

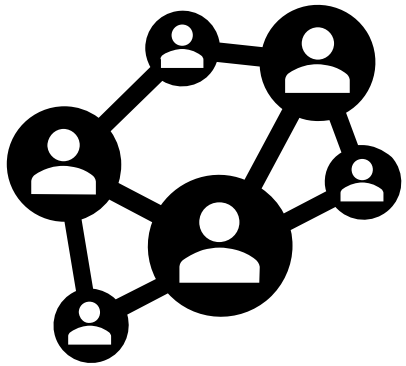
The evidence provided in this section has demonstrated that the corridor's transport infrastructure must meet the needs of a socially diverse population. Transport investment can play a vital role in enabling all residents to access the wide range of jobs, services and amenities located within the study area.

Place

The evidence outlined in this section suggests that any growth that occurs in the corridor must be balanced against the preservation and enhancement of the local environment. On top of this improvements to the existing area through transport investment can be provided to ensure the study area remains an attractive place to live and work for existing and future residents.

Investment in connectivity has a crucial role to play in enhancing the local environment, urban townscapes and the future spaces throughout the corridor by achieving modal shift and inclusive access to jobs and services. Reducing emissions in the corridor will contribute to the achievement of the local, regional and national air quality policies and overall decarbonisation.

Connectivity



The evidence provided in this section has demonstrated that there is a lack of attractive longer distance public transport connectivity between the key settlements. Car travel is the predominant mode of transport in the corridor, resulting in congestion and heavy delays at a number of key junctions across the corridor.

Investment in a high-quality transport infrastructure through the corridor that encourages sustainable and active travel, will enable modal shift for existing inter-urban and intra-urban movements, as well as opening up new journey opportunities for existing residents across the full length of the corridor.

Sub area profiles

Combining observations from the previous analysis has helped us to identify four sub-areas, each with their own place quality, challenges and opportunities which need to be considered when considering interventions appropriate in each setting. It should be noted these sub areas have been considered for contextual purposes and not

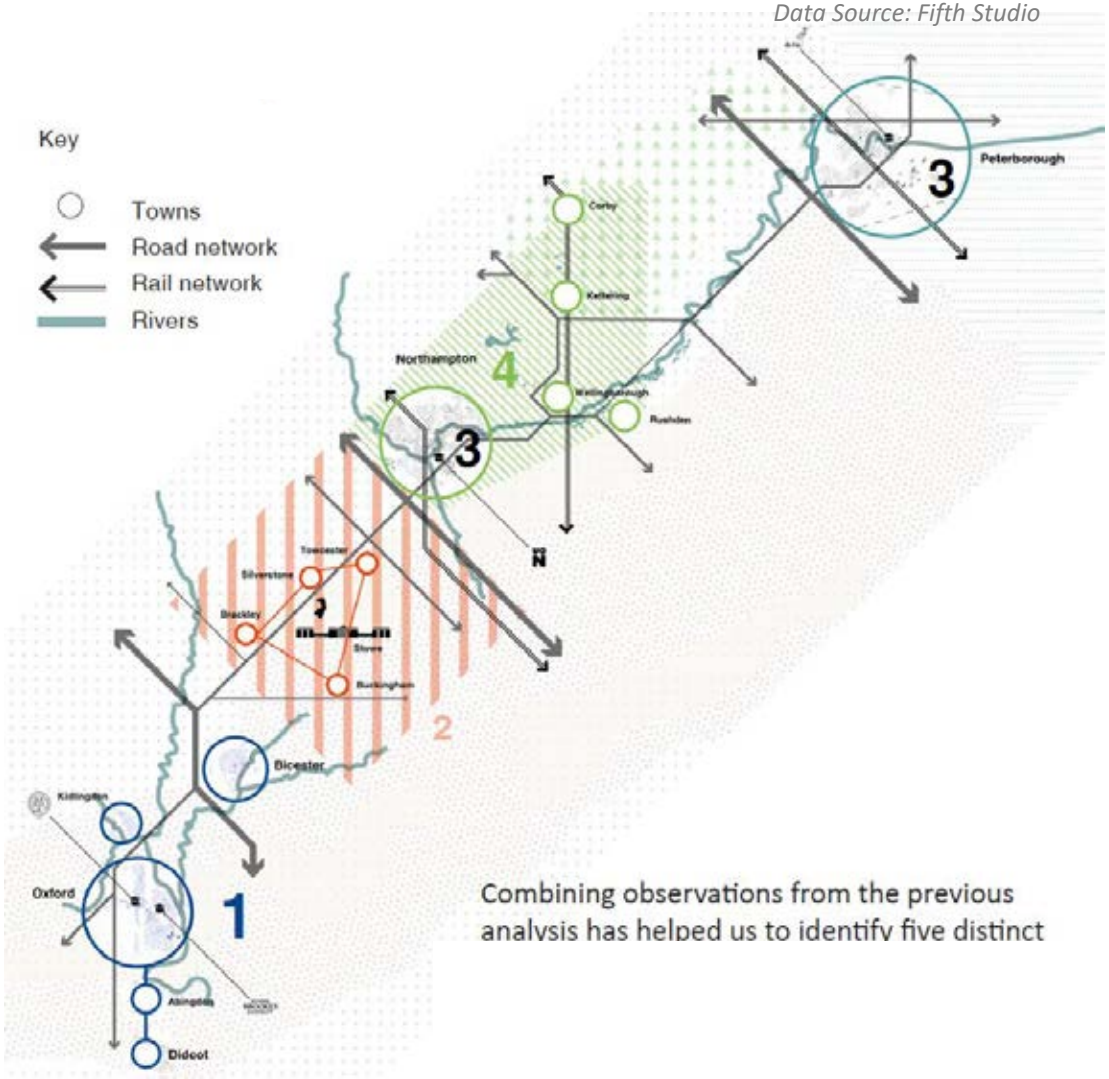
1 Central Oxfordshire Corridor Oxford - cluster of settlements and out-of-town employment locations that need to be effectively networked in terms of public transport and active travel.

2 Brackley-Buckingham-Silverstone Triangle – a collection of relatively remote smaller towns and visitor destinations in a rural hinterland, that, being in the 'missing link' between Oxford and Northampton, are difficult to serve by public transport.

3 Northampton & Peterborough - Historic cities that underwent significant expansion as third wave new towns, each with new universities in development opening up their respective waterfronts, and each facing the challenge of improving active travel and public transport within an urban form that is oriented towards car use, but with latent segregated cycle networks and plenty of space for reallocation of road space along the parkway systems.

4 Central Northamptonshire - with a combined population of around 450,000 across a c.20mile span there is the potential here for a coordinated plan for public transport, active travel, transit-oriented development and road space reallocation around and between the five towns - with a particular need for improved links E-W.

Data Source: Fifth Studio



Part 3

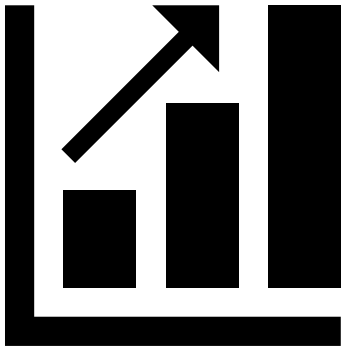
Future Context

Overview

Background

This chapter will set out the scale of the growth challenge and provide an understanding of the committed transport improvements schemes within the corridor. It will also demonstrate the potential implications of planned growth if they are not provided alongside high quality transport infrastructure and implemented without the premise of reducing the high levels of car dependency identified in Part 2. Housing and economic growth within the study area should be provided in a sustainable and equitable way.

Growth Challenge



The corridor faces substantial levels of housing and employment growth that will result in considerable increases in population, jobs and travel demand, Which if not addressed could negatively impact upon the local environment, levels of sustainable travel and the quality of place. This section will assess the implications of planned growth against the extent of committed transport improvement through the corridor.

Covid-19

The undesirable arrival of a shock event, such as the recent Covid-19 Pandemic, has required a fundamental shift in how society and business operate on a day to day basis. The pandemic has resulted in the acceleration of several mobility patterns such as working from home, active travel, increased freight and increased local deliveries. Whilst some of these trends will be short lived, such a significant transformation in everyday life will undoubtedly lead to some longstanding transport behaviours and patterns.

Future Growth Sites

Residential Sites

A total of 345 residential developments around the corridor are expected to be constructed by 2031, with a total increase of 125,858 dwellings.

The largest residential developments can be found on the outskirts of Northampton and Oxford, with the largest planned residential development Bicester (Eco-Town), proposing 6000 dwellings.

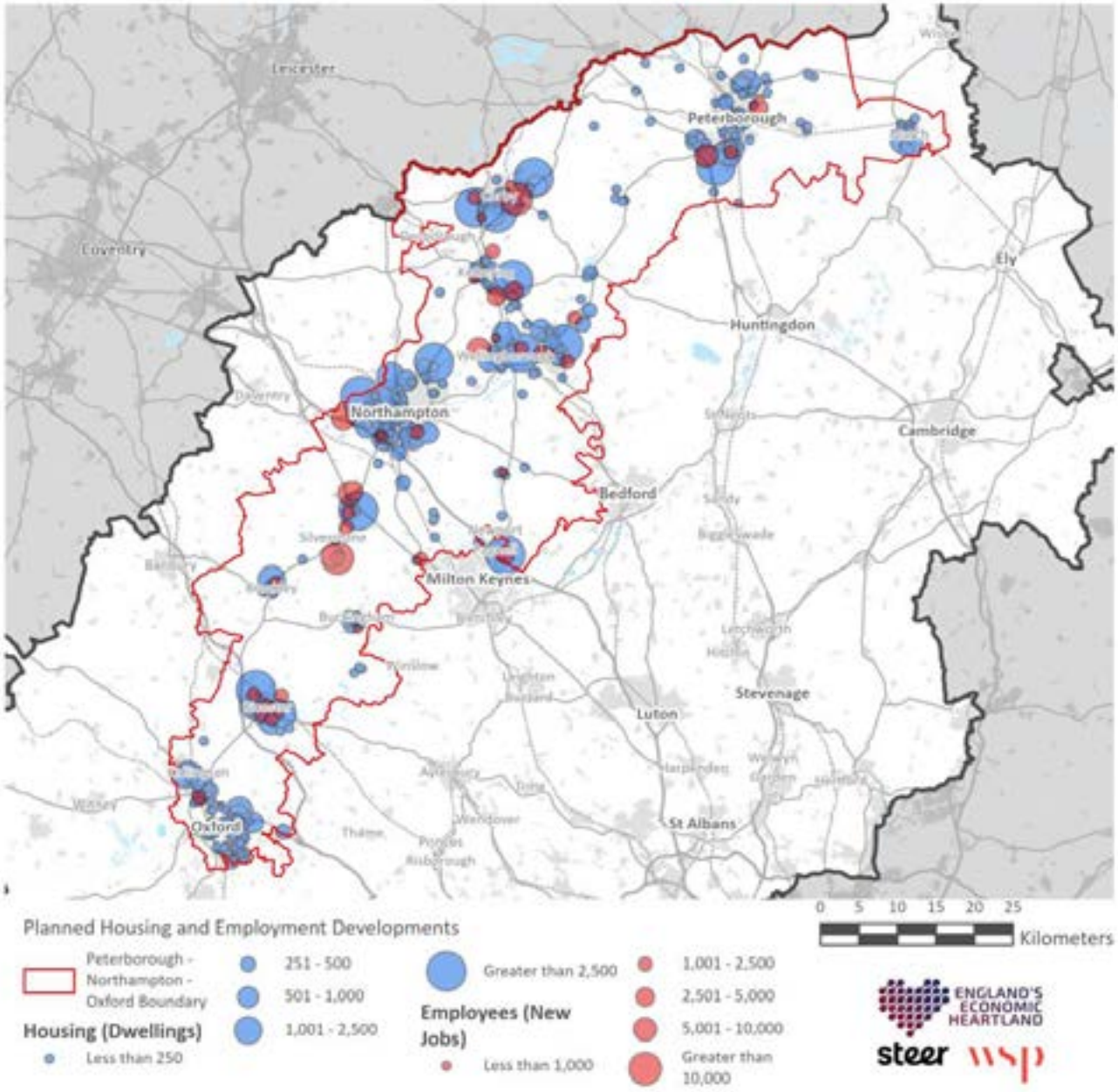
Employment Sites

Future employment development sites have been identified throughout the corridor. A total of 48 sites have been identified with a total floor space of more than 1278 hectares.

The largest employment site developments can be found within and surrounding Silverstone, Bicester, Corby and Peterborough. The most notable developments include Rushden Lakes Phase 1, 2 and 3 (2605 jobs) alongside Rushden East SUE in East Northamptonshire (1486 jobs).

To support long-term planned growth, high quality transport infrastructure will need to be provided to connect existing and new development sites and access to employment opportunities.

Data Source: EEH Databank



Population

Tempro Forecasts

Future population changes identify how future growth patterns are likely to change the demographics of the corridor. Tempro population projections have been used to find population changes for the next 20 years.

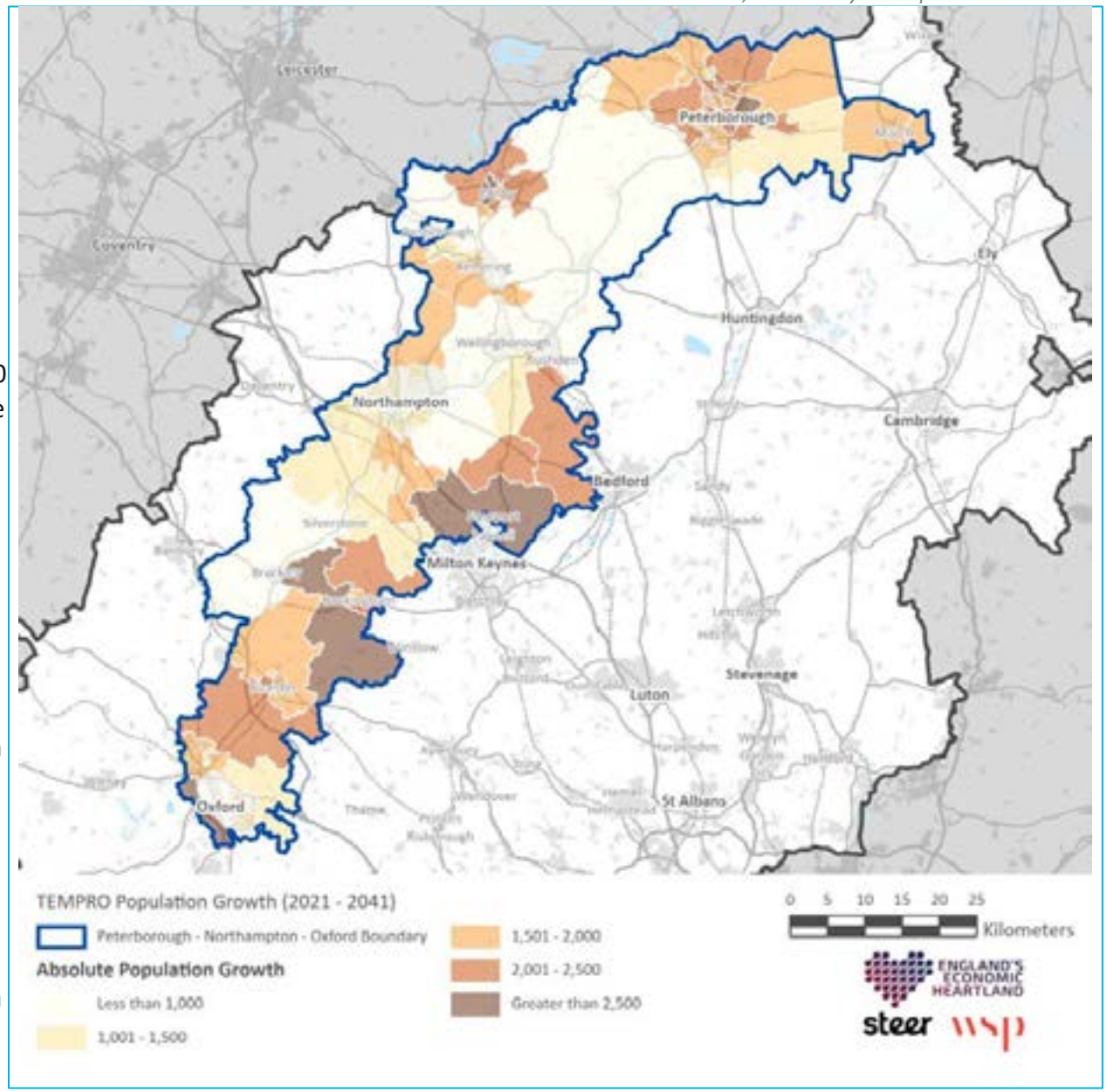
Population estimates for 2041, highlight an expected growth of 187,648 throughout the corridor. This indicates that the population is expected to increase by about 15% in total over 20 years. This matches the growth forecast across the EEH region as a whole (15%) and is significantly higher than the growth forecast across England and Wales as a whole (10%).

The distribution of growth differs throughout the corridor, with some areas experiencing more than others. The most notable areas are in Newport Pagnell and Buckingham, which comprises both Cranfield and Milton Keynes East. The presence of large residential developments also coincides with areas of large population growth.

Areas with little growth include rural areas, notably surrounding greenbelt areas such as east of Oxford, Wellingborough and the corridor between Kettering and Peterborough.

The planned increases in population will result in additional intra-urban and inter-urban travel demands that will put further pressure on the existing transport networks.

Data Source: TEMPro, 2019 Mid year Population Estimates



Transport Improvement Schemes

Data Source: Local Authority Major Transport Schemes, Highways England RIS 2 Schemes and Network Rail 's 2019-2024 Delivery Plan

In response to the transport issues on the core study area's existing transport networks, and to support planned housing and employment growth, a number of strategic transport improvement schemes are currently being / planned to be delivered. This includes:

East – West Rail (EWR)

The EWR project is expected to complete in 2024 (Phase 1) and will allow for direct rail connection from Oxford to Milton Keynes, along with potential access from Aylesbury.

A34 Improvement Project

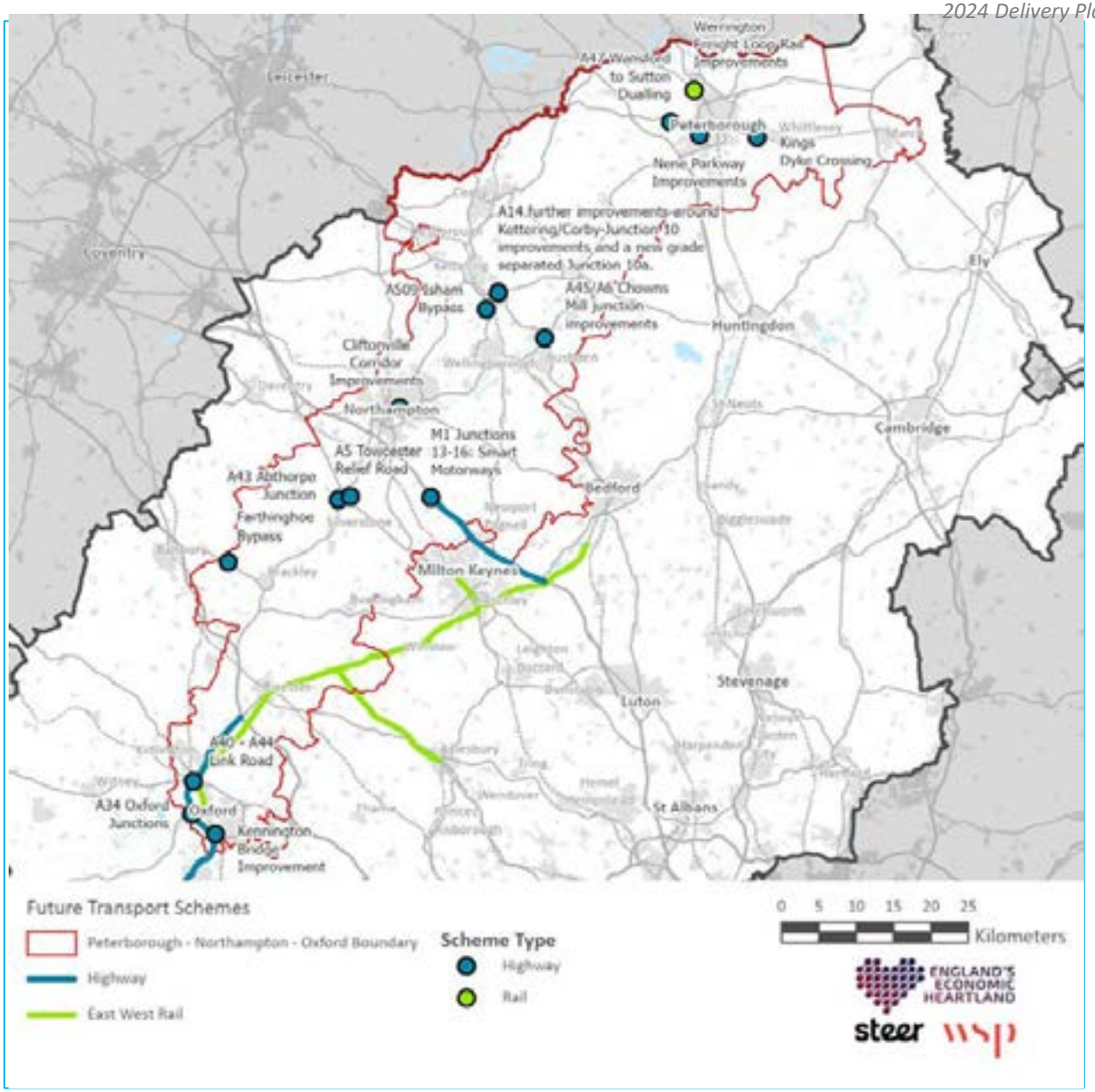
Highways England are exploring opportunities to reduce congestion on the A34 between the M4 and M40. Their immediate focus is understanding how the A34 and the local roads interact so that potential improvements may be explored.

M1 Smart Motorway Scheme

On the M1 between Junctions 13 – 16, hard shoulders are being converted into a fourth lane, and new electronic signs, CCTV cameras and noise barriers are being implemented.

Other Schemes including:

- A5 Towcester Relief Road
- A509 Isham Bypass
- A45/A6 Chowns Mill Junction Improvements
- A47 Wansford to Sutton Dualling



Covid-19 Recovery

The undesirable arrival of a **shock event**, such as the recent Covid-19 Pandemic, has required a fundamental shift in how society and business functions to advance through a difficult period of uncertainty. Under the resulting lockdowns, some mobility trends have accelerated (for example: working from home; active travel; increased freight and more local deliveries) whilst others have been paused or moved in the other direction. Whilst some of these trends will be short lived, such a fundamental pause in everyday life will undoubtedly lead to some longstanding lifestyle changes in behaviour.

National Response

In combating the spread of COVID-19, the UK government has taken a number of significant actions that have placed restrictions on individuals, areas and the wider economy. Whilst these restrictions have caused very significant disruption to people's lives, they have also resulted in changes of behaviour which, if continued, could help to resolve some transport-related issues.

The organisational and business actions are a snapshot of those taken by individual organisations and whole industries to cope with the ongoing pandemic and its impacts on how organisations operate:

- Investing in IT systems to support remote working
- Expansion of capacity of home delivery services
- Contactless payment preference
- Community groups to help with local capacity
- Bus services reduced in medium to long term
- Reduced local services due to closing down

Attitudes to Public Transport

Due to the increased physical interaction required by public transport, there has been reluctance to return to bus and rail use. Transport Focus's latest research from September 2021 found:

- 86% of train passengers feel safe in relation to COVID-19; however only 62% of non-rail passengers would feel safe if they had to make a rail journey.
- 83% of bus passengers feel safe in relation to COVID-19; however only 54% of non-bus passengers would feel safe if they had to make a rail journey.

The safety concerns expressed by non-rail and bus users is likely to be a significant barrier to encouraging mode shift and encouraging greater use of public transport. Careful consideration will need to be given to how public attitudes on the safety of travelling by rail and bus can be improved.

Work From Home

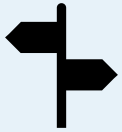
The biggest impact of Covid-19 has been the increased usage and attractiveness for work from home (WFH) behaviours. A total of 40% of all adults began working from home at the start of the first lockdown. The DfT's "All Change?" document has outlined the reluctancy of many workers returning to the office on a regular daily basis.

Several large companies have established policies outlining future WFH patterns that can be allowed for employees in the future. British Airways, BP, and Nationwide have outlined that WFH will become an accepted practice for at least a few days a week. As more and more companies and organisation embrace the use of WFH, it is likely that the amount of total commuting will see a reduction. Ideas surrounding Agile working are also staring to appear, with locations and hours dictated by the employee. WFH and Agile working will have several impacts on the future of transport and developments:

- Significantly reduced greenhouse gas emissions from reduction in commuting. COVID-19 lockdown led to a 42% reduction in Nitrogen Dioxide levels.[1]
- Changes to the way offices are structured, Savills found that office vacancy rate increased from 4.9% to 8.4% from early 2020 to 2021.

[1] Lee, J. D., Drysdale, W. S., Finch, D. P., Wilde, S. E., Palmer, P. I. (2020) UK surface NO2 levels dropped by 42% during the COVID19 lockdown: impact on surface O3. Atmospheric Chemistry and Physics Discussions. [Online]. Available at: https://acp.copernicus.org/preprints/acp-2020-838/acp-2020-838.pdf [Accessed 1 September 2021].

Summary

Theme	Issues & Opportunities
 FUTURE GROWTH	**Issues** • **Growth –** substantial levels of housing and employment growth will result in substantial increases in population, jobs and travel demand Which if not addressed could negatively impact upon the local environment, levels of sustainable travel and the quality of place. **Opportunities** • **Networks –** investment in a high quality transport network that encompasses all modes of transport will facilitate long-term sustainable economic growth supporting local, regional and national objectives.
 TRANSPORT SCHEMES	**Issues** • **Demand –** Population increase will result in additional intra-urban and inter-urban travel patterns will put further pressure on the existing transport networks in the corridor. **Opportunities** • **Planned Schemes –** investment in a high quality transport infrastructure including both major regional projects and local schemes can ensure future demands are met and ensure that economic growth is achieved sustainably across the corridor.

Part 4

Need for Intervention

SWOC Analysis

A summary of the highlighted strengths, weaknesses, opportunities and challenges for the study area are provided below. As highlighted significant challenges are faced due to the high levels of car dependency including travel within the existing settlements and a lack of good quality public transport and active travel connectivity within and between existing settlements.

Strengths

- The study area is home to approximately 1.2 million, which is forecast to grow, resulting in a substantial 'addressable market' that will directly benefit from enhanced intra-urban and inter-urban connectivity.
- The corridor is characterised by a diverse and highly skilled workforce. Transport investment will enable employers to better attract and retain the right skills needed to drive economic growth.
- In total 291 non-residential EVCP's are available for public use across the corridor. Shared-mobility services are also being trialled across the corridor, all of which provide a good foundation for future-ready transport interventions.

Weaknesses

- The existing population is predominately located in a series of large and medium-sized cities / towns dispersed across the corridor creating unique and complex connectivity issues.
- Greenbelt areas surrounding urban areas such as Oxford pose environmental constraints in the study area, which may impact on the deliverability of certain interventions.
- Current rail lines do not offer connectivity between the more longer distance key settlements and buses in rural areas lack service quality and frequency, reducing the attractiveness of public transport and increasing private car usage across the corridor.
- With high car usage in the corridor, several junctions in the corridor experience adverse congestion and queueing such as the M40/ A34 interchange, A508/ A5/ Deanshanger Road and A5/ A43 Junction in Towcester.

Opportunities

- Areas of significant growth are located in built up areas of relative proximity such as Northampton, Kettering, Wellingborough and Corby – providing strong opportunities to deliver high quality infrastructure that will promote active and sustainable travel.
- The most common travel to work distance for the corridor ranges from 2-5km, which are achievable distances using active and sustainable modes thereby representing an opportunity to encourage modal shift.
- Trips between the longer distance urban areas such as Oxford, Northampton and Peterborough are currently low. However, this may be driven by existing constraints such as lack of high-quality public transport infrastructure. Concepts such as the 'northern arc' rail link connecting these urban areas has the potential to increase movement and stimulate economic growth in the corridor.

Challenges

- The study area includes a wide range of geodemographics, meaning transport intervention must be diverse in order to cater for a mix of demands and needs.
- Car travel makes a substantial contribution to carbon emissions and therefore has a huge impact on achieving net zero. Achieving net zero in the corridor will be a significant challenge given the high levels of car use.
- Significant levels of growth will result in substantial increases in population, jobs travel demand and HGV movements, Which could negatively impact upon the local environment, levels of sustainable travel and the quality of place.

Objectives

The evidence base and issues and opportunities identified at Steering Group 1 have been used to establish 18 draft objectives for the connectivity study. These are centred around the four strategic principles of the connectivity study.

Key Principle 1: Achieving net zero no later than 2050, with ambition to reach this by 2040.	**Key Principle 2**: Improving quality of life and wellbeing through a safe and inclusive transport system which emphasises sustainable and active travel.	**Key Principle 3**: Supporting the regional economy by connecting people and business to markets and opportunities.	**Key Principle 4**: Efficient movement of people and goods through the region and to international gateways.
Objectives			
1a – Reduce the need to travel through a suite of interventions which support alternatives to travel. **1b –** Deliver a 'smart' transport network that uses digital technology alongside other physical measures to manage transport demand, encourage shared transport and make more efficient use of the network. **1c –** Facilitate a transition to zero-emission transport modes and support greening of the grid to minimise overall carbon impacts of transport. **1d –** Promote the use of sustainable and active travel modes.	**2a –** To create a transport network within the corridor that is affordable and accessible for all and supports social inclusion. **2b -** Minimise the impact of transport-related air and noise pollution on local communities. **2c -** Facilitate increased active travel, including as part of longer first mile /last mile journeys and promote the associated health benefits. **2d –** To improve sustainable access to education, health, leisure and retail opportunities. **2e –** To provide a transport network that supports new flexible working patterns.	**3a –** To improve connectivity by sustainable means to strategically important economic assets within the corridor (including major town and city centres, Enterprise Zones, Science Parks, Research and Technology Zones). **3b –** To improve connectivity by sustainable means to medium sized towns/Market Towns and rural locations. **3c -** Enable a boost in productivity through better connecting a skilled workforce with high growth, high value opportunities. **3d –** To improve accessibility to/from new development.	**4a -** Develop a transport network which maximises the benefits of East-West rail. **4b –** To improve efficiency of movement of people and goods through the corridor and to key international gateways. **4c -** Develop a seamless, integrated network with transport users at its heart. **4d -** Facilitate sustainable first mile/last mile connectivity for people and goods in both urban and rural areas. **4e -** Enable an increase in sustainable movement of freight.

Critical Success Factors

To help shape the development of this Connectivity Study and the development of a long list of transport interventions for the corridor, **ten Critical Success Factors have been identified.**

They have been developed to provide:

- an articulation of the **need for intervention;**
- specificity around the **outcomes that need to be achieved** through each Connectivity Study without defining what interventions are required for achieving those outcomes;
- the "**missing step**" between issues and opportunities and option development; and
- a **basis for the multi-criteria assessment framework** that will be used to assess the long list of transport interventions.

The Critical Success Factors are drawn from:

- The Evidence Base (this report);
- Previous Steering Group inputs; and
- 1st Stakeholder workshop inputs.

The Critical Success Factors are focused around the **four themes** listed opposite.

The following pages provide a more detailed overview of the challenges associated with each Critical Success Factors.

Global Issues

- *Improved digital infrastructure reduces the need to travel*
- *The carbon emissions of transport are reduced to zero by 2050*
- *Improved transport connectivity enables sustainable and high-quality development growth, helping to address inequalities and accessibility issues*
- *The benefits of new technologies that enable improved connectivity are accessible to everybody*

Freight

- *The transport network supports sustainable distribution of goods within and through the corridor*

Public Transport and Shared Mobility

- *There is a step change in public transport connectivity within and between our urban areas (including market towns) and areas of strategic interest*
- *A high quality, sustainable, integrated and accessible transport network connects the corridor's strategic economic assets*
- *Rural and more deprived communities are well connected to key opportunities by the public transport network*
- *Public transport provides a competitive alternative to car for longer distance trips in the corridor*

Active Travel

- *Active travel mode share within and between our towns and cities increases*

Critical Success Factors: Global Issues

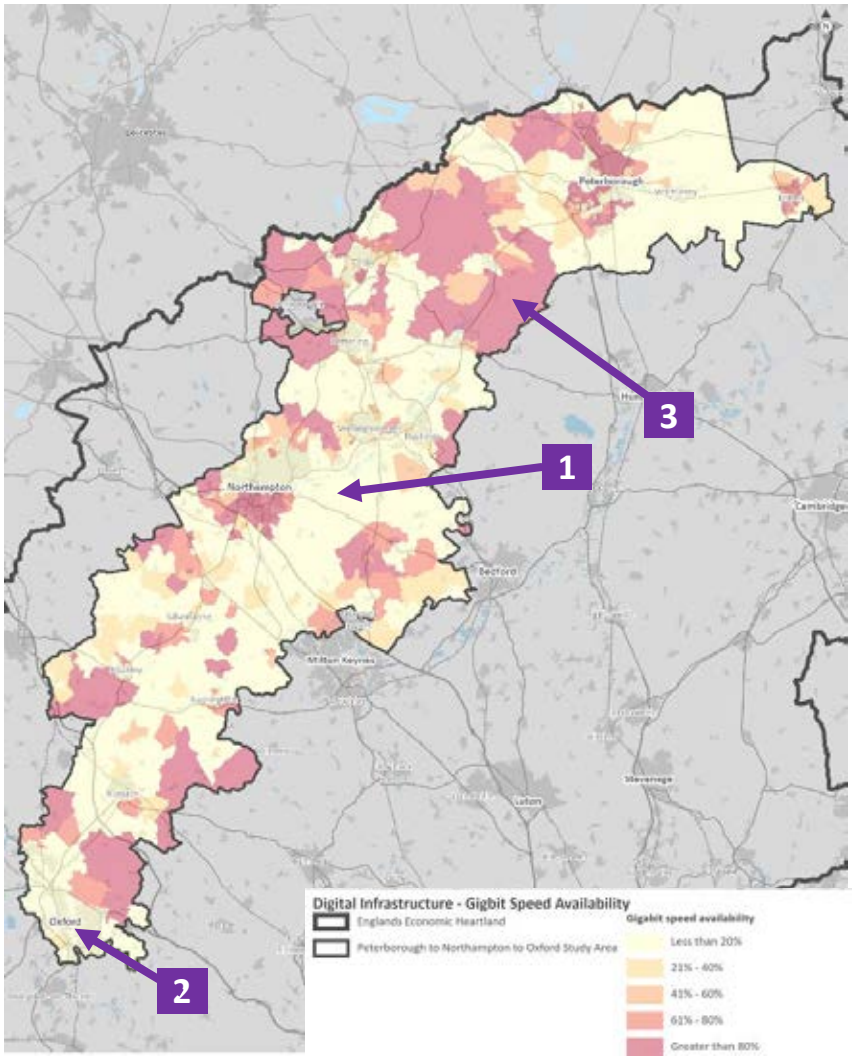
1 Improved digital infrastructure reduces the need to travel.

The impact of Covid-19 has increased attractiveness of working from home (WFH), increased usage of e-commerce facilities and increased communications via digital platforms, highlighting the importance of access to superfast and ultrafast broadband.

The DfT's "All Change?" document has outlined the reluctancy of many workers to return to the office on a regular daily basis; therefore, several large companies have established policies outlining future WFH patterns that can be allowed for employees in the future, thus increasing pressures on digital infrastructure.

The evidence demonstrates that gigabit provision across the corridor is not uniform, with significant parts of the corridor where less than 20% of the population having gigabit speed availability (1). Many of these areas are located in urban environments - particularly in Oxford, but also parts of other key settlements (2). Alternatively, areas with a high proportion of populations with access to gigabit speed include several rural / semi-rural areas (3).

Improved digital infrastructure has the potential to reduce demand for transport but also support new transport technologies and businesses that require high speed internet, creating a future demand. In the short-term, targeted improvements in rural areas should be made to bring connectivity to a good baseline, whilst medium / long-term solutions should focus upon bringing all infrastructure up to a gigabit standard.



Challenge – Evidence indicates that access to digital infrastructure is variable across the corridor, increasing the need for those to travel where availability is low**. How can we make high speed digital infrastructure more accessible?**

Critical Success Factors: Global Issues

2 **The carbon emissions of transport are reduced to zero by 2050.**

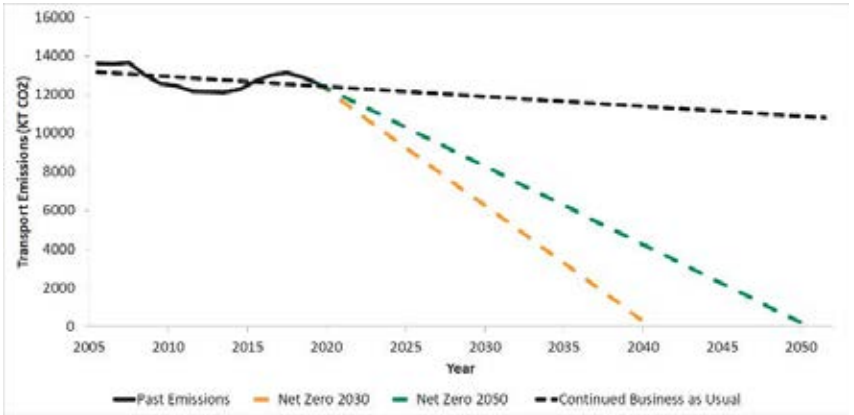
To address the UK's Greenhouse Gas (GHG) emissions, the Government has set a legally binding target of reaching net zero carbon emissions by 2050, which is a challenging target for the transport sector, the largest carbon-emitting sector of the UK economy.

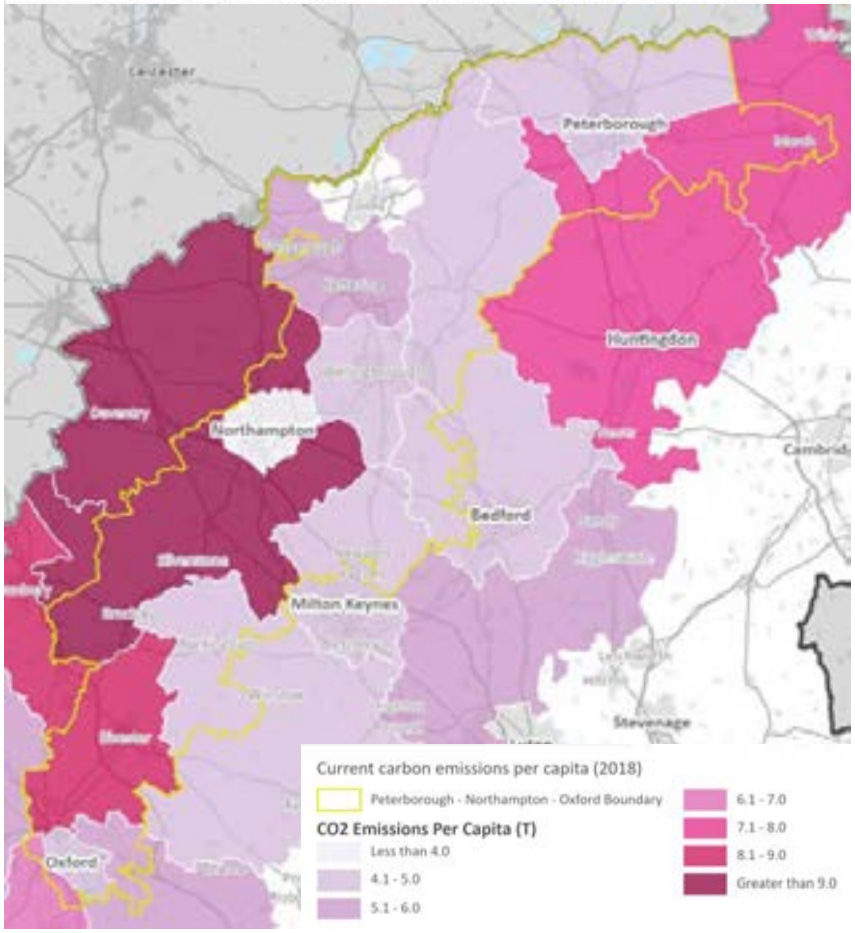
The graph shows the trajectories required to achieve decarbonisation from transport by 2040 and 2050 and the extent these deviate from the "Business as Usual" situation. The trajectory shown indicates that, at the current rate, EEH will not reach its net-zero carbon target.

The evidence indicates that Carbon Emission per capita vary in each local authority across the corridor. The average Carbon Emission per capita within the corridor was 2.60 Tonnes with several local authorities above the corridor average, including Daventry, South Northamptonshire, Cherwell, South Oxfordshire, Vale of White Horse, Huntingdonshire, East Northamptonshire and Kettering. Major A Roads and Motorways contribute 70% of all transport emissions within the corridor, highlighting the impact private cars have on the environment.

To achieve this there must be reduction in the number trips made using internal combustion engine cars, vans, LGVs and HGVs and a substantial change in the vehicle fleet towards zero-emission vehicles. This must be coupled with technological solutions to improve vehicle efficiencies and the use of the road and rail networks.

Challenge – Significant intervention is required to move away from Business as Usual and reduce CO2 emissions from transport by 2050. **How can we achieve this alongside EEHs other priorities?**





Critical Success Factors: Global Issues

3 Improved transport connectivity enables sustainable and high-quality development growth, helping to address inequalities and accessibility issues

Having easy access to required services and amenities within a close distance for walking and public transportation, can help promote sustainable travel patterns and reduce single occupancy car trips.

The map illustrates connectivity issues at a settlement level. Currently the proportion of residents who drive to work is generally higher in peripheral areas of our urban settlements. It can be seen for example the contrast between the inner suburbs of Northampton (centre-right, yellow) and recent peripheral urban extensions (left, red).

There is significant housing growth forecast in the periphery of the of the large and medium-size settlements in the corridor, particularly where existing access to key services and amenities via active and sustainable modes is more limited, thereby increasing reliance on private vehicles. The evidence demonstrates that there are high levels of multiple car ownership per household across the study area and there is a clear pattern of rural / urban divide for access to services / amenities as well as differences based on levels of transport provision / infrastructure.

Improved connectivity by sustainable modes enables sustainable growth; therefore, there is a need to target interventions in areas where accessibility to services and amenities is poor, particularly where the public transport offer does provide a viable alternative. New housing developments should also aim to reduce the number of trips they produce overall, creating more local high-quality services, to reduce the need for long distance travelling.

Plan showing % of all residents aged 16-74 who drive to work by car or van
Source: Datashie.org.uk *Census data (c) Crown Copyright Office of National Statistics. Contains Ordnance Survey data (c) Crown copyright & database right 2014-5.*

Challenge – Development is often located in areas where existing sustainable transport options and access to key services are more limited. **How can we best improve transport connectivity to address inequalities and accessibility issues for planned development?**

Critical Success Factors: Global Issues

4

The benefits of new technologies that enable improved connectivity are accessible to everybody.

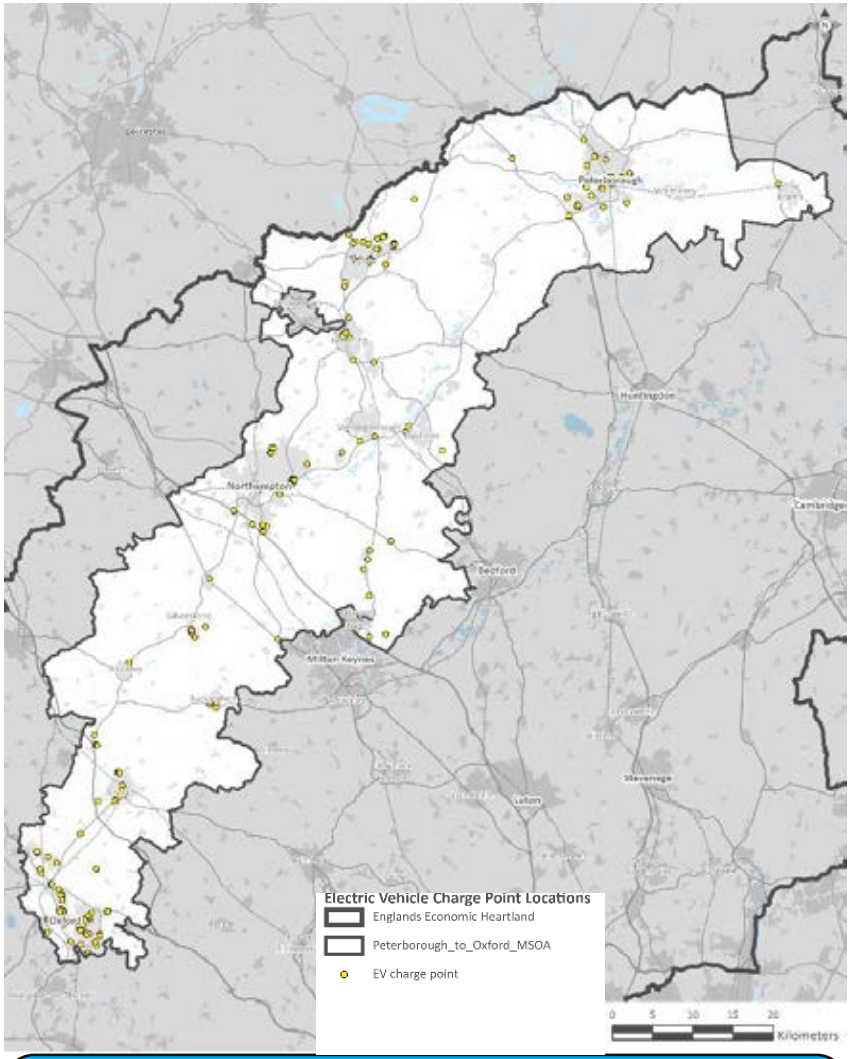
Electric vehicles, e-bikes and micro-mobility schemes represent a key component of a future multi-modal transport network that is capable of achieving net zero targets.

At a corridor level, electric vehicle charging points (ECVPs) are well spread throughout, though at a relatively low volume, potentially limiting the uptake of EVs. Across Local Authorities in the corridor, the number of public EVCPs ranges from 8 to 57 per 100,000 households, with significantly fewer charging points located in rural areas. This compares to 133 in Milton Keynes and 391 in City of Westminster.

E-bikes are also an attractive option for commuting over traditional cycling, allowing good connectivity when commuting within urban areas as well as offering opportunities to support inter-urban trips. To support the use of e-bikes, appropriate and attractive infrastructure (routes, charging points and changing facilities) are required.

Shared / public micro-mobility schemes have also become a new first mile / last mile active travel option, forming part of a longer journey undertaken by passenger transport. However, micro-mobility schemes are more viable in urban areas where there is a density that ensures commercial viability.

The evidence indicates that new technologies promoting low-carbon travel modes can form part of an inclusive and connected transport network. Interventions should seek to create networks of high-quality infrastructure supporting short-distance trips travelled by shared micro-mobility schemes. In addition, EVCP should be supplied to areas with less coverage (notably rural areas.)



Challenge – Current provision of infrastructure to support low carbon travel modes ranges across the corridor and is lower than other areas. **How can we narrow this gap in provision?**

Critical Success Factors: Public Transport and Shared Mobility

5

There is a step change in public transport connectivity within and between our urban areas (including Market Towns) and areas of strategic interest.

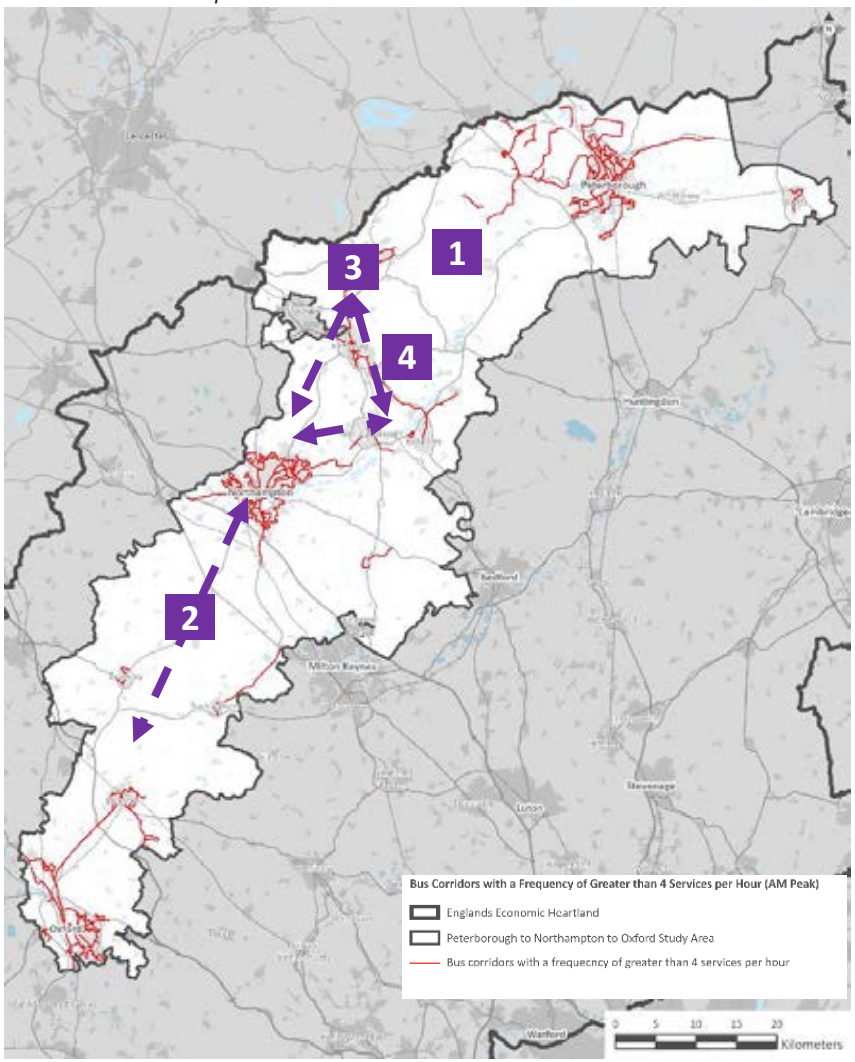
Buses represent a good alternative to the private car and promote sustainable travel within the corridor. However, there are varying service frequencies which impact upon attractiveness. The plan shows bus corridors in the connectivity study geography with a frequency of 4 buses per hour of greater. It can be seen that:

- Relatively few intra-urban high frequency bus corridors (1).
- There is a lack of high frequent public transport service along the A43 corridor including the Silverstone area of strategic importance (2).
- There is a lack of bus connectivity between Rushden, Wellingborough and Northampton (3).
- Kettering and Rushden have very limited high-frequency services (4).

There is significant housing growth forecast in the periphery of the of the large and medium-size settlements in the corridor, where travel by bus could be maximised.

Interventions should focus on improving service frequency on existing routes and providing connectivity between planned development and key service centres in the first instance. In the medium to long-term connectivity between areas of strategic interest (identified above) should be explored with potentially new high-quality, high-frequency services to bring about a step change in travel behaviour.

Bus movements (2-way total) Monday morning peak (0700-0859).
Data source: Basemap 2019



Challenge – Connectivity between our areas of strategic interest is poor across the corridor. Connectivity is also poor in some specific areas. **How can we best improve connectivity?**

Critical Success Factors: Public Transport and Shared Mobility

6

A high-quality, sustainable, integrated an accessible transport network connects the corridor's strategic economic assets.

Currently, jobs within the corridor are predominantly located in the urban centres (Northampton, Oxford and Peterborough), with clusters within mid-sized towns and pockets within more rural areas (Silverstone).

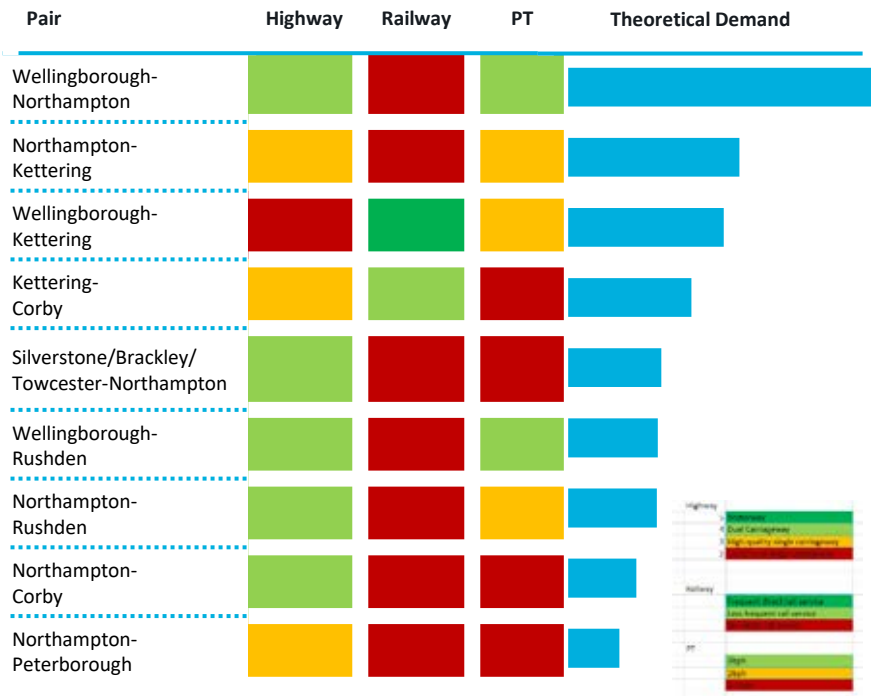
In the future, large employment developments will be located within and surrounding Silverstone, Bicester, Corby and Peterborough; therefore, to support long-term economic growth, a high-quality, sustainable, integrated and accessible transport network will need to be provided.

A gravity model, considering the potential demand (through quantifying the relationship between population, employment and distance) between selected strategic sites across the corridor is in development and highlights: most linkages are well served by highway; there is a high potential demand between Wellingborough and Northampton; rail connectivity is poor with only Wellingborough-Kettering and Kettering-Corby connected; current bus connections are poor in most cases; Northampton-Kettering is poorly linked by all modes.

The evidence demonstrates that the transport network may be impacting upon demand and restricting opportunities for people to access employment and economic assets. Therefore, interventions should focus upon connectivity between settlement pairs that indicate a high theoretical demand and seek to take up opportunities to improve existing road-based connections (for example, road space allocation to bus-based transit).

However, the Use of public transport services (Notably Buses) run into issues of funding and affordability. Proposals for extensive public transport systems will need to consider funding arrangements to ensure consistent and affordable transport for the corridor.

Theoretical Demand between Major Economic Hubs and RAG rating of highway, railway and PT connectivity



$$\text{Theoretical demand} = \frac{(\text{Pop'n A} + \text{Emp A}) \times (\text{Pop'n B} + \text{Emp B})}{(\text{Distance between A and B})^2}$$

Challenge – Potential demand between our strategic economic assets is constrained by the transport network. **How can we ensure high quality connections are provided that meet sustainability needs, whilst also being affordable and economically viable?**

Critical Success Factors: Public Transport and Shared Mobility

7

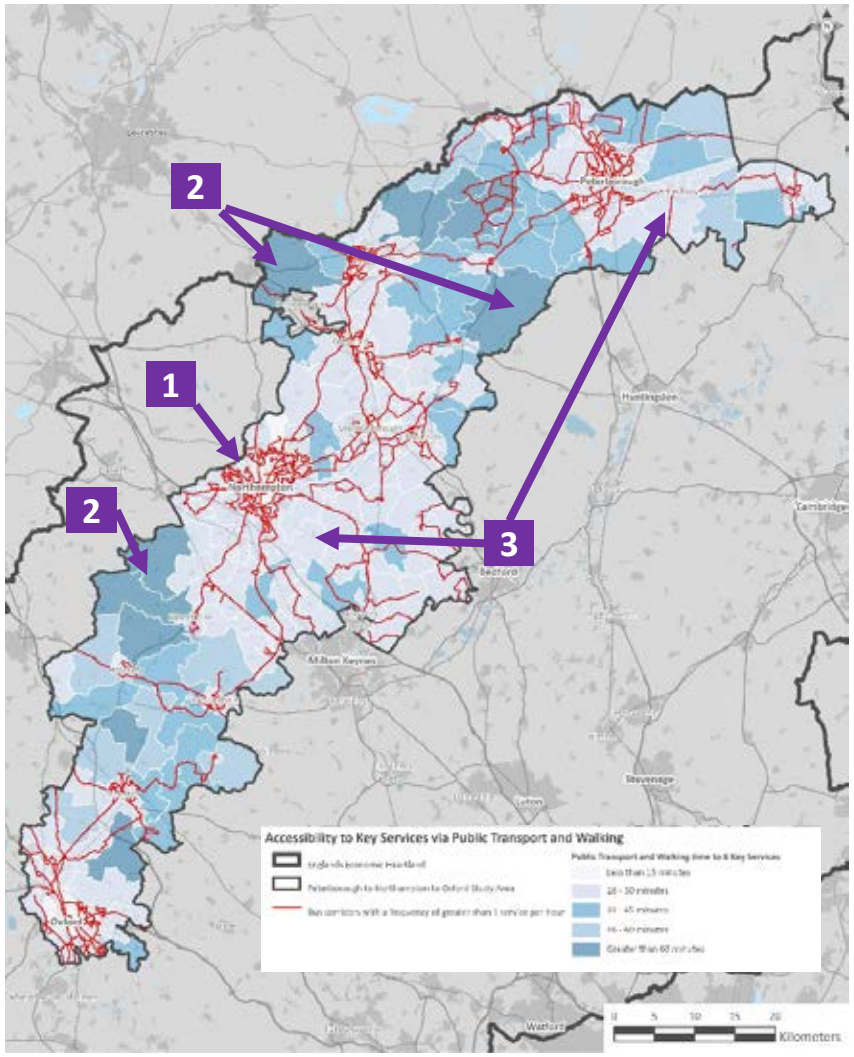
Rural and more deprived communities are well connected to key opportunities by the public transport network.

Levels of deprivation vary hugely within the corridor, aligning with other socio-economic factors such as average income and in some instances access to key services. The map shows public transport and walking time to eight key services, overlaid with bus routes of at least one bus service per hour. It can be seen that:

- Urban areas show good access to services due to short (15 mins or less) travel time by public transport & walk (1).
- Some rural areas (such as those east and south east of Peterborough, east of Corby, and north of Brackley) have much poorer access to key services, coinciding with poorer bus provision (2).
- Some semi-rural areas have good levels of access to key services despite lower bus service provision indicating good local service availability (3).

The evidence demonstrates that there is a correlation between public transport routes and accessibility to services / amenities. To ensure rural / deprived communities are connected to key opportunities, interventions should focus upon providing high-quality, high-frequency public transport links between key services and amenities and those areas within the corridor that are least connected.

Market towns play an important role in providing access to a wide range of everyday services and activities. Improvements to rural public transport will not only improve the accessibility of market towns by sustainable transport, but also provide the opportunity for sustainable multi-modal journeys where local bus services connect with express bus / coach services or rail



Challenge – Evidence indicates areas of the corridor where access to services is limited**. How can we ensure our rural communities are well connected in a sustainable way, whilst offering good service frequencies and journey times?**

Critical Success Factors: Public Transport and Shared Mobility

8

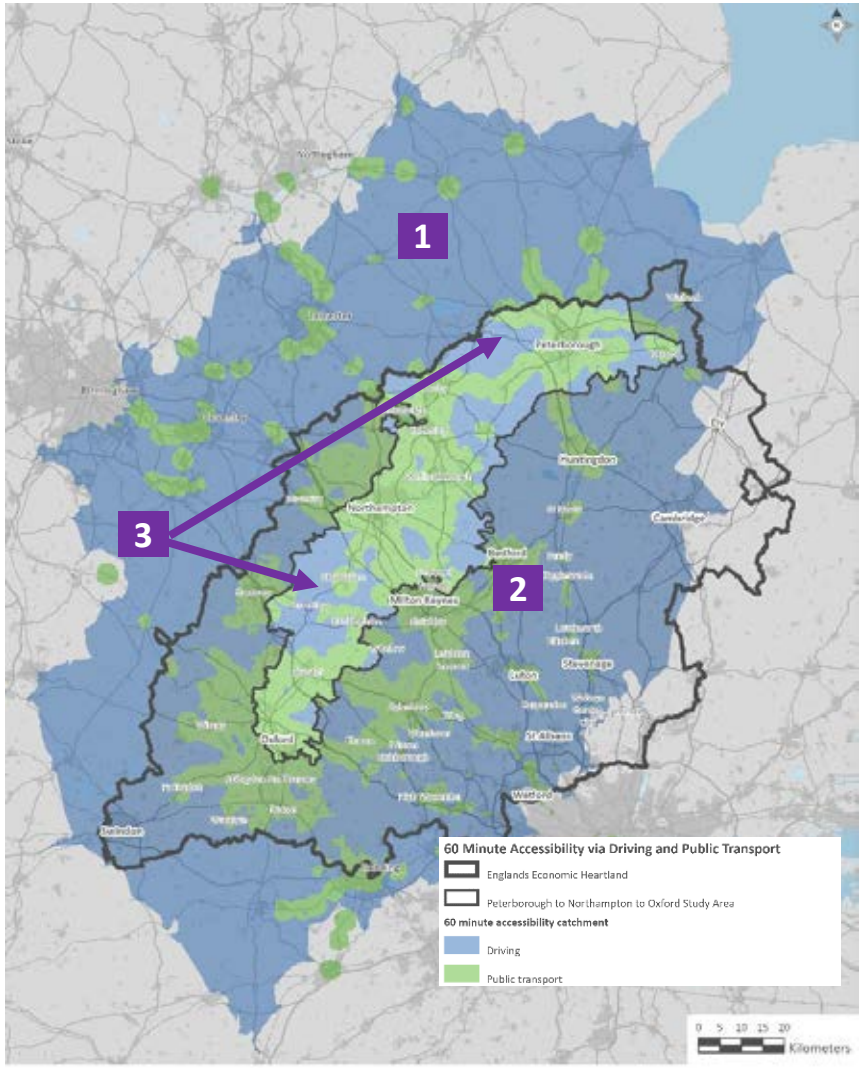
Public transport provides a competitive alternative to car for longer distance trips in the corridor.

In order for public transport to be a realistic alternative to private car travel it must provide a similar level of accessibility. The plan opposite indicates the combined 60-minute AM peak public transport and car driver catchments for travel towards several CoSI[1]. It can be seen that:

- A 60-minute drive time catchment is much greater than for public transport (1).
- In many cases public transport is not competitive in terms of travel time when compared to car for longer journeys. Reliability and cost are also key issues (2).
- Though much of the corridor is accessible, there are pockets (for example west of Peterborough, areas surrounding Silverstone and Brackley) that are inaccessible by public transport (3).

Forecast population and employment growth across the study area will increase travel demand. If public transport does not provide a viable alternative to private car, existing levels of car ownership and mode share for private vehicles will remain high.

The evidence demonstrates that there are areas within the corridor with poor levels of public transport accessibility. Interventions should focus upon providing attractive and inclusive public transport that competes with the private car for longer-distance journeys across the corridor.



[1]CoSI considered are Peterborough, Corby, Kettering, Northampton, Oxford, Peterborough, Silverstone Park and Wellingborough.

Challenge – The map above illustrates areas of the corridor with poor levels of public transport accessibility compared with the private car. **How can we ensure public transport provides a competitive alternative to the private car for longer distance trips in the corridor?**

Critical Success Factors: Freight

9

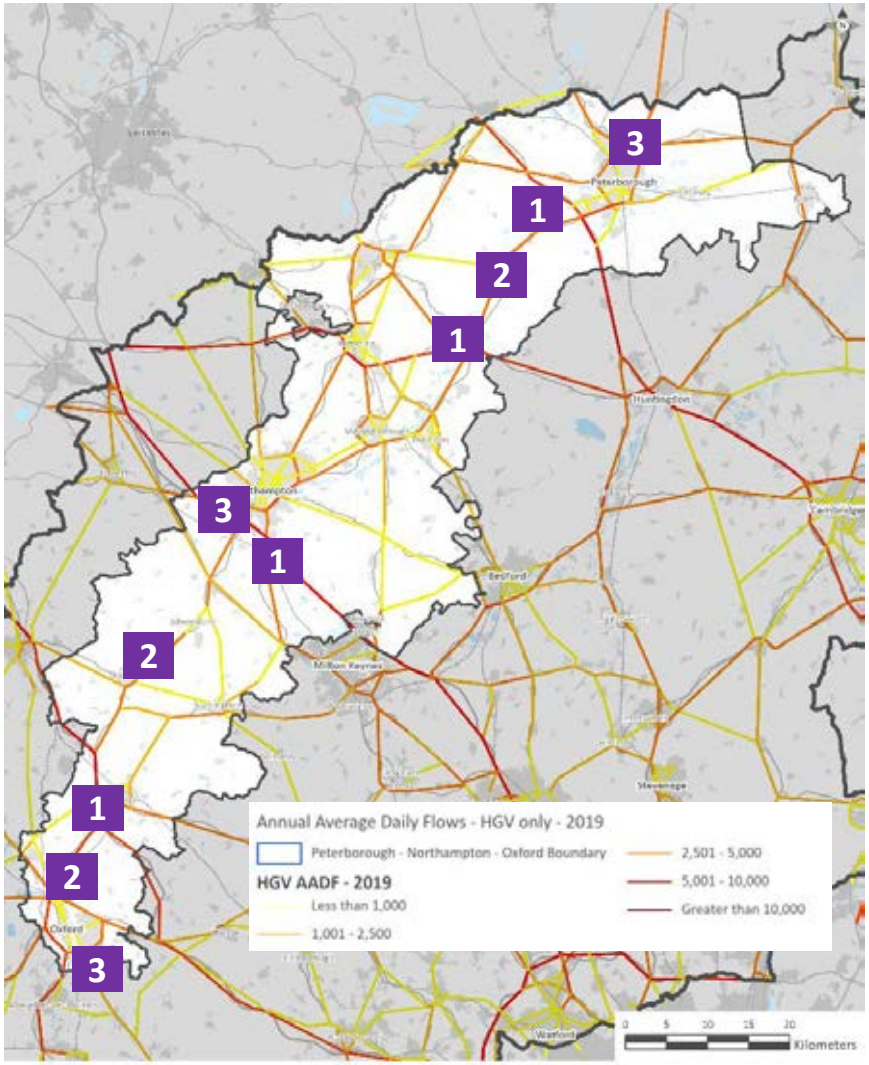
The transport network supports sustainable distribution of goods within and through the corridor.

Road haulage is essential to growth and success of businesses across the corridor. Due to its geographical centrality, there are a number of distribution centers / operators who operate from Northampton, Corby and the surrounding area.

Many of the heaviest flows transect the corridor including the M40, M1, A14 and A1(M) (1); however, within the corridor key HGV routes include the A34 / A41 between Oxford and Bicester; the A43 between Bicester and Northampton and the A605 between Northampton to Peterborough (2). Furthermore, HGV flows are heavy on the orbital routes around Oxford, Northampton and Peterborough (3). Many of these routes are congested, reducing business efficiency and productivity.

The impact of Covid-19 has increased usage of e-commerce and the demand for goods is predicted to increase over the next 20-30 years. This increase in freight traffic will need to be accommodated, whilst ensuring its impact on the transport network is minimised – where possible – and balancing the needs of local communities and operators.

To support EEH's principles, transport interventions should explore HGV management options, explore opportunities for non-road-based freight options (multi-modal rail-road freight terminals), use of consolidation center and sustainable First Mile/Last Mile solutions as a means to relieve traffic problems and promoting decarbonisation. Zero emission HGV fleets should also be considered alongside increases in rail freight movements, for further decarbonisation.



Challenge – The map shows heavy volumes of goods transport in the corridor. **How can we ensure goods are transferred efficiently within and corridor in a way that supports our four principles?**

Critical Success Factors: Active Travel

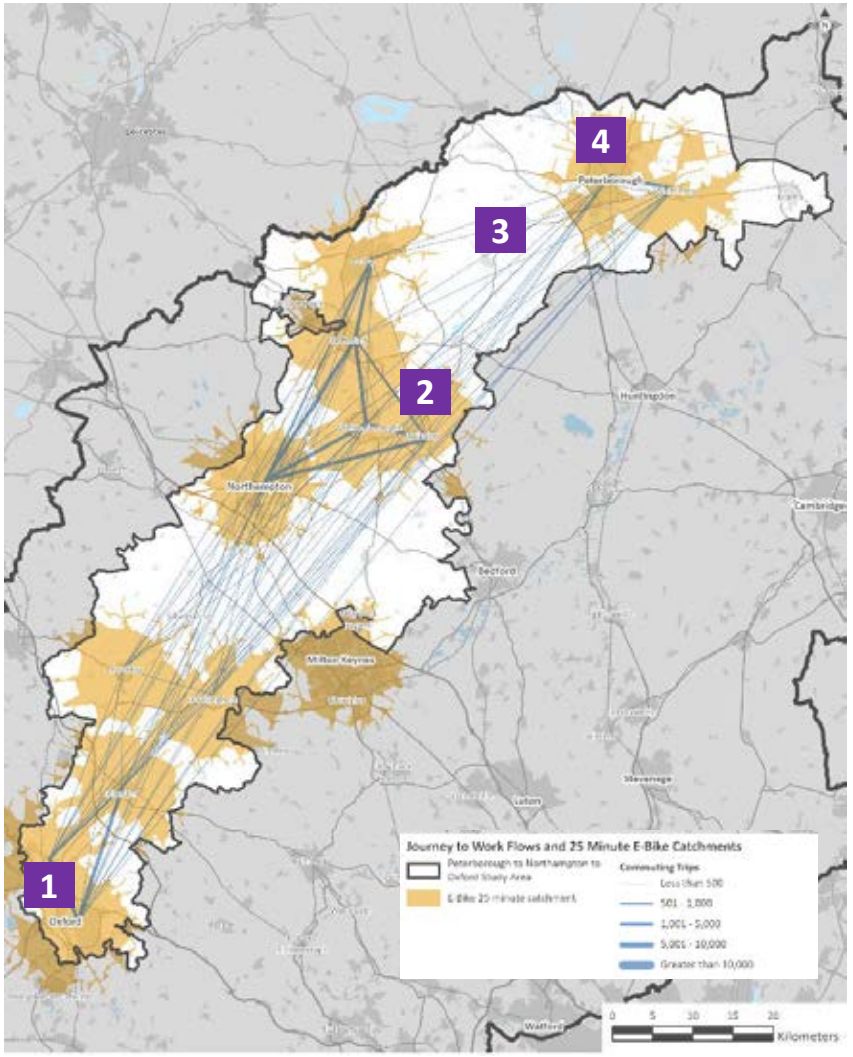
10

Active travel mode share within and between our towns and cities increases.

The distribution of active travel infrastructure throughout the corridor varies. National cycle routes provide connections between some of the built-up areas in the corridor, however some key gaps are present, particularly between settlements that are each within cycling distance.

The map shows potential 25-minute e-bike catchments and journey to work flows. It can be seen that: e-bikes have the potential to significantly increase the active travel mode share, particularly between settlements where there is a high flows of workers; Rushden – Wellingborough are within 25min e-bike distance; E-bikes broadens the rural travel reach of urban centres but requires attractive infrastructure to encourage modal shift; and, there is a risk that lower income households may be excluded from new forms of mobility (e.g. they cannot afford an e-bike).

Journey to work distances are generally short across the corridor, which provides significant opportunity for micro mobility schemes to incentivise workers to complete these trips using active modes. On top of this, some of the E-Bike catchment areas overlap between key urban areas such as Corby, Kettering and Wellingborough, providing opportunities for collaboration and cooperation between these urban areas in delivering such schemes. This may also encourage trips between the areas to be completed by active modes. The delivery of LCWIPs can also help improve the active travel potentials for within each settlements, with improved walking and cycling infrastructure.



Challenge – The plan above shows that e-bikes could significantly enhance the active travel catchment of large towns and cities in the corridor but remains as a relatively expensive option. **How can we take advantage of the opportunities presented by new forms of mobility and what can be done to ensure affordable options?**

Part 5

Infrastructure and Mobility Scenarios

Overview

Scenario Planning

Scenario planning is increasingly viewed as good practice in long-range planning given how uncertain the future is so.

As part of the programme of Connectivity Studies we have two approaches

- Alternative Futures – at an England's Economic Heartland level (reported in Appendix F); and
- Infrastructure and Mobility Scenarios – at a Connectivity Study level

Both will help inform the options we identify and shortlist as part of each Connectivity Study, as well as testing the resilience of our shortlists

We want consistency of approach between Connectivity Studies so that when the Investment Pipeline is developed from the sum of the Connectivity Studies' shortlists, we can demonstrate to stakeholders that the shortlists have undergone the same fair and robust process of validation

Infrastructure and Mobility scenarios

Infrastructure and mobility scenarios represent different voices and approaches to infrastructure planning all of which could contribute to realizing England's Economic Heartland's Transport Strategy and addressing the objectives and Critical Success Factors of the Connectivity Study. However, on their own, none of the infrastructure and mobility scenarios can fully achieve these goals.

They have been developed to present plausible and realistic scenarios from which the most appropriate components with the highest positive impact can be drawn to develop an optimal infrastructure scenario which will then guide option development.

Four infrastructure and mobility scenarios have been developed all of which are made up of a range of component interventions and supporting elements.

Four infrastructure and mobility scenarios

Over the next four slides the infrastructure and mobility scenarios are presented in more detail in summary they are:

- **Digital and demand management**: Focused on interventions which reduce the need to travel or manage its demand for people and goods.
- **Sustainable First Mile Last Mile:** Focused on interventions which support low carbon journeys, particularly over shorter distances, for people and goods as part of a single trip or as part of a First Mile-Last Mile leg of a longer journey.
- **Rail & Mass Rapid Transit:** Focused on interventions which deliver fast, frequency, reliable, high capacity transit options which connect people and goods where they need to travel.
- **Highway:** Focused on interventions which improve highway efficiency between key origins and destinations for people and goods.

Digital and Demand Management

Infrastructure impact

In this infrastructure and mobility scenario, improved digital infrastructure reduces the need for individuals to travel for many activities. This includes increased home- or local-working, and reduced commuting, the resurgence of home delivery for many goods, and the ability for many services to be provided remotely.

The reduction of the need to travel and the advent of 'mobility as a service' (MAAS) also reduced the need for some individuals to own a car.

Demand Management measure will reduce the amount of vehicular traffic within an urban area reducing congestion, and its negative impacts on the places it affects including noise, pollution and severance.

Demand management can support the reallocation of road space to other uses, including improved walking and cycling facilities, segregated or priority public transport, all of which have the potential to help transform currently abrasive, car-dominated environments, into pleasant places to be.

Impact on place

Improved digital infrastructure results in less need for many people to travel outside of their immediate neighbourhood for many day-to-day activities. This implies a greater focus on the local area as a setting for certain activities so local shared workspaces, libraries, community facilities, places for eating and socialising, and streets that support more inhabitation are all potential responses to this at a place level.

As fewer car parking spaces are required a substantial amount of space could be released for other uses, whether that be cycle parking, greenspace or better residential or commercial development within a given site.

Similarly, demand management measures such as Workplace Parking Levies, may also free up space currently used for parking associated with existing places of work. This could allow the environmental improvement of these places, helping secure the attractiveness of communal workplaces as an alternative to working from home. It may also allow the densification of these existing – effectively brownfield - places, helping reduce pressure to develop elsewhere.

However, it could also cause people to stop visiting town centres, leading to eventual economic decline if not planned properly.

Summary

Core elements

- Urban Demand Management
- Integration of land use and transport planning
- Increased digital connectivity
- Deliver of Mobility as a Service.

Supporting elements

- Increase adoption of shared mobility solutions.
- Bikeshare scheme across the corridor.
- Demand responsive transport.
- Road space reallocation to public transport.
- Road space reallocation to active modes.

Pros

- Reduces carbon emissions.
- Improved air quality.
- More efficient use of road space.

Cons

- Limitation on the scale of impact
- Possible equity issues (access to new tech, impact of low emission zones)
- Increase in urban freight traffic.
- Potential economic decline of town / city centres.

Sustainable First Mile Last Mile

Infrastructure impact

This scenario involves prioritisation of first mile last mile intra-urban movement within each settlement whilst also linking key population centres by improving inter-urban movement by low-carbon transport form of transport. This allows end-to-end journeys utilising public transport to be a realistic choice across the area.

In residential areas simple and low-cost interventions to restrict through-traffic and create low traffic neighbourhoods can radically improve the street environment for local communities as well as supporting walking and cycling for a broader group of the population

Demand responsive transport, coupled with access to real time information can bring public transport closer to many people's homes, particularly in low density suburbs and rural areas, and may lead to the removal of many fixed bus stops or shelters in some locations, and the creation of hubs, linked to a broader range of activities, in others.

New, high-quality inter-urban bus routes would better connect people to employment, vital services and leisure opportunities. The potential for Road space Reallocation for bus and active travel modes will also be considered.

Impact on place

This scenario presents a great opportunity from a 'place' perspective. General vehicular traffic is an inefficient use of limited road space within towns, compared to the capacity that active travel and public transport can achieve within the same space, so the reallocation of space to these modes has the potential to both increase capacity and release more space other purposes. Reduced space for vehicles can lead to safer streets, and lower impact from noise and air pollution.

High-quality inter-urban bus connectivity presents opportunities for 'transit-oriented development.' Subject to other planning considerations and environmental constraints, settlements can grow around the catchment of intermediate stations or stops strung along the new high-capacity public transport routes. The parallel active travel routes (as per the Cambridgeshire guided busway) further increase the development potential.

Conversely there are challenges in creating new routes through the countryside given the potential impact on the landscape from the infrastructure itself, and any associated development – although new landscape interventions, biodiversity net-gain and the repurposing of existing routes can all mitigate against this.

Summary

Core elements

- Alternative bus operating models
- Bus service improvements
- Adoption of shared mobility solutions
- Sustainable urban goods transport.
- Segregated active travel network
- Strategic mobility hubs across the corridor.
- Demand responsive transport.

Supporting elements

- Urban Demand Management
- Integration of land use and transport planning
- Support deliver of Mobility as a Service
- Road space reallocation to public transport.
- Road space reallocation to active modes.

Pros

- Reduced carbon emissions
- Improves health
- Improves air quality
- Inclusive interventions

Cons

- Measures less effective on longer distance journeys through corridor.
- Requires demand management measures to 'lock in' benefits.
- Financial challenges for local bus services.

Rail & Mass Rapid Transit

Infrastructure impact

This scenario suggests a focus on creating a grid of fast and frequent rail and/or Mass Rapid Transit (MRT) connections across the area, through improvements on existing lines, new lines connecting major settlements and intra-urban MRT in major settlements.

Rail-based MRT network in major settlements would provide high capacity, fast, reliable, frequent public transport services for the corridors major settlements, better connecting people to key opportunities and reducing car dependence. New rail lines connecting major settlements would provide fast, direct, low carbon alternatives to road-based options. Potential for new stations may be limited by the national/regional nature of the network.

However, any potential constrains may be mitigated through capacity increases as a result of HS2 or other capacity upgrades. Service improvement on existing rail lines would make rail more attractive. Improved integration of rail with other modes would support mode shift for longer journeys within the corridor from road based to rail reducing congestion and emissions.

Impact on place

From a 'place' perspective, a focus on development of a rail and MRT network may support creation of a more singular regional place identity which would support economic agglomeration effects that government hopes will boost growth and productivity in the area.

A key aspect of this scenario from a place perspective is the role and potential of stations. Many of the area's existing stations are poorly connected to their wider urban setting, are surrounding by vacant or low-density development, with low intensity of use, or areas with regeneration potential. Stations should be secured as concentrated places in their own right – with the needs of interchange and onward travel integrated within a strong and site-specific approach. The environs of station should reflect the needs and characteristics of the community as well as making them as attractive for use as possible.

One challenge with the creation of any new cross-country routes, and the development that might be associated with them, would be the effect on the existing places that they pass through - in terms of visual impact, noise, and so forth.

Summary

Core elements

- Rail-based MRT network in major settlements
- New rail lines connecting major settlements
- Increase capacity on existing rail lines
- Service improvement on existing rail lines
- Improved integration with other modes

Supporting elements

- Supporting elements
- Support deliver of Mobility as a Service
- Bus service improvements in major settlements
- Bus based MRT between major settlements
- Inter-urban segregated active travel network
- Region-wide smart and integrated ticketing
- Road space reallocation for active modes

Pros

- High capacity, low emission, fast, reliable alternatives to road-based travel
- Opportunity for transit orientated development

Cons

- Requires sufficient demand
- Limited existing MRT networks
- Possible impact on existing 'place'

Highway

Infrastructure impact

This scenario focusses on highway interventions which seek to ensure road space meets the needs of the corridor in the most efficient way, provides for accessibility requirements and supports sustainable growth. Inter-urban journey times are already relatively good, particularly when compared to the available alternatives thus further justifiable upgrades would likely be focused on specific pinch points or where safety is of concern.

Given the constraints around further capacity increases, this scenario assumes the reallocation of road space for walking, cycling (including e-bikes) and public transport alternatives to the private car, to provide greater choice and address congestion issues. Segregated active travel routes, combined with Low Traffic Neighbourhoods (LTNs) would also support freight delivery by sustainable modes such as cargo bike operated from strategically located depots linked to the main road and/or rail networks.

Interventions which provide the enabling conditions for alternative fueled and automated vehicles are also part of the scenario.

Impact on place

Highway influences 'place' at a range of levels – from the main inter-urban roads, to the highways in urban areas to local access roads. Capacity reallocation of road space on main inter-urban roads has huge potential to create a positive improvement from a 'place' perspective.

To aid placemaking, where access roads are considered, it may be appropriate to think of ampacity these as lower speed urban high streets with associated facilities including segregated walking and cycling routes rather than as high-speed 'distributor roads'. In residential areas the creation of low traffic neighbourhoods (LTNs) would support walking and cycling and allow greater occupation of residential streets for play and socialising.

Small scale 'pinch point' interventions on main inter-urban roads along with incremental changes to the charging and digital technology unlikely have a significant effect on the overall place quality of the study area but may offer opportunities for localised place improvements.

This scenario is also probably most pertinent to smaller settlements – such as Bicester or Brackley – where there are less constraints on peripheral growth.

Summary

Core elements

- Inter-urban, private car journey time improvements
- Enabling access to development
- Improved safety package
- Access to vital services e.g. healthcare
- Freight connectivity
- Developing enabling conditions for new modes and vehicle automation
- Road space reallocation to public transport
- Road space reallocation to active modes
- Alternative fuel vehicles infrastructure

Supporting elements

- Increase digital connectivity – connected vehicles

Pros

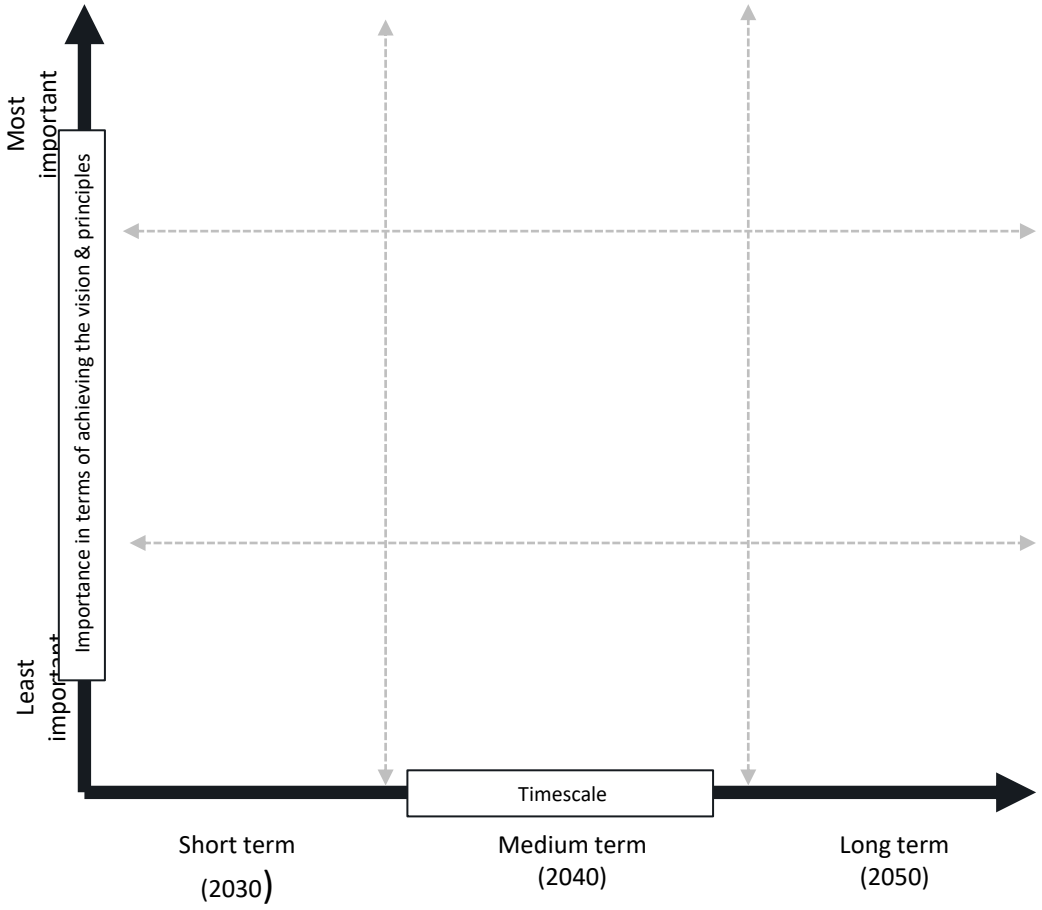
- Supports flexible movement
- Builds on existing road-based infrastructure

Cons

- Dependent on significant development to achieve significant carbon reduction
- Continued congestion impacts on the economy
- Continued social exclusion and health impacts

"To support sustainable growth and improve quality of life and wellbeing through a world-class, decarbonised transport system which harnesses the region's global expertise in technology and innovation to unlock new opportunities for residents and businesses, in a way that benefits the UK as a whole."

1 Urban Demand Management (e.g. Low Emission Zones, Workplace Parking Levy)	2. Integration of land use and transport planning (e.g. Transit Orientated Development)	3. Increase digital connectivity – connected vehicles	4. Increase digital connectivity – Broadband.
5. Support deliver of Mobility as a Service.	6. Alternative bus operating models (e.g. Franchising, Enhanced Partnership)	7. Focus active travel infrastructure investment on deprived communities	8. Region-wide smart and integrated ticketing
9. Bus-based MRT (bus priority & segregation) between major settlements	10. Increase adoption of shared mobility solutions e.g. bike share.	11. First Mile/Last Mile – sustainable urban goods transport.	12. Bus service improvements (freq. and operating hrs) in major settlements.
13. Intra-urban segregated active travel network	14. Inter-urban segregated active travel network.	15. Network of multi-modal mobility hub across the corridor.	16. Demand responsive transport.
17. Bus service improvements (freq. and operating hrs) in rural settlements	18. Station improvements to improve rail/P/active travel integration	19. Rail-based MRT network in major settlements.	20. New rail lines connecting major settlements
21. Intervention to increase capacity on existing rail lines.	22. Service improvement on existing rail lines.	23. Highway – Improved safety package	24. Highway – Enabling access to development
25. Highway - Road space reallocation (public transport)	26. Highway - Road space reallocation (active modes)	27. Highway - Access to vital services e.g. healthcare	28. Accelerate uptake of alternative fuel vehicles through infrastructure.
29. Highway – Freight connectivity	30. Developing enabling conditions for new modes and vehicle automation	31. Highway- Improved inter-urban private car journey times.	32. Bus service improvements (freq. and operating hrs) generally



Infrastructure and Mobility Scenarios

Following stakeholder assessment outcomes of the process were sense checked to develop a suite of packages as set out below. Those interventions which were classed as low priority by the group were sifted out.

	Packages					
	Demand management	**New use for reallocated road space**	**Supporting rail to do what it does best**	**Support mode shift to active and sustainable modes**	**Sustainable and efficient freight solution**	**Plans to accommodate sustainable development and a decarbonised fleet**
	Components					
Short term (2025-30)	• 4. Increased digital connectivity - broadband	• 13. Intra-urban segregated active travel network • 25. Road space reallocation (Public Transport) • 26. Road space reallocation (Active Modes) • 32. Bus service improvements (freq. and operating hrs) generally.	• 18. Station improvements to improve rail/bus/active travel integration.	• 6. Alternative bus operating models (e.g. franchising, Enhanced Partnership) • 8. Region wide smart and integrated ticketing • 15. Network of multi-modal mobility hubs. • 32. Bus service improvements (freq. and operating hrs) generally. • 14. Inter-urban segregated active travel network.	• 11. First Mile/Last Mile – sustainable urban goods transport.	• 28. Accelerate uptake of alternative fuel vehicles through infrastructure. • 2. Integrate land use and transport planning.
Medium term (2030-40)	• 1. Urban Demand Management • 5. Support delivery of Mobility as a Service • 30. Developing enabling conditions for new modes and vehicle automation	• 9. Bus Based MRT (Bus priority and segregation between settlements)		• 9. Bus-based MRT (Bus priority and segregation between settlements) • 23. Highway – Improved safety package.	• 29. Highway freight connectivity.	• 24. Highway – Enabling access to development (for all modes).
Long term (2040-50)			• 19. Rail based MRT system in major settlements.			

Part 6

Next Steps

Next Steps

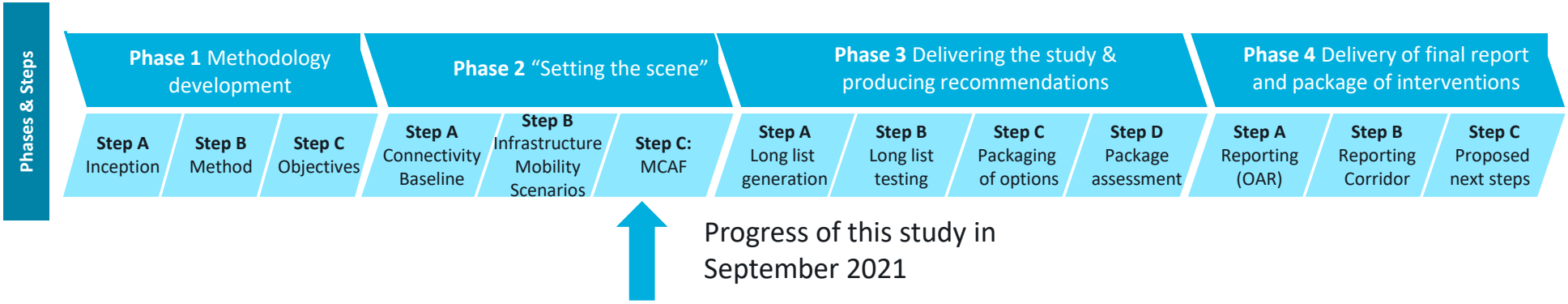
This report provides a summary of the work undertaken in the second of the four phases underpinning the Peterborough – Northampton – Oxford corridor Connectivity Study. The graphic below shows the phases and steps that are being delivered for this study.

This report presents the connectivity baseline providing a common understanding of the current and future context, demonstrates a need for intervention in the area, and defines objectives for the Peterborough – Northampton – Oxford corridor Connectivity Study. It also shows the identification of alternative infrastructure and mobility scenarios and the development of an optimal scenario.

The next Phase for this study is **Phase 3**. The purpose of this phase is to generate a long list of options in response to the need for intervention and guided by the detail of the optimal scenario identified in Phase 2, describe them in a consistent way, and assess them informed by the evidence base, against the criteria included in the Multi Criteria Assessment Framework (MCAF) tool, also developed as part of Phase 2. The optimal scenario and subsequently the package of options will be modelled in the England's Economic Heartland Economy and Land Use Model to support quantification of impact

This phase has already mobilized and will be reported in December 2021.

The purpose of **Phase 4** will be is to produce outputs to make the case (to government and others) for investment in the England's Economic Heartland infrastructure networks. This will mobilise in January 2022 and report by the end of March 2022.



Part 7
Appendices

Appendix A – Mosaic Groups

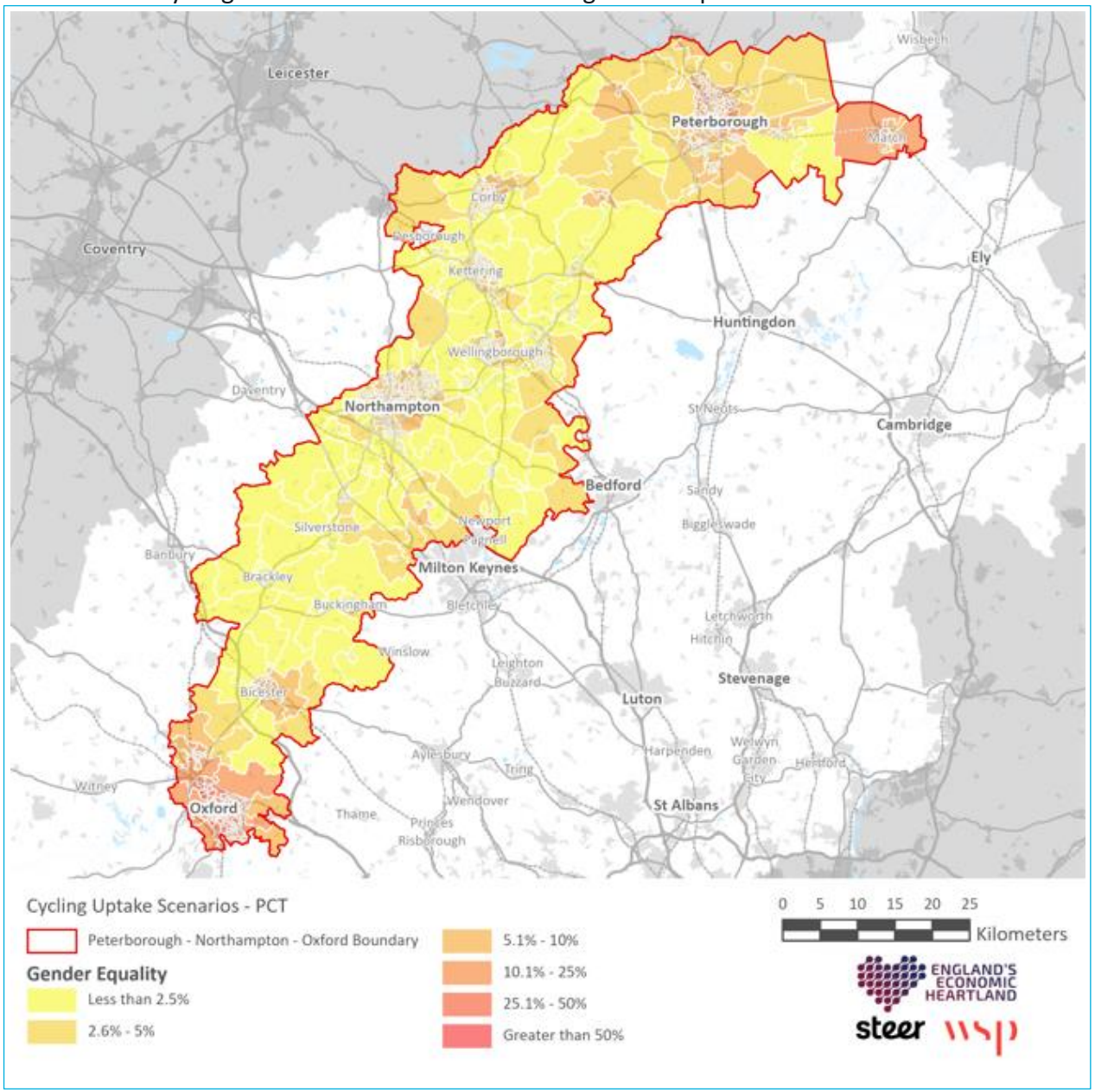
Mosaic Groups

Mosaic Group	Characteristics Description
City Prosperity	Living in central locations and pursuing careers with high rewards. Likely to be married couples, in managerial / senior positions, supporting students or older children, and are used to using online services.
Prestige Positions	Living in a high value detached homes, being employed in managerial or senior positions and supporting students/older children.
Country Living	Well-off owners in rural locations enjoying the benefits of country life. High car ownership and high levels of internet use.
Domestic Success	Thriving families who are busy bringing up children and following careers. They are likely to have children and own new technology.
Suburban Stability	Living in a suburban mid-range home, which they've lived in for several years with older children.
Aspiring Homemakers	Younger households, in full time employment, settling down in housing priced within their means, which may be in the suburbs.
Urban Cohesion	Residents of settled urban communities with a strong sense of identity. They are likely to be multicultural and reside in the suburbs. Younger family members are likely to have an interest in new technology.
Rural Reality	Householders living in inexpensive homes in village communities or outlying houses. Experience slower internet speeds.
Transient Renters	Single people privately renting low cost homes, often in terraced housing, for the short term.
Modest Traditions	Smaller terraced properties located in the outskirts of urban areas. They tend to be composed of couples with no children (or with children who have left home). They are quite likely to have access to a car.
Rental Hubs	Educated young people privately renting in urban neighbourhoods. They are likely to be single or sharing accommodation. They have high smart phone use.
Senior Security	Elderly and those who are enjoying a comfortable retirement. These more elderly households have lower mileage and less likely to take up new technology.
Family Basics	These families limited resources who have to budget to make ends meet. Likely to have children, limited resources. squeezed budgets.
Municipal Tenants	Mature residents living in affordable suburban housing.
Vintage Value	People living alone, in small homes or flats, on low income and need of support.

Appendix B – Cycling uptake scenarios

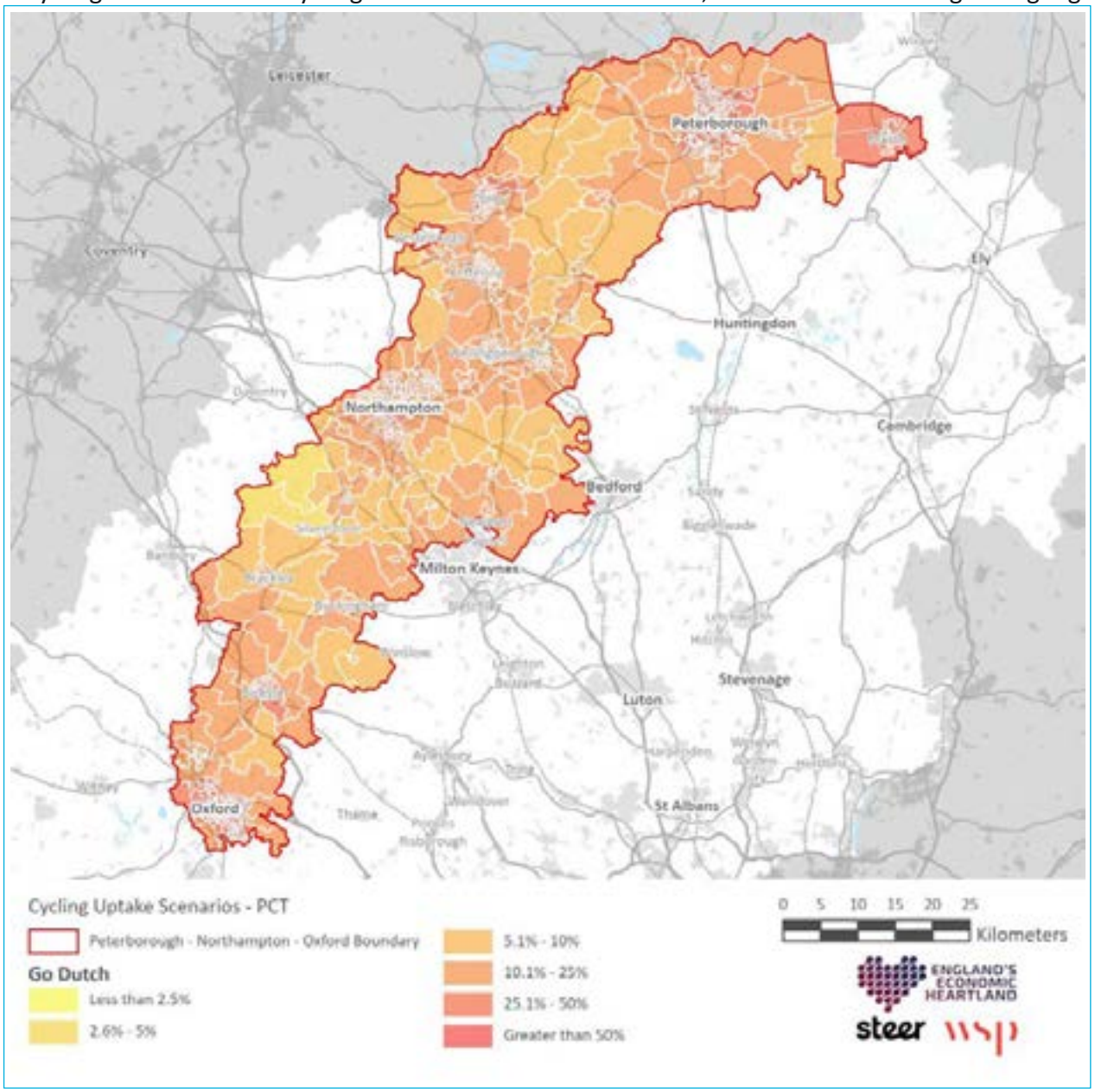
Cycling Propensity – Gender Equality

This scenario considers the level of cycling that that would be achieved if gender disparities are eliminated.



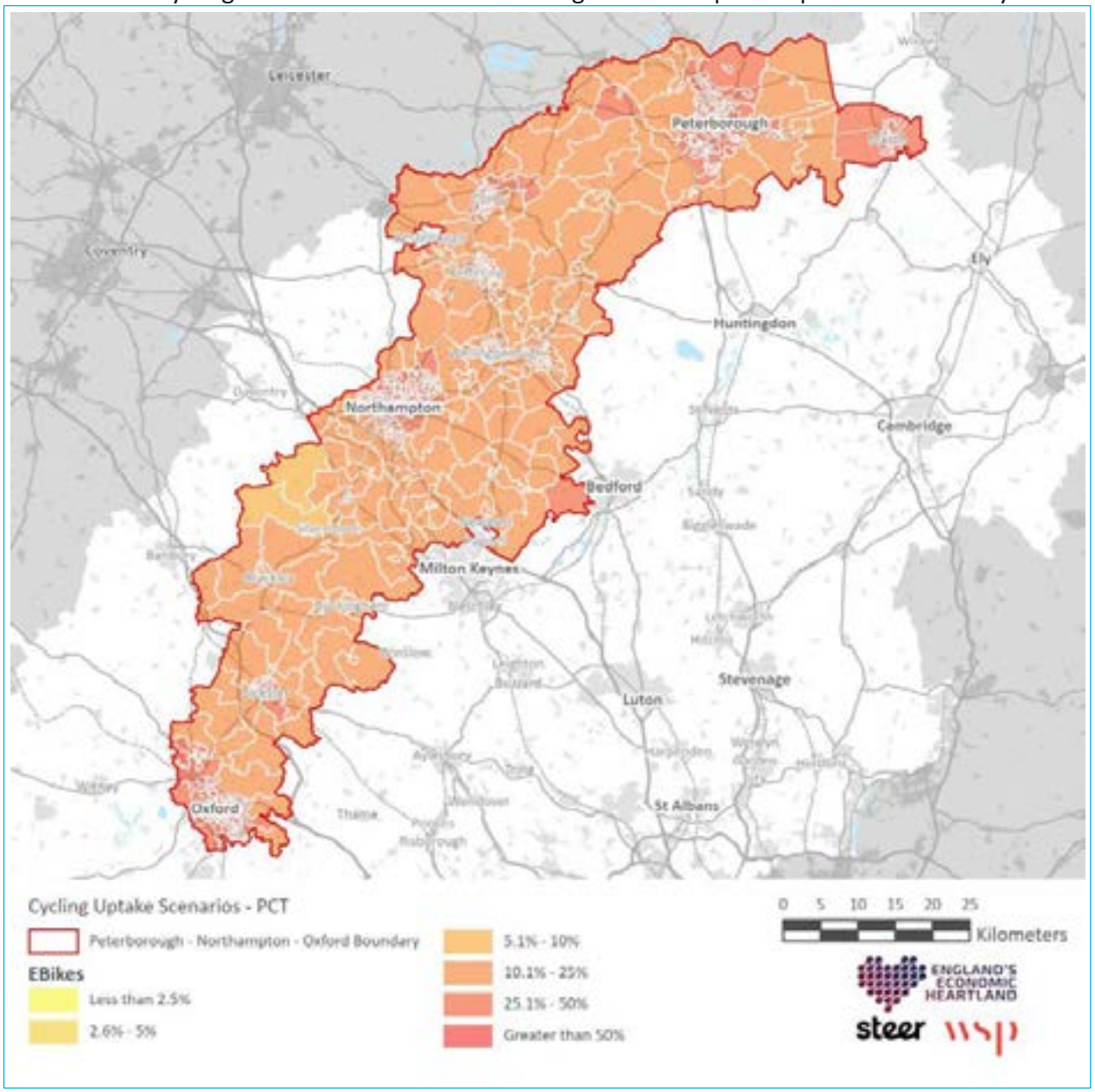
Cycling Propensity – Go Dutch

This scenario considers cycling levels based on cycling records from the Netherlands, whilst still considering local geography.



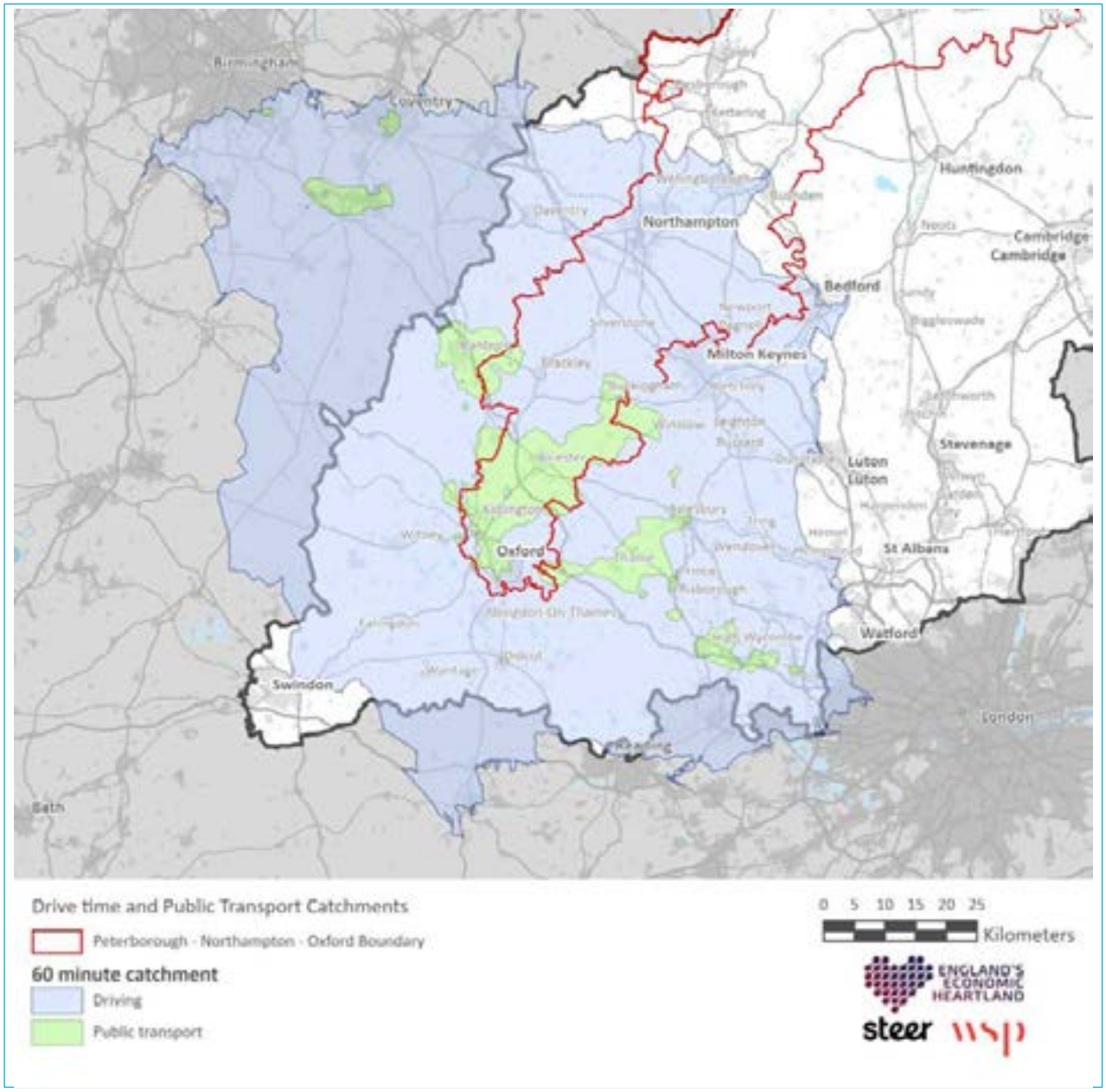
Cycling Propensity – E-Bike

This scenario considers the level of cycling that would be achieved through the widespread uptake of electric cycles.

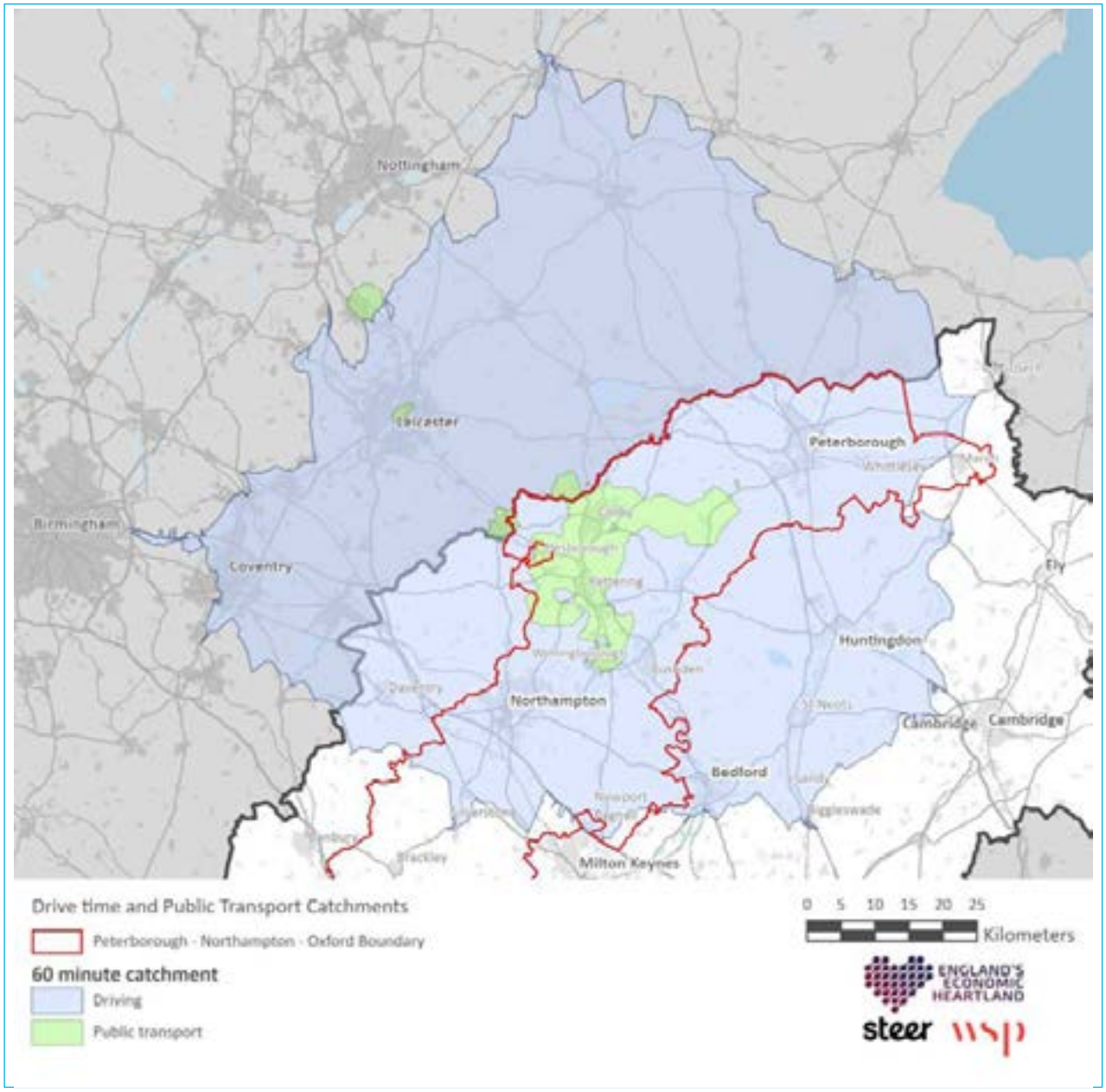


Appendix C – Drive Time and PT Catchments

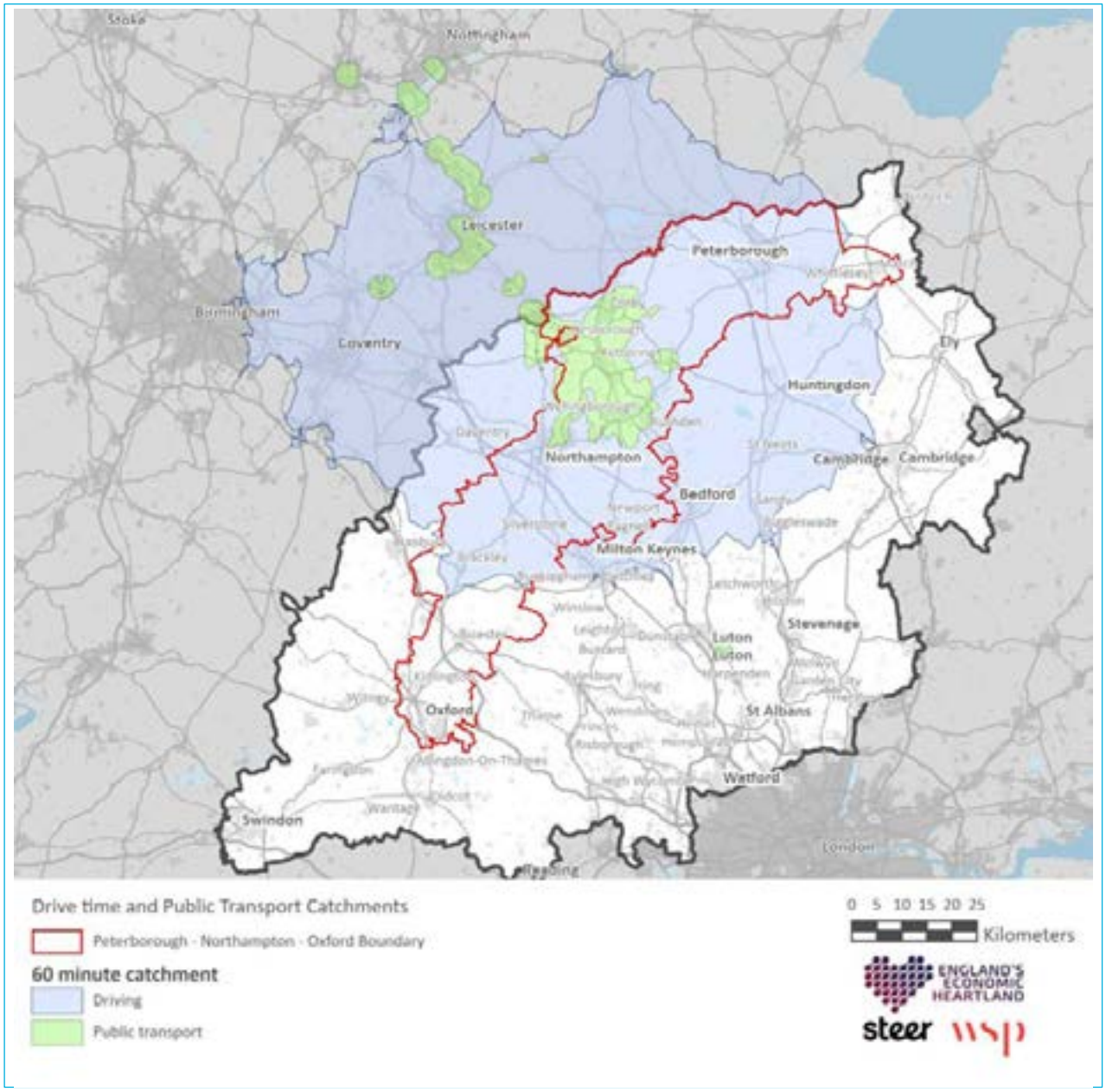
60 Minute Drivetime / PT Catchment - Bicester



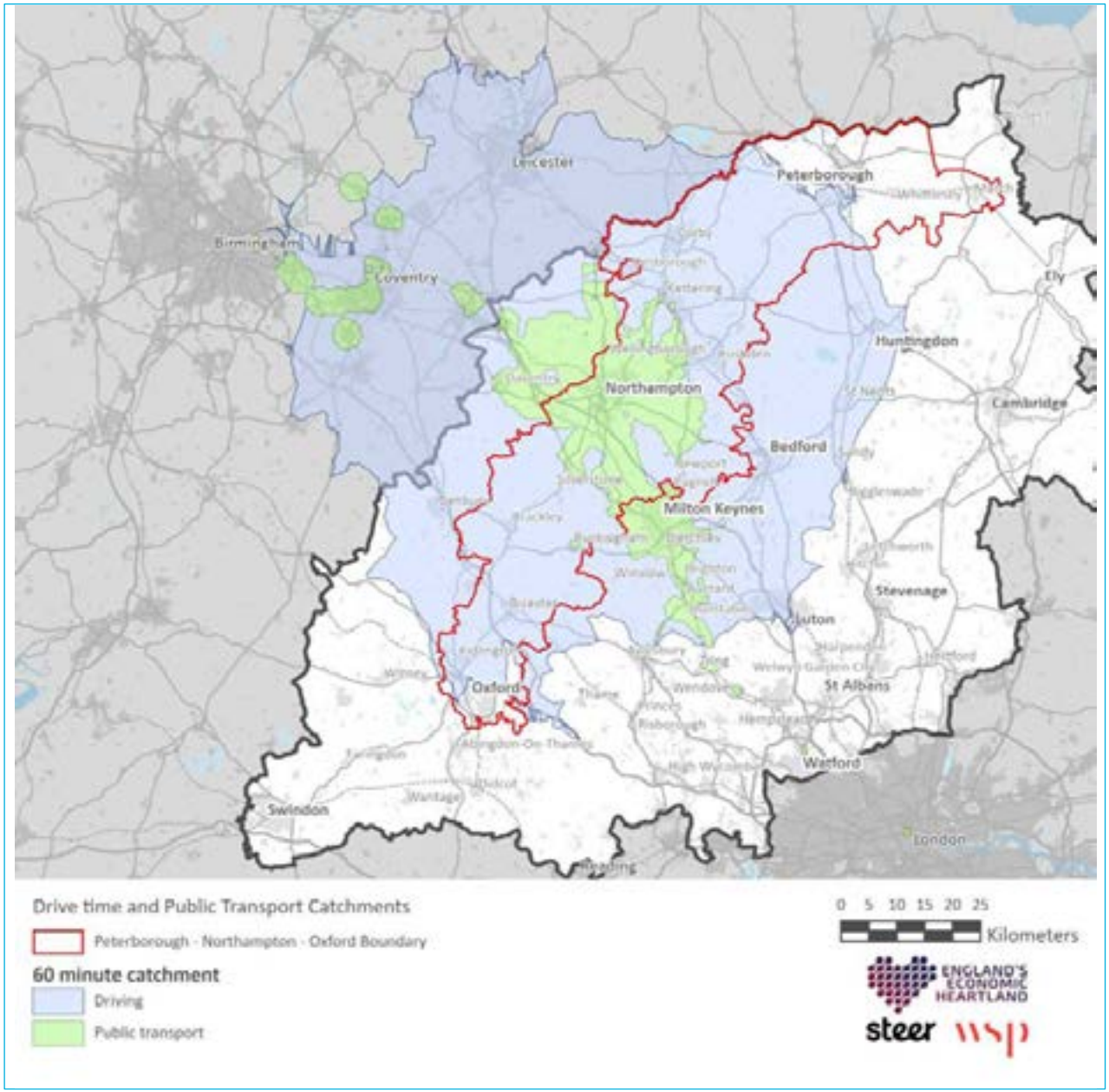
60 Minute Drivetime / PT Catchment - Corby



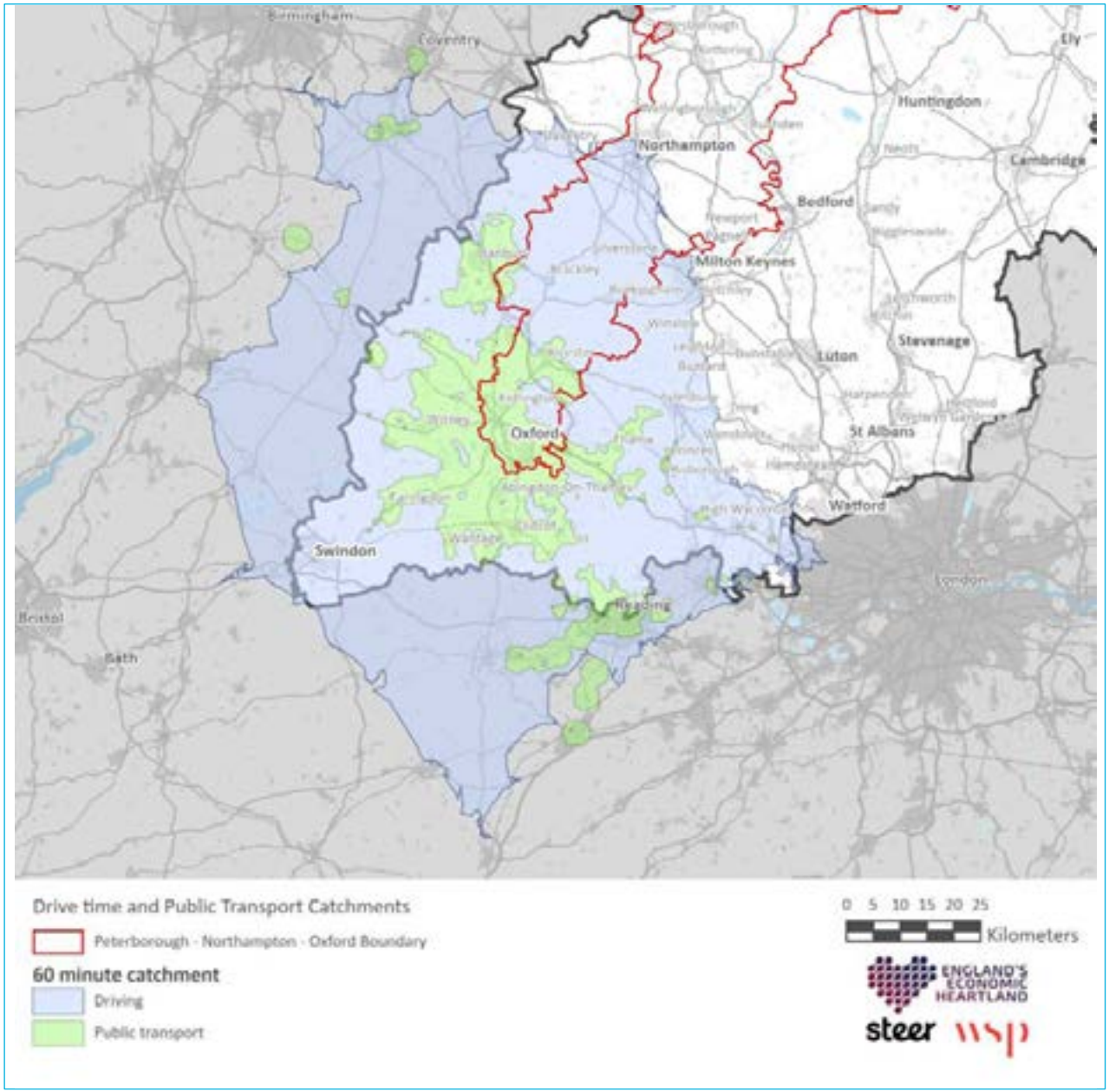
60 Minute Drivetime / PT Catchment - Kettering



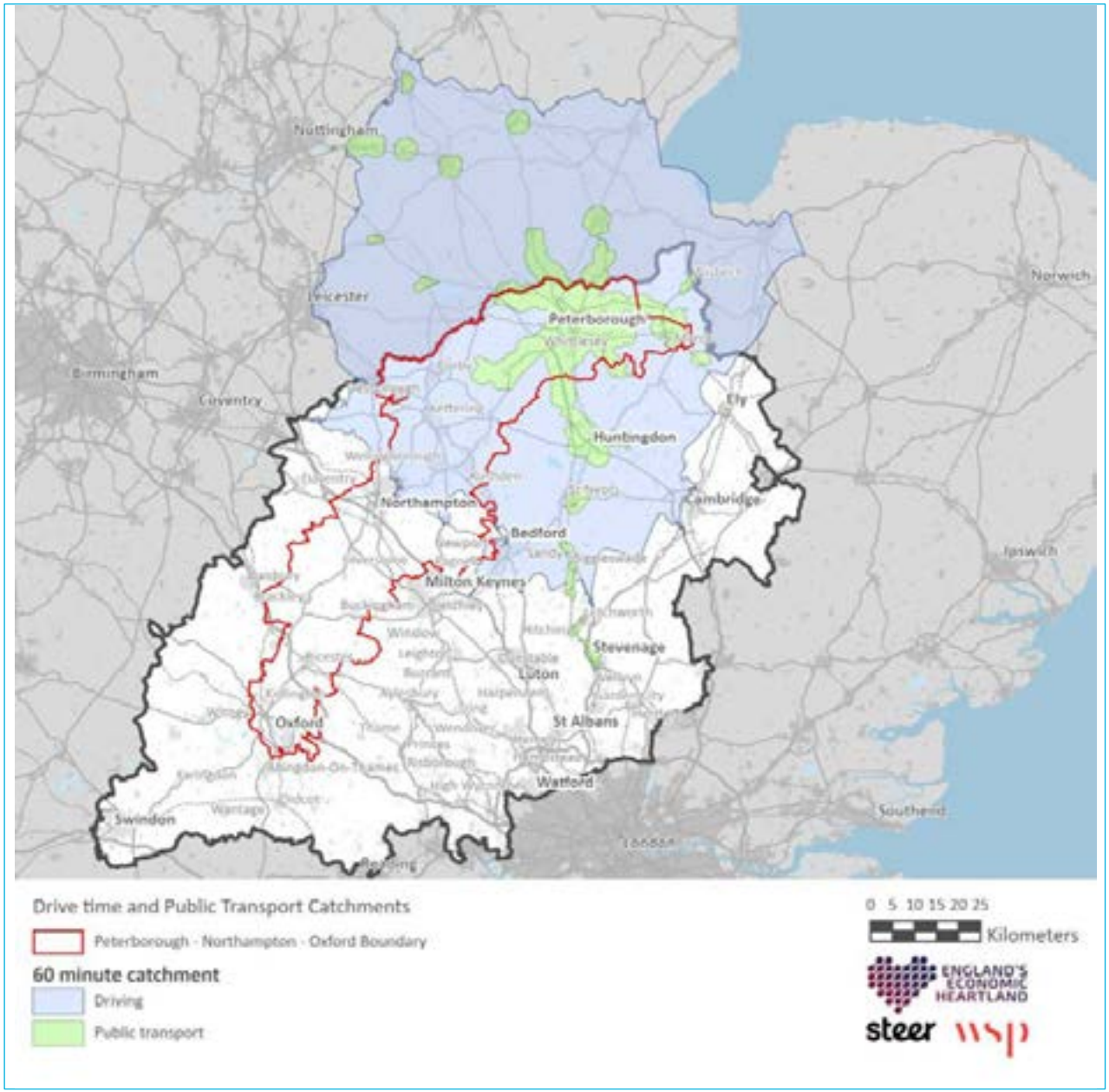
60 Minute Drivetime / PT Catchment – Northampton



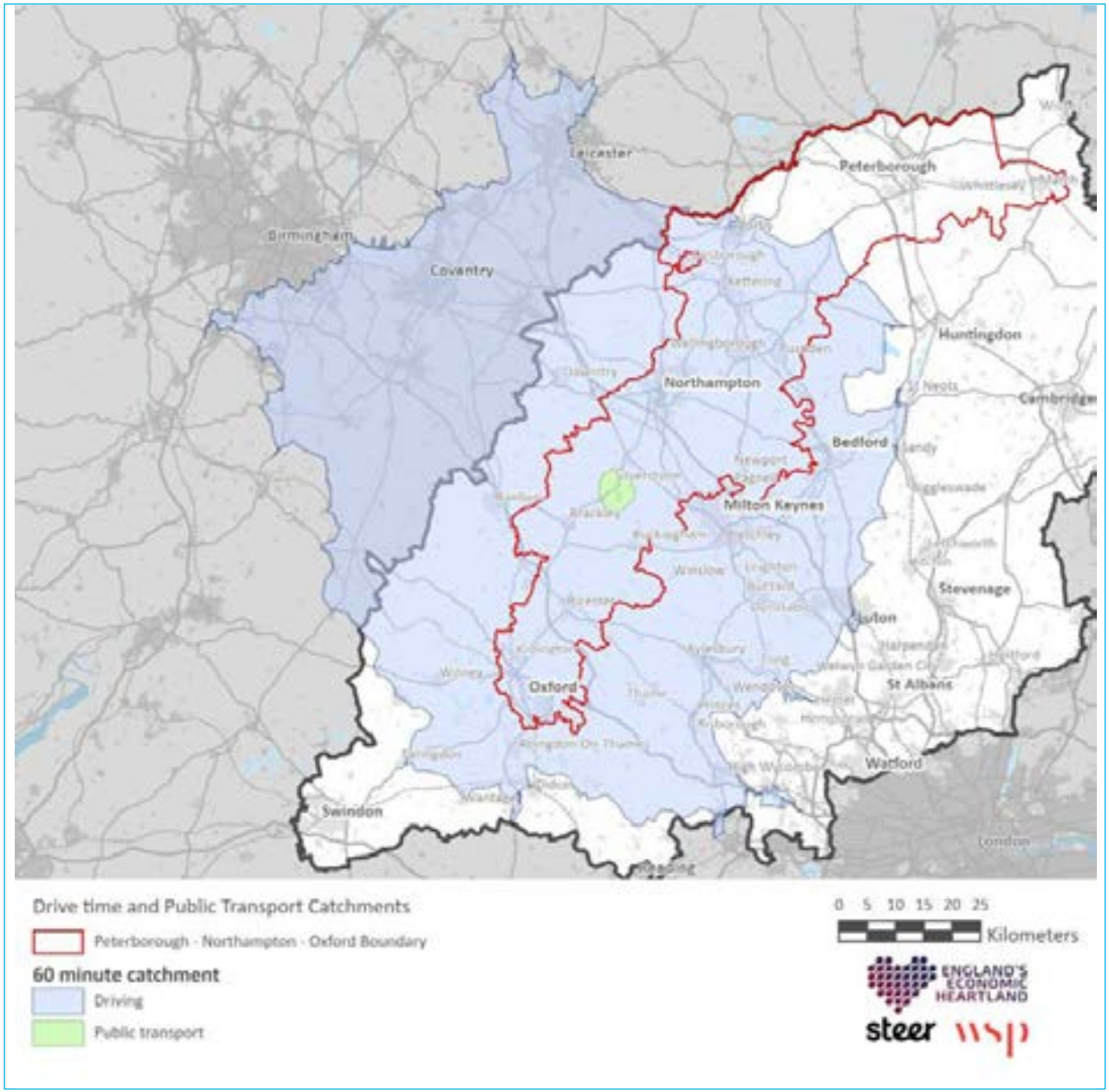
60 Minute Drivetime / PT Catchment – Oxford



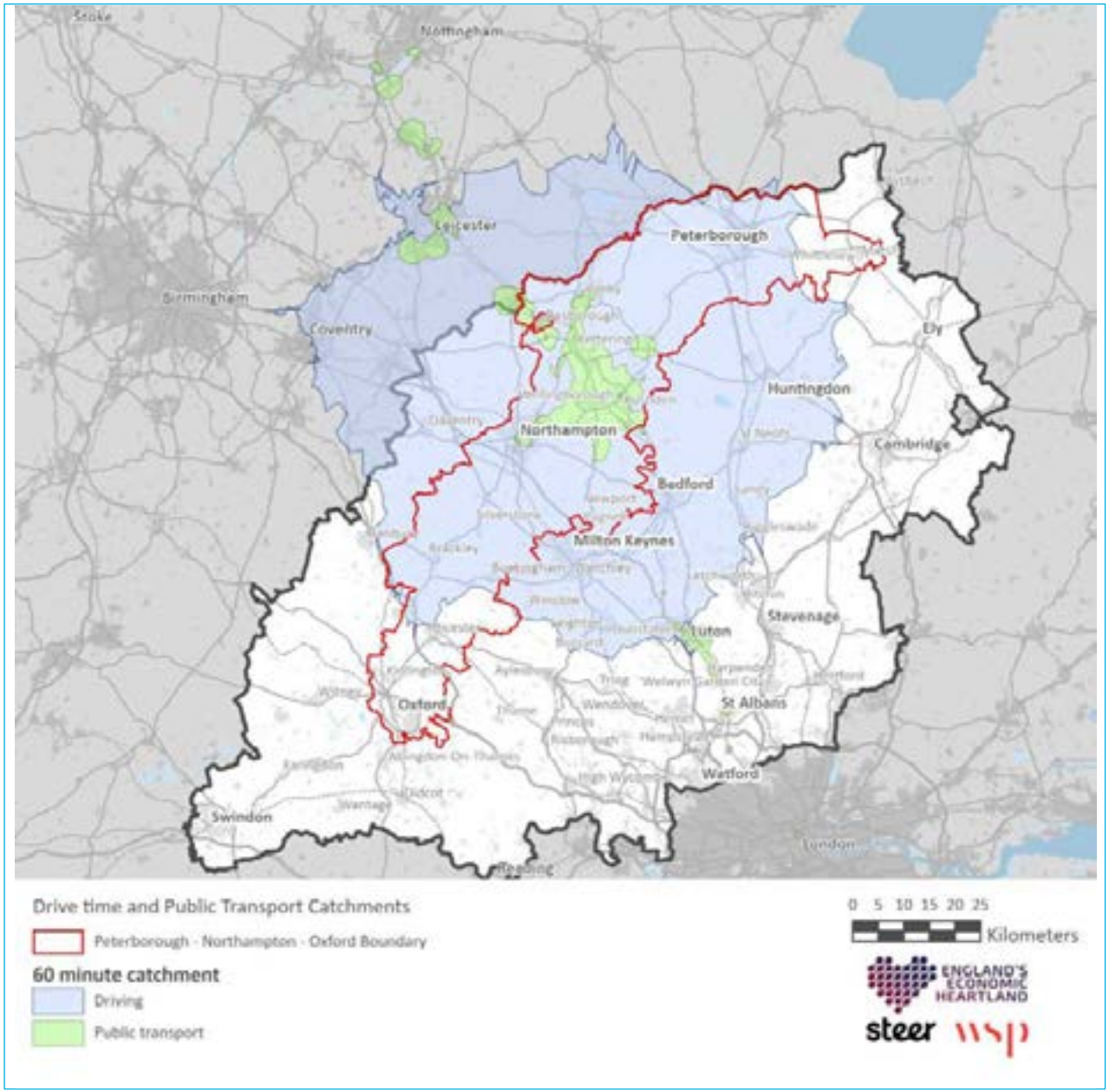
60 Minute Drivetime / PT Catchment – Peterborough



60 Minute Drivetime / PT Catchment – Silverstone Park

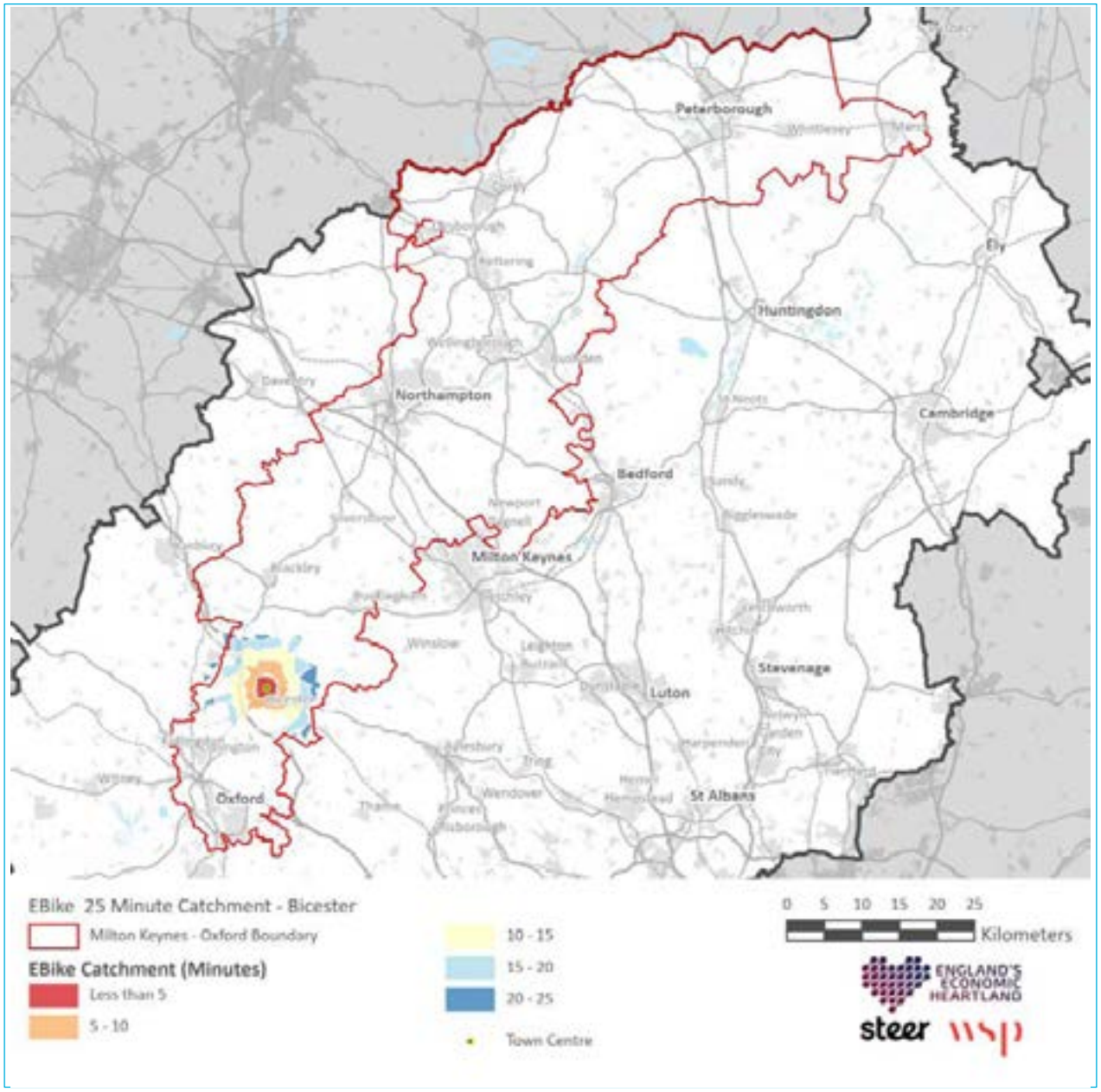


60 Minute Drivetime / PT Catchment – Wellingborough

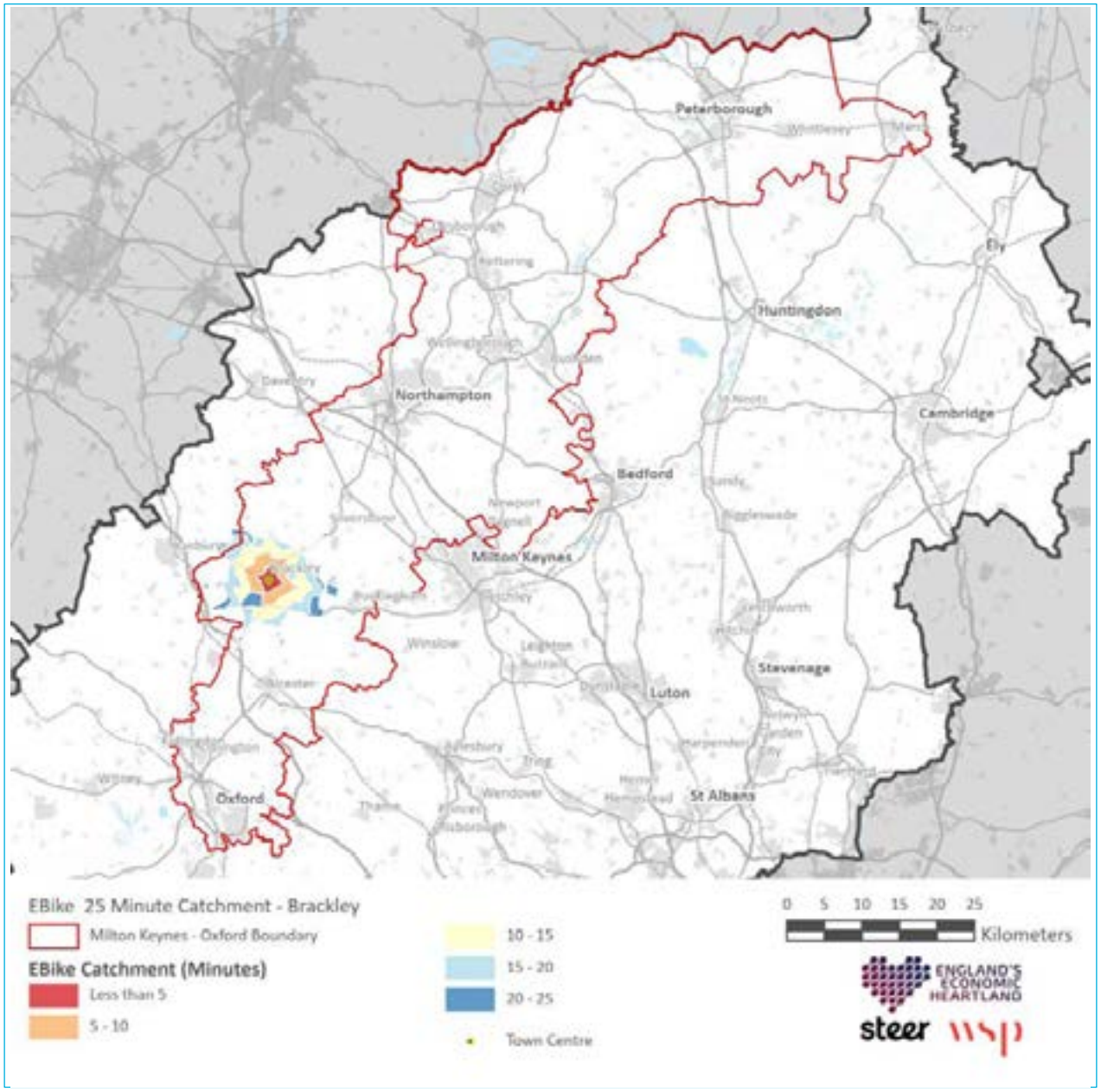


Appendix D – E-bike Catchments

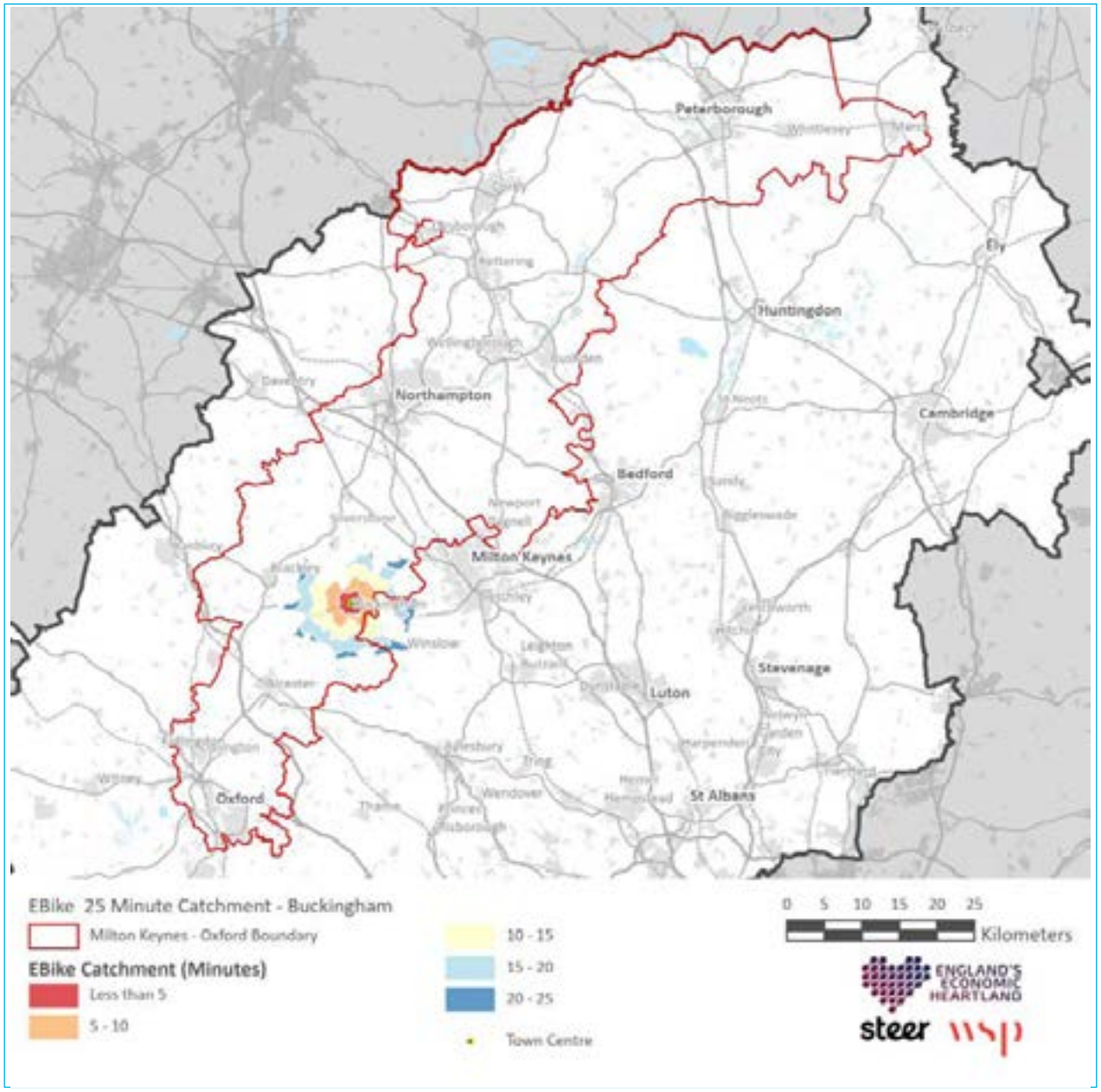
E-Bike 25 Minute Catchment - Bicester



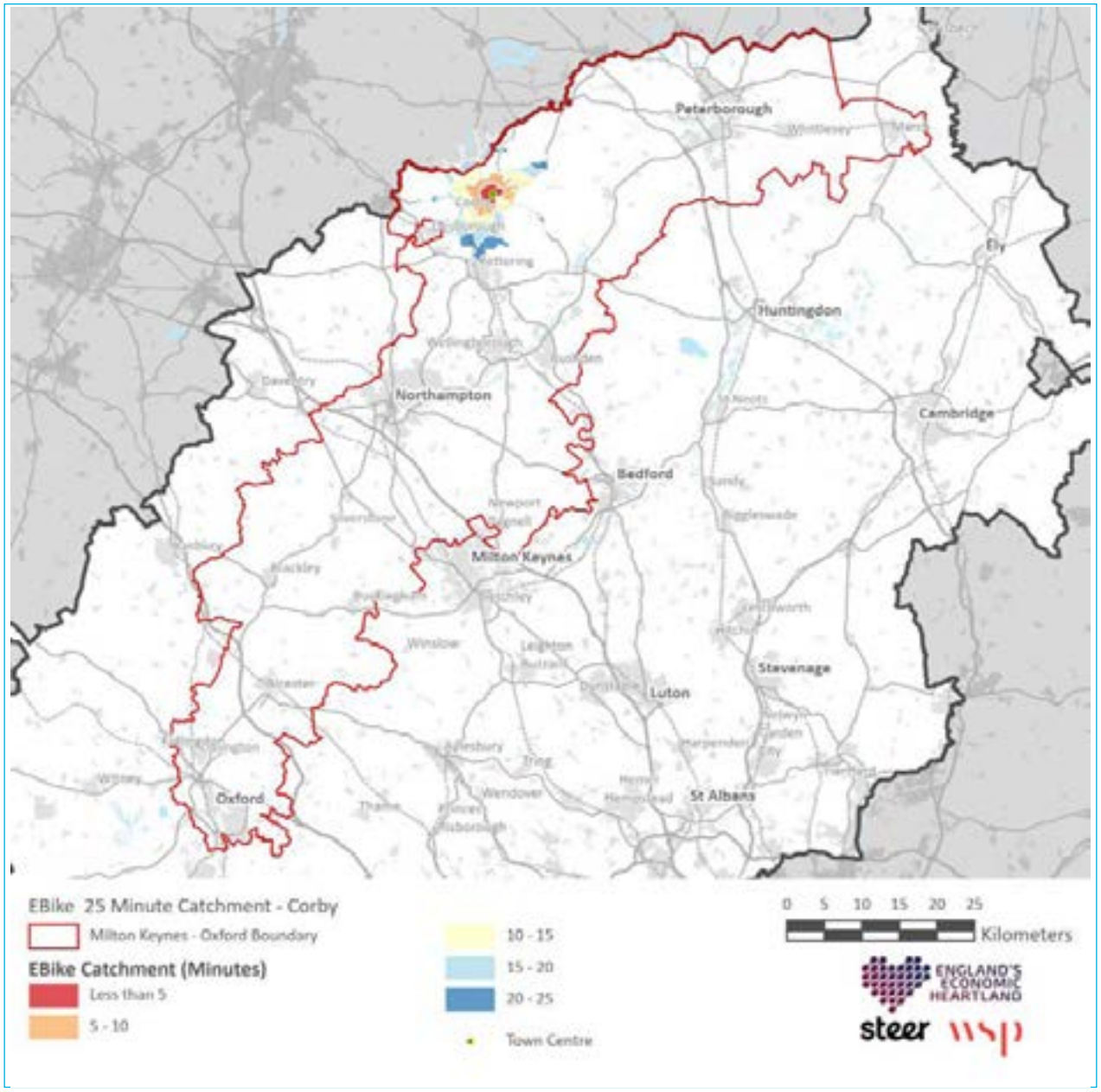
E-Bike 25 Minute Catchment - Brackley



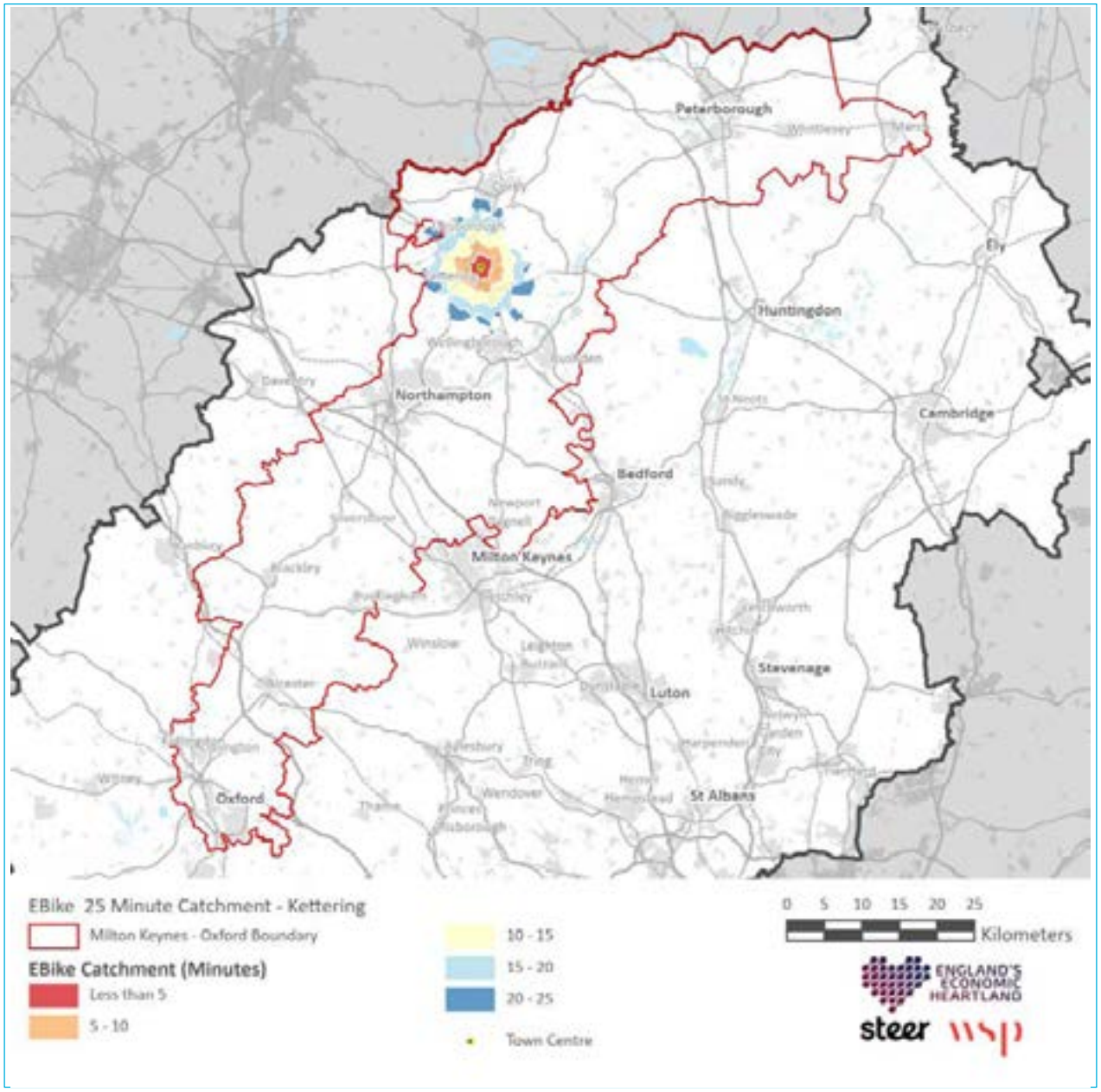
E-Bike 25 Minute Catchment - Buckingham



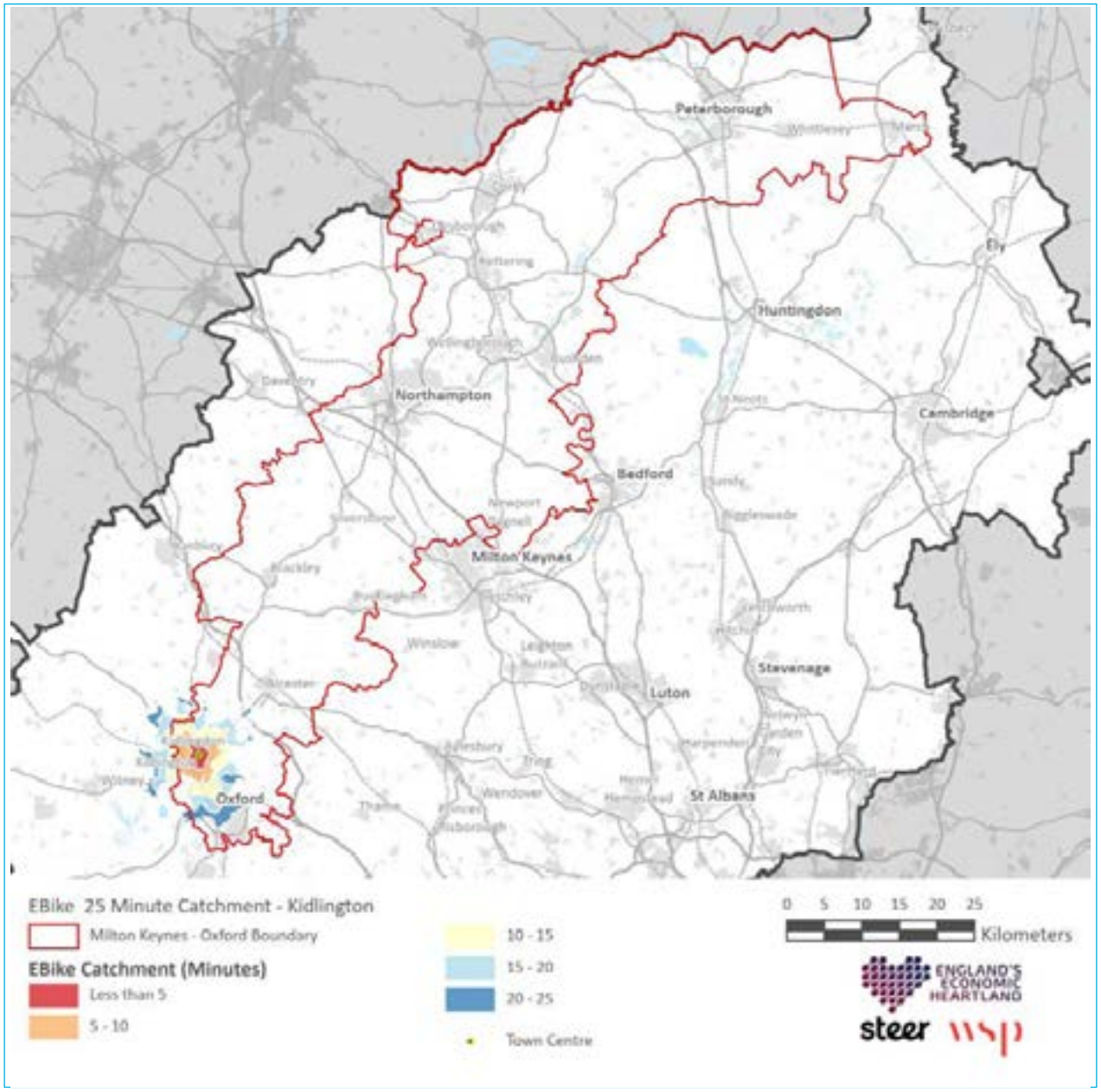
E-Bike 25 Minute Catchment - Corby



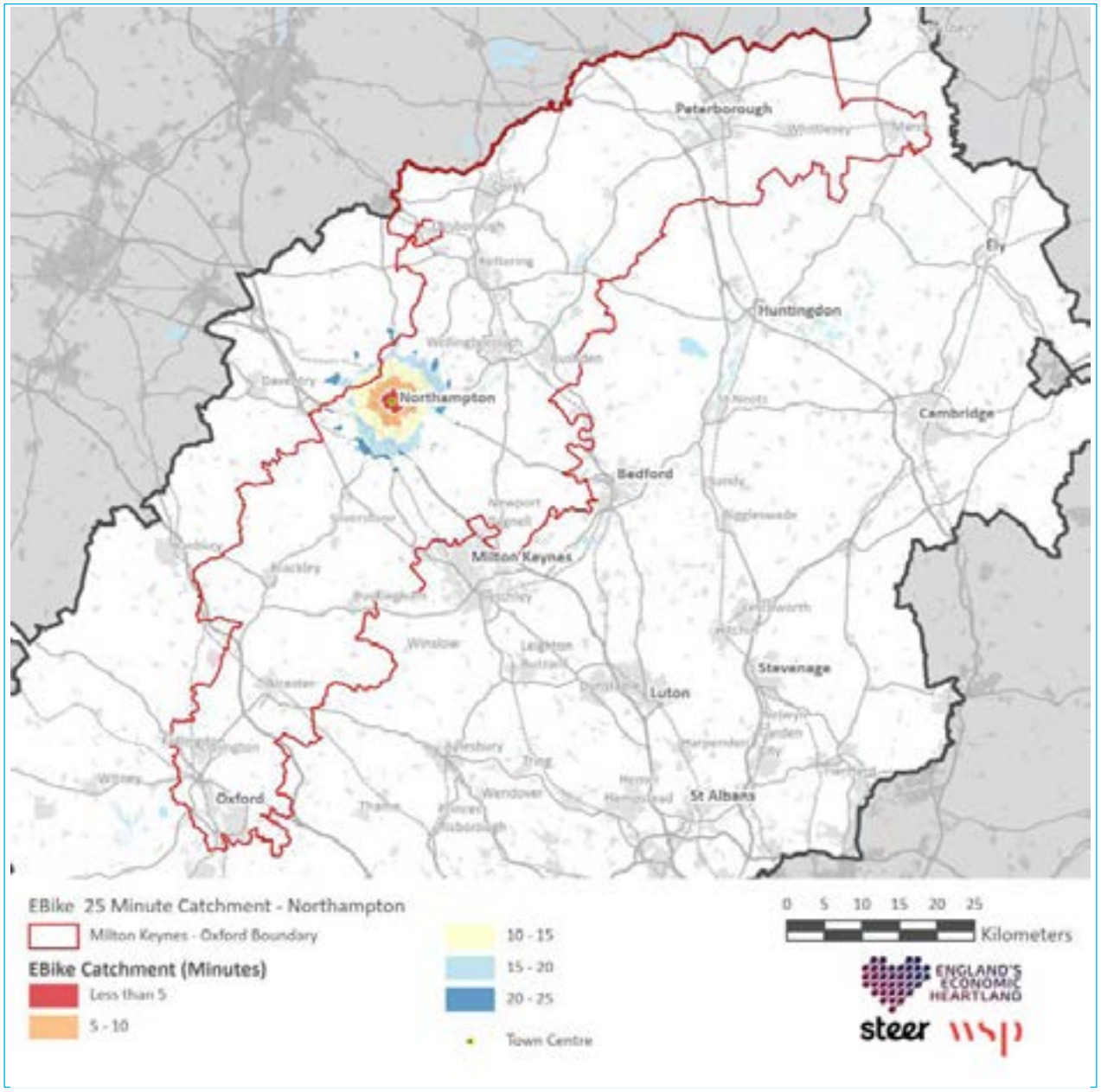
E-Bike 25 Minute Catchment - Kettering



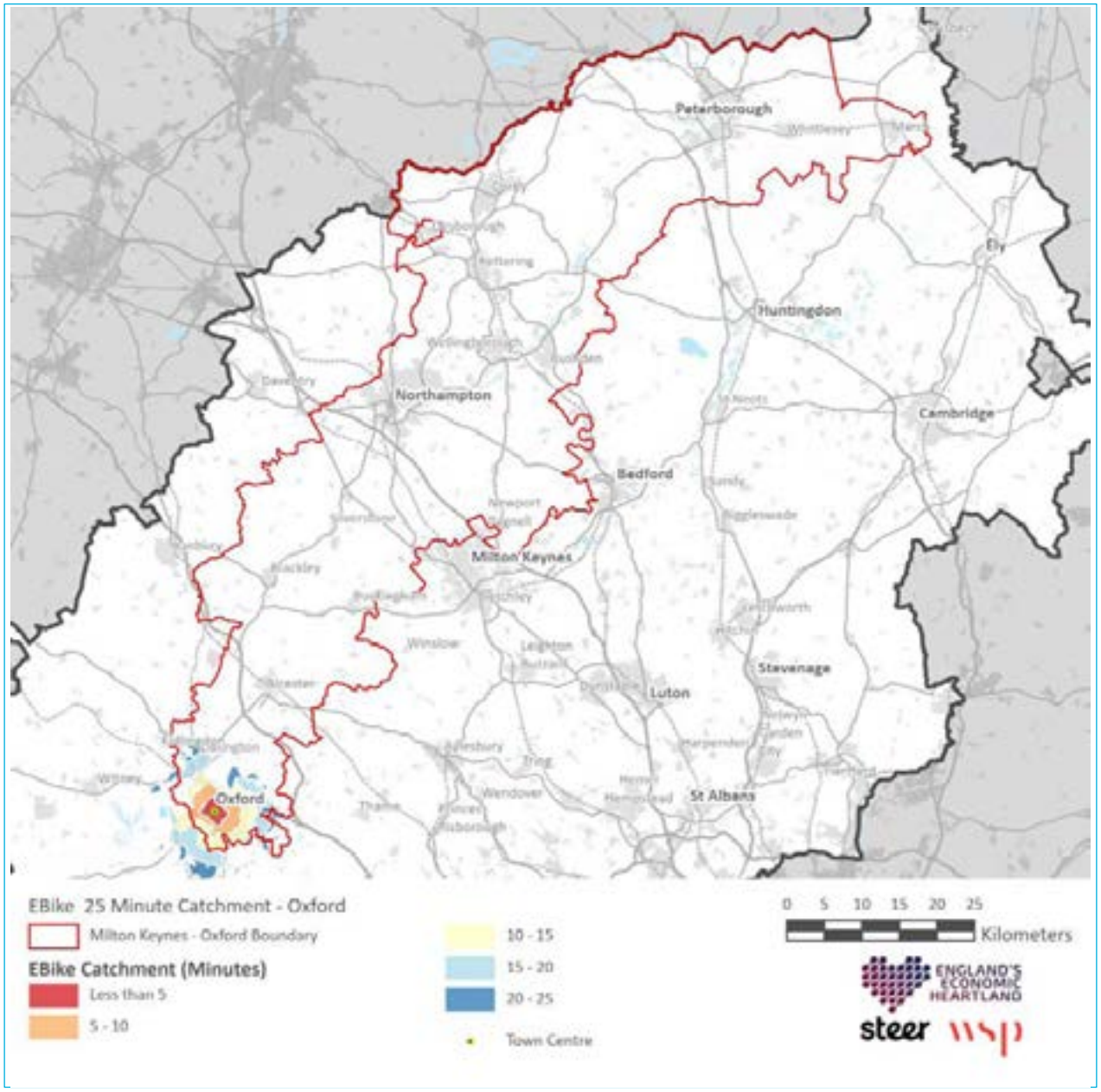
E-Bike 25 Minute Catchment - Kidlington



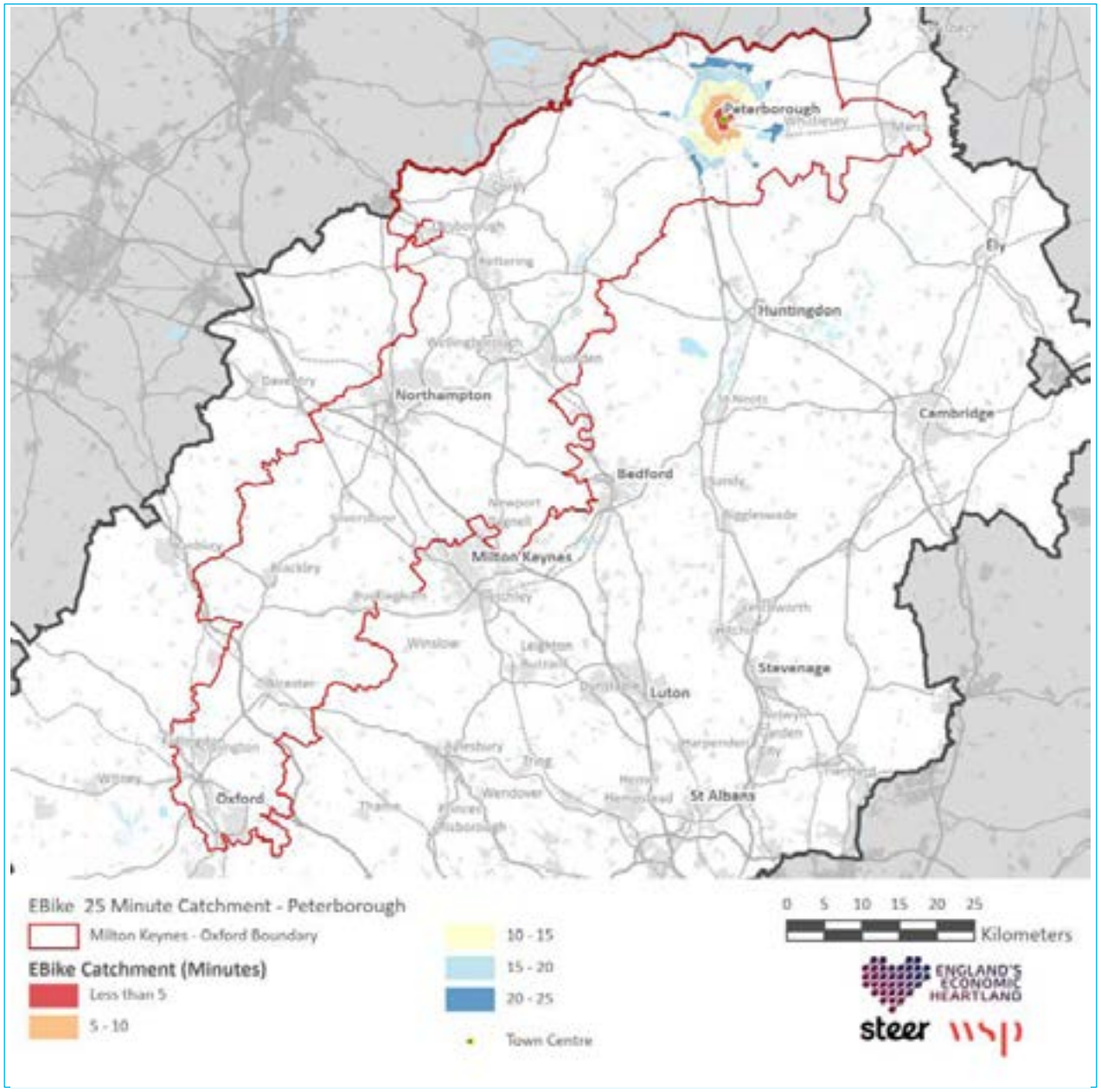
E-Bike 25 Minute Catchment - Northampton



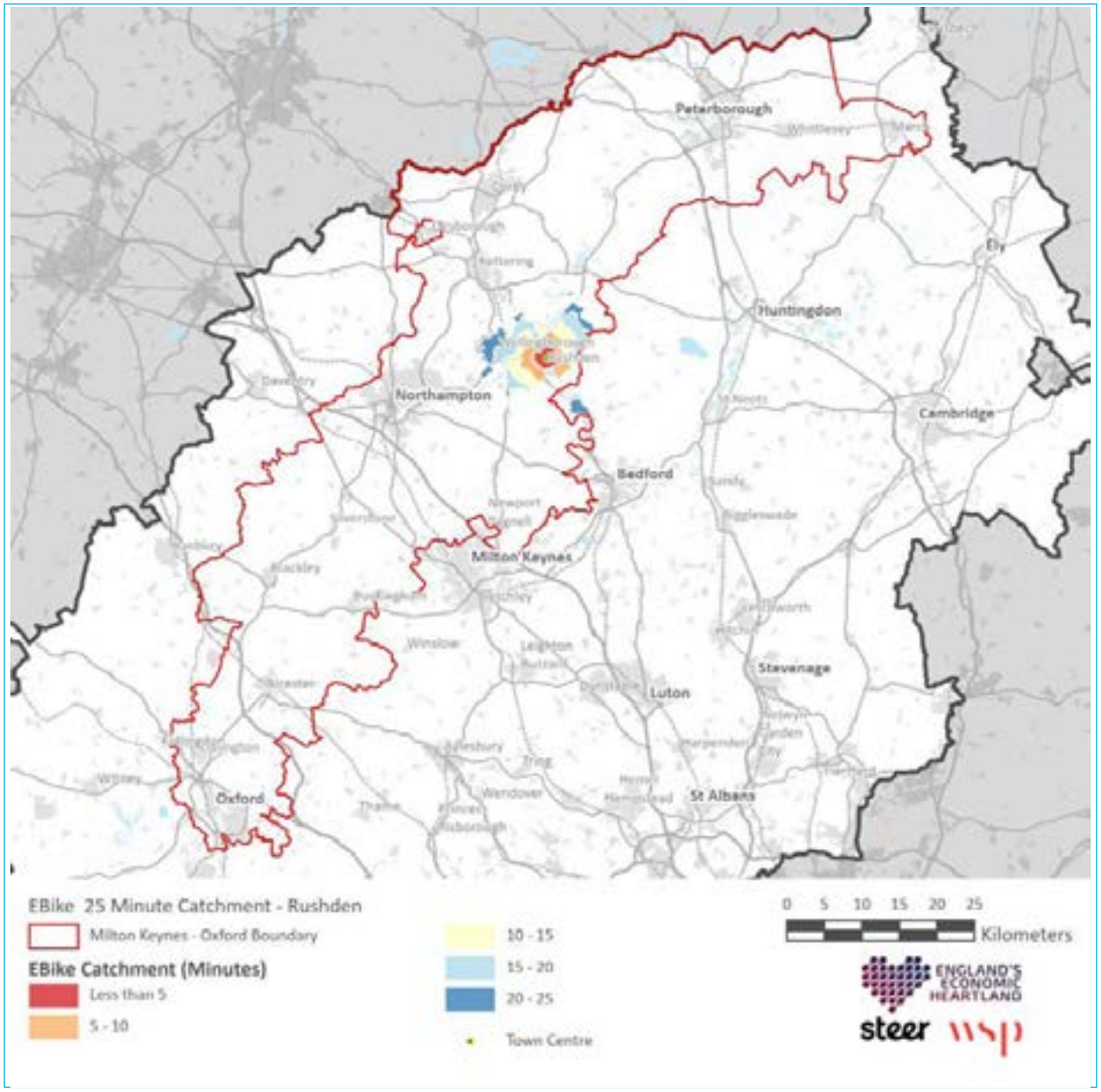
E-Bike 25 Minute Catchment - Oxford



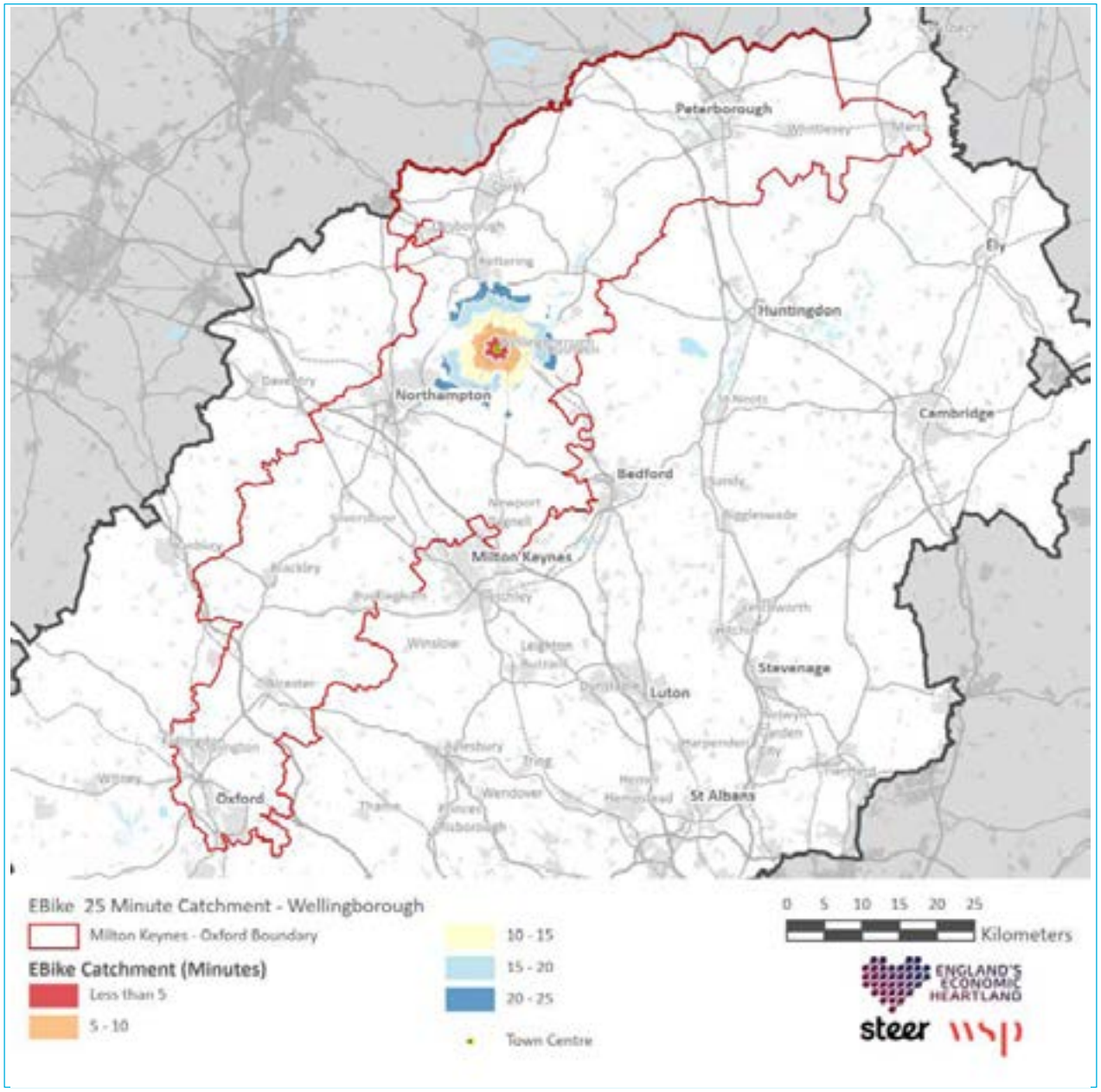
E-Bike 25 Minute Catchment - Peterborough



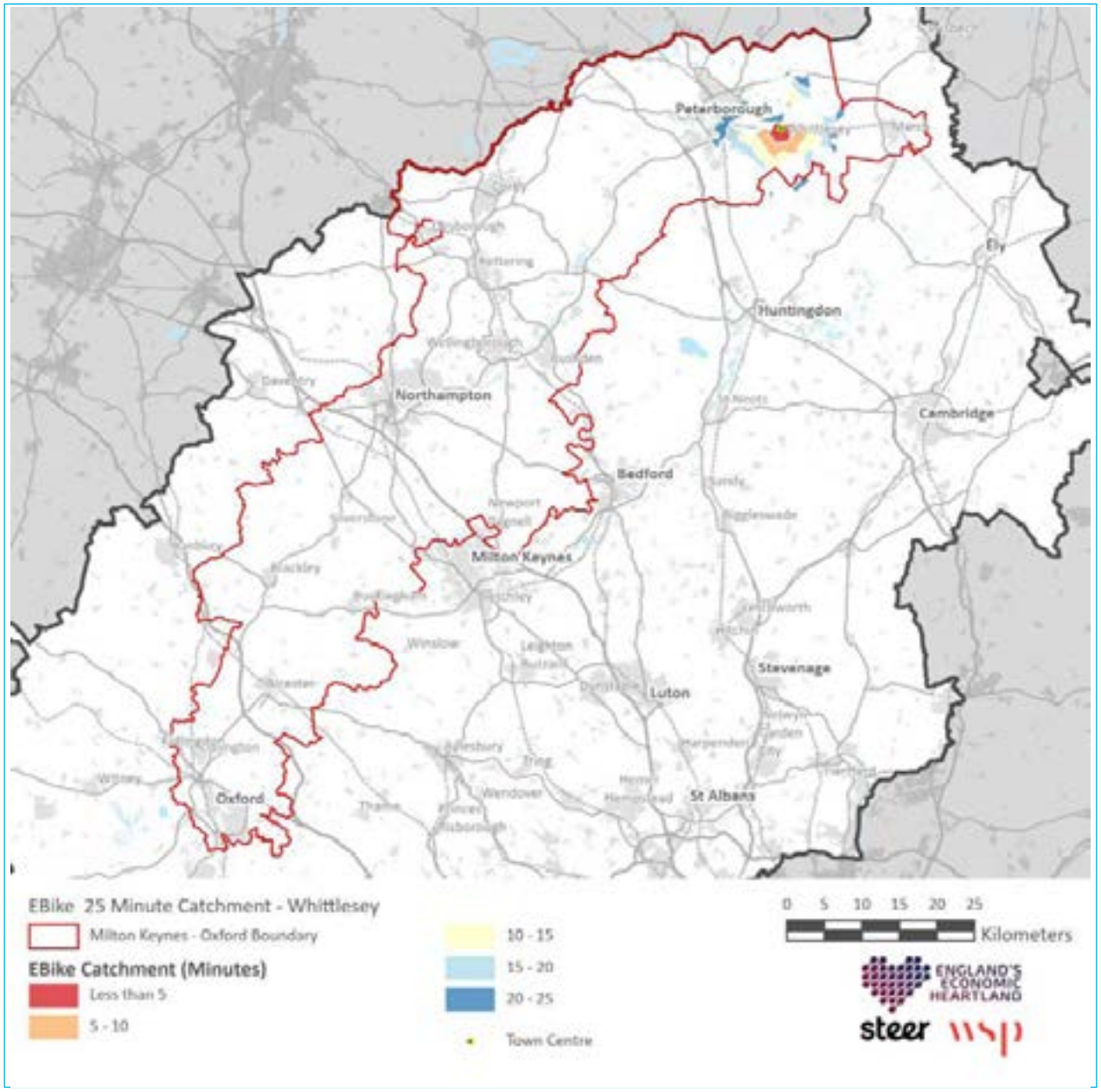
E-Bike 25 Minute Catchment - Rushden



E-Bike 25 Minute Catchment - Wellingborough



E-Bike 25 Minute Catchment - Whittlesey



Appendix E – Travel Patterns and Behaviour

Travel Patterns & Behaviour

Car Driver

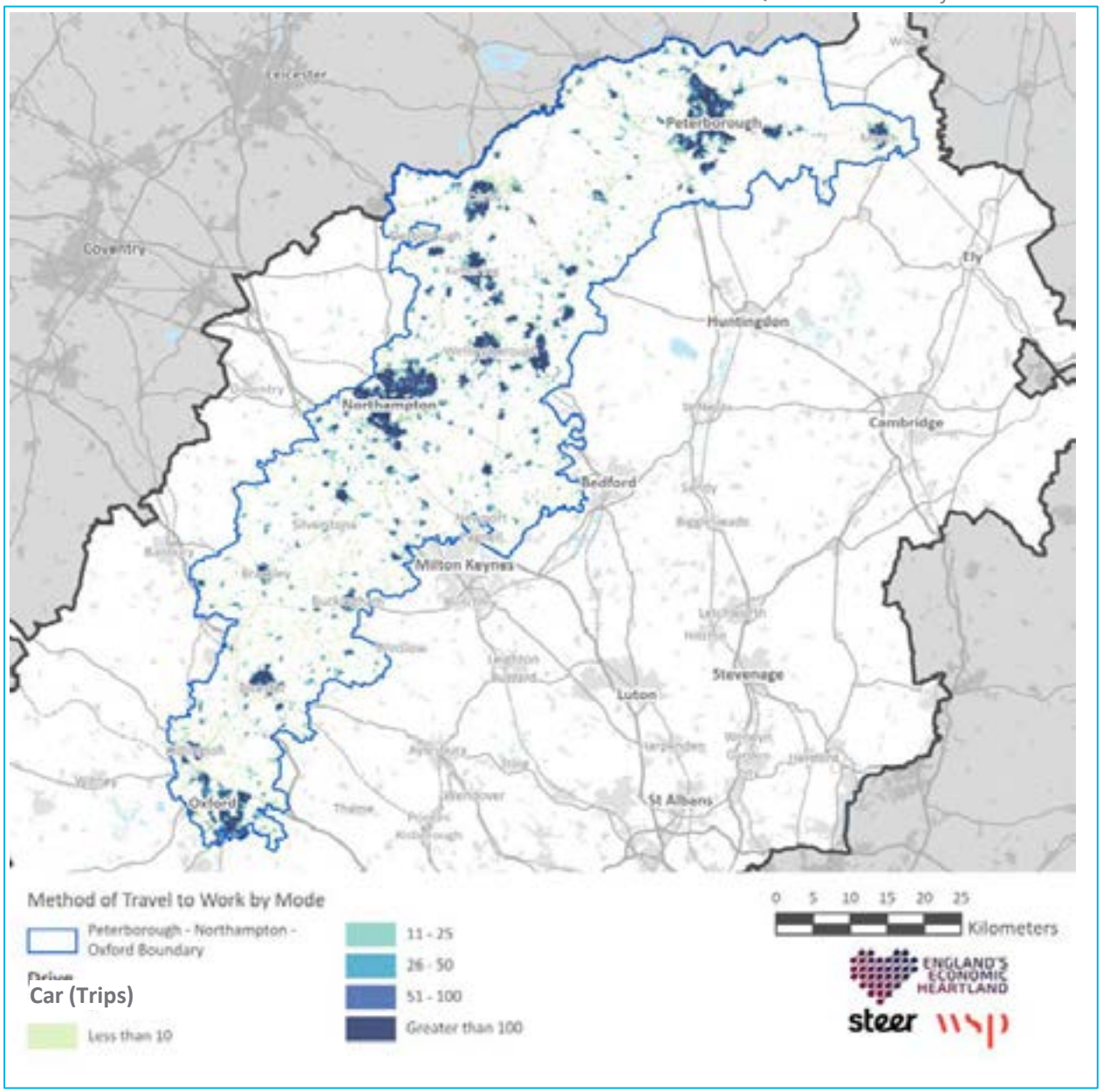
For the Peterborough – Northampton – Oxford corridor, trips by car account for the majority of all commuting trips. There is a total of 327,095 trips by car drivers within the corridor, representing a total of 59% of the total trips within the area.

The distribution of trips shows that the majority of car drivers originate from the larger settlements, with the highest concentrations in Northampton and Peterborough.

Car use remains the most utilised mode of transport in both urban and rural areas. When compared to car trips that include a passenger, a total of 91% of all car driver trips are single occupancy, further emphasising the unsustainability of this form of travel.

As well as high quality public transport infrastructure, schemes such as the proposed concept of the 'northern arc' rail link between Oxford, Northampton and Peterborough have the potential to reduce the number of trips between these locations being completed by car by increasing public transport patronage.

Data Source: 2011 Census – QS701EW Method of travel to Work



Travel Patterns & Behaviour

Car Passengers

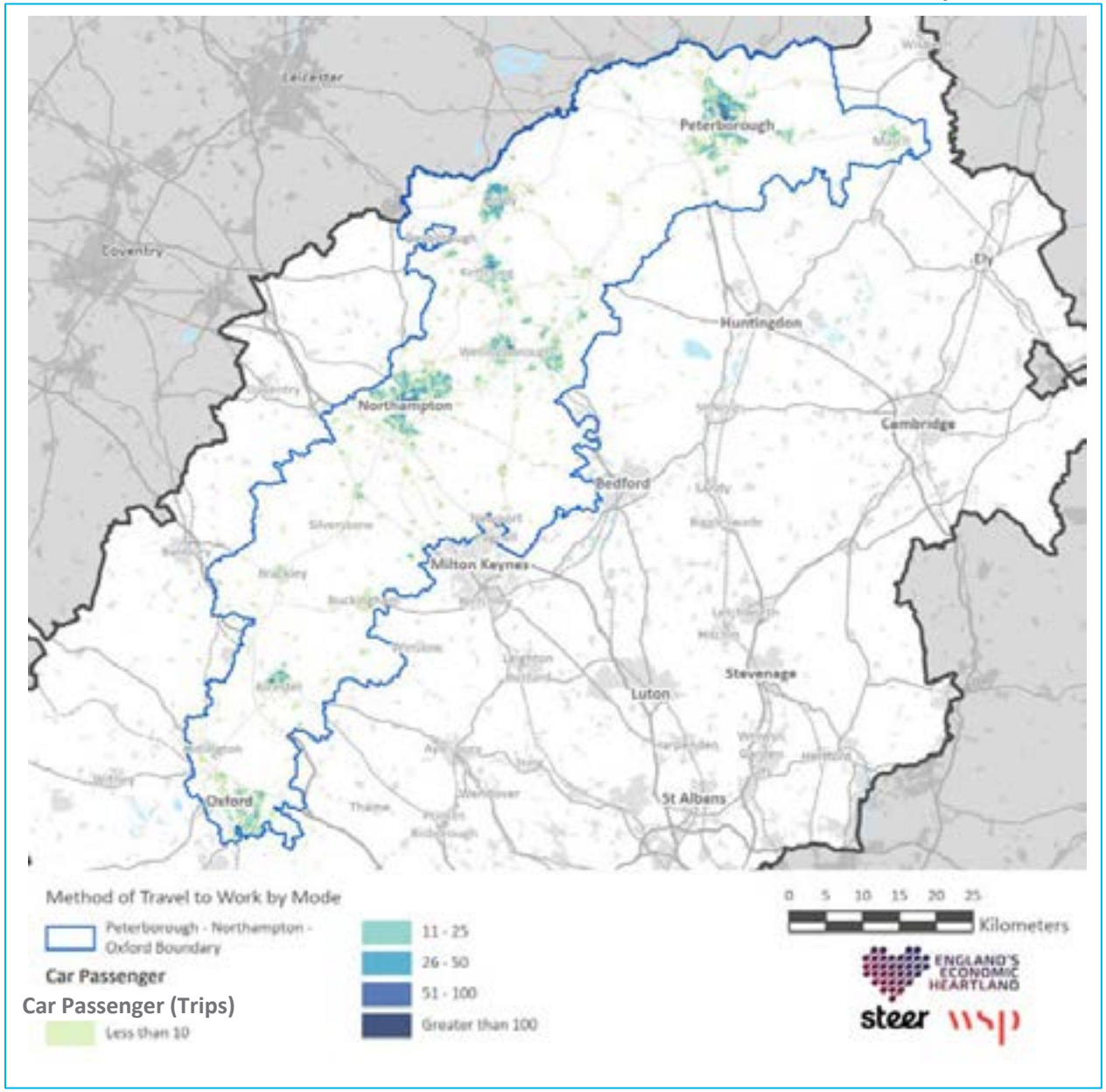
A total of 32,145 trips are made by Car passengers, making a total of 5% of all movements within the corridor. When compared to Car drivers a total of 8.9% of drivers include a passenger, showing a relatively small amount of car sharing within the corridor.

The distribution highlights the largest amount of car passengers within urban areas, notably with Northampton and Peterborough. Other notable settlements with high car passenger use include Oxford, Kettering, Crosby, Bicester and Wellingborough.

Car passenger trips from rural areas are significantly lower (26%) compared to 74% in urban areas. The effectiveness of expanding car pooling/ car share programmes to rural areas should be assessed to promote sustainable travel.

Car passenger trips account for a low proportion of overall trips in the corridor. However, with high overall car usage, there is an opportunity to increase the number of car trips that include a passenger. This can be promoted by local authorities and businesses in the form of vouchers, car sharing apps and priority parking bays.

Data Source: 2011 Census – QS701EW Method of travel to Work



Travel Patterns & Behaviour

Bus, Minibus and Coach

Bus usage makes up the majority of the public transportation movements within the corridor.

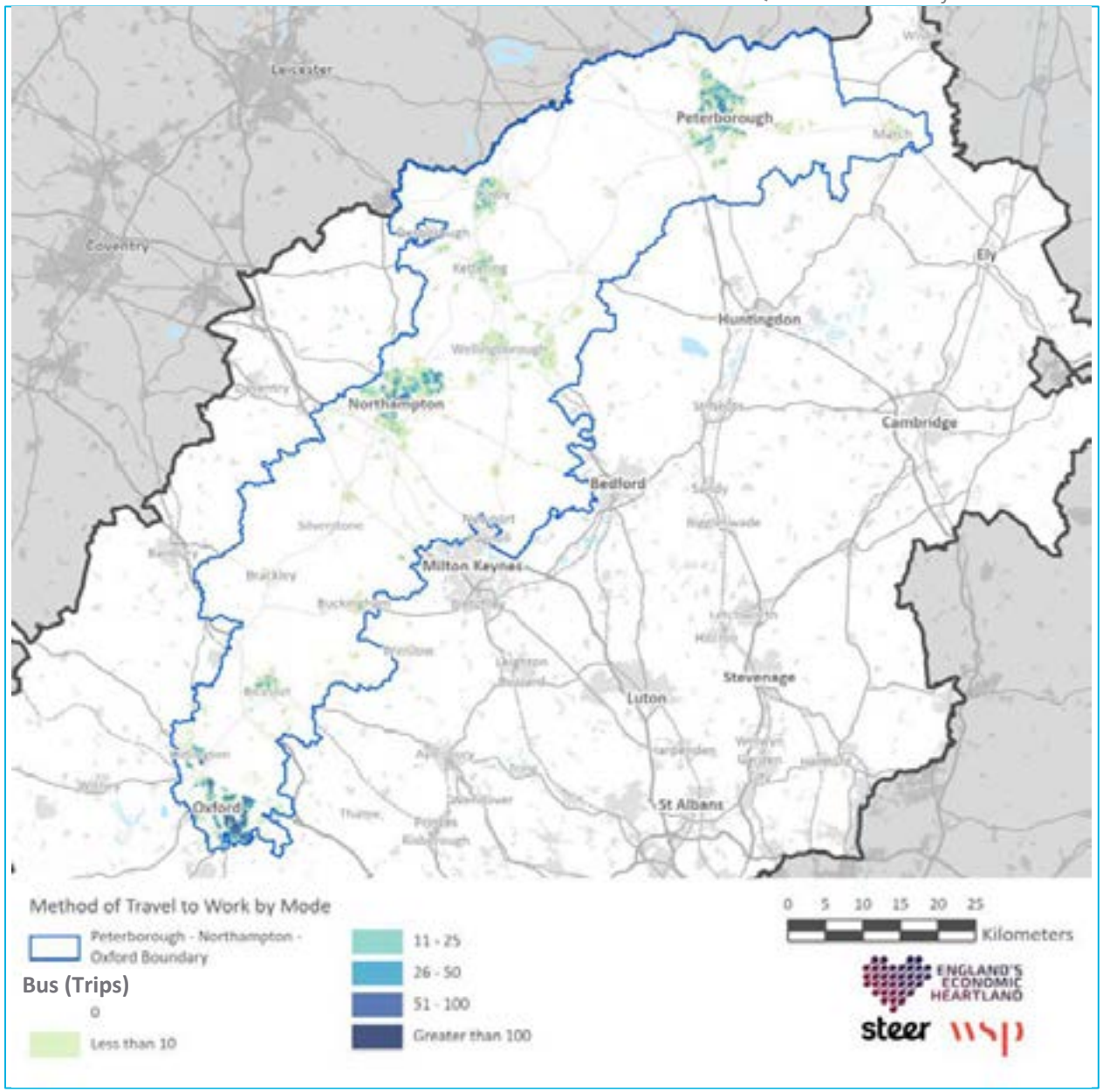
A total of 31,960 movements are made by bus, creating 6% of the total mode share, and making up 78% of all public transport movements.

The distribution of bus travel highlights an urban / rural divide with high bus usage found in Oxford, Northampton & Peterborough and the surrounding settlements.

There is a substantial urban / rural divide in bus use for commuting journey purposes, with 85% of bus commuting trips originating in urban areas compared to 15% from rural areas. This divide suggest that there is weaker public transportation connectivity outside the major urban areas.

Bus use currently represents the most utilised public transport option within the corridor. Improvements to local bus services and infrastructure has the potential to reduce the amount of car trips, improve air pollution and facilitate equitable growth within the corridor.

Data Source: 2011 Census – QS701EW Method of travel to Work



Travel Patterns & Behaviour

Train

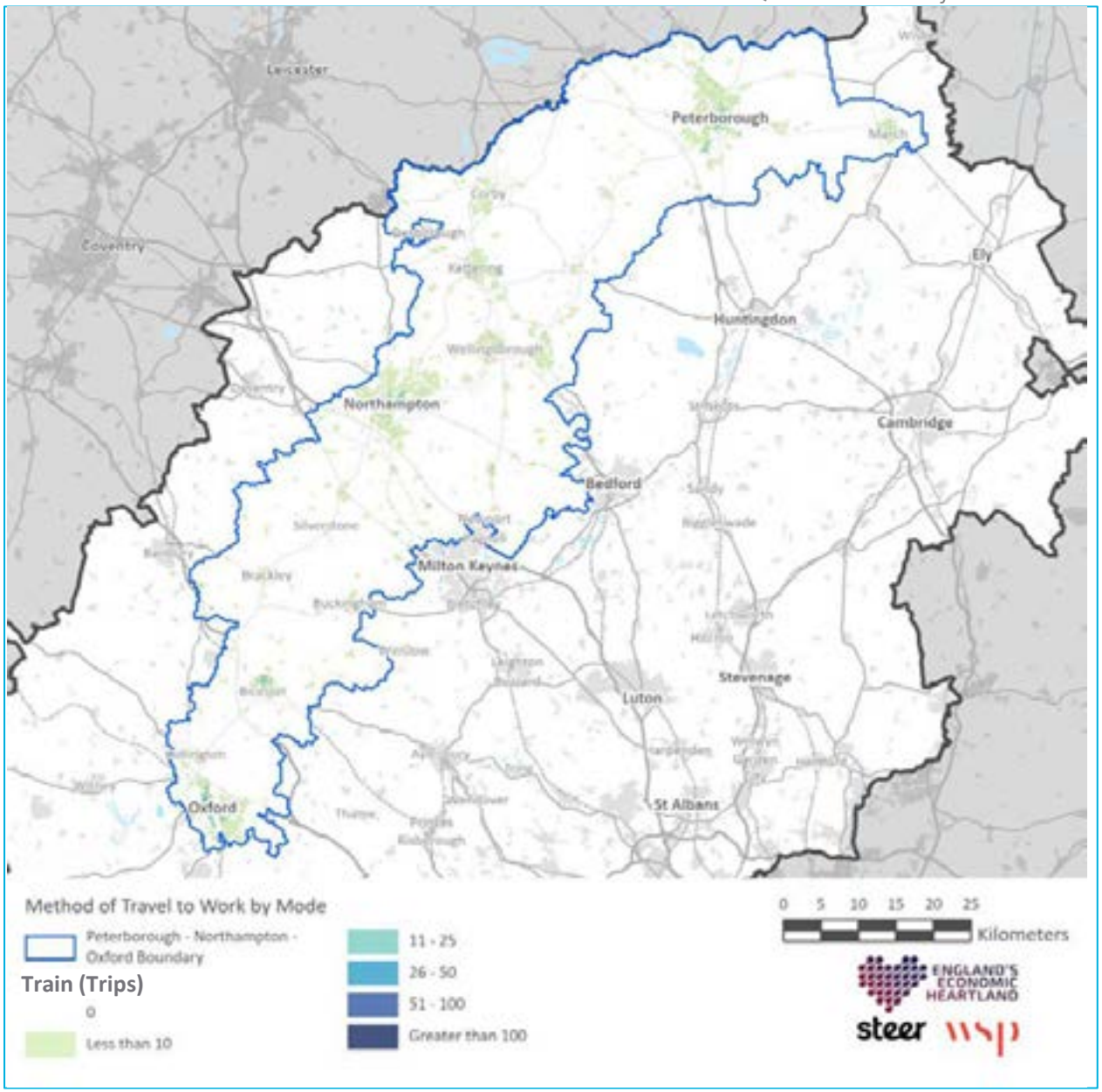
There is a total amount of 8,804 trips made by train within the corridor, representing under 2% of total commuting movements. Travel by train accounts for 22% of all public transport movements within the corridor, showing it as a less utilised mode of transport as compared to bus.

The urban / rural split for train use is less significant compared than other modes of transport, with 60% overall use from people in urban areas, compared to 40% from rural areas.

The distribution of train trips highlights a correlation between areas that have better rail infrastructure i.e., stations, which are more often present in areas with higher population levels.

Low rail use in the corridor may be associated with a lack of connectivity between the key urban areas. England's Economic Heartland has put forward a new Transport Strategy outlining the concept of a 'northern arc' rail link, connecting Peterborough, Northampton and Oxford that has the potential to increase rail patronage in the corridor by providing faster and more direct services.

Data Source: 2011 Census – QS701EW Method of travel to Work



Travel Patterns & Behaviour

Cycling

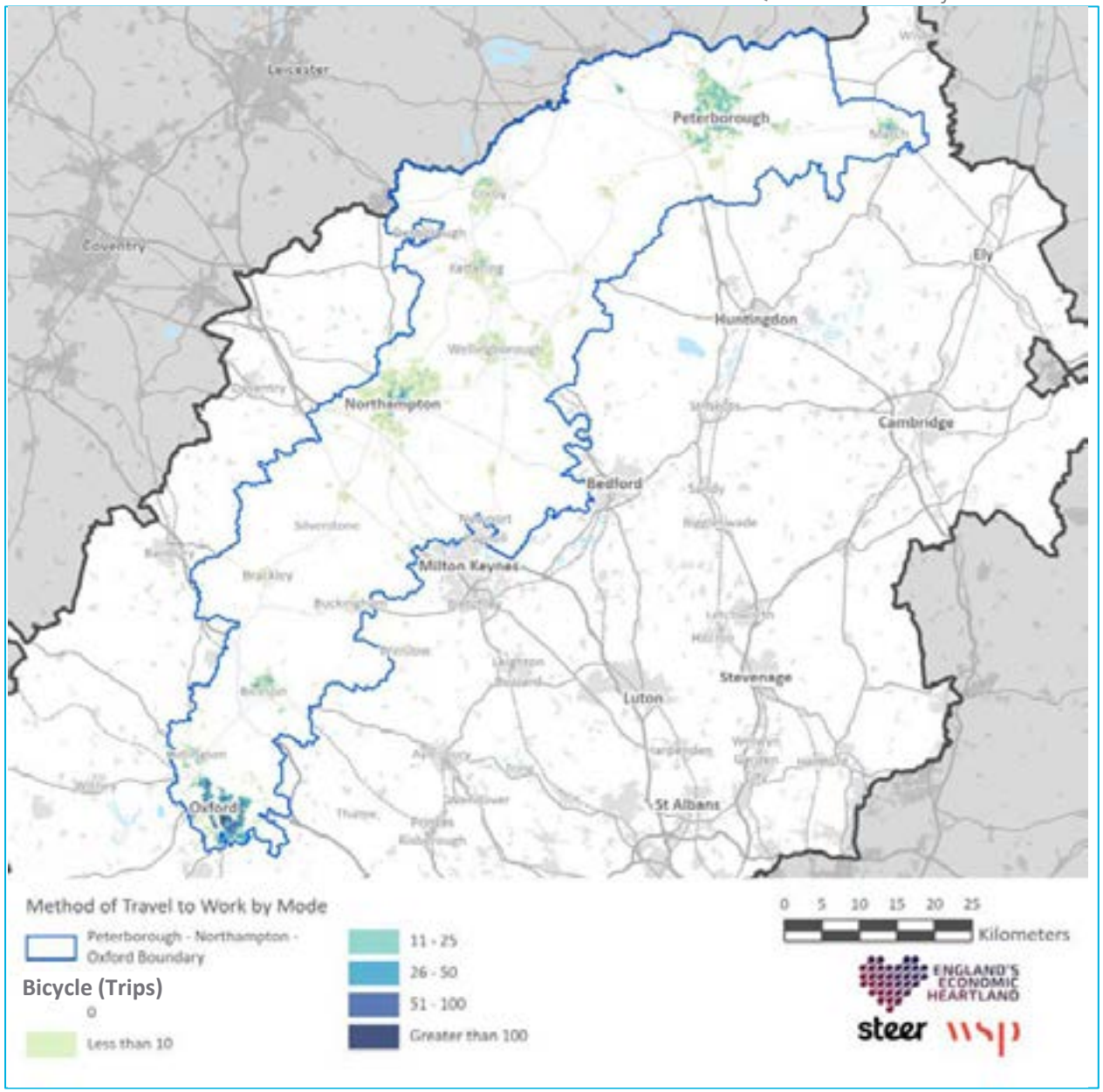
The total mode share for cycling makes up 24,306 movements within the corridor, representing 32% of all overall active travel trips.

The majority of cycling trips can be found within the major urban areas. Oxford has the largest amount of cycle modal share in the corridor, followed by Peterborough and Northampton. Northampton, Wellingborough, Kettering and Corby all have reasonable levels of cycle use and are in relative proximity (Kettering to Corby is a 45-minute cycle), suggesting these could be suitable locations for active travel corridors.

Cycling numbers appear to be low within rural areas in the corridor. A total of 19% of overall cycling journeys in the corridor originate from rural areas. This highlights that there may be a lack of quality cycling infrastructure in rural areas, as well as less key destinations being within cycling distance.

Oxford, Northampton and Peterborough have all received active travel funding from the DfT, which will be invested in upgrading cycling infrastructure. These interventions have the potential to increase cycle uptake in these areas.

Data Source: 2011 Census – QS701EW Method of travel to Work



Travel Patterns & Behaviour

Walking

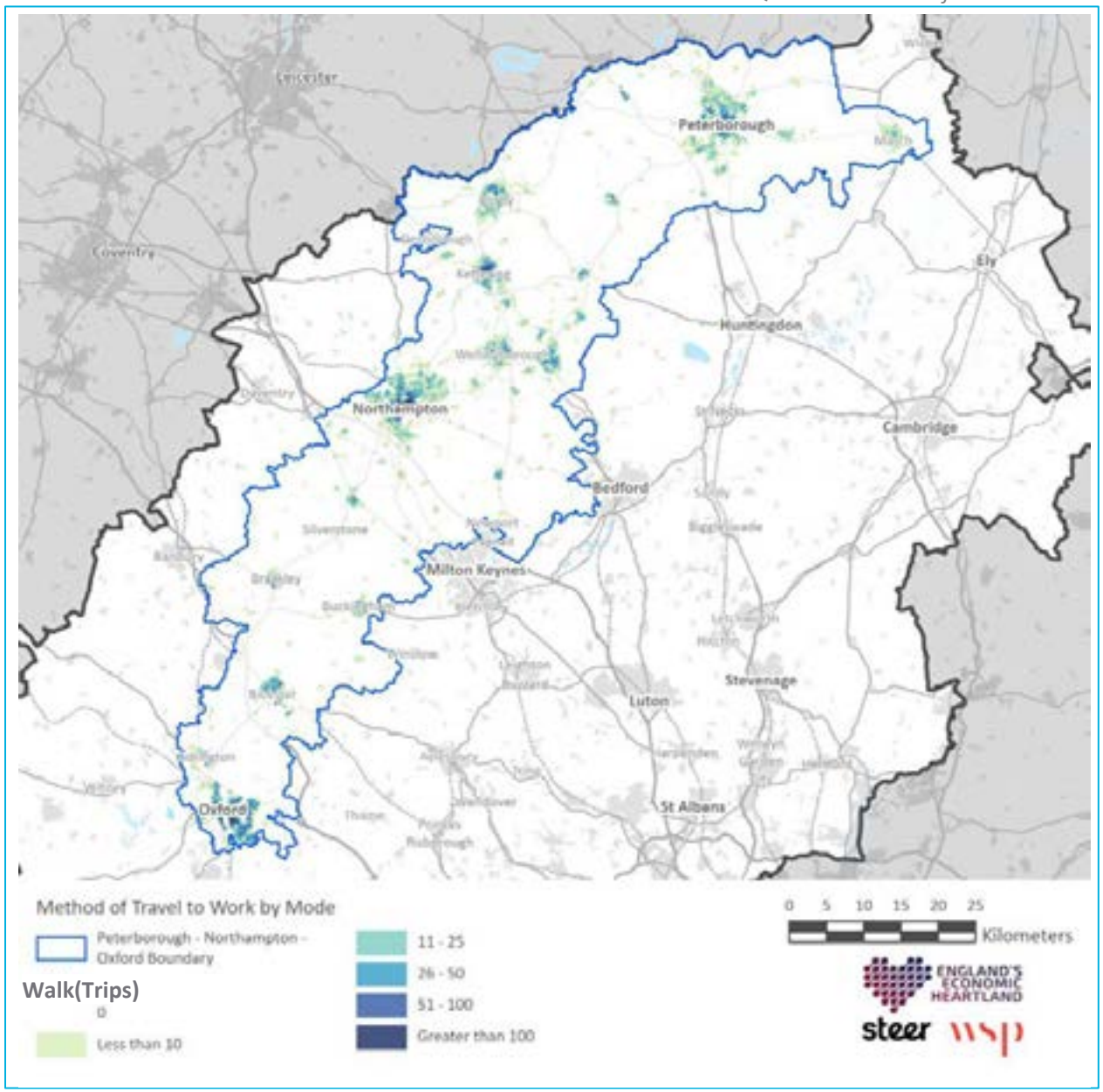
Another component of active travel is pedestrian commuting to work. The total amount of pedestrian trips in the corridor represents 50,617 commuting movements. This represents 9% of all movements within the corridor.

Pedestrian movements within the corridor make up 68% of the active travel mode share, representing a significant mode share for all movements. Northampton, Peterborough, Oxford, and Kettering have the highest concentrations of walking trips.

The distribution of walking trips highlights that there is a large urban / rural divide. The majority of overall walking trips in the corridor take place in urban areas (76%). However, the graphic does demonstrate that there are clusters of high walking use in rural areas such as Olney, Rushden and Towcester.

The evidence shows that walking trips are more common in urban areas. Lower walking trips in rural areas may be associated with longer distance commutes and a lower number of local jobs making the utilization of other modes less desirable. There is also less localised services within walking distance for rural areas (E.G. GP Clinic, Schools, Etc.).

Data Source: 2011 Census – QS701EW Method of travel to Work



Travel Patterns & Behaviour

Work From Home (WFH)

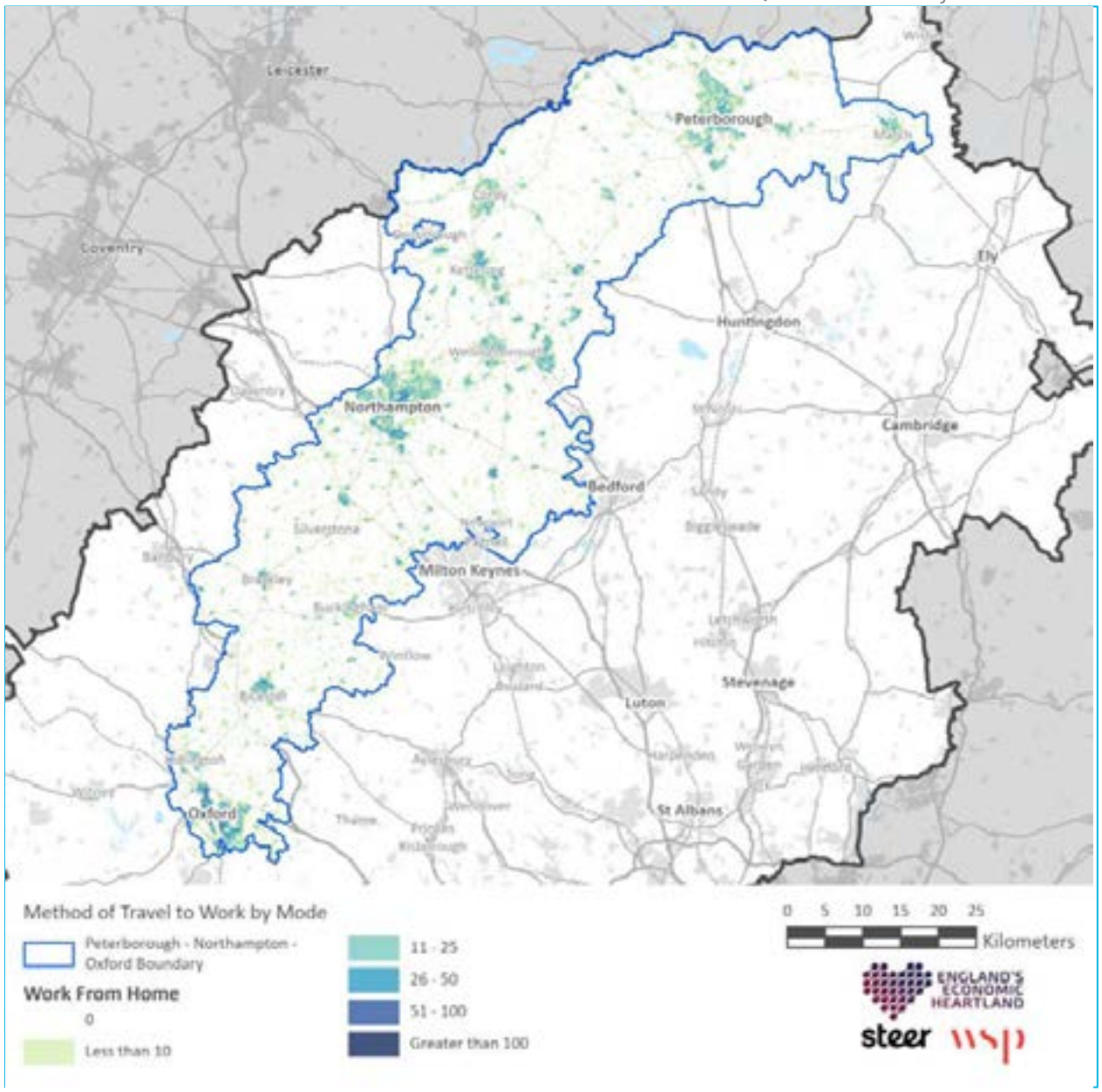
One of the most significant changes to transport patterns as a result of Covid-19 is the increase in working from home (WFH). It is difficult to predict the longer-term impacts on travel patterns, however it is likely that hybrid working will remain a common workplace arrangement.

The pre Covid-19 patterns of WFH behaviours show that 52,722 people worked from home, representing just under 10% of the corridor.

On the contrary to other modes, there is a much more even split in the number of people WFH in urban areas (51%) compared to rural (49%). This is pattern is unsurprising as WFH enables people who live in rural areas to not undertake longer distance commuter journeys every day of the week.

With the onset of Covid-19, the concentration of people WFH in the corridor is likely to be significantly higher and is likely to remain into the future. If agile working remains a long-term workplace pattern, it has the potential to be a key component in reducing the number of car trips undertaken in the corridor, which could help ease congestion and reduce transport's carbon emissions.

Data Source: 2011 Census – QS701EW Method of travel to Work



Travel Patterns & Behaviour

Distance Travelled to Work

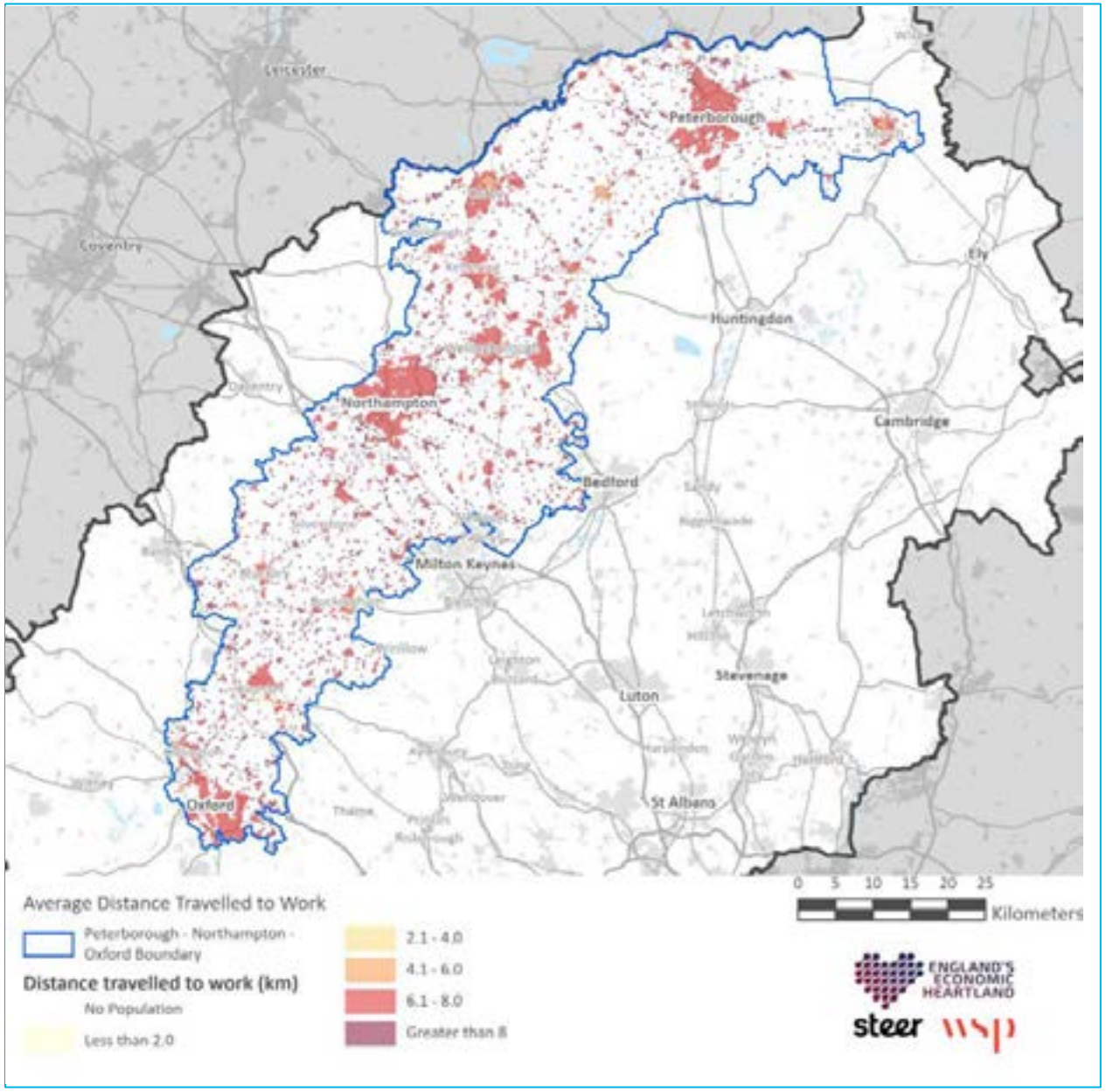
The most common distances for travelling within the corridor range from 2-5km in total throughout the corridor.

The distribution of trips and distances shows a slight urban rural divide. Urban areas are more likely to have distances of less than 5 kms, with rural areas being more likely to have distances larger than 5km than the urban areas. This shows that in general the distance of rural commutes is larger than urban commutes.

Oxford, Corby & Peterborough have the largest proportion of trips < 5 km out of the built-up urban areas in the corridor. This may be due to a variety of contributing factors such as having large employment centres based locally, healthcare facilities (i.e. Oxford, Corby and Peterborough) or universities (University of Oxford & Oxford Brookes University).

The most common travel to work distance range for the corridor is 2-5km (25%), a distance achievable using active and sustainable modes. Therefore, transport interventions should seek to provide attractive alternatives for short to medium journeys to reduce reliance on single occupancy car trips.

Data Source: 2011 Census – QS702EW Distance travelled to Work



Appendix F – Alternative Futures

England’s Economic Heartland: Development of Alternative Futures

August 2021 (Draft)

Context

- This slide pack reports on the approach to creating, and the purpose of, the alternative future scenarios for England's Economic Heartlands.

- Two workshops have been facilitated by Steer, WSP and England's Economic Heartland, and attended by key stakeholders to support the development of the alternative futures.

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How will the scenarios be used for the connectivity study?

- The four alternative futures will support a high level qualitative assessment of the infrastructure scenarios that have been developed as part of the connectivity studies. The alternative futures will not be modelled.

- While alternative futures are not modelled, optimised infrastructure scenarios are being modelled. This approach continues to be in line with TAG, however, we have not explicitly modelled higher or lower demand scenarios (e.g. as a result of a higher or lower levels of housing or employment), rather housing, employment, and demand are outputs of the model.

- The futures will then form one part of the multi-criteria assessment framework process, for the assessment of the long list of infrastructure options, and support with the short listing to arrive at the preferred package of options. Infrastructure options that perform well, not only in relation to the connectivity study and transport strategy objectives, but also against all futures, implies a more resilient strategy.

- The formation of these alternative futures are distinct from the Transport Strategy and Local Economic Strategies future – the exercise was not designed to scope/re-scope this preferred future.

- The emerging Transport Strategy and local economic strategies future is the benchmark against which infrastructure scenarios will be tested.

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Stage 1: Driver Mapping

- The first stage in the development of the alternative futures is Driver Mapping. This process is drawn from ‘The Futures Toolkit’ by the Government Office for Science and aligns with the Department for Transport’s Transport Analysis Guidance (TAG) – ‘Uncertainty Toolkit’.

- Driver Mapping is used to identify the various political, economic, societal, technological, legislative and environmental drivers shaping the future environment. It is intended to:
  - Identify drivers shaping the future;
  - Identify which drivers are most important for the future; and
  - Identify which drivers are most uncertain in the future.

Workshop 1: Driver Mapping

- An online stakeholder workshop was held on 22 June to explore what attendees believe would drive changes in transport demand between today and 2050.

- Stakeholders were divided into groups and invited to assess a number of ‘external drivers’ which describe broad areas outside of the control of EEH which could have an impact on future transport outcomes in the EEH area.

- There are a number of areas where EEH and its partners are defining policy and strategy which envisions specific future outcomes. The planned direction of travel for these outcomes are established, either through legally-binding requirements, regulatory frameworks or other policy arenas. Therefore, for the purpose of the EEH Alternatives Futures work, these will be assumed as established, and drivers related to these areas were not included in the driver mapping exercise.
  - Net zero carbon
  - Regional development (committed growth in Local Plans, following ‘trends’ of growth past plan period)
  - Regional economic development / industrial sectors (as set in the Arc Economic Prospectus)

- For the driver mapping exercise, stakeholders were encouraged to think about how the world could look in the long-term future – thinking beyond what is on the horizon now, and what could be of much more importance in the future.
- The drivers are listed on the following slide. All drivers except those in the ‘Anything else’ section were suggested by the project team, and stakeholders were invited to suggest additional external drivers that ought to be considered in the development of alternative futures.

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‘External Drivers’

Theme	#	Driver	Detail
Economy	A	**Covid-19 recovery pathway**	Medical resolution pathway to current health crisis
	B	**Economic shocks**	Degree of economic stability nationally and regionally e.g Covid-19, Brexit, trade wars, globalisation/isolationism
	C	**Robotics/AI in industry**	Extent of automation effects on employment.
	D	**Demographics**	Changes in migration patterns and age profiles
Policy	E	**Government spending**	Extent of public expenditure on local/regional authorities and infrastructure
	F	**How we pay for transport**	Forms of payment for consuming mobility including distance or tax-based.
	G	**Last-mile connectivity**	Local transport plans/strategies and degree of connectivity beyond the private car
Environment	H	**Attitudes to the environment**	Degree of support for protection of the natural environment
Technology	I	**Health technology**	Improvements in medicine and healthcare
	J	**Automation in transport**	Change in share of manually controlled motor vehicles
	K	**Clean transport technology**	Rate of diffusion of lower carbon transport technologies
	L	**New transport modes**	Changing modal mix of mobility with new modes entering the industry (e-scooters, hyperloop, ?)
Attitudes	M	**Attitudes to health**	Importance of addressing public health individually and collectively
	N	**Attitudes to shared mobility**	Willingness to share journeys and reduction in vehicle ownership
	O	**Changes in working patterns**	Extent of flexible working and its effects on commuting.
	P	**Changes in remote activities**	Degree that remote activities increase/decrease over face-to-face (business, leisure, retail, education)
Energy	Q	**Energy prices**	Oil, gas and electricity wholesale cost changes
	R	**Data and connectivity**	Communications technology and influence of data/networks on service delivery
Anything else?	S	**Social structure/inequality**	
	T	**Attitudes to diversity**	
	U	**Place design/placemaking**	
	V	**Environmental policy and protection**	
	W	**Policy and planning delivery**	
	X	**Attitudes to carbon**	
	Y	**Attitudes to radical change**	

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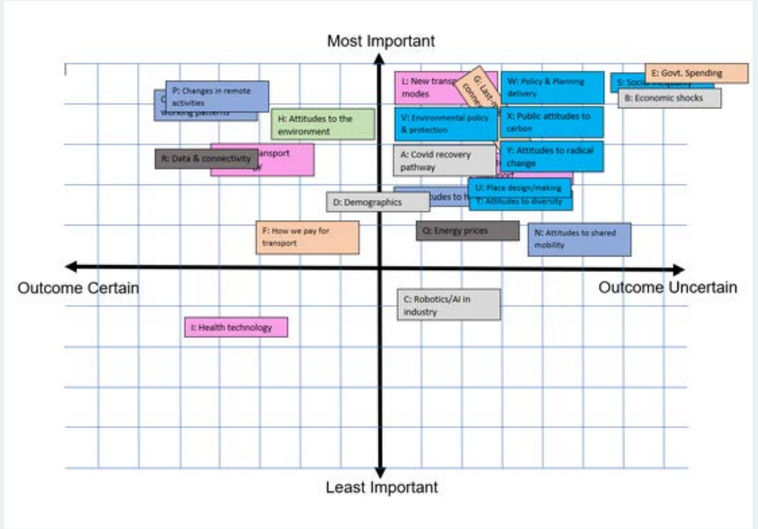
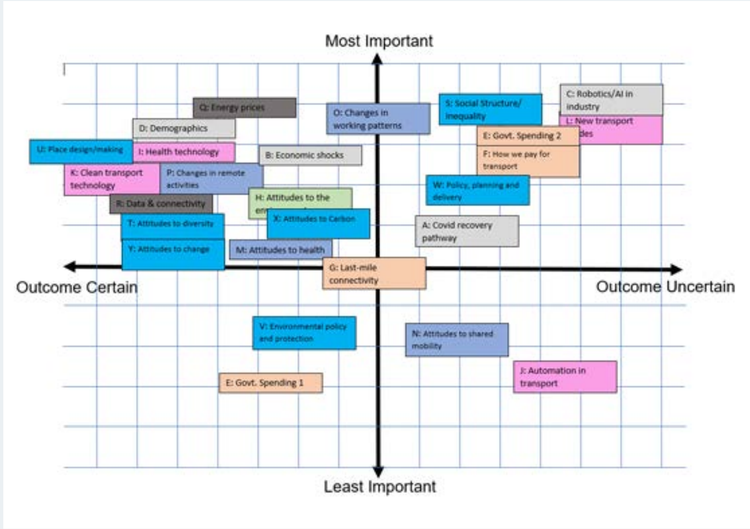
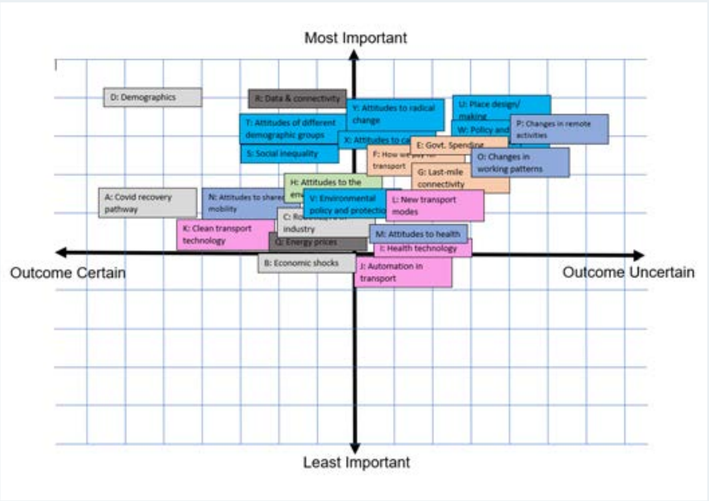
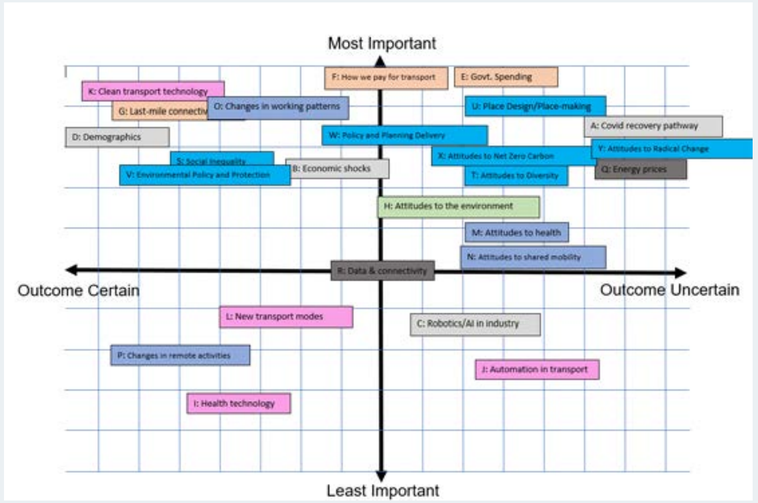
Workshop 1: Driver Mapping Outputs

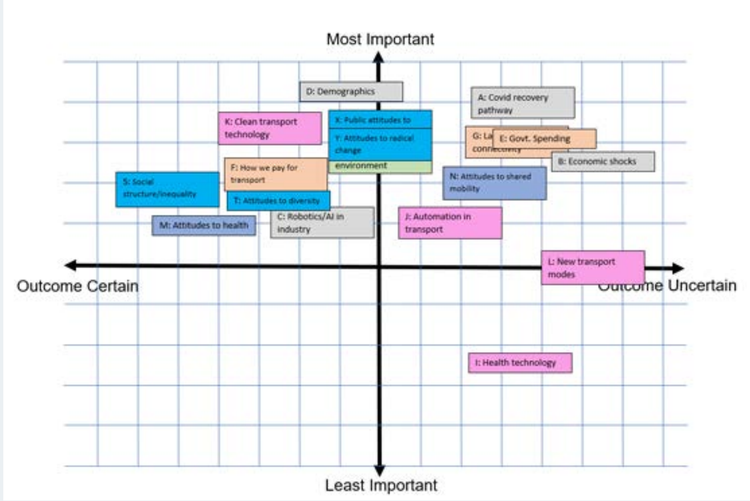
- In breakout rooms, and using the axis shown in the figures, stakeholders discussed and agreed where each driver should be placed, assessing each driver's importance and level of certainty in the future.
- The figures show the output from each breakout group. Not all groups completed this exercise, and so those drivers not mapped have been removed from the figures.







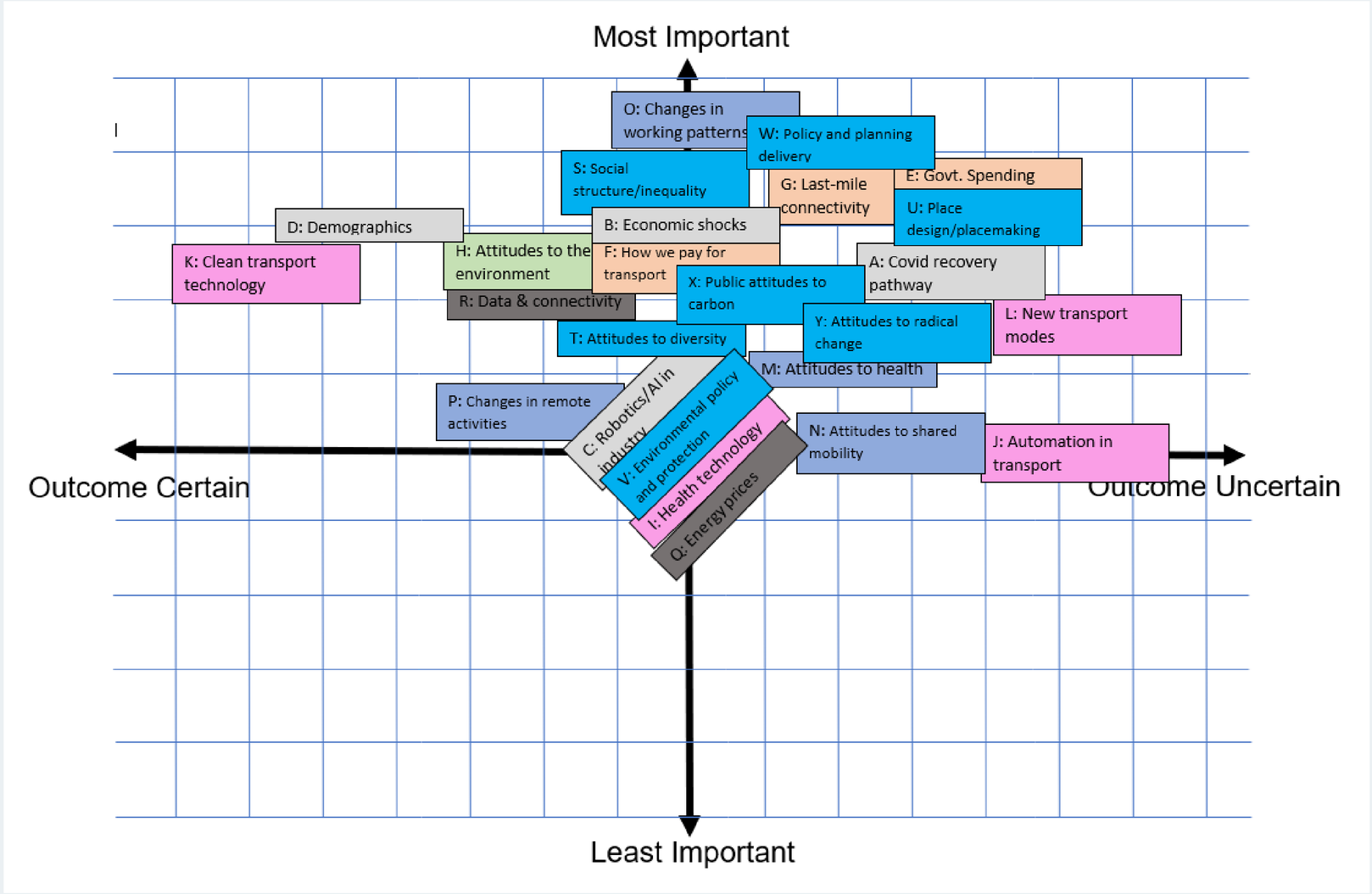




Workshop 1: Driver Analysis

- Based on the Workshop 1 outputs presented on the previous slide, Steer collated all drivers on to one axis, taking an ‘average’ across the outputs from the five groups.

- These were then grouped into three categories, as presented on the following slides:
  - Higher importance / Uncertain
  - Higher importance / Certain
  - Lower importance



Stage 2: Cluster Analysis

- The drivers that were grouped under each of the three categories, based on their location on the axis, is presented in the table below.
- The project team then considered which drivers naturally progress with one another, and focussed primarily on those assessed as *higher importance* and *uncertain* to develop suggested alternative futures.

Higher Importance and Uncertain	Higher Importance and Certain	Lower Importance
A: Covid recovery pathway	D: Demographics	J: Automation in transport
B: Economic shocks	H: Attitudes to the environment	N: Attitudes to shared mobility
E: Govt spending	K: Clean transport technology	C: Robotics/AI in industry
F: How we pay for transport	P: Changes in remote activities	I: Health technology
G: Last mile connectivity	R: Data and connectivity	Q: Energy prices
L: New transport modes	T: Attitudes to diversity	V: Environmental policy and protection
M: Attitudes to health		
O: Changes in working patterns		
S: Social structure/inequality		
U: Place design/placemaking		
W: Policy and planning delivery		
X: Attitudes to carbon		
Y: Attitudes to radical change		

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Stage 2: Cluster Analysis

- The table below presents the outputs of this consideration. It can be seen that some of those drivers assessed as certain and/or lower importance (drivers K, R, J and N) were included within one of the groupings. The project team considered that these drivers sit naturally with drivers F and L, and had the potential to form a plausible alternative future that ought to be considered by the stakeholders in the second workshop.

Higher Importance and Uncertain	Higher Importance and Certain	Lower Importance
A: Covid recovery pathway	D: Demographics	J: Automation in transport
B: Economic shocks	H: Attitudes to the environment	N: Attitudes to shared mobility
E: Govt spending	K: Clean transport technology	C: Robotics/AI in industry
F: How we pay for transport*	P: Changes in remote activities	I: Health technology
G: Last mile connectivity	R: Data and connectivity	Q: Energy prices
L: New transport modes	T: Attitudes to diversity	V: Environmental policy and protection
M: Attitudes to health		
O: Changes in working patterns		
S: Social structure/inequality		
U: Place design/placemaking		
W: Policy and planning delivery		
X: Attitudes to carbon		
Y: Attitudes to radical change		

* Sits in two alternative futures

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Stage 2: Cluster Analysis – Alternative Futures

- The output of the cluster analysis was four plausible alternative futures, plus an additional set of drivers that will be important and certain across all futures. These are presented below.
- The formation of these alternative futures are distinct from the Transport Strategy and Local Economic Strategies future – the exercise was not designed to scope/re-scope this preferred future.

Slow Recovery	High Policy Impact	Radical Social Change	High Tech	All Alternative Futures
A: Covid recovery pathway	E: Govt spending	X: Attitudes to carbon	F: How we pay for transport*	D: Demographics
B: Economic shocks	W: Policy and planning delivery	Y: Attitudes to radical change	J: Automation in transport	H: Attitudes to the environment
O: Changes in working patterns	L: New transport modes	M: Attitudes to health	N: Attitudes to shared mobility	K: Clean transport technology
	U: Place design/placemaking		K: Clean transport technology	P: Changes in remote activities
	S: Social structure/inequality		R: Data and connectivity	R: Data and connectivity
	F: How we pay for transport*			T: Attitudes to diversity
	G: Last mile connectivity			

* Sits in two alternative futures

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Stage 3: Impact of each alternative future on transport

- Each alternative future was then considered against the six criteria presented in the table below. The project team considered how demand and mode share proportions for transport modes may vary from the business as usual case under each of the futures.
- The results of this analysis for the five alternative futures is presented here, and the key is provided below. This was presented to the stakeholders during Workshop 2.

Alternative Future		Transport demand	Proportion using public transport	Proportion using active modes	Proportion using private motor vehicles	Proportion using new mobilities	Digital replacement of real-world activity
0	BAU	●	●	●	●	●	●
1	Transport Strategy	-	+++	+++	--	+++	++
2	Slow Recovery	--	--	-	--	-	-
3	High Policy Impact	+ / ●	++	+ / ++	- / ●	++	+
4	Radical Social Change	-	+ / ●	+++	---	+	++
5	High Tech	+ / ++	-	-	++	+++	+++

● in line with BAU

\- lower than BAU

\+ higher than BAU

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Stage 3: Impact of each alternative future on transport

- During the stakeholder workshop there was a discussion on suggested alterative futures. It was decided that the *High Policy Impact* future could be merged with the *Radical Social Change* future as one is unlikely to be a scenario without the other (i.e. there is a need for a shift in public thinking, as well as spend, regulation and policy direction). The results of the assessment when the two are merged is presented below.

Alternative Future		Transport demand	Proportion using public transport	Proportion using active modes	Proportion using private motor vehicles	Proportion using new mobilities	Digital replacement of real-world activity
0	BAU	●	●	●	●	●	●
1	Transport Strategy	-	+ + +	+ + +	- -	+ + +	+ +
2	Slow Recovery	- -	- -	-	- -	-	-
3	Radical Change	-	+ +	+ + +	- - -	+ +	+ +
4	High Tech	+ / + +	-	-	+ +	+ + +	+ + +

● in line with BAU

\- lower than BAU

\+ higher than BAU

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Workshop 2: Activity

- During Workshop 2 stakeholders were split into four breakout rooms, and each group was allocated one alternative future scenario to consider.
- Groups were asked to considered how each of the drivers grouped under the Higher Importance / Uncertain and Higher Importance / Certain categories perform under the allocated scenario. The facilitator for each group noted down the discussion points and provided a summary of discussion to the wider group.
- The outputs were collated by the project team to develop narratives for each alternative future (including the likely travel demand and behavioural patterns). These are summarised on the following slides.

Higher Importance / Uncertain

Driver	Impact on driver
A: Covid recovery pathway	
B: Economic shocks	
E: Govt spending	
F: How we pay for transport*	
G: Last mile connectivity	
J: Automation in Transport	
L: New transport modes	
M: Attitudes to health	
O: Changes in working patterns	
S: Social structure/inequality	
U: Place design/placemaking	
W: Policy and planning delivery	
X: Attitudes to carbon	
Y: Attitudes to radical change	

Higher Importance / Certain

Driver	Impact on driver
D: Demographics	
H: Attitudes to the environment	
K: Clean transport technology	
P: Changes in remote activities	
R: Data and connectivity	
T: Attitudes to diversity	

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Alternative Future: Radical Change

High government spend is coupled with a radical change in policy, directed to support a shift in public attitudes towards health and carbon and accelerate progress towards achieving net zero carbon ambitions ahead of the EEH 2040 ambition (against the backdrop of the 2050 national government target). A resilient economy has supported a fast Covid19 recovery and government spending priorities include Transport Strategy objectives, with improvements for last mile connectivity and new modes, including shared / micro mobilities and digital demand responsive transport. Automated vehicles are less of a priority, with policy and regulations behind compared to a high-tech world. Users pay for their travel fully accounting for all externalities, including carbon emissions and road space usage, and payment is fully integrated across modes. Place-making is at the heart of local policy and planning decisions, with reclamation of road space, pedestrianization and environmental, social and health outcomes prioritized over purely economic ones.

Driver	Summary
E: Govt spending	Achievement of Transport Strategy objectives is enabled by prioritisation or increase in spending.
F: How we pay for transport*	Integrated payment systems across modes for users. Cost set to encourage usage of modes with better environmental, social and health outcomes – at a minimum fully accounting for any carbon / negative externalities of each mode.
G: Last mile connectivity	Increased use of sustainable options, enabled through increased funding – on demand, integrated and seamless options.
L: New transport modes	Increased use of shared and micro mobilities, and digital demand responsive transport.
M: Attitudes to health	Increased awareness leading to behavioural change and more successful outcomes.
U: Place design/ placemaking	Revitalisation of town centres and improved connectivity to new developments. Integrated planning – “15 minute neighbourhoods”.
W: Policy and planning delivery	Strong policy environment with funding to match.
X: Attitudes to carbon	Support for acceleration of net zero carbon ambition.
Y: Attitudes to radical change	Support radical change and spending directed appropriately to support this.

Alternative Future: High-tech

Public and government attitudes to technology and technological change are very positive. An acceptance of a hybrid model of working, locking in the benefits of home working, leads to a lower overall and peak travel demand. With less need to travel, private car ownership reduces, and individuals seek alternative shared, on-demand and convenient options. Public and private sectors work collaboratively to respond to changing travel trends with new, innovative and inclusive transport options emerging, such as CAVs. The necessary policy, regulation support, and investment to encourage and advance the pace of the shift to clean transport technology, automated vehicles and shared mobility leads to increased demand and capacity for both private and shared road transport options. Meanwhile, traditional public transport modes such as bus and rail decline. Strong national policy and supporting regulation leads to differentiated per-km charges for road space usage.

Driver	Summary
F: How we pay for transport*	Integrated payment systems across modes for users. Cost dependent on carbon / negative externalities of a given mode.
J: Automation in transport	Advanced policy and regulatory environment supports automation for users and freight.
N: Attitudes to shared mobility	Mobility as a Service is widely adopted, with individuals seeking on-demand shared mobility over private vehicle ownership.
K: Clean transport technology	Policy and regulatory environment is supportive of clean transport modes.
R: Data and connectivity	Methods to overcome potential barrier to sharing data to encourage uptake. Advancement in MaaS provides opportunities to collect and use data.

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Alternative Future: Slow recovery

With a slower return to the pre-Covid19 business-as-usual and an economy vulnerable to external and internal economic shocks, there will be a prolonged period of working from home / hybrid working and subsequently, a continuation of fewer journeys for all trip types, across all modes. This will be particularly true for peak travel demand and for private vehicle trips due to wage stagnation/unemployment. Affordability will impact on social structure, with transport choice being removed for some individuals due to the cost being disproportionate to income. For journeys that are required (e.g. to access employment), there will be increased reliance on public transport and active modes. The impacts of Covid19 on retail trips will continue, with a reliance on home delivery services. There will be less focus on new transport modes, automation of transport and last mile connectivity under this scenario due to the lack of funding to create policy, invest, and incentivise change (though there may be some potential for increased use of new low cost modes such as e-scooters).

Driver	Summary
A: Covid recovery pathway	Slow recovery due to new variants emerging, resistant to the vaccine, and vulnerability of the economy more generally to external and internal economic shocks. Home working is the norm, causing lower travel demand, particularly in the peak. Increased reliance on home delivery services.
B: Economic shocks	Vulnerable economy with expected national and global economic downturn. Rising unemployment, stagnant wages and increased cost of travel works to lower travel demand, particularly private vehicle trips, and public transport. Increased reliance of low cost modes for necessary trips.
C: Changes in working patterns	Home working continues for several sectors and there is an increased degree of flexibility for working hours.

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Alternative Future: Business as usual

Driver	Summary
A: Covid recovery pathway	Following period of low public transport demand, peak demand returns in short-medium term post Covid19.
B: Economic shocks	Following period of reduced overseas travel, in the short-term medium term travel demand returns to pre-Covid19 level.
E: Govt spending	Unfocussed government spending and lack of clear and consistent policy on sustainable transport across geographies. Funding available is focused on larger authorities.
F: How we pay for transport	Increased public transport fares and fuel prices reduce transport affordability.
G: Last mile connectivity	A continued gradual shift towards sustainable modes, no acceleration in pace, with individuals still reliant on private car.
J: Automation in transport	Slow shift, no acceleration in pace. Pace more advanced for freight purposes.
L: New transport modes	Public resistance to new modes causes a slow shift to new modes. No acceleration in pace. Pace more advanced for freight with continued uptake of cargo bikes, and smaller, more efficient vehicles.
M: Attitudes to health	Aspects of health, primarily air quality, increasingly a driver in policy and public attitudes.
N: Attitudes to shared mobility	Younger generations more open to shared mobility. Demand responsive transport is being trialled.
O: Changes in working patterns	Hybrid model is developed for some sectors where appropriate. Flexible working patterns are more widely accepted. Number of business trips reduced compared to pre Covid19 world.
S: Social structure/inequality	Transport poverty increased due to increased fares and fuel prices. A level of digital inequality.
U: Place design/placemaking	Some shift towards improved place design, e.g. healthy streets, with increased less focus on motor vehicles and more focus for other road users.
W: Policy and planning delivery	Shift towards green policy, but with continued disconnect between high level political drivers and local change.
X: Attitudes to carbon	Some positive shift, but not sufficient to achieve net zero ambitions within strategy timescales.

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