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Transport East

70099686

TRANSPORT EAST EV:READY

Final Report

Report contents

TRANSPORT EAST

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Introduction

WSP was appointed by Transport East and England's Economic Heartland (EEH) to provide an interactive and bespoke tool that shows predicted electric vehicle (EV) uptake and electric vehicle charge point (EVCP) requirements for a number of scenarios across the region.

The EV model and associated analysis is to cover the entire Transport East and EEH region, covering analysis in the following areas for car (and excludes light and heavy goods vehicles):

- **Opportunity to shift modes** – which car trips within the South East Regional Transport Model (SERTM) could switch to active and sustainable travel. This has wider applications, as it could support the development of Local Transport Plans (LTPs), active and sustainable transport investment programmes. It also ensures that the EV advice is grounded within the wider transport decarbonisation opportunity.
- **EV analysis to estimate EV uptake across the region up to 2050** – which will inform the number, type and location of charge points.
- **EVCP requirements forecast across the region up to 2050** – combining EV charging demand and supply forecasts, to predict when, where, how and what type of charges will be required.
- **Bespoke interactive tool** – presentation of the findings of EVReady hosted on a PowerBI dashboard, with ArcGIS Online functionality, to be hosted by Transport East

This report summarises the key findings from the analysis. After the introductory section, the report is structured according to the research areas.

This project is part of a joint venture between Transport East and England's Economic Heartland. This joint approach was undertaken due to the commonalities of the two regions, and their close relationship, not just in terms of transport approaches, but also geographically, with east-west links a key focus for the two regions.

The report has been split into two versions, one for Transport East, and one for England's Economic Heartland. This approach was decided in order to properly highlight the respective situations and needs within each region with further detail.

This version covers the Transport East region, with more detail for the Local Transport Authorities within the region.

The Opportunity to Shift Modes section still covers the whole region.

Methodology

OPPORTUNITY TO SHIFT MODE ANALYSIS

Outputs from the South East Regional Transport Model (SERTM) were used to identify a representative sample of journey origins and destinations in the area.

The trip matrices were run through Google's Directions Application Programming Interface (API) to provide real-world transport route options for each journey, to produce network distance and journey time per mode (walking, cycling, public transport and driving).

From this, maps of areas recording a large demand for each mode, considering first mile and last mile sections for public transport, were produced.

Additional analysis was undertaken to identify areas where more sustainable modes are competitive with driving, and quantified these figures with Passenger Car Units (PCU) and Vehicle Kilometres Travelled (VKT) to understand the impact that this could have on net-zero goals.

EV UPTAKE FORECAST

WSP's EV:Ready tool was used to estimate EV uptake forecasts for higher and lower uptake scenarios for years up to 2050 throughout the study area.

The model uses baseline Department for Transport EV registration data in addition to consumer segmentation analysis with Experian Mosaic (2022) and Census (2011) to calculate expected Electric Vehicle numbers.

The tool first assesses the baseline situation of the region, in terms of existing EV ownership, existing EVCPs, and further information shown below.

This feeds into an analysis of UK EV sales trends up to 2050, which looks at past sales trends, and industry forecasts – based on weighting National Grid's Future Energy Scenarios to determine a low and high UK EV uptake curve.

Then an upper and lower bound of likely EV growth scenarios are developed, taking into account the opportunity to shift modes work, which then leads to the EV uptake forecast specific to hexagonal shaped cells throughout the study area, with cells being 400m by 400m.

Hex cells have been used for all of the plots showing geographical representations of the inputs and outputs of the EV: Ready tool in this report to minimise the ambiguity caused by links travelling along cell edges or through corners joining multiple cells. This normalises the different data sets across the study area and allows for easier comparison.

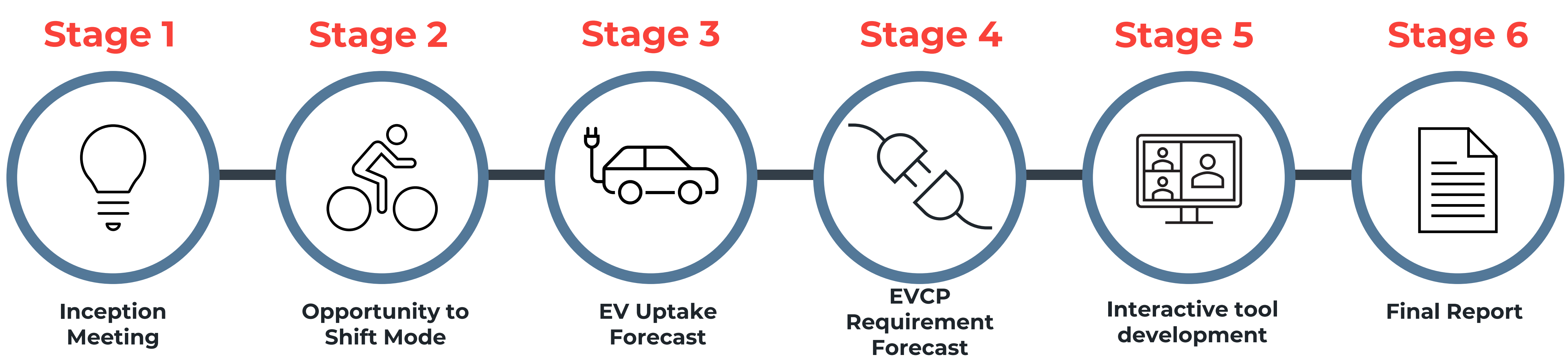
EVCP REQUIREMENTS FORECAST

EV:Ready's Electric Vehicle Charge Point module was run, to generate forecasts for EVCP requirements to 2040.

This forecast was developed following an assessment of EV charging demand based on forecasted mileages and efficiencies of the expected EV and PHEV fleet. EV charging supply forecasts were also made by looking at expected en-route, origin and destination charging, which all have different requirements:

- **En-route charging supply** is assumed to be reliant on SERTM vehicle demand on links along with the distribution of spare grid capacity. The latter assumption is particularly important when considering the feasibility of charging close to strategic links where electricity supply may be confined to specific points.
- **Origin charging supply** is assumed to be distributed according to EV-uptake, reliance on on-street parking, spare grid capacity and SERTM trip demand by origin.
- **Destination charging supply** is assumed to be distributed according to modelled vehicle flow by link, spare grid capacity, relevant land use, and SERTM trip demand by final destination.

From this, the EVCP requirements forecast is created providing detail on when, where, how and what type of charges will be required. This provides the region with an indication of where charge points should be prioritised for installation in the medium-term.



Opportunity to shift modes

WHICH CAR TRIPS COULD BE MADE BY ACTIVE AND SUSTAINABLE MODES?

Before thinking about likely EV uptake, it is worth understanding which existing car trips could be made by active and sustainable modes (walking, cycling and public transport). Using transport model trip matrices and data from Google Maps, we have analysed the origins and destinations of all trips within Transport East and England's Economic Heartland to understand trips which could be:

- Walked (based on travel time)
- Cycled (based on travel time)
- Completed by public transport (based on a travel time comparison with car)

From this analysis, we have developed two scenarios, described in the table opposite.

- Scenario 1: High mode shift – which has ambitious thresholds for trips to be made by sustainable modes as set out in Gear Change. These thresholds were agreed with the client based on 2020 DFT travel to work data.
- Scenario 2: Lower mode shift – which has a more conservative set of journey time limits for trips to be made by sustainable modes to achieve a 15-20 minute neighbourhood (as agreed with the client).

Scenario	Car trips that could be walked	Car trips that could be cycled	Car trips that could be done by public transport
Scenario 1 (High mode shift)	**URBAN** Under 2 miles / 3.2 km / **40 mins**	**URBAN** Under 5 miles / 8km / **30 mins**	Less than **2.4x** slower
	RURAL Under 1.5 miles / 2.4km / **30 mins**	**RURAL** Under 4 miles / 6.4km / **20 mins**	
Scenario 2 (Lower mode shift)	**URBAN** Under 1 mile / 1.6 km / **20 mins**	**URBAN** Under 3 miles / 4.8 km / **15 mins**	Less than **1.5x** slower
	RURAL Under 0.75 miles / 1.2km / **15 mins**	**RURAL** Under 2 miles / 3.2km / **10 mins**	

Opportunity to shift modes	Baselining	UK EV sales trends	Uptake scenario development	EV uptake forecast	EV demand forecast	EV supply forecast	EVCP requirements forecast
Which car trips could be made by active and sustainable modes?	*What is the baseline situation?*	*How might EV uptake increase into the future in the UK?*	*What are the likely EV growth scenarios going forward?*	*How might this translate into EV growth at a local level?*	*Where will there be the highest EV charging demand?*	*How attractive is the area for installing charge points?*	*When, where, how and what type of chargers will be required?*
Lower mode shift to achieve **15-20 minute neighbourhood**	Baseline EV ownership	EV sales trends	Opportunity to shift modes (lower & higher)	EV uptake by:	En-route demand and supply		Rapid charging
	Baseline vehicle ownership			Scenario	Destination demand and supply		Standard charging (slow & fast)
	Reliance on on-street parking			Year	Origin demand and supply		
	Wider fleet and vehicle turnover trends	National forecast growth in EVs	EV uptake (lower & higher)	Numbers of EVs			
Higher mode shift to achieve **Gear Change** (two and five miles)	Propensity of local populations to switch to EVs			Proportion of fleet			
	Current grid capacity						
	Existing car parks						

Opportunity to shift modes

OUR PROCESS

Opportunity to shift modes uses data from a range of sources to quantify the opportunity for current car trips to be shifted to sustainable modes. These sources include:

- Modelling outputs, recording the origins, destinations and daily trip numbers of car journeys across the study area.
- Google Maps data, giving the distance, duration and route shape for a sample of these modelled outputs.
- Government travel statistics and other research, which gives insight into how far people would be willing to travel by different modes.

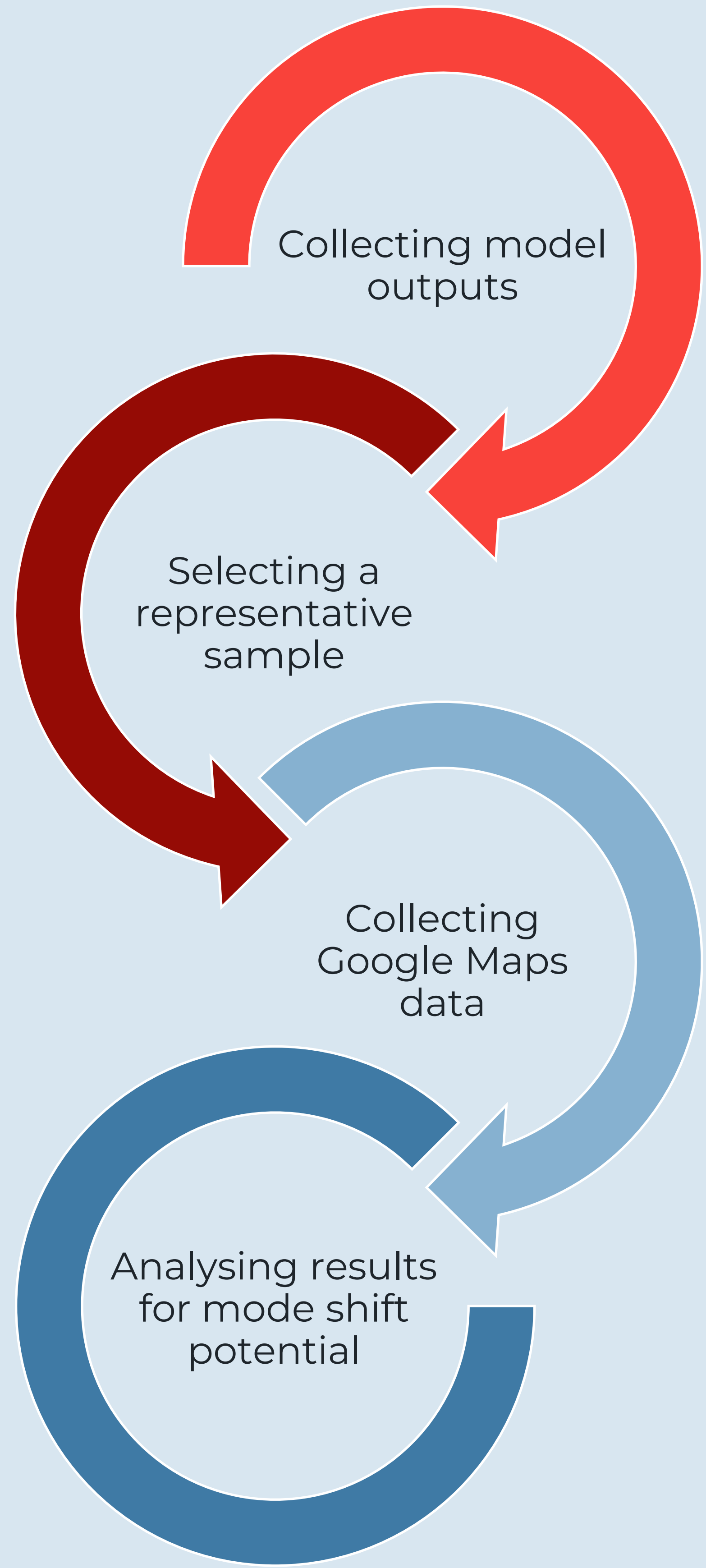
For the Transport East and England's Economic Heartland area, the SERTM model was used to obtain daily trip numbers by origin and destination (O-D pairs) in the model year 2031.

For the Transport East & EEH study area, there are 11.3 million trips (resulting in 222.7 million vehicle kilometres) across 11.3 million O-D pairs.

- 25% of these trips are internal trips within the same zone
- 32% of trips are <8km between zones
- 43% of trips are >8km between zones

The sample taken (which cover 92% of total inter-zone trips and 64% of vehicle kilometres travelled) were run through Google Maps Directions API to calculate possible trip routes and durations. This sample gives a good spatial coverage of the study area. There were 14% of trips between zones which were not assessed as part of the study because the large quantity of O-D pairs with small individual trip numbers made it unfeasible to test.

The results from Google Maps are then analysed and compared against the travel time thresholds for each mode and each of the two scenarios described on the previous page. This gives a figure for proportion of driving trips which could shift to public and active modes.



Opportunity to shift modes

SHORTER TRIPS WERE SELECTED TO STUDY

For Transport East, the SERTM model was used to obtain daily trip numbers by origin and destination (O-D pairs) in the model year 2031. From the model 92,711,378 trips were extracted, however, many of these trips had paths that fell entirely outside of the study area. As these were not relevant to this study, they were not analysed further. **Figure A1** shows the analysed trips.

To focus these trips only car trips which began in or finished in the Transport East region were extracted. In total, there were 11,388,219 trips and 186.6 million vehicle kilometres across 1,127,109 O-D pairs that fit this criteria.

Some of these trips were internal (i.e., they start and end within a single SERTM zone) and so details of their opportunity to shift modes was not possible to analyse.

The remaining trips were then divided into two groups: short and long, depending on whether it was realistic that they were taken by active modes or not. The threshold for this distinction was set at 8km.

10,000 O-D pairs were categorised as short trips and 1,117,000 were categorised as long trips. It was not practical to analyse all of the long O-D pairs and so a sample had to be taken. As a result, the 100,000 O-D pairs that had the highest number of trips were selected. The remaining O-D pairs accounted for a relatively small proportion of the total trips in the study area.

These sampled trips were run through Google Maps Directions API to calculate possible journey routes and durations.

The results from Google Maps were then analysed and compared against the travel time thresholds for each mode and each of the two scenarios described earlier. This gives an indication for proportion of driving trips which could shift to public and active modes.

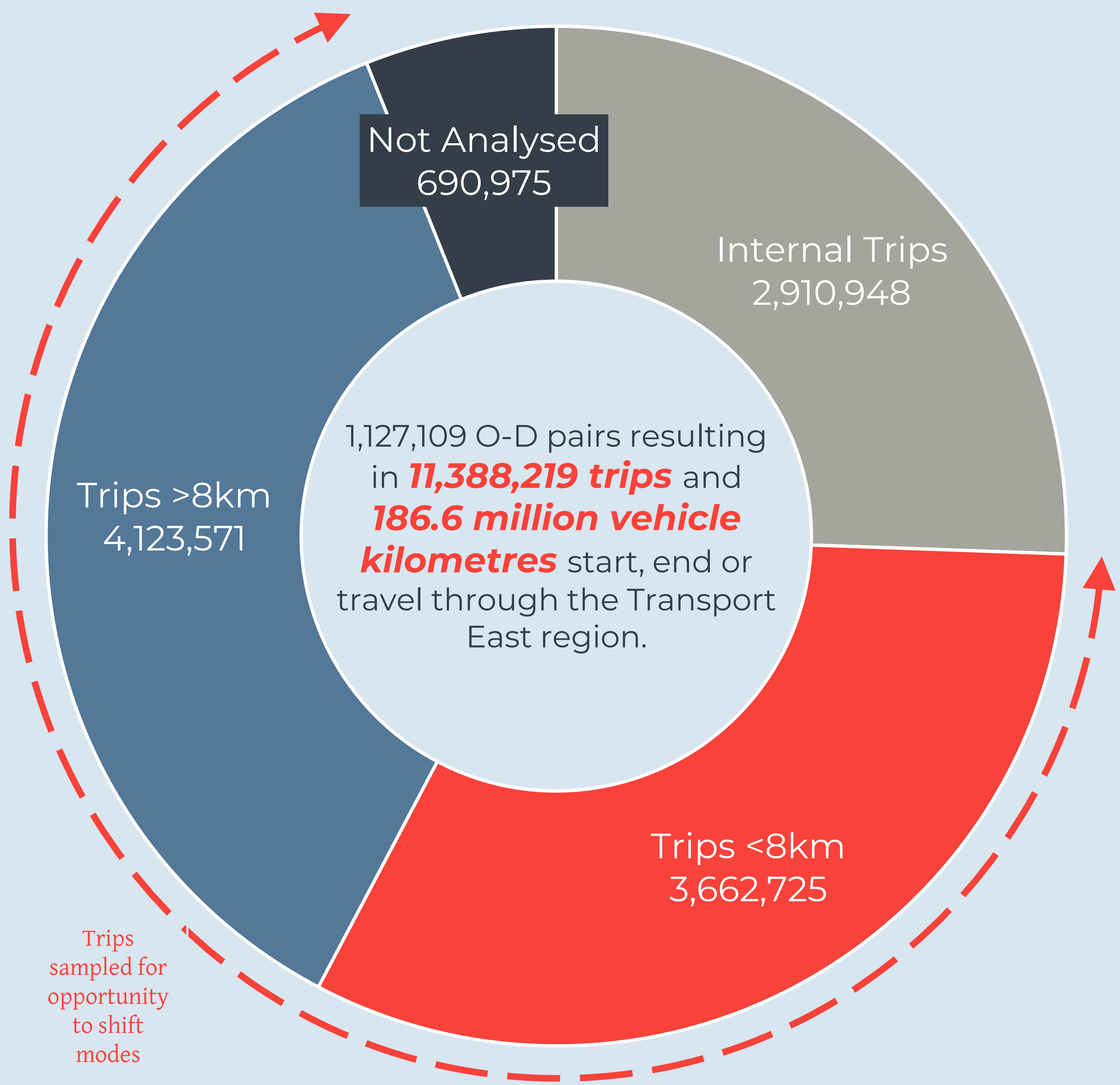


Figure A1: All trips modelled by SERTM which run through the Transport East study area. The selected sample of trips are shown in blue and red for >8km and <8km respectively.

Mode shift potential

WHAT IS THE MODE SHIFT POTENTIAL ACROSS TRANSPORT EAST AND EEH?

Figure A2 shows high and low mode shift potential for trips and vehicle kilometres travelled (VKT) within the study area.

25% of trips are identified as internal within the same zone. Based on the size of the zone analysed, 21% of trips are identified as short internal trips which are possible to be undertaken by active travel modes. The remaining 4% of internal trips are long and therefore more likely to be undertaken by other modes (i.e. public transport and driving).

Based on the analysed sample of data, Scenario 1 (High mode shift) shows that as many as **31% of trips could be shifted** from car to active or public transport. This includes a quarter of trips which are cyclable, demonstrating the large opportunity that bicycle travel uptake presents to support the decarbonisation of transport in Transport East and EEH regions.

Scenario 2 (Lower mode shift) presents a more modest 14% shift from cars to sustainable modes. This includes 11% of trips which could be cycled even given the shorter time threshold of 15 minutes (10 minutes rural).

When assessing mode shift potential by kilometres travelled, there is a larger proportion of kilometres which must be made by car than when measuring by trip numbers. Non-analysed car trips take up 31% of total trips within the study area.

Of analysed trips, 16% of vehicle kilometres could be shifted to sustainable modes in the high scenario, with just 4% for the low scenario. This demonstrates how a small number of longer trips can outweigh the large number of shorter trips when measuring vehicle kilometres. As VKT is proportional to carbon emissions, it is key to reduce car kilometres as well as car trips.

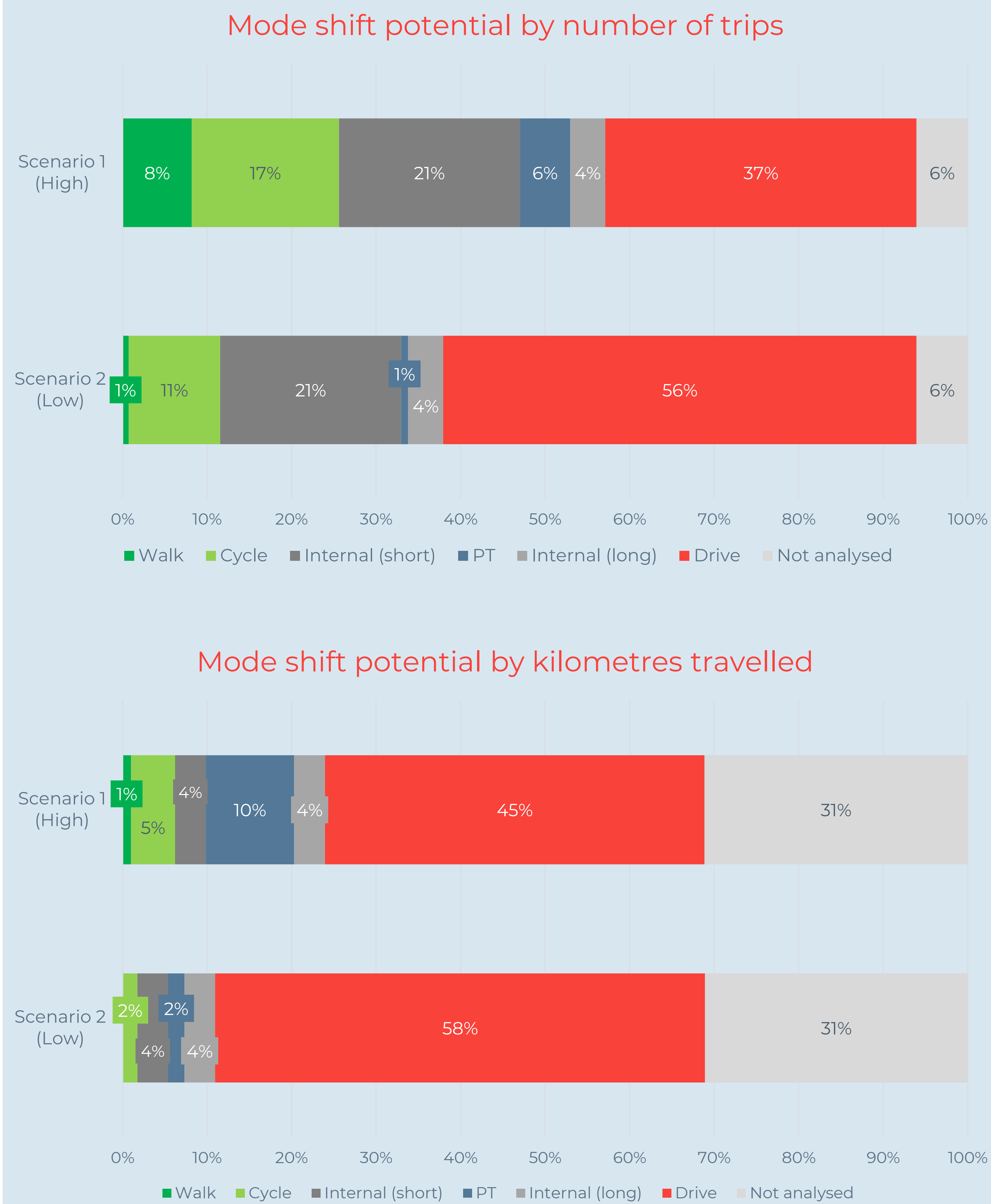


Figure A2: Mode shift potential (by number of trips and vehicle kilometres travelled)

Mode shift potential

WHAT IS THE URBAN RURAL SPLIT?

Mode shift potential in trip numbers for urban and rural areas is shown opposite in **Figure A3**. This assesses only shorter trips (<8km) between zones, which are trips that could possibly be walked or cycled.

There is a large divide between urban and rural areas regarding proportion of trips which can be shifted to sustainable modes. In the high scenario, **83% of trips could be shifted in urban areas**, but this figure is **only 19% in rural areas**. While walking can facilitate over a quarter of urban trips, the large distances in rural areas mean that a half hour trip can only carry a fraction of a percent of trips.

In the low scenario, car dependency in rural areas rises from 81% to 91%. Public transport holds only 1% of rural trips in the high and low scenarios, indicating that services are not competitive with driving.

Also to note, many shorter trips which may be possible by public transport are potentially cannibalised by active modes, especially in urban areas. In the high mode shift scenario, active travel accounts for 81% of trips with just 1% for public transport. However, the low mode shift scenario assigns a lower 62% of trips to active transport and a higher 3% of trips to public transport. Improved public transport services would pose a more competitive transport option when compared to driving, and help more trips not taken by active modes to be shifted from car.

One caveat to note is The Transport Accessibility Gap, and how it relates to high and low mode shift potentials. In the UK the transport accessibility gap currently stands at 38%, which means that disabled people (as defined under the Equality Act 2010) take 38% fewer trips than those without disabilities.

Figure A3: Mode shift potential among short trips (by number of trips) by Urban and Rural area

Mode shift potential

WHAT IS THE PT DRIVE SPLIT?

Mode shift potential in trip numbers and VKT is shown opposite in **Figure A4**. This assesses only longer trips (>8km) as these are trips that are very likely to be made by public transport or car.

This analysis shows that even with the high mode shift scenario's threshold of PT journey times being as much as 2.4 times slower than driving, and without competition from active modes, **only 14% of trips could be shifted to public transport**. The lower mode shift scenario, of 1.5 times slower than the equivalent journey by car, sees just 2% of trips having the potential to shift from car to public transport.

Comparatively public transport appears better, when assessing by vehicle kilometres, with the potential to shift 19% of trips by VKT from car in the high scenario and 4% in the low scenario. This reflects particularly how rail is an efficient long-distance mode.

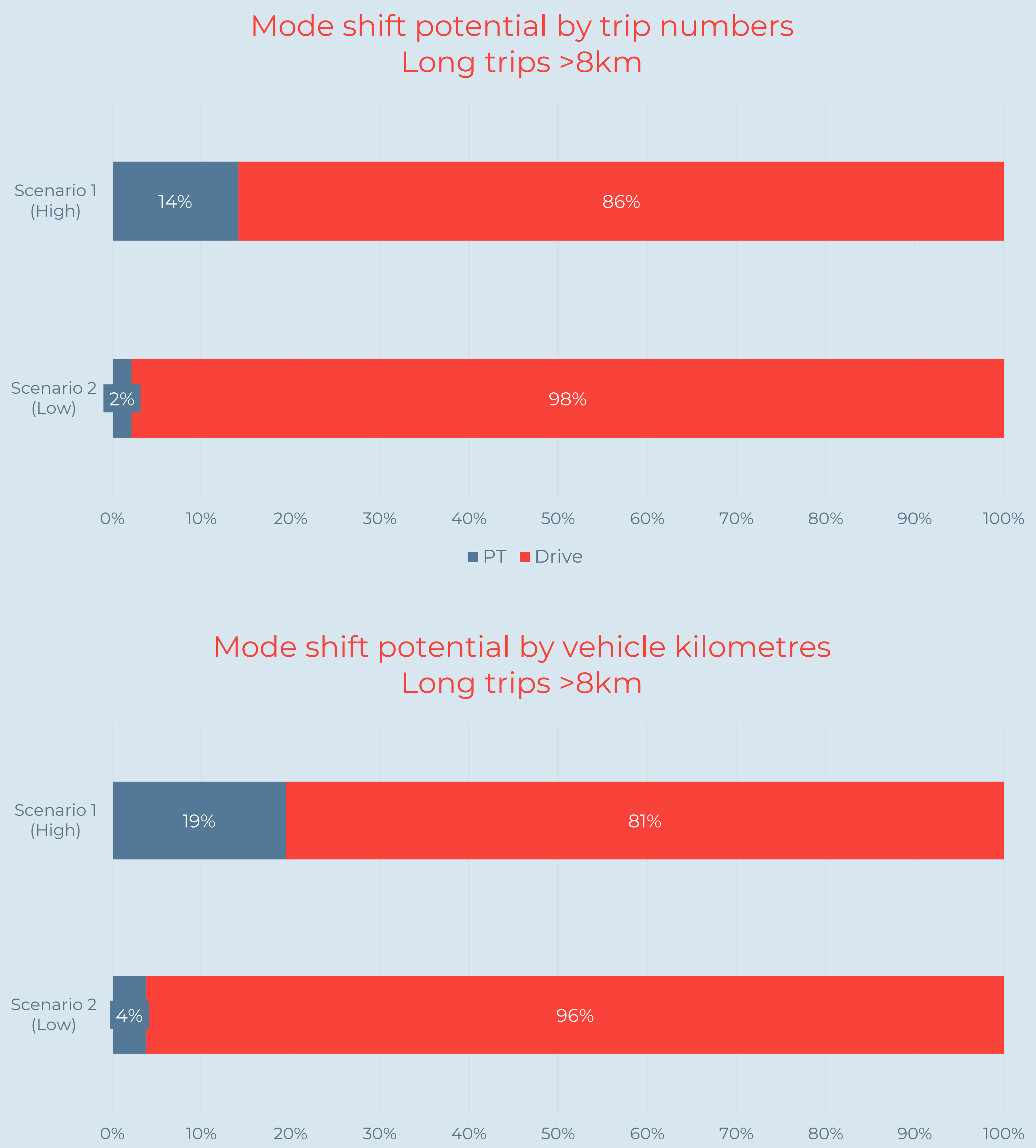


Figure A4: Mode shift potential among long trips (by number of trips and vehicle kilometres travelled)

Mode shift potential

CARBON EMISSIONS REDUCTION

The carbon emissions potential for the two scenarios is shown opposite in **Figure A5** for Transport East and EEH combined.

Across the region's total 8,477,270 daily inter-zone trips, there were 35,621 tonnes of CO_2e emissions daily in the baseline scenario.

The results of this analysis show that under Scenario 1 (High mode shift), **15% of baseline emissions could be removed** by mode shift towards walking, cycling and public transport. This equates to 5,405 tonnes of CO_2e per day. Scenario 2 can reduce 4% of emissions (1,494 tonnes).

When presenting as a percentage of only analysed trips, these numbers rise to 23% and 6% carbon reduction for the respective scenarios.

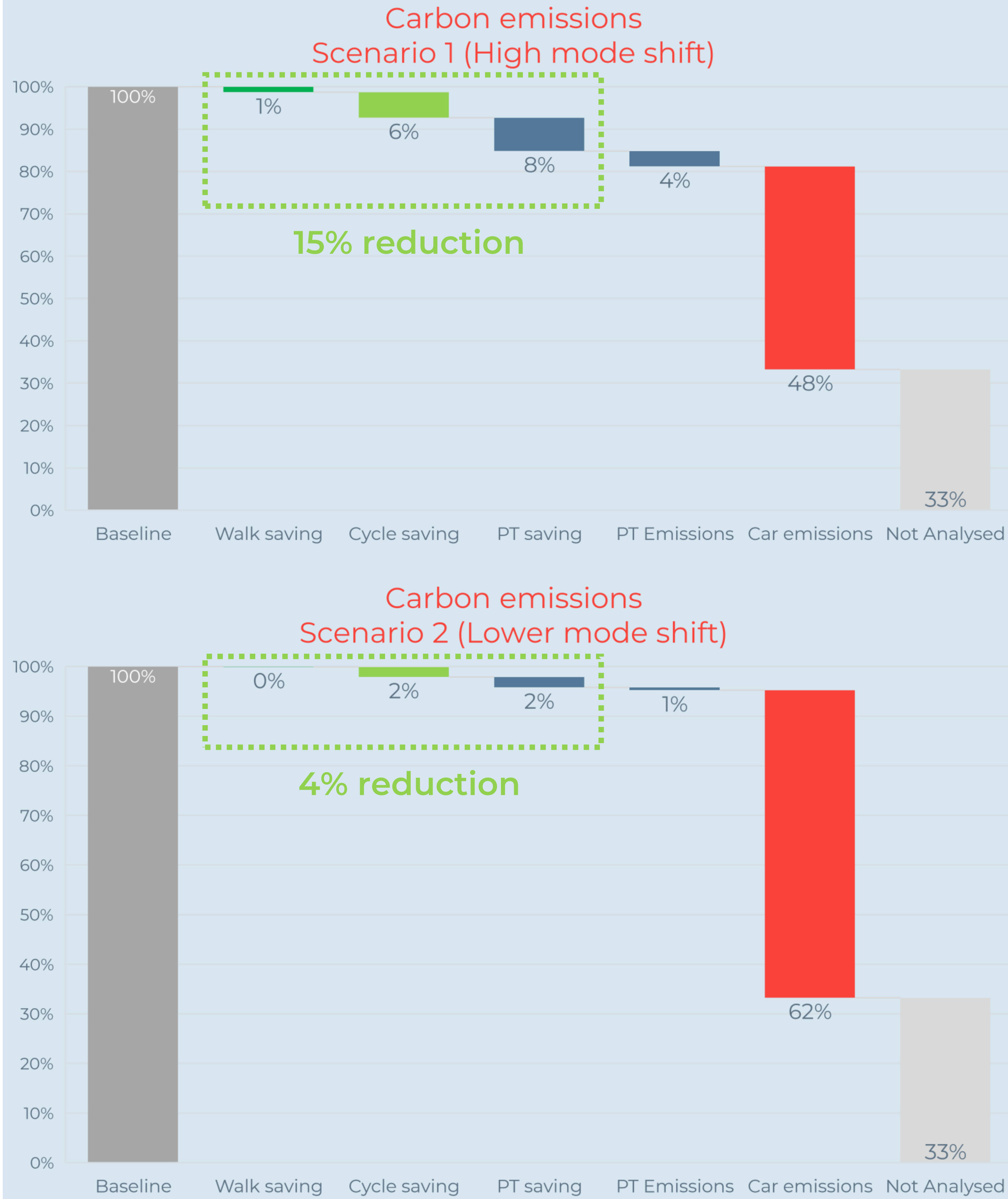


Figure A5: Carbon emissions and saving potential by scenario (measured in CO_2e)

Mode shift potential

APPROACH DETAILS

Table A1 shows the trip, people kilometre and CO_2e figures calculated for this analysis.

Data source

SERTM produced origins and destinations (O-D) with trip numbers of all journeys in the forecast year 2031. For internal trips, distance was estimated based on zone area.

Google Maps Directions API was used to source route options, lengths and durations for each mode (walking, cycling, public transport and driving) for each O-D pair. For public transport, a journey arrival time of 9am on a Tuesday has been applied.

Pre-processing

For Transport East & EEH there were 11.3 million trips and 222.7 million vehicle kilometres (VKT) total across 11.3 million O-D pairs. 26% of these trips are internal trips within the same zone. 32% of trips are under 8km and were processed with Google Maps. Out of the remaining longer trips, 86% were also selected to run through Google Maps. This results in a sample covering 92% of total inter-zone trips and 64% of VKT, giving a good spatial coverage of the study area.

Methodology

Using Google Maps outputs, each O-D pair's travel time was compared between modes to identify where trips were walkable and cyclable. Trip numbers by mode were calculated for each scenario. VKT and carbon emissions were calculated using the journey distance by mode and UK Government carbon factors.

While this approach is data-driven and based on evidence as much as possible, it should only be viewed as a high-level picture of mode shift opportunity. While trip distance is a major factor in choice of mode, other factors are not considered by this approach, including peoples' propensity and attitudes to shift modes; their ability to walk and cycle; their ownership of a bike; the quality of infrastructure and public transport services; and aspects such as safety and comfort which people may value when they select transport modes.

Scenario	Internal Trips	Walk	Cycle	PT	Drive	Not Analysed
Baseline			**None**		**All**	
Trips	2,910,948 26%	0	0	0	7,786,297 68%	690,973 6%
People km	16,141,521 (estimated) 7%	0	0	0	137,220,712 62%	137,220,712 (estimated) 31%
Tonnes CO_2e	N/A	0	0	0	23,419	11,841 (estimated)
1: High mode shift		**40 mins or less**	**30 mins or less**	**PT if less than 2.4x slower than drive**		
Trips	2,910,948 26%	933,073 8%	1,983,279 17%	676,121 6%	4,193,824 37%	690,973 6%
People km	16,141,521 (estimated) 7%	2,253,473 1%	11,600,198 5%	23,339,393 10%	100,027,649 45%	69,379,882 (estimated) 31%
Tonnes CO_2e emissions; percentage of baseline	N/A	0	0	1,303 4%	17,071 48%	11,841 (estimated) 33%
Tonnes CO_2e savings; percentage of baseline	N/A	-466 1%	-2,145 6%	-2,794 8%	0	N/A
2: Lower mode shift		**20 mins or less**	**15 mins or less**	**PT if less than 1.5x slower than drive**		
Trips	2,910,948 26%	82,425 1%	1,233,453 11%	93,613 1%	6,376,806 56%	690,973 6%
People km	16,141,521 (estimated) 7%	114,677 0%	3,830,289 2%	4,363,092 2%	129,360,356 58%	69,379,882 (estimated) 31%
Tonnes CO_2e emissions; percentage of baseline	N/A	0	0	208 1%	22,077 62%	11,841 (estimated) 33%
Tonnes CO_2e savings; percentage of baseline	N/A	-25 0%	-725 2%	-743 2%	0	N/A

Table A1: Trip figure summary by scenario

Public Transport Compared with Driving

THE AVERAGE TRIP IN THE STUDY AREA IS AROUND FOUR TIMES SLOWER BY PUBLIC TRANSPORT

In the study area, a total of 604,609 trips (7.8%) and 18,794,370 vehicle kilometres (13%) cannot be made by public transport in any amount of time, according to Google Maps with an arrival time of 9am on Tuesday.

Of the remaining trips, they take an average of 3.9 times the travel time of driving to be completed by public transport (**Figure A6**).

Longer trips lead to higher VKT levels, so when weighted by kilometres, the average trip takes 4.0 times the PT journey time.

Around 94% of trips (6,727,458) take more than double as long by public transport as by car. Only 1.4% of trips (101,692) take less than 1.5 times drive time. Just 0.1% of trips (8,900) have journey times which are faster or the same as driving.

Mode shift across the region

Figures A7 and A8 (overleaf) show the opportunity to shift modes for the low and high scenarios across the study area. In both scenarios it is clear that there are more opportunities to shift to more sustainable modes in more urban areas, and fewer opportunities in more rural areas.

In the low scenario opportunity to shift modes is mostly only viable in the centre of urban areas, such as: Cambridge, Peterborough and Stevenage.

In contrast, for the high scenario, the opportunity to shift modes spreads further into rural areas. In particular, areas that fall in the gap between two or more urban areas. For instance, the area between Chelmsford and Southend has a large increase in mode shift potential.

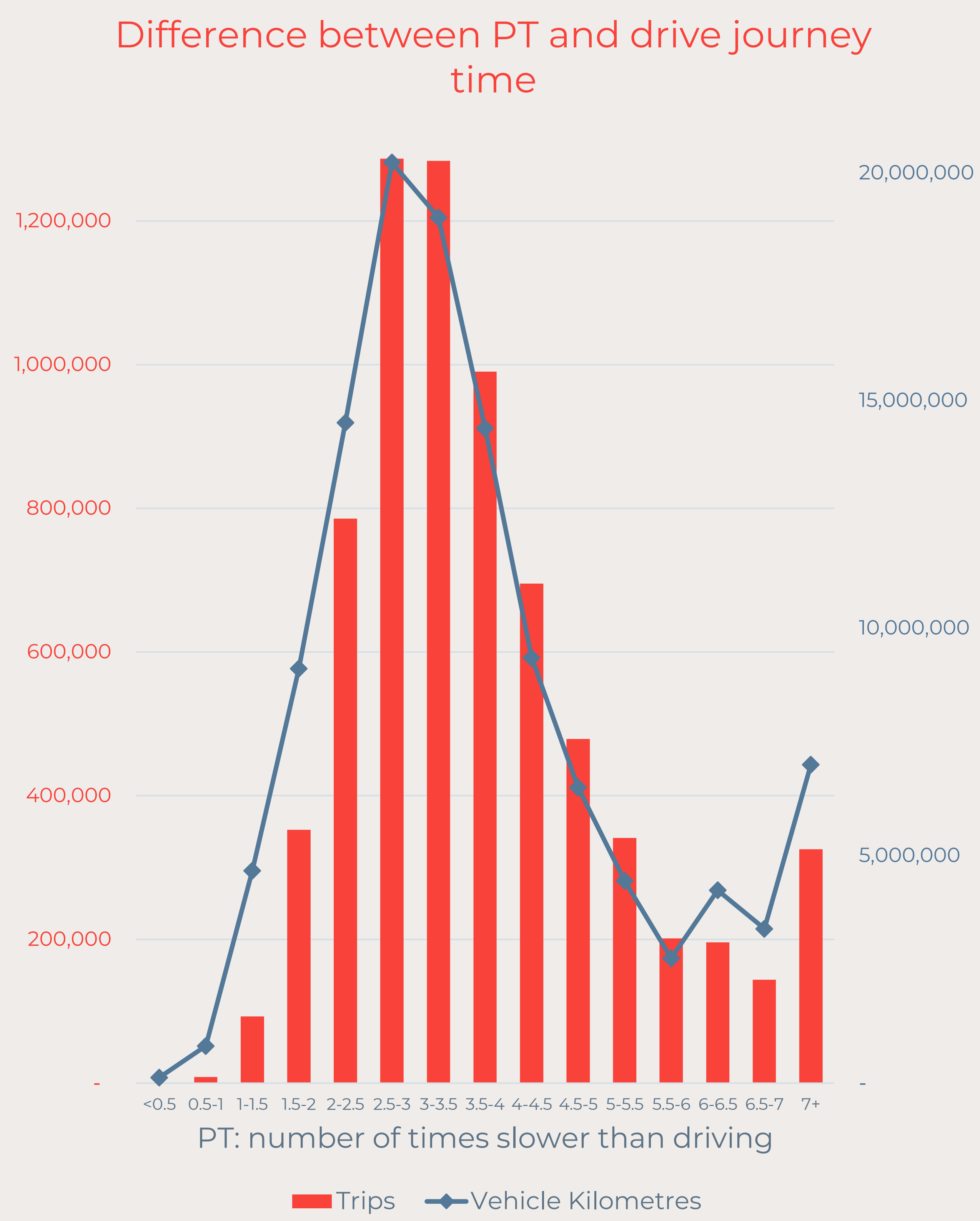


Figure A6: Distribution of differences in Public Transport journey time compared with driving

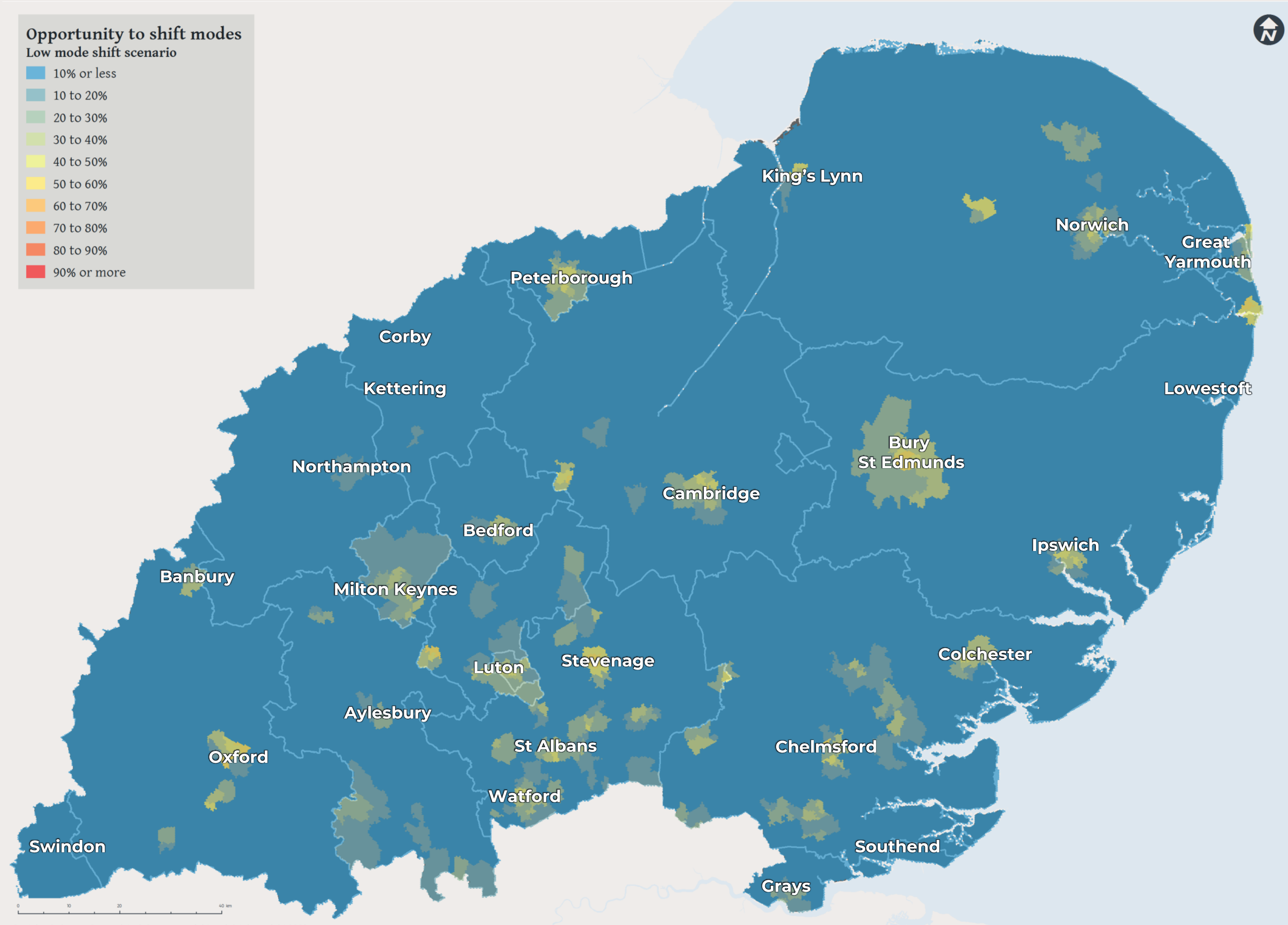


Figure A7: Opportunity to shift modes (Low)

Source: WSP EV:Ready

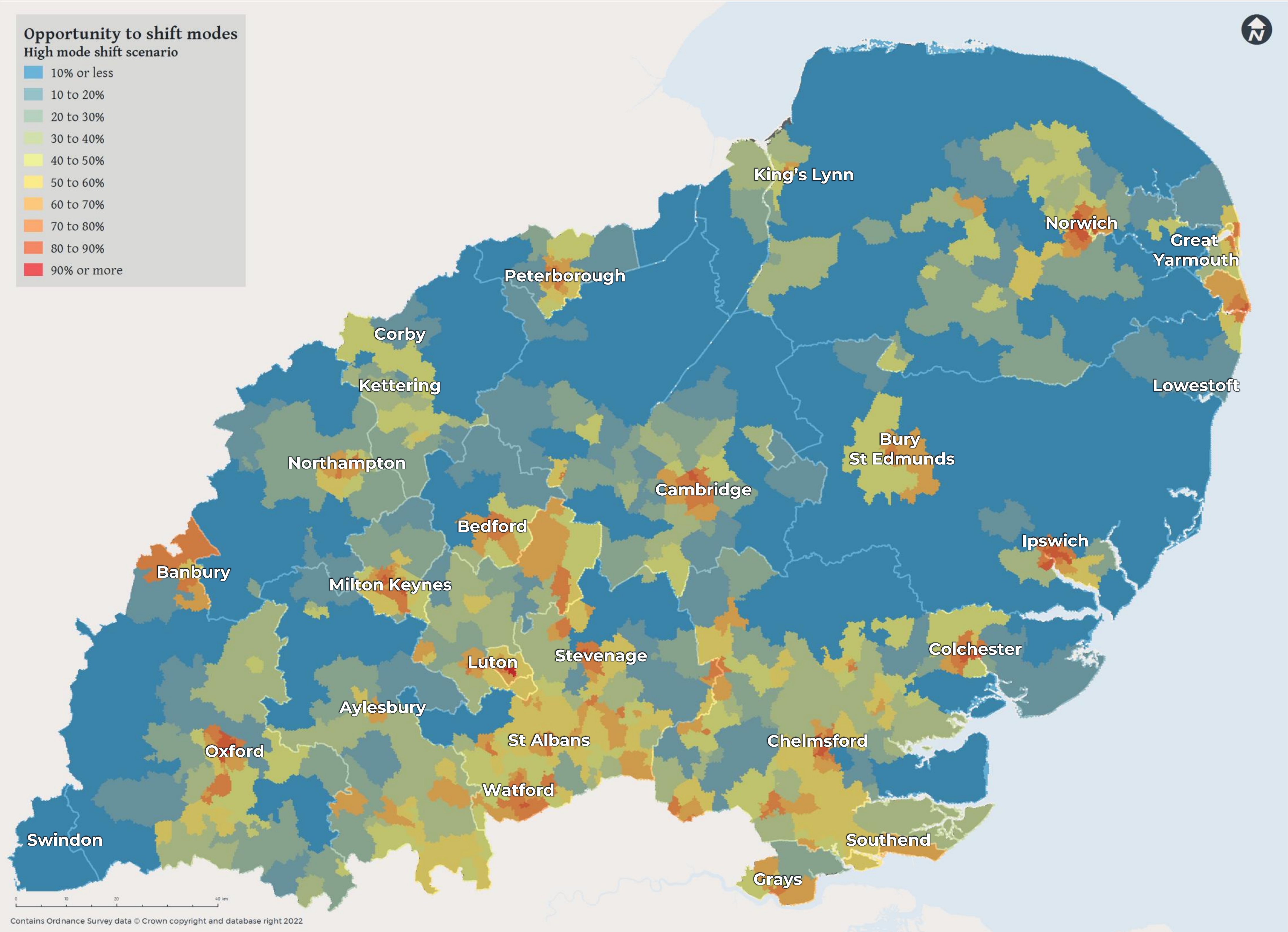


Figure A8: Opportunity to shift modes (High)

Source: WSP EV:Ready

PART B

EV:Ready Inputs

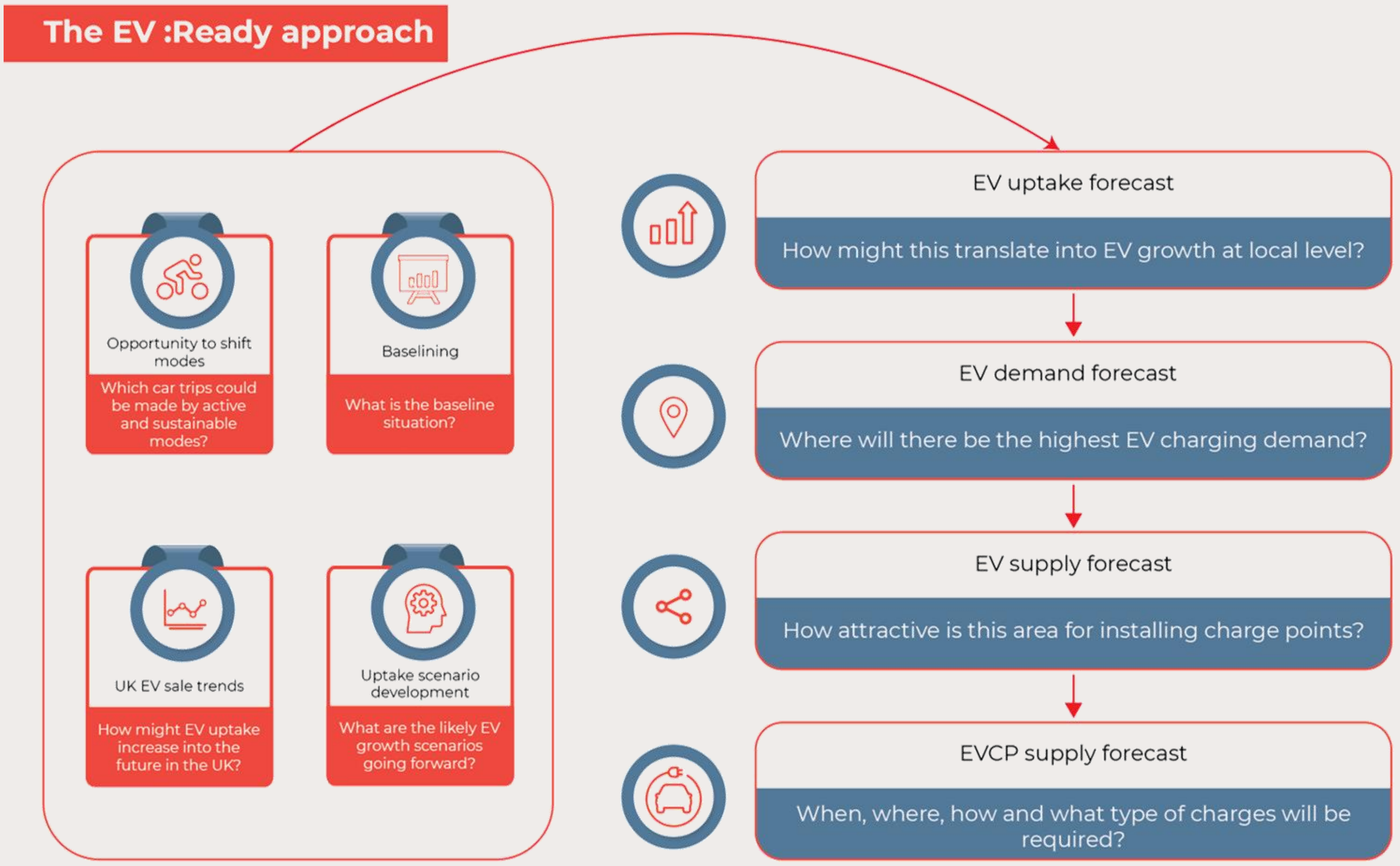


Figure B1: The EV:Ready approach

Source: WSP EV:Ready

Baselining

WHAT IS THE BASELINE SITUATION?

The aim of this work is to determine the baseline situation within the study area, and includes consideration of:

- **Baseline EV ownership** – how many EVs have been registered in the study area.
- **Baseline vehicle ownership** – how many vehicles (EVs and non-EVs) are registered in the study area.
- **Reliance on on-street parking** – how many households are reliant on on-street parking.
- **Wider fleet and vehicle turnover trends** – how often do people replace their vehicles.
- **Propensity of local populations to switch to EVs** – using Mosaic socio-demographic data to estimate the likelihood of households to switch to EVs.
- **Current grid capacity** – understand the existing grid capacity at the primary substations.
- **Existing car parks** – location and capacity of both private and public car parks in the study area.

When considering baseline data, an adjustment was made to EV ownership to account for distortions introduced by company registered EVs, which are often registered far from where they are situated in reality.

To account for this source of error, company vehicles were redistributed across local authorities in the UK using the same distribution as that followed by private EVs.

HOW ARE THE INPUTS ARE USED?

The inputs are used to adjust WSP's UK-wide EV uptake forecast to apply at a local authority level, and to advise the allocation of public and private investment into EV charging infrastructure:

- **Local authority EV uptake forecasts** are calculated by adjusting the UK high and low uptake forecasts in accordance to EV and non-EV ownership rates, reliance on on-street parking, vehicle replacement rates and propensities to switch to EVs specific to each LA.
- **Energy requirements** to support the future EV fleet are then calculated using the forecasted number of EVs, vehicle mileage and efficiencies, BEV and PHEV ratios, and PHEV electrical mileage splits.
- **Required Public EVCP numbers** are calculated by analysing the split of private and public charging, the number of EVs with access to off-street parking, charger utilisation rates and trends in EVCP technology such as in-use charge rates.
- Hexes are given a forecasted **supply score** for both standard and rapid chargers in 2030, representing the likely distribution of charge points of each type, based on where the private and public sector will likely invest. This considers EV uptake, on-street parking, trip demand taken from SERTM, grid supply and relevant land use.
- Vehicle demand adapted from SERTM is then normalised to 1 to produce a **demand score**, and a gap analysis is used to identify the advised areas of further investment.

Opportunity to shift modes	Baselining	UK EV sales trends	Uptake scenario development	EV uptake forecast	EV demand forecast	EV supply forecast	EVCP requirements forecast
Which car trips could be made by active and sustainable modes?	*What is the baseline situation?*	*How might EV uptake increase into the future in the UK?*	*What are the likely EV growth scenarios going forward?*	*How might this translate into EV growth at a local level?*	*Where will there be the highest EV charging demand?*	*How attractive is the area for installing charge points?*	*When, where, how and what type of chargers will be required?*
Lower mode shift to achieve **15-20 minute neighbourhood** Higher mode shift to achieve Gear Change (two and five miles)	Baseline EV ownership Baseline vehicle ownership Reliance on on-street parking Wider fleet and vehicle turnover trends Propensity of local populations to switch to EVs Current grid capacity Existing car parks	EV sales trends National forecast growth in EVs	Opportunity to shift modes (lower & higher) EV uptake (lower & higher)	EV uptake by: Scenario Year Numbers of EVs Proportion of fleet	En-route demand and supply Destination demand and supply Origin demand and supply		Rapid charging Standard charging (slow & fast)

EV:Ready inputs Baselining

GENERAL INPUTS

Table B1 (across) summarises key household statistics for the Transport East region. This informs several of the figures overleaf.

The table shows population, the number of households, total vehicles, the average number of vehicles per household and the proportion of households reliant on on-street parking.

This data is directly fed into the EV:Ready tool to inform both EV uptake and EVCP requirements.

Household density is a valuable indicator to consider alongside EV uptake forecasting because it provides an indication of areas that are more likely to require publicly accessible charging. Areas with a lower housing density are more likely to have access to private EV charging options on private driveways, whereas areas with a greater housing density are less likely to have access to private EV charging and therefore may require publicly accessible EVCPs.

In addition, understanding household density provides the region with an indication of where EVCP installation will have the greatest impact, in terms of the number of households served by an EVCP, and therefore the best value for money.

Table B1: Household statistics

County/Unitary Authority	Population	Households	Total vehicles	Average number of vehicles per household	Proportion of households reliant on on-street parking
Essex	1,555,031	652,346	993,216	1.52	23.93%
Norfolk	942,269	410,618	628,014	1.53	24.35%
Southend-on-Sea	181,386	79,189	94,075	1.19	30.62%
Suffolk	796,293	343,235	546,254	1.59	24.98%
Thurrock	173,741	69,136	103,264	1.49	33.82%
Total	**3,648,720**	**1,554,524**	**2,364,823**	**1.52**	**24.44%**

EV:Ready inputs Baselining

HOUSEHOLD DENSITY

Figure B2 (overleaf) indicates that housing density is greatest in the southern part of the Transport East Area, and becomes more sparse going northward from Essex through the counties of Suffolk and Norfolk. Norfolk and Suffolk both contain large areas of land with fewer than 60 dwellings per hectare, however they each contain their own more urbanised areas with housing densities exceeding 120 dwellings per hectare such as Ipswich, Norwich, Bury St Edmonds and Great Yarmouth. Essex contains far more urbanised regions with less distance separating them. These regions also appear to be larger than the towns and cities found in Suffolk and Ipswich in most cases. Examples include Colchester, Southend-on-Sea, Basildon and Chelmsford.

As a result of this we'd expect a higher reliance on on-street parking in Essex than in the rest of the region, along with a lower vehicle ownership rate per household due to the spatial limitations for housing within urban centres, and therefore lower rates of EV ownership and uptake per household.

Authorities governing regions with more areas of high housing density are likely to be more reliant on public charging infrastructure and so will likely have a higher public spending allocation to increase the uptake of EVs, whilst those with lower housing density across the regions will be more likely to be more reliant on privately owned chargers.

EV:Ready Inputs

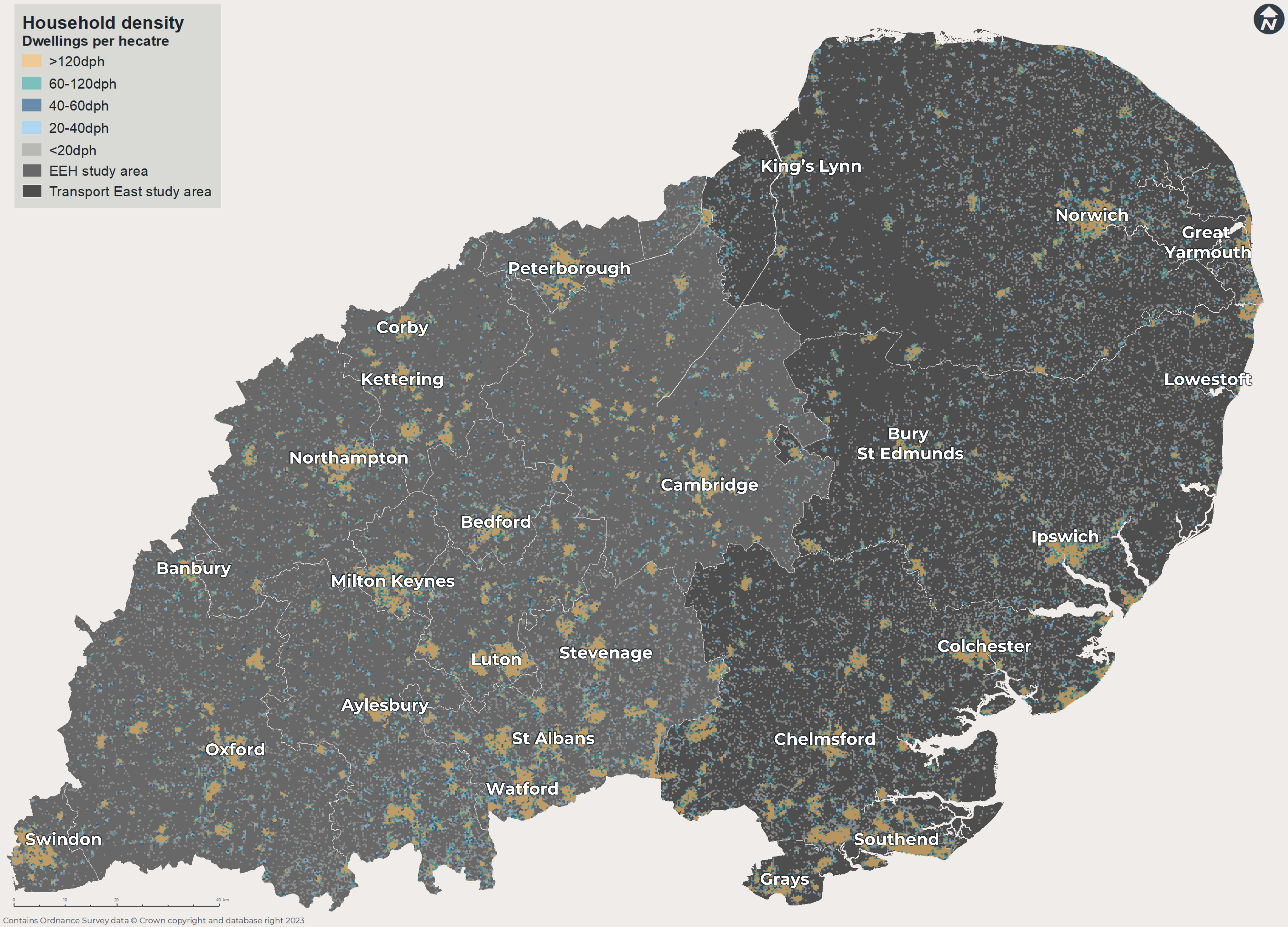


Figure B2: Household density

Source: WSP EV:Ready

EV:Ready inputs Baselining

BASELINE EV OWNERSHIP

In order to assess the future EV uptake, it is first necessary to assess baseline ownership levels.

Baseline data published on a quarterly and annual basis by DfT provides the initial EV registrations and EV shares for the region[1]. There is a caveat for this data; licensing data includes where vehicles are registered and thus within the data there can be some distortion for how and where vehicle fleets are registered. This distortion is especially prominent in areas which have a large number of company owned EVs, meaning registrations are made in a different location to where the vehicles are used. In reality these EVs have a similar distribution to other private vehicles. This is accounted for before the data is used as an input into EV:Ready.

Figure B3 shows how EV ownership has grown steadily in England from less than 100,000 vehicles in 2016 to over 800,000 vehicles in 2022. Using the exact figures this amounts to an approximate 12-fold increase. This is due to a range of factors including the growing choice of EV models available, increasing range, faster charging speeds and a growing network of publicly accessible charge points.

Figure B4 similarly shows how EV ownership has increased steadily across the Transport East area from approximately 2,500 vehicles in 2016 to nearly 30,000 vehicles 2022. Using exact figures, growth in EV ownership throughout the study area has multiplied by approximately 13 across the 6 year time period, which is slightly over the national trend and likely due to similar factors.

Over the time period, EV uptake across the different LTAs seems to have generally been in proportion with the LTAs' respective EV numbers at the start of the period.

[1] See DfT Vehicle Licensing Statistics. Available online: https://www.gov.uk/government/collections/vehicles-statistics

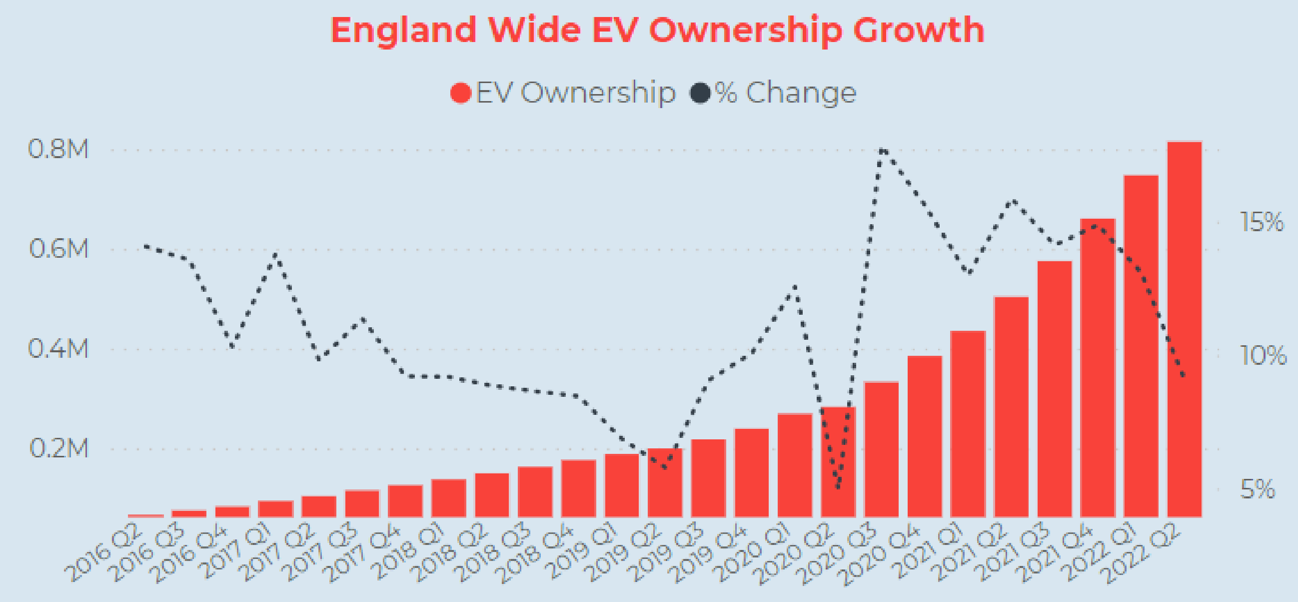


Figure B3: EV ownership in England (2015 – 2022)

Source: DfT Vehicle Licensing Statistics (Table VEH0132)

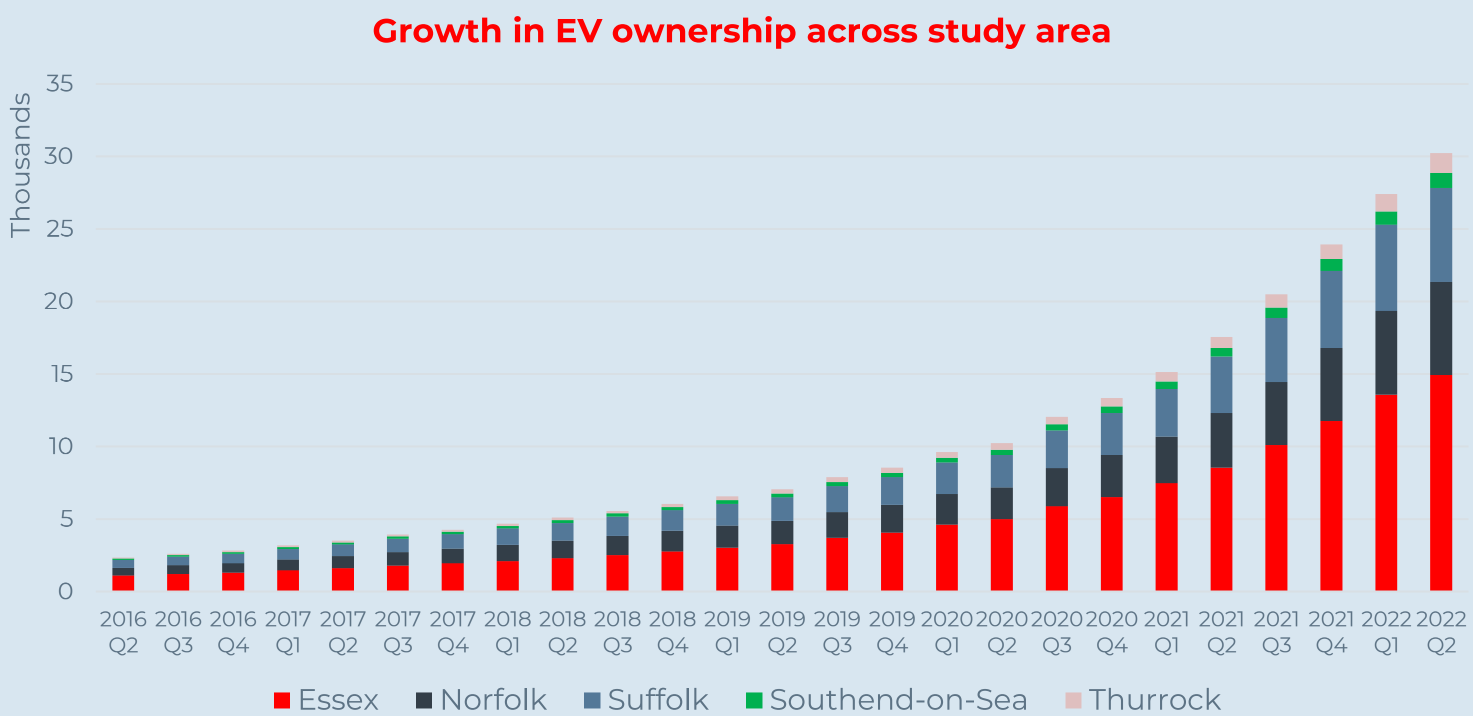


Figure B4: EV ownership in the Transport East study area (2016 – 2022)

Source: DfT Vehicle Licensing Statistics (Table VEH0132)

EV:Ready inputs Baselining

BASELINE EV OWNERSHIP

Current EV ownership as of 2022 Q2 is shown in **Table B2**. Out of the EV types, the majority are Battery EVs (BEVs), with comparatively few diesel plug in hybrid EVs (PHEVs). Essex has by far the highest number of EVs, with more than double that of Suffolk and Norfolk, however this can be attributed to the fact that the population of Essex is almost as high as Suffolk and Norfolk combined.

[1] See DfT Vehicle Licensing Statistics. Available online: https://www.gov.uk/government/collections/vehicles-statistics

Table B2: EV ownership (as of 2022 Q2)

Local authority	BEV	PHEV (diesel)	PHEV (petrol)	Unknown	Total
Essex	8,074	114	5,826	901	**14,915**
Norfolk	3,974	54	2,200	191	**6,419**
Southend-on-Sea	594	9	344	83	**1,030**
Suffolk	4,028	36	2,252	148	**6,464**
Thurrock	660	16	574	116	**1,366**
Total	**17,330**	**229**	**11,196**	**1,439**	**30,194**

EV:Ready inputs Baselining

BASELINE CAR OWNERSHIP

Current levels of car ownership (vehicles per household) helps to inform EV uptake projections, as estimates are based on the transition from internal combustion engine (ICE) ownership to EV ownership. Some populations may have a high propensity to switch to an EV in theory, but if they are not already a vehicle owner then it is unlikely they will become one for the sole purpose of purchasing an EV.

Table B3 shows vehicle ownership levels, including EV ownership, EVs as a percentage of total vehicles, and the average number of vehicles per household.

Essex, Suffolk, and Norfolk all have very similar vehicle ownership rates per household, ranging from 1.49-1.59. There are likely to be increased opportunities to travel by sustainable modes in urban areas such as Southend-on-Sea due to the better facilities, services and infrastructure in such areas.

Table B3 also shows EV ownership as a percentage of total vehicles for the study area. Across the region as of 2022 Q2, 1.3% of vehicles are EVs. Essex has the highest percentage of EV at 1.5%. Norfolk has the lowest percentage at 1.0%.

Figure B5 (overleaf) shows that car ownership has a high variety across the study area. In general, lower rates of ownership are seen in urban centres whilst more rural regions have higher ownership rates.

Rural areas tend to have higher ownership rates in the southern side of the study area. This is especially noticeable in Essex where a high proportion of the rural areas in the county have vehicle ownership rates exceeding 1.75 vehicles per household (VPH), whilst in Suffolk we see that vehicle ownership is in excess of 1.75 only in some rural areas the southern and middle parts of the county. To the north of this, vehicle ownership is below 1.75 VPH in almost all of the Transport East area.

Table B3: Baseline car ownership (2022 Q2)

Local authority	Total vehicles	Total EVs	EVs as a % of total vehicles	Average number of vehicles per household
Essex	993,216	14,915	1.5%	1.52
Norfolk	628,014	6,419	1.0%	1.53
Southend-on-Sea	94,075	1,030	1.1%	1.19
Suffolk	546,254	6,464	1.2%	1.59
Thurrock	103,264	1,366	1.3%	1.49
Total	**2,364,823**	**30,194**	**1.3%**	**1.52**

EV:Ready Inputs

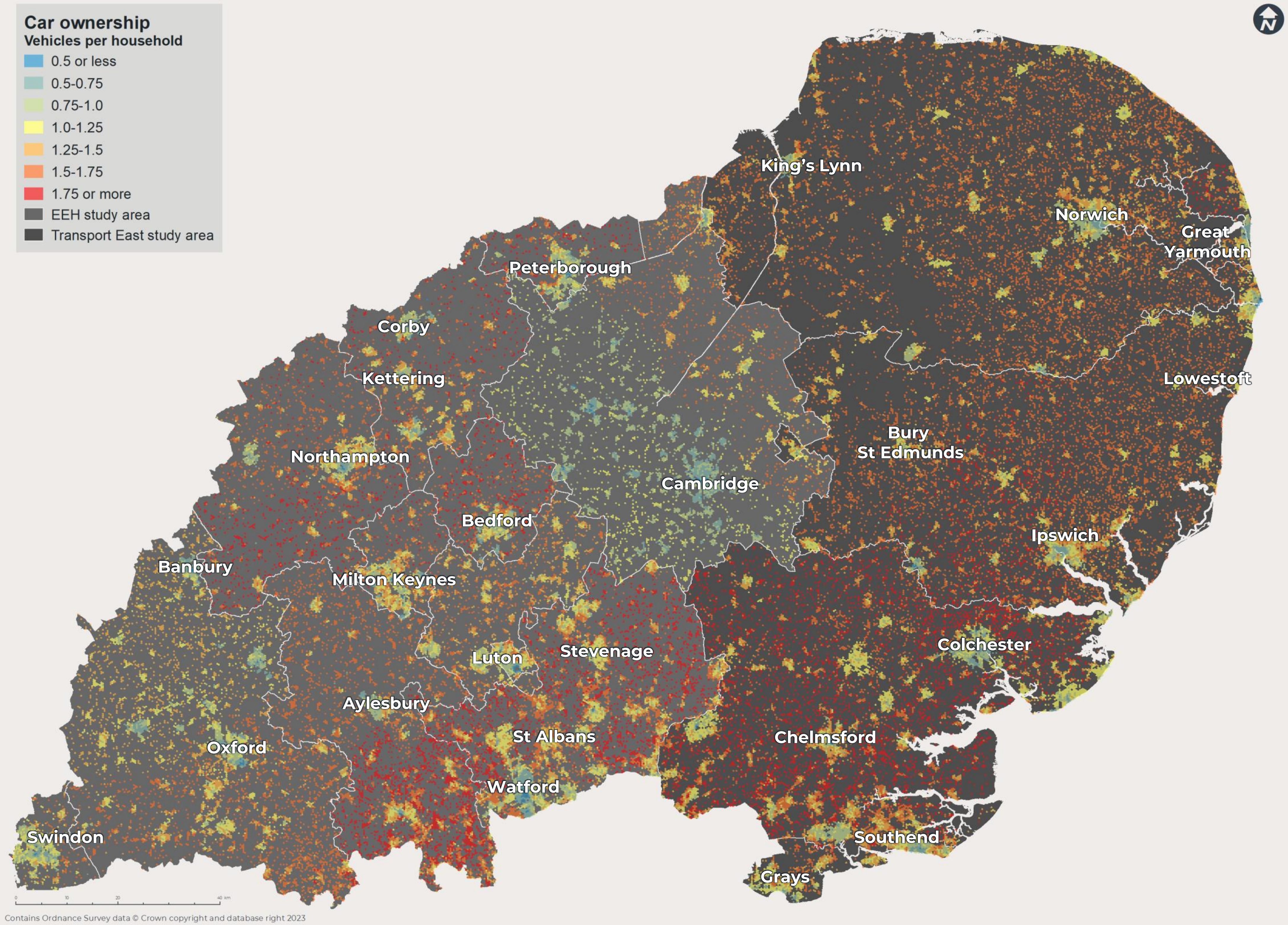


Figure B5: Car ownership (vehicles per household)

Source: WSP EV:Ready

EV:Ready inputs Baselining

RELIANCE ON ON-STREET PARKING

An important factor to EV uptake and EVCP demand is the extent to which areas are reliant on on-street parking. To date, those with access to off-street parking where they can conveniently and reliably charge their vehicle overnight have been over three times more likely to switch to an EV. About 93% of EVs are estimated to have access to home charging, despite between 20-40% of vehicles nationally having no such access to off-street parking. This shows the tendency for current EV ownership to be indicative of off-street parking access. It is expected that the tendency for EV owners to rely on off-street parking will lessen over time as EV ranges increase, recharging times shorten and public infrastructure improves.

Table B4 shows the proportion of households that are reliant on on-street parking in the study region.

Reliance on on-street parking is fairly uniform across the region, ranging from 24% to 34%. More urban areas have a higher proportion of households reliant on on-street parking, such as Thurrock and Southend-on-Sea at 34% and 31% respectively, whilst the larger areas of Norfolk, Suffolk and Essex have a lower proportion of households reliant on on-street parking (24-25%) due to the higher amount of rural space contained within each region.

In the areas where there is a lower reliance on on-street parking, often homeowners can install EV chargers on their driveways. In areas of a higher reliance on on-street parking, there needs to be access to publicly accessible EV charging provided by either the public or private sector.

The proportion of households reliant on on-street parking across the Transport East area is 24%, which is lower than the average for the UK (30%).

Reference:

'Plugging the Gap' (2018) ICCC. https://www.theccc.org.uk/2018/01/19/plugging-gap-next-britains-ev-public-charging-network/

Table B4: Reliance on on-street parking

Local authority	Households	Proportion of households reliant on on-street parking (%)
Essex	652,346	23.93%
Norfolk	410,618	24.35%
Southend-on-Sea	79,189	30.62%
Suffolk	343,235	24.98%
Thurrock	69,136	33.82%
Total	**1,554,524**	**24.44%**

EV:Ready inputs Baselining

RELIANCE ON ON-STREET PARKING

The likelihood of an area having access to off-street parking is determined based on the typical property types of the predominant Mosaic group at a postcode level, and assumes that terraced dwellings and converted flats would be reliant on on-street parking. All other housing types, such as detached dwellings, semi-detached dwellings and purpose-built flats, are assumed to have dedicated off-street parking and therefore not reliant on on-street parking. It should be noted however, that car ownership is much lower amongst households without off-street parking.

Figure B6 shows that reliance on on-street parking is generally low across the study area. In general, the reliance on on-street parking is much higher in urban areas and follows a similar trend to housing density.

In particular the reliance is high around Norwich, Ipswich, Southend-on-Sea, Colchester, Great Yarmouth and Lowestoft, with the reliance exceeding 250 households in some areas within these urban regions. Other urban centres with slightly lower reliance are Basildon, Chelmsford, and Harlow, with a high number of hexes in these towns having over 60 households reliant on on-street parking.

Noticeably low reliance on on-street parking can be seen around the majority of Suffolk and Norfolk, where reliance on on-street parking rarely exceeds 60 households per hex aside from within the large urbanised areas of those counties where dwelling density is higher.

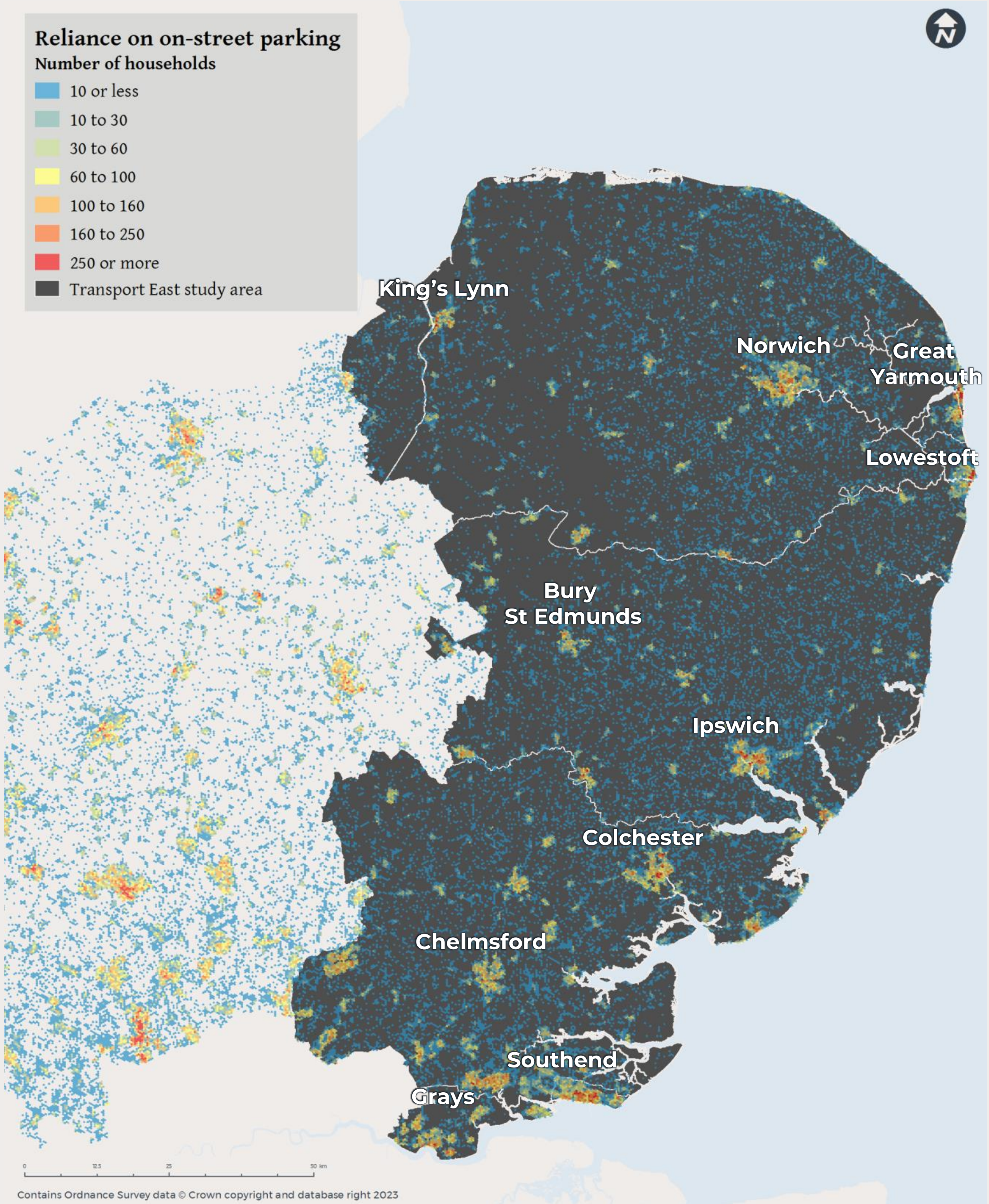


Figure B6: Reliance on on-street parking (number of households)

Source: WSP EV:Ready

EV:Ready inputs Baselining

RELIANCE ON ON-STREET PARKING

Figure B7 shows that proportions of households reliant on on-street parking follows a similar trend as **Figure B6**, with large percentages of households relying on on-street parking in urban areas, and a lower percentage in rural areas.

One difference between **Figures B6 and B7** is that the proportion of households reliant on on-street parking in urban centres is more heavily contrasted with that in rural regions, as areas on the edge of towns and cities tend to have similar rates of reliance to those in the centre of the urban centres. This is not the case when examining raw numbers of households reliant on on-street parking, and is likely a result of housing becoming more sparse towards the edge of urban centres.

The proportion of households reliant on on-street parking is particularly high in the large urban centres of Norwich, Ipswich and Colchester, however in some smaller urban areas such as King's Lynn, Great Yarmouth, Grays and Harlow we see similar and in some cases higher rates of reliance.

An on-street parking deflator is applied to reflect the impact on EV sales if a household does not have access to a driveway. This forecast is then applied to the EV sales profile by comparing the estimated proportion of households with a driveway and factoring this by the average number of houses with a driveway, relative to the national mean. The degree to which being reliant on on-street parking negatively effects EV uptake is forecast to reduce over time, as access to public charging infrastructure, battery range and consumer awareness improve.

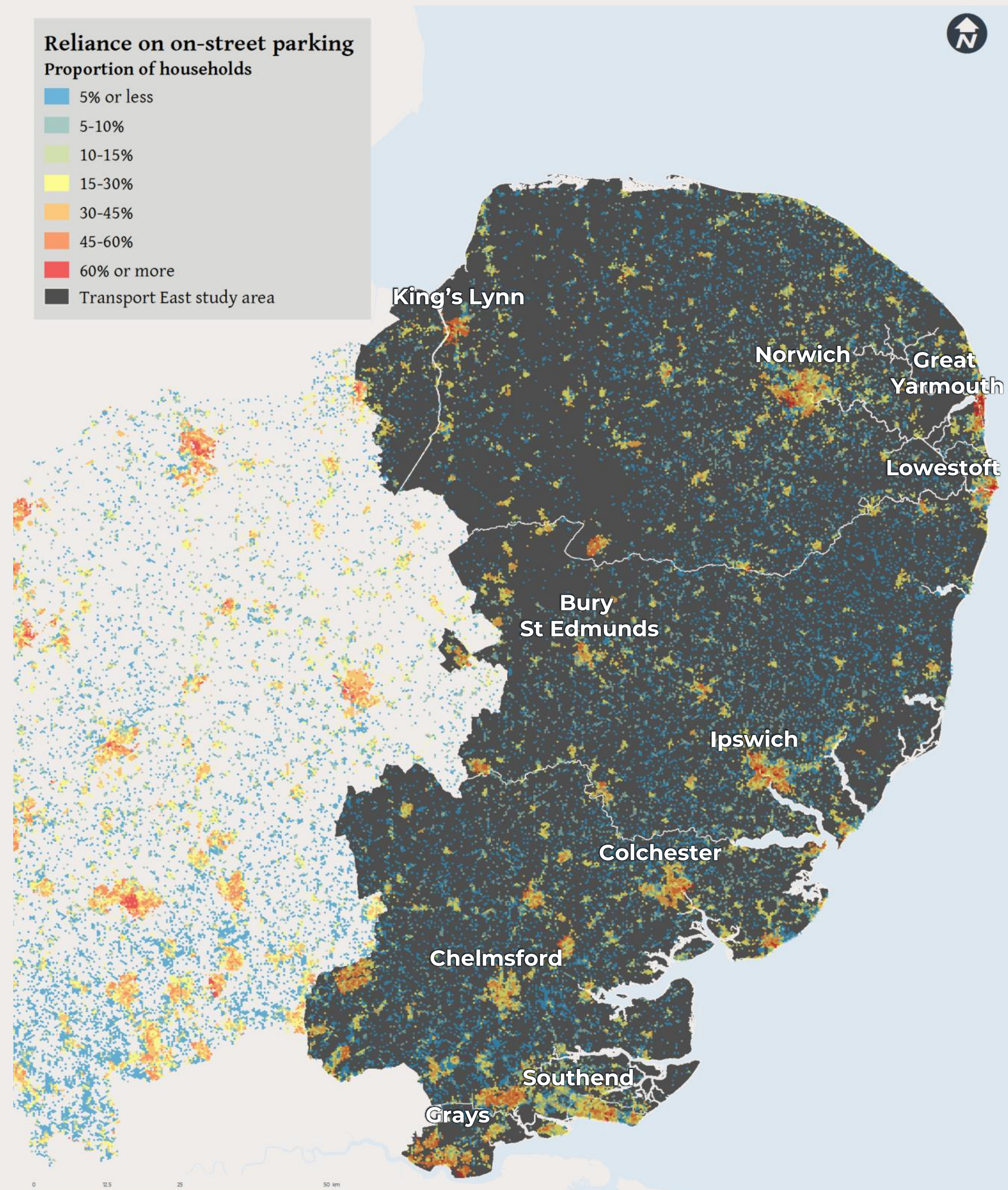


Figure B7: Reliance on on-street parking (proportion of households)

Source: WSP EV:Ready

EV:Ready inputs Baselining

CHARGE POINT TYPES

The range of charging solutions for EVs is evolving rapidly and reflects the ongoing technological developments and increasing investment in this market, as well as the range of different users and use cases for charging. The suitability of a particular charging technology is dependent on a wide range of factors, including the use case of the individual, their vehicle type, the type of location and the available power supply.

For instance, standard chargers are more appropriate for overnight domestic charging, whereas rapid charging points may be more beneficial on long distance routes, and rural regions between centres.

Table B5 summarises the different charge point types and provides information on the rates of charge, socket/plug type and charging duration.

EXISTING ELECTRIC VEHICLE CHARGE POINTS

Figure B8 shows the proportion of standard charge points versus rapid charge points across the entire study area. Of the charging points currently in the study area, ~28% are rapid and ~72% are standard.

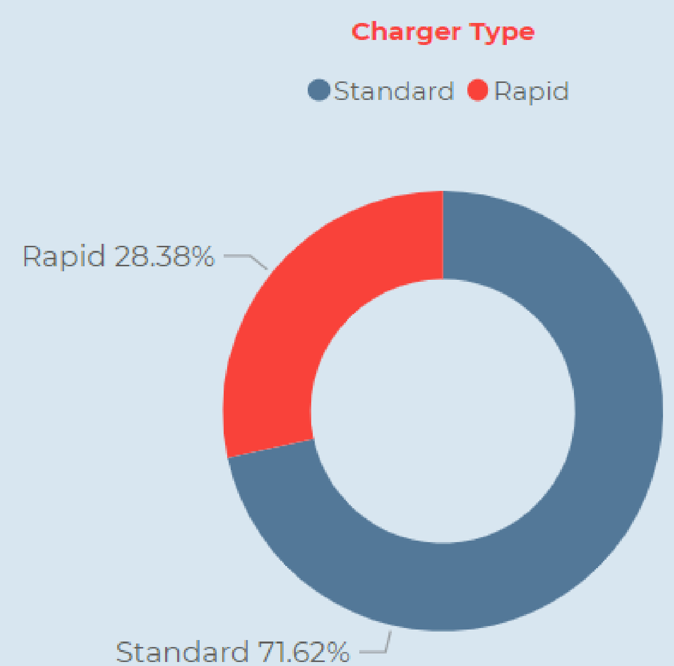
Figures B9-11 and Table B6 (overleaf) shows the existing EVCP infrastructure in the study area. There are a total of 1,037 EVCPs across the region.

Rapid chargers away from urban areas are mostly found on the Strategic Road Network (SRN), particularly at service stations. To date, more urbanised areas have a greater number of both rapid and standard EVCPs. The increase of EVCPs chargers in these areas is due to a higher amount of EVs present in the area reflected by the higher uptake numbers.

Table B5: Summary of the different charge point types

Charge point type	Maximum Power Output	Current/ Supply Type	Input Voltage	Maximum Current	Charging Mode	Socket / Plugs	Charging duration (40kW battery)
Domestic Socket	2.3-3kW	AC – Single Phase	230V	10-13A	1/2	Type 1/2	Approx. 17 hours
Slow	3.7kW	AC – Single Phase	230V	16A	2/3	Type 1/2	Approx. 11 hours
Standard	7.4kW		230V	32A	2/3	Type 1/2	Approx. 6 hours
Fast	11-22kW	AC – Three Phase	400V	16-32A per phase	3	Type 2	Approx. 2-4 hours
Rapid	43kW	AC – Three Phase	400V	60A per phase	3	Type 2	Approx. 55 mins
	20-50kW	DC	400V	100A	4	CHAdeMO / CCS	Approx. 40 mins
Tesla Super Charger	75-250kW	DC	Up to 400V	Up to 800A	4	Tesla adapted Type 2	Approx. 10-20 mins
Ultra-Rapid	Up to 350kW	DC	Up to 920V	Up to 500A	4	CCS / Tesla adapted Type 2	Approx. 7-16 mins

Figure B8: Proportion of EVCP by type



EV:Ready inputs Baselining

EXISTING ELECTRIC VEHICLE CHARGE POINTS

Figure B9 and Table B6 show that the spread of rapid EVCPs across the region is varied between different counties. Suffolk and Norfolk both have much lower numbers of rapid EVCPs (39 and 71 respectively) than Essex (122), despite being comparably similar in size. In fact Thurrock has almost as many rapid EVCPs as Suffolk at 35. Which outlines the uneven distribution of rapid charging infrastructure throughout the Transport East area when the relative sizes of the two areas are considered. There may be a need to prioritise allocation of rapid chargers along strategic transport links in the large mostly rural counties of Norfolk and Suffolk to ensure a sufficient supply away from urban centres.

Figure B10 shows good coverage of standard EVCPs across most of the study area. As shown in **Table B6** there are almost 3 times as many standard chargers as rapid chargers and they are far more evenly spread throughout the study area. This is due to standard chargers being far cheaper to install, and the fact that standard chargers have comparatively more use cases compared to rapid chargers.

From **Figure B10** we can also see that there is relatively poor coverage of standard chargers in the more rural parts of Suffolk and Norfolk, is an indication that increased intervention may be required to allow charging along the strategic road network in these areas.

Figure B11 shows the total number of chargers across the study area. When looking at rapid and standard chargers combined, there is still a lack of coverage in more rural areas. It highlights the need to plug the gaps throughout the region, to ensure a fully joined up network.

Table B6: Existing EVCP infrastructure

Local authority	Rapid	Standard	Total
Essex	122 (34%)	241 (66%)	**363**
Norfolk	71 (21%)	270 (79%)	**341**
Southend-on-Sea	4 (21%)	15 (79%)	**19**
Suffolk	39 (14%)	233 (86%)	**272**
Thurrock	35 (83%)	7 (17%)	**42**
Total	**271 (26%)**	**766 (74%)**	1037

EV:Ready Inputs

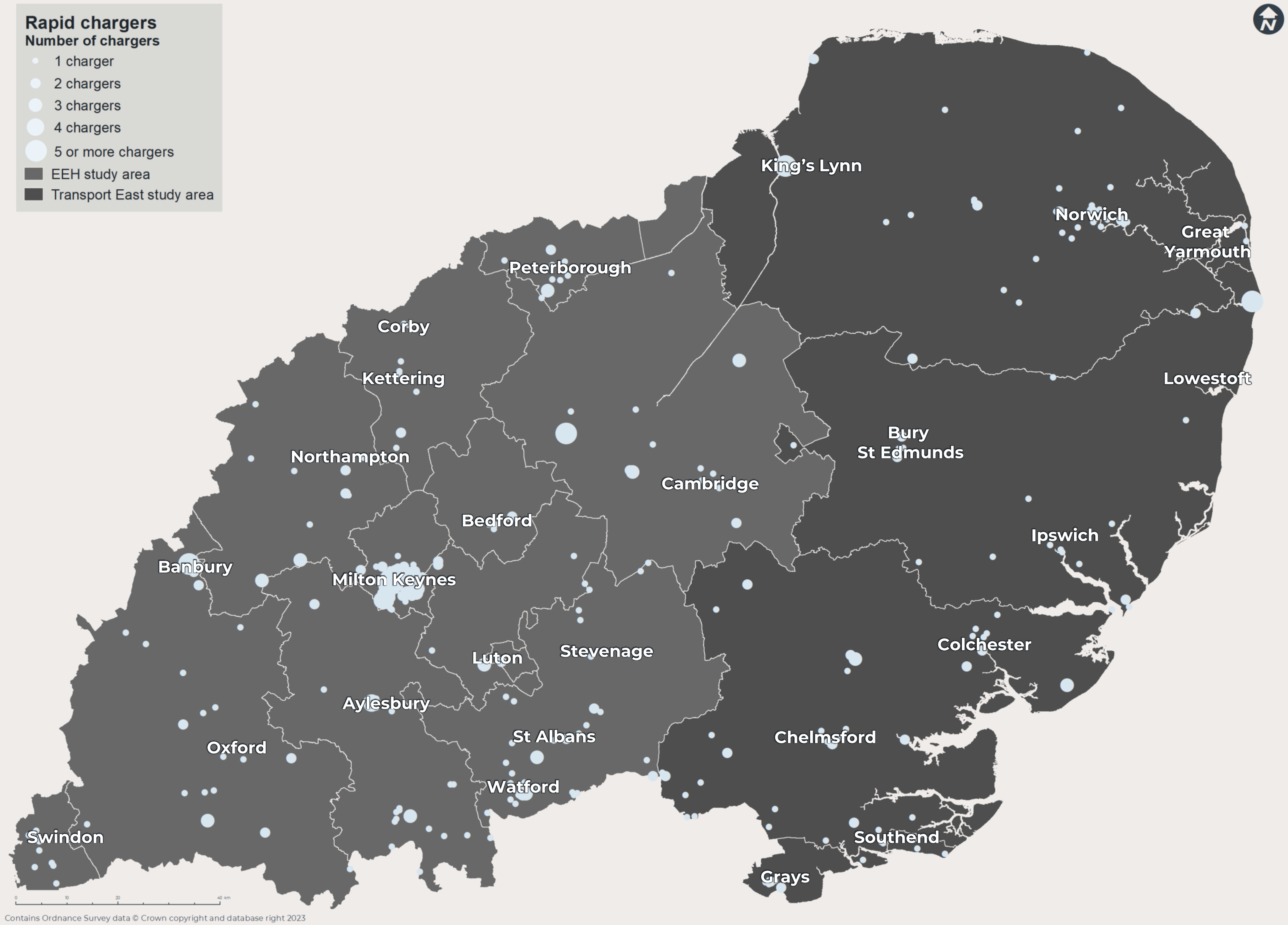


Figure B9: Existing rapid chargers

Source: WSP EV:Ready

EV:Ready Inputs

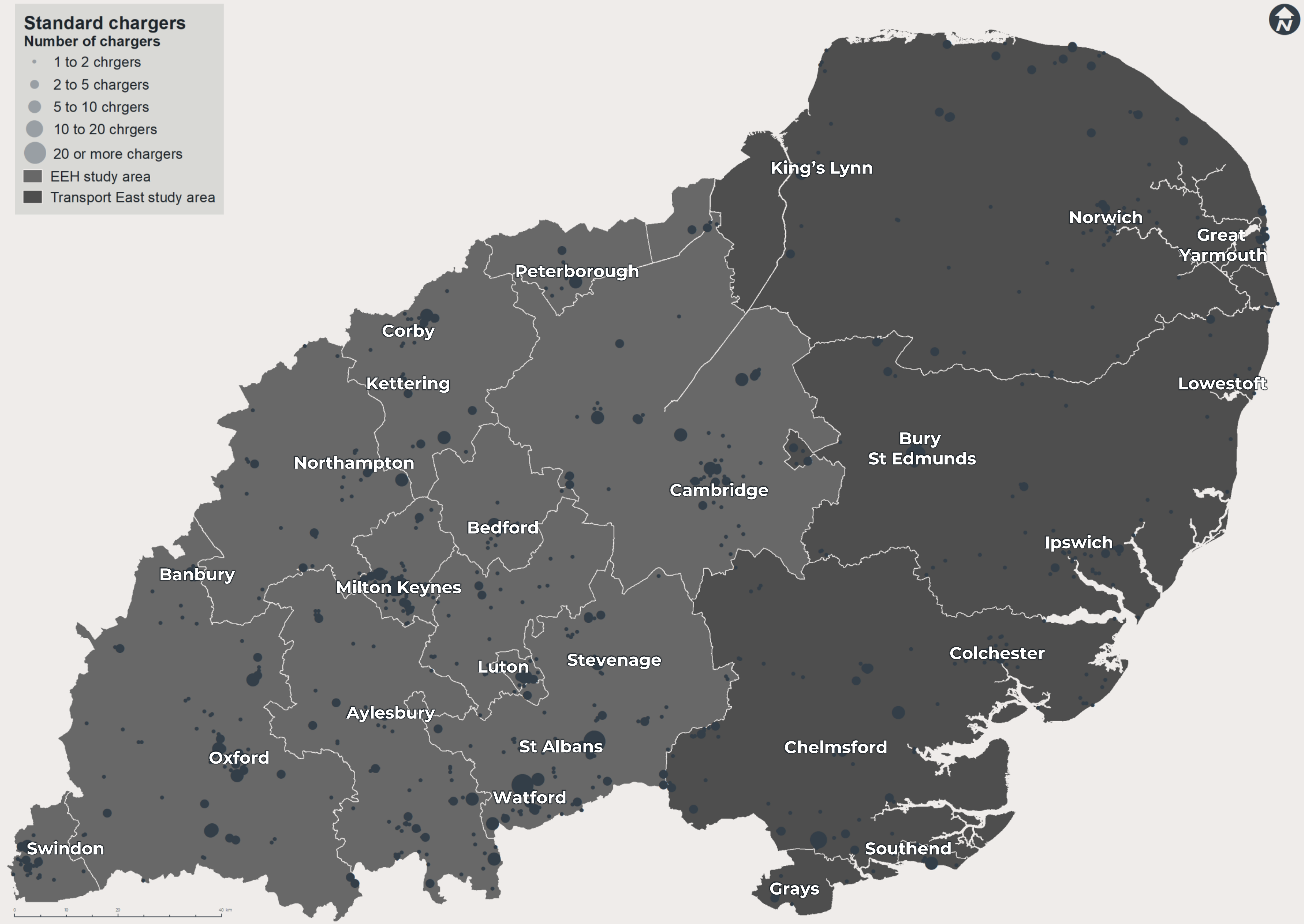


Figure B10: Existing standard chargers

Source: WSP EV:Ready

EV:Ready Inputs

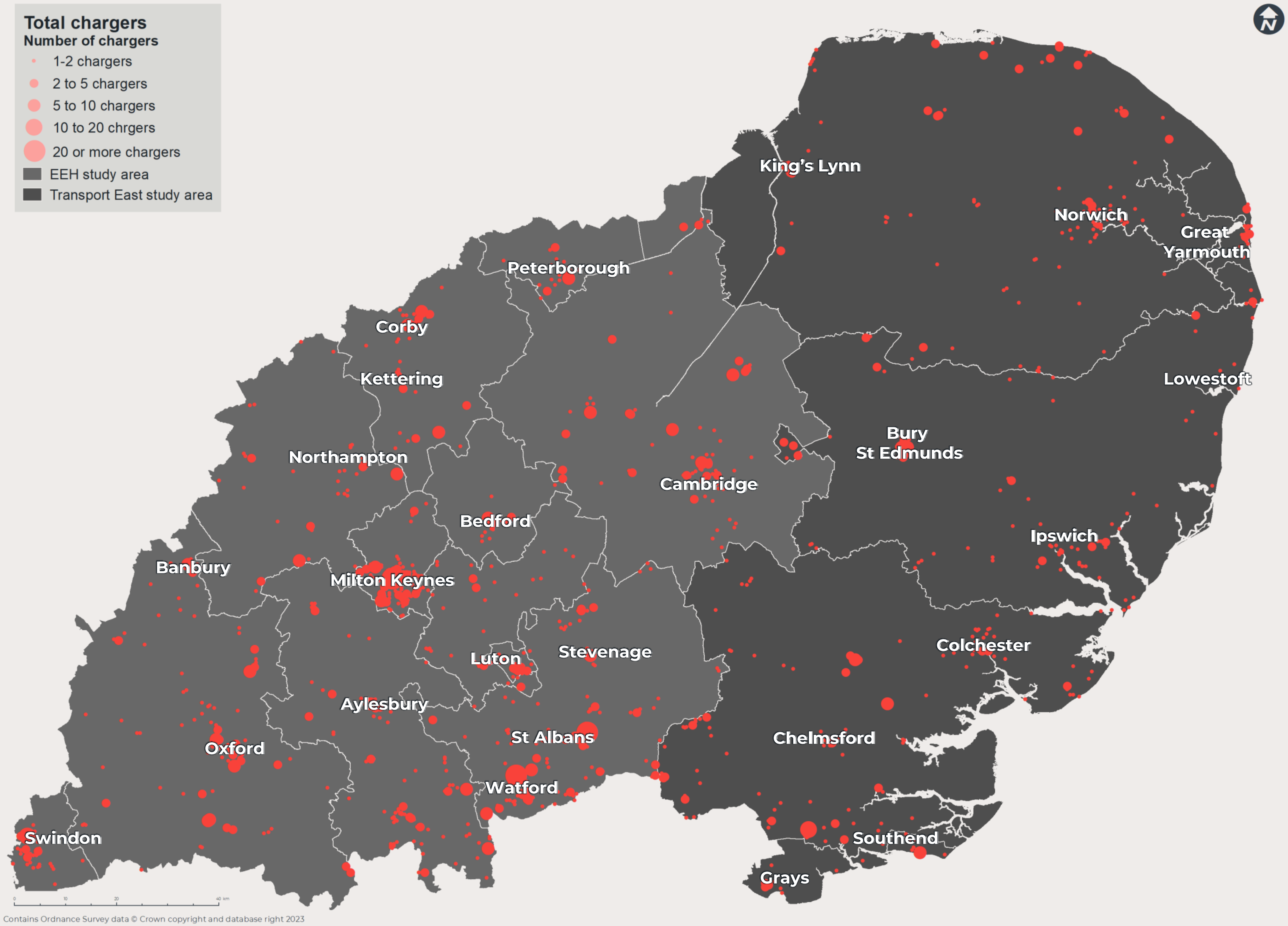


Figure B11: Total chargers (standard and rapid)

Source: WSP EV:Ready

EV:Ready Inputs Baselining

PROPENSITY TO OWN AN EV

Figure B12 presents the forecast propensity of residents to register an EV across the region, based on socio-demographic factors captured in Experian Mosaic.

Experian Mosaic

Experian Mosaic profiles have been used to classify residents into user 'segments' of similar characteristics in order to determine their propensity to own an EV. The Experian Mosaic dataset is a cross-channel consumer classification system which segments the UK population into 15 groups. These segments are determined based on a wide array of data relating to demographics, employment, education and technology. The segments are summarised in **Table B7**.

Table B8 shows the overall propensity of Experian Mosaic segments to own an EV in the UK. Groups City Prosperity, Prestige Positions and Domestic Success have the highest propensity.

Table B8: Experian Mosaic segments

Mosaic segment	Propensity to own an EV
City Prosperity	218.76
Prestige Positions	167.82
Country Living	122.63
Rural Reality	81.40
Senior Security	59.73
Suburban Stability	88.22
Domestic Success	140.29
Aspiring Homemakers	104.14
Family Basics	61.73
Transient Renters	87.52
Municipal Tenants	53.77
Vintage Value	30.29
Modest Traditions	69.15
Urban Cohesion	99.04
Rental Hubs	120.58

Table B7: Experian Mosaic segments

Mosaic segment	Description
City Prosperity	High status city dwellers living in central locations and pursuing careers with high rewards
Prestige Positions	Established families in large detached homes living upmarket lifestyles
Country Living	Well-off owners in rural locations enjoying the benefits of country life
Rural Reality	Householders living in inexpensive homes in village communities
Senior Security	Elderly people with assets who are enjoying a comfortable retirement
Suburban Stability	Mature suburban owners living settled lives in mid-range housing
Domestic Success	Thriving families who are busy bringing up children and following careers
Aspiring Homemakers	Younger households settling down in housing priced within their means
Family Basics	Families with limited resources who have to budget to make ends meet
Transient Renters	Single people privately renting low cost homes for the short term
Municipal Tenants	Urban renters of social housing facing an array of challenges
Vintage Value	Elderly people reliant on support to meet financial or practical needs
Modest Traditions	Mature homeowners of value homes enjoying stable lifestyles
Urban Cohesion	Residents of settled urban communities with a strong sense of identity
Rental Hubs	Educated young people privately renting in urban neighbourhoods

EV:Ready Inputs Baselining

PROPENSITY TO OWN AN EV

Figure B12 shows the propensity to own an EV across the region. The general trend is that people are more likely to own an EV in more rural areas.

As mentioned on the previous page, there are 15 groups that Mosaic classes the population into. **Tables B7 and B8** show these segments. The City Prosperity segment has the highest propensity to own an EV, which explains high propensity in cities such as Colchester which have more affluent populations when compared to other cities such as Norwich and Ipswich, which show a lower propensity to own an EV.

Propensity to own an EV tends to be higher towards the southern parts of the Transport East area than in the north. In particular, the more rural areas in Essex and Suffolk generally have higher propensities than those in Norfolk. is a higher propensity to own EVs. This is likely due to the populations there being classed into either the Prestige Positions or Country Living segments, which would likely mean the households have access to off-street parking, with tech savvy, affluent residents.

There are several segments that represent renters, such as Transient Renters and Municipal Tenants. These segments are more likely to be found in urban areas, and have a low propensity to own an EV.

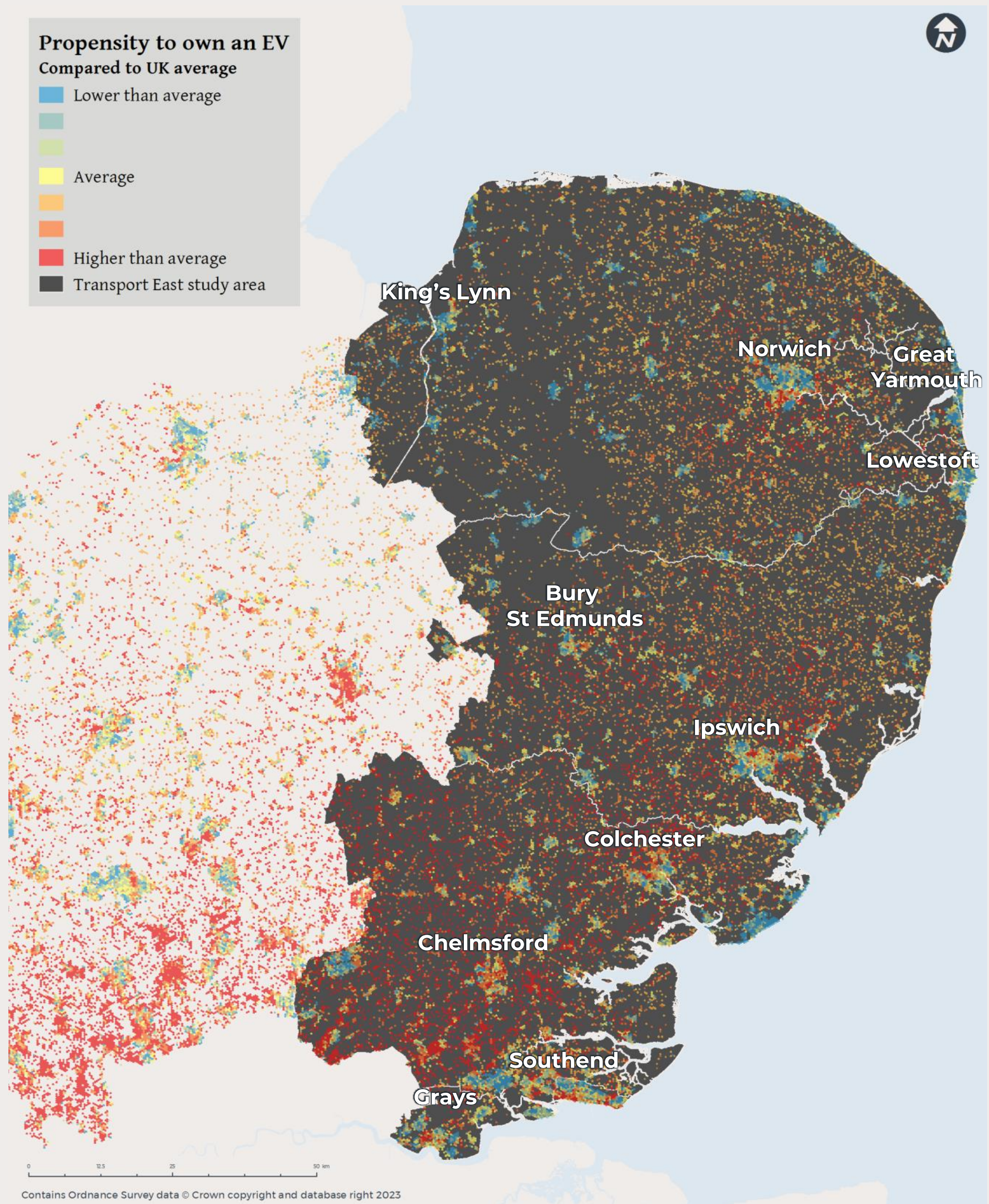


Figure B12: Propensity to own an EV

Source: WSP EV:Ready

EV:Ready Inputs Baselining

EXISTING CAR PARKS

An understanding of the location and capacity of existing car parks is useful for when considering EVCP infrastructure, as these car parks are potential locations for installation.

For the purposes of this study, the EV:Ready model utilises the Valuation Office Agency Non-Domestic Property Rates, which has data on the number of car parking spaces. This includes public or privately operated car parks, as well as car parking spaces attached to non-residential land uses.

As there are typically fewer space constraints and stakeholder considerations, EVCP installation in car parks can be operationally preferable than at other sites such as on-street, particularly from the local authority perspective.

In the short term, Transport East and the constituent authorities may choose to pave the way for electric vehicle uptake across the region by installing affordable, publicly accessible EVCP infrastructure in their council owned car parks. In the medium term, Transport East and the constituent authorities could engage with charge point operators (CPOs) to incentivise EVCP installation by the private sector.

In the long term, as EV uptake increases, it is expected that private sector EVCP installation will take over, such that the public sector will only be required to support EVCP rollout in the more challenging or less commercially attractive locations.

Figure B13 (overleaf) shows the existing car parks across the region.

As expected, in more urban areas there are more car parks, with higher capacities. Car parks are also seen along key links in the road network across the study area.

CURRENT GRID CAPACITY

By analysing data published by DNOs, the estimated available grid capacity (MVA) can be approximated by taking the maximum forecasted demand and firm capacity at each primary substation. This is shown in **Figure B14** (overleaf). This gives a general indication of how much further demand can be added in at this level.

The data shown in the figure is using available demand data from the LTDS, (Long Term Development Statement, for the 2021/22 period), to present the worst case. Though it should be noted that significant EV uptake is expected after this time.

The grid capacity in the region has good coverage of spare capacity. However, there are some areas with more constrained demand, such as West Norfolk.

RELEVANT LAND USE

Figure B15 (overleaf) shows the total area of land use within each cell that drives vehicle demand. This includes a wide array of uses such as shopping centres, retail parks, offices, healthcare facilities, and tourist attractions etc. Many of these sites will coincide with the existing car parks shown in **Figure B13**.

Darker (red) cells have a greater area of land use for such activities, whereas lighter (blue) cells have a smaller area of land use for these activities. As such, darker areas will have a higher demand for electric vehicle charging.

As with existing car parks, there is more relevant land use in urban areas.

This map intends to show likely destinations for users of electric vehicles, and aids in mapping where EVCP demand will be highest.

WIDER FLEET AND VEHICLE TURNOVER TRENDS

Across the UK, reduced car ownership and increasing use of car sharing and ride hailing schemes continues to be a growing trend amongst younger demographics. This shift may be slower in areas with low population density, longer trip distances and limited public transport access which may increase driving demands. However, car ownership is expected to grow until early 2040, when 'peak car' is reached.

In order to forecast the number of EVs it is necessary to assess current and future vehicle fleet size, vehicle replacement rates, average vehicle age when scrapped and the range of ages at which vehicles are scrapped.

The baseline vehicle fleet for the region (6,202,206) was projected forward based on an average of the National Grid Future Energy Scenarios (FES), which include a range of assumptions around the share of travel by public transport, the growth in ride sharing and autonomous vehicles. This equates to a steady growth in vehicle numbers up to 2035, after which point growth rates slow, peaking in 2042 and then slowly declining.

The average age a vehicle is scrapped in the UK is approximately 13 years (SMMT).

EV:Ready Inputs

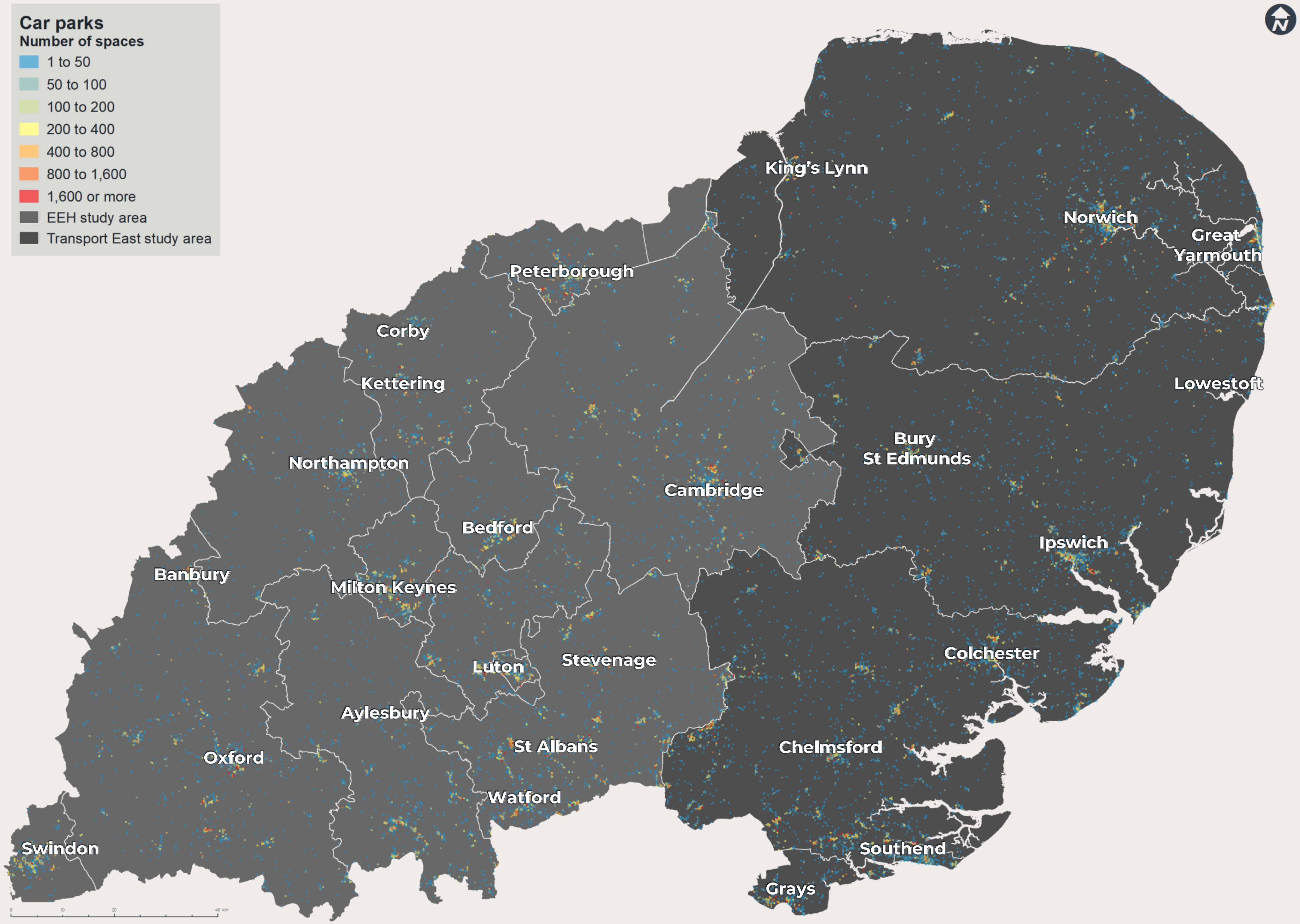


Figure B13: Car parks

Source: WSP EV:Ready

EV:Ready Inputs

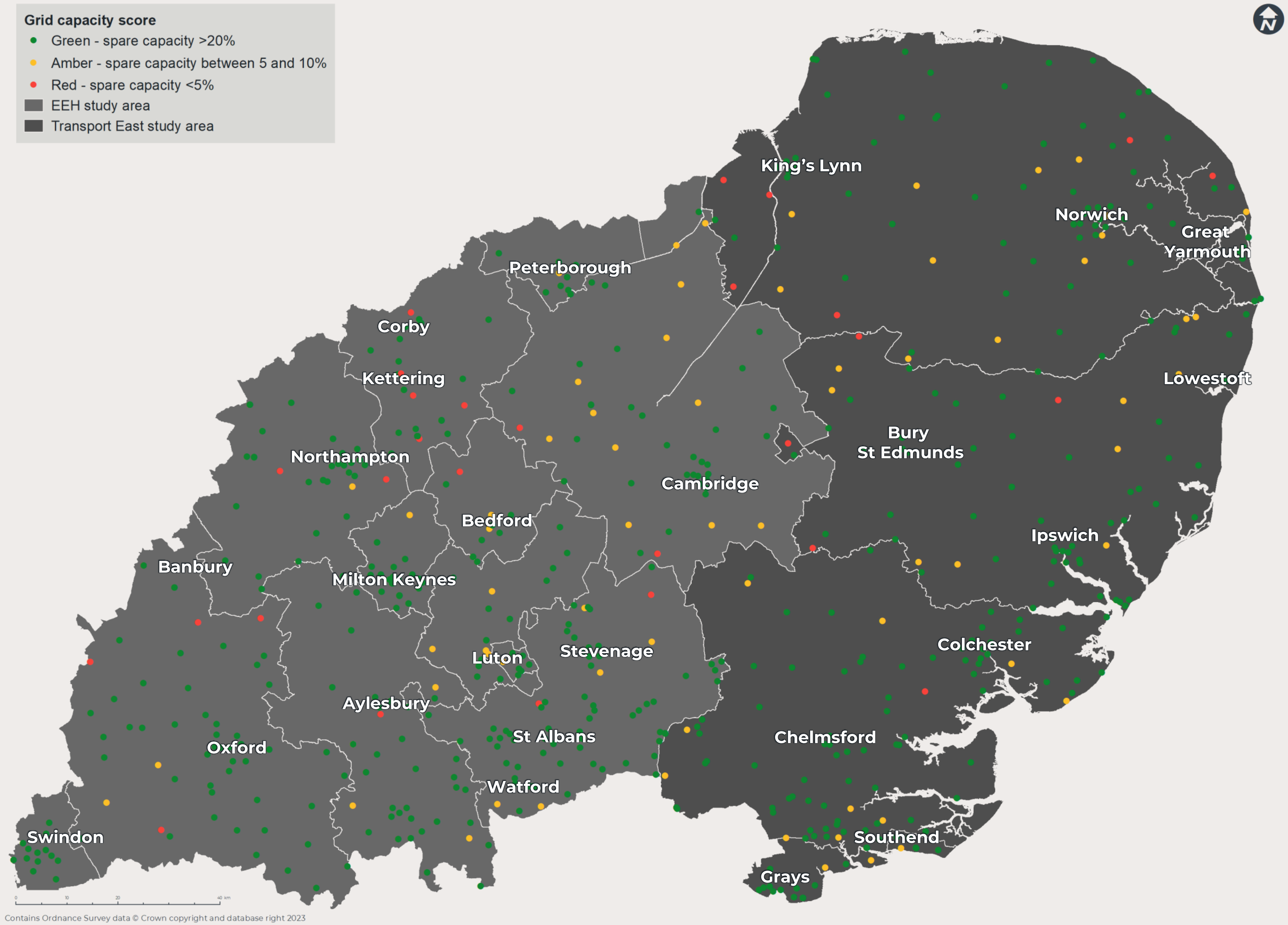


Figure B14: Spare grid capacity

Source: WSP EV:Ready

EV:Ready Inputs

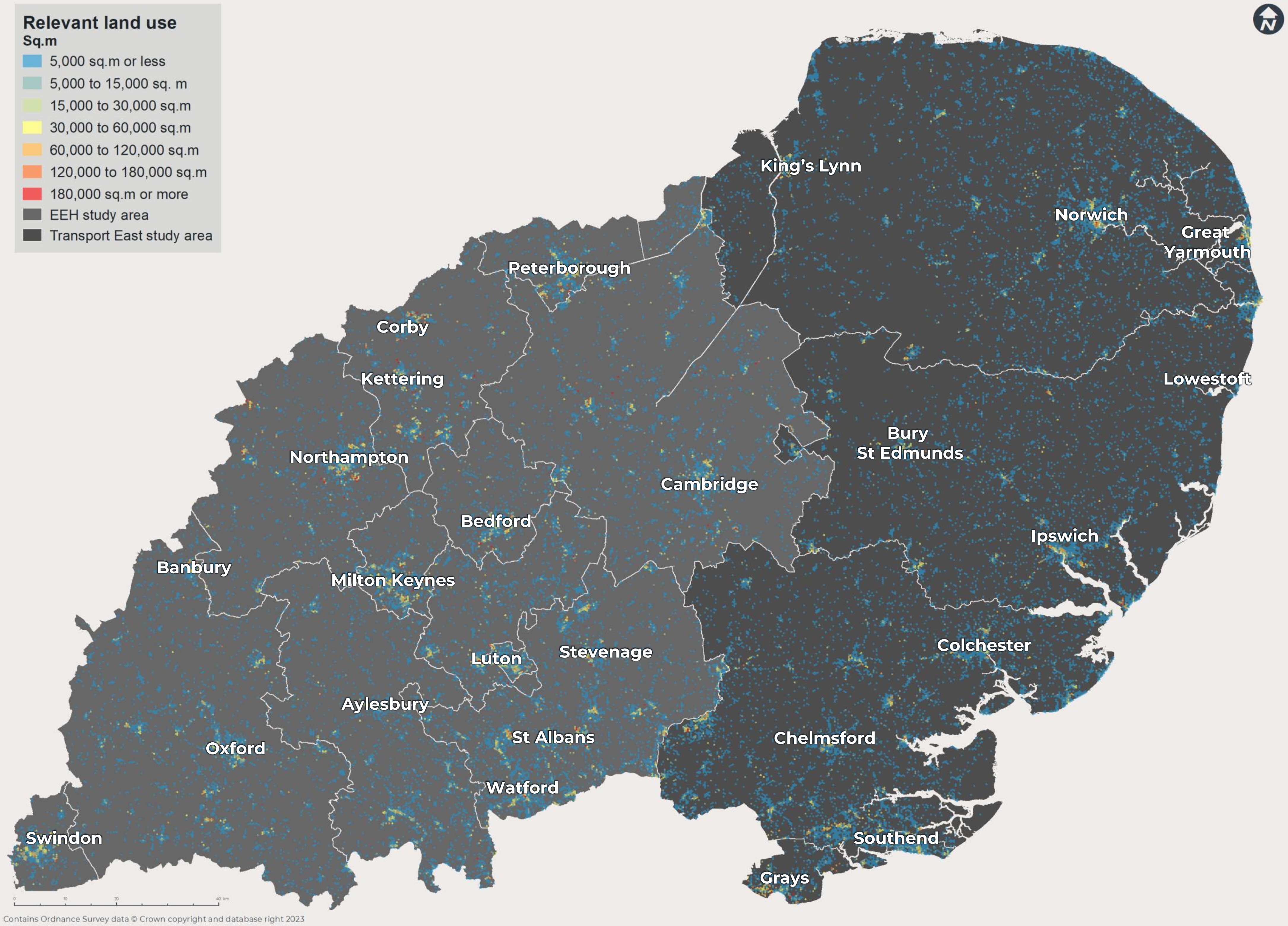


Figure B15: Relevant land use (Sq.m)

Source: WSP EV:Ready

PART C

EV:Ready outputs

EV:Ready Outputs

UPTAKE FORECAST

As part of EV: Ready, WSP conducted a comprehensive review of available literature and other key determining factors, including a wide range of forecasts being assembled and reviewed.

There was a high variety in statistics being reported, with many forecasts reporting mileage splits and sales trends rather than fleet numbers or share, and often reporting European figures rather than UK figures. The National Grid's Future Energy Scenarios 2022 (FES) was the most relevant and comprehensive source of data for determining a UK based uptake forecasts and had a clearly reported methodology for the way its forecasts were made.

There are far reaching assumptions involved in converting sales data, mileage data and European EV fleet shares into UK fleet shares. As a result, it was decided that forecasts should be calculated by examining the assumptions made in each of the FES 2022 scenarios, along with their forecasted EV uptake growth until 2030. From this high and low uptake scenarios could be derived using appropriate weighting systems for each of them.

After the UK forecast was derived, WSP used vehicle licensing statistics and propensities for EV ownership to calculate uptake forecasts specific to each local authority in the study area.

Table C1 shows the low and high bound of projected EV uptake for 2022, 2025, 2030 and 2040.

Table C1: Forecast uptake to 2040 – number of vehicles

LA	2022 (Actual – private vehicles only)	2025	2030	2035	2040
Essex	10,596	78,000 - 132,000	279,000 - 464,000	588,000 - 816,000	844,000 - 992,000
Norfolk	4,894	39,000 - 68,000	153,000 - 272,000	348,000 - 506,000	523,000 - 631,000
Southend-on-Sea	823	5,000 - 11,000	21,000 - 42,000	51,000 - 78,000	79,000 - 98,000
Suffolk	4,598	35,000 - 58,000	135,000 - 232,000	207,600 - 232,000	452,000 - 539,000
Thurrock	1,066	7,000 - 11,000	27,000 - 43,000	59,000 - 80,000	85,000 - 100,000
Total	21,977	164,000 - 280,000	615,000 - 1,053,000	1,253,600 - 1,712,000	1,983,000 - 2,360,000

Source: WSP EV:Ready

EV:Ready Outputs

UPTAKE FORECAST

Figure C1 shows the forecasted EV registration numbers within the study area in the high and low uptake scenarios. Here we see that the high scenario shows faster initial growth in uptake up until approximately 2034, when the gap between the low and the high scenarios begins to close.

The low uptake scenario reaches it's highest rates of EV uptake shortly after 2030, whereas the high uptake scenario reaches peak growth a few years prior to 2030. This reflects the increased level of early stage intervention and consumer adoption assumed in the high uptake scenario. The acceleration of uptake up to approximately 2030 is impacted by the 2030 ban on the sale of ICE vehicles.

Both scenarios maintain their peak growth rates for approximately eight years, after which both rates of uptake start to drop off. This reflects the fact that by that time a very large proportion of the vehicle fleet is expected to be electric.

Figure C2 shows the fleet mix of ICEs and EVs in the low scenario forecast. The fleet mixes are shown in five year intervals from 2025 to 2040. In 2030, it is predicted that 25% of vehicles will be EVs, and by 2040 that figure is predicted to rise to 77%.

As previously mentioned the average age a vehicle is scrapped is approximately 13 years, which explains the rapid decline of ICEs in large numbers up to 2040 (10 years after the ban). This trend is seen in both the high and low scenarios.

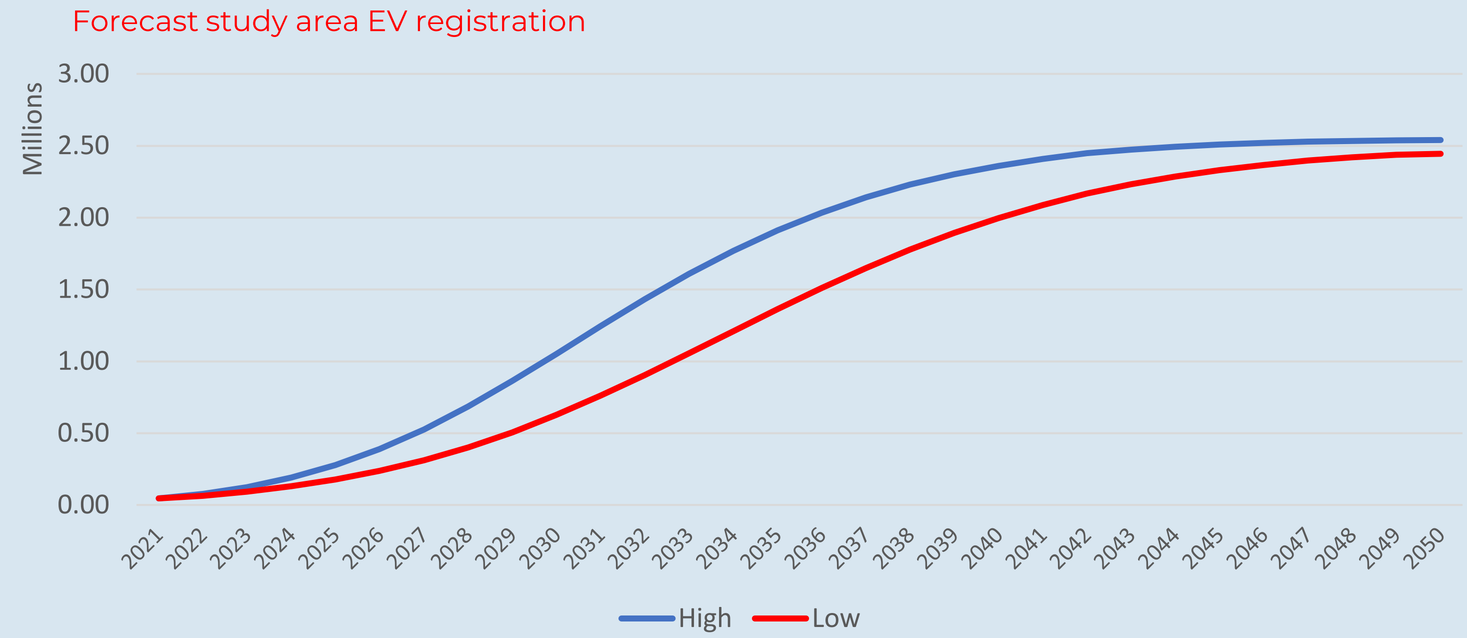


Figure C1: Forecast EV registration across the study area

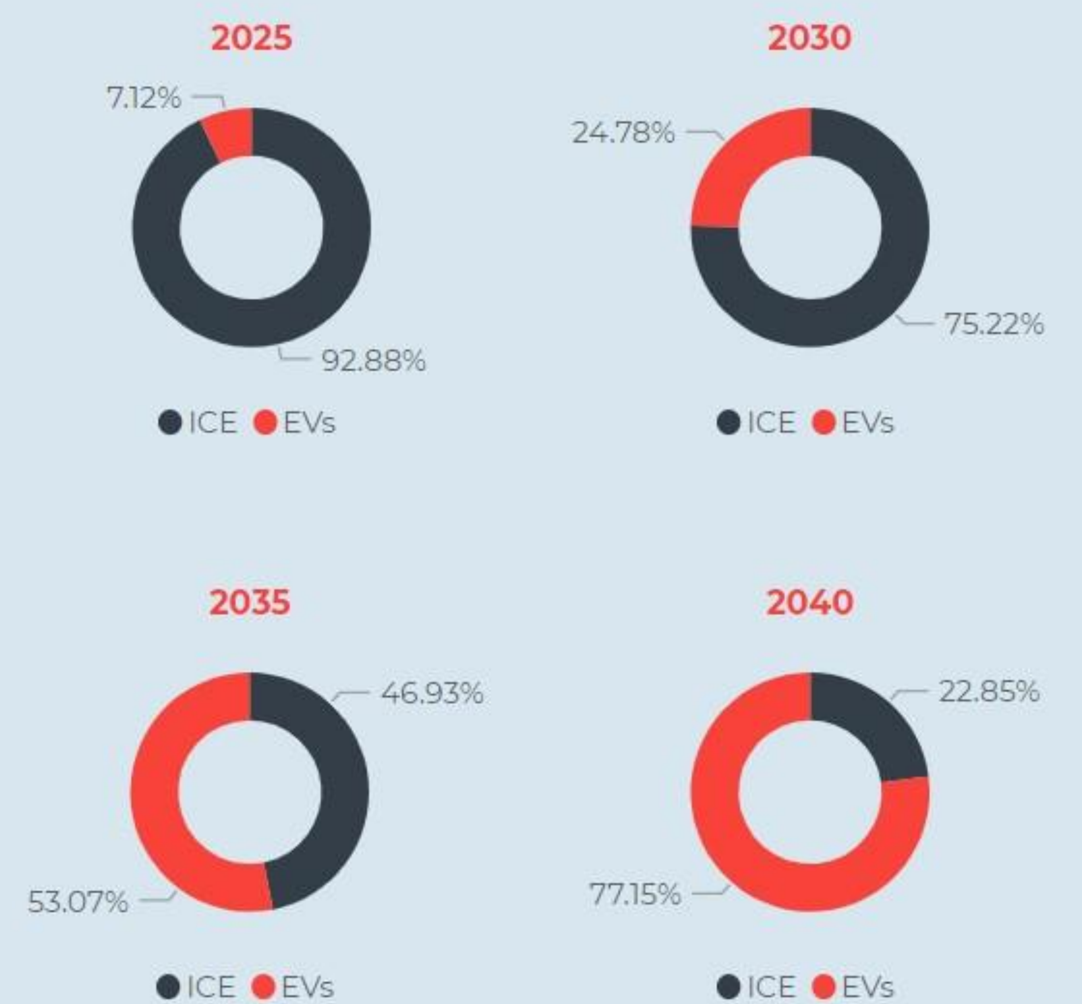


Figure C2: Fleet mix (EV and ICE)
Source: WSP EV:Ready

EV:Ready Outputs

UPTAKE FORECAST

Figures C3 – C6 show the uptake forecast across the region, for both the low and high scenarios, and shown as both number of vehicles and proportion of vehicles.

Figure C3 shows the low EV uptake forecast for 2030 across the region, given as raw numbers of vehicles. It is clear that EV uptake is focussed around urban areas across the region, with towns and cities closer to London having the highest uptakes, and those further away such as Norwich having lower uptakes.

More rural areas show lower rates of EV uptake, not least due to the reason there are fewer vehicles as a whole in rural areas, but also likely due to barriers to the uptake of EVs in rural and coastal areas, such as the north east of Norfolk.

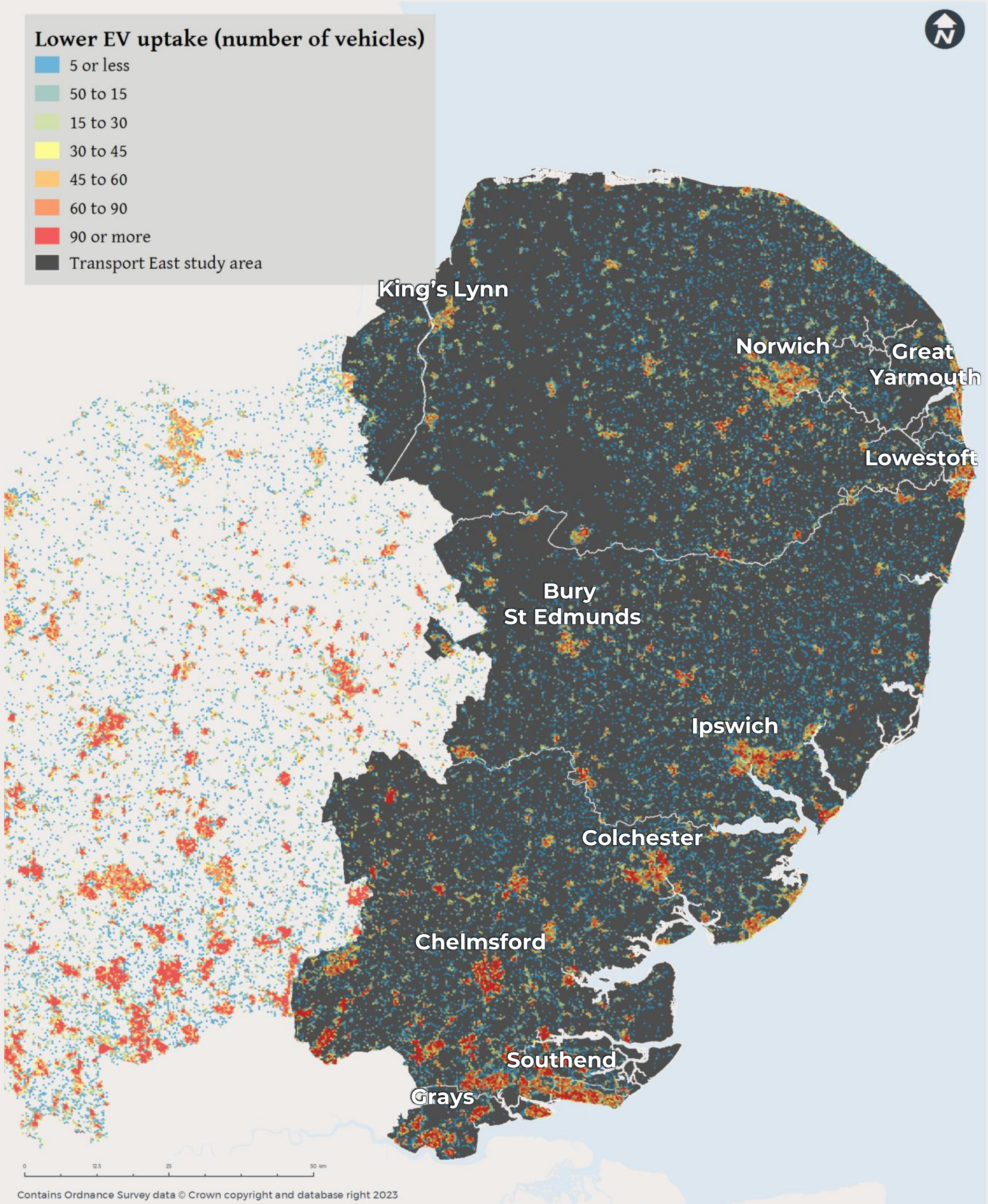


Figure C3: EV uptake low (number of vehicles) - 2030

Source: WSP EV:Ready

EV:Ready Outputs

UPTAKE FORECAST

Figure C4 shows the high EV uptake forecast across the study area, which follows the same general trend as the low forecast, but with a more even spread of EV density amongst the urban centres across the region. This is noticeable especially in the areas further away from London, which in this scenario show more similar levels of EV uptake to the towns and cities closer to the capital.

The other obvious difference between the low and high scenarios across the region is the increased EV uptake in the outskirts of towns and cities across the study area, which exceeds 90 vehicles per hex in the vast majority of such hexes in the high scenario.

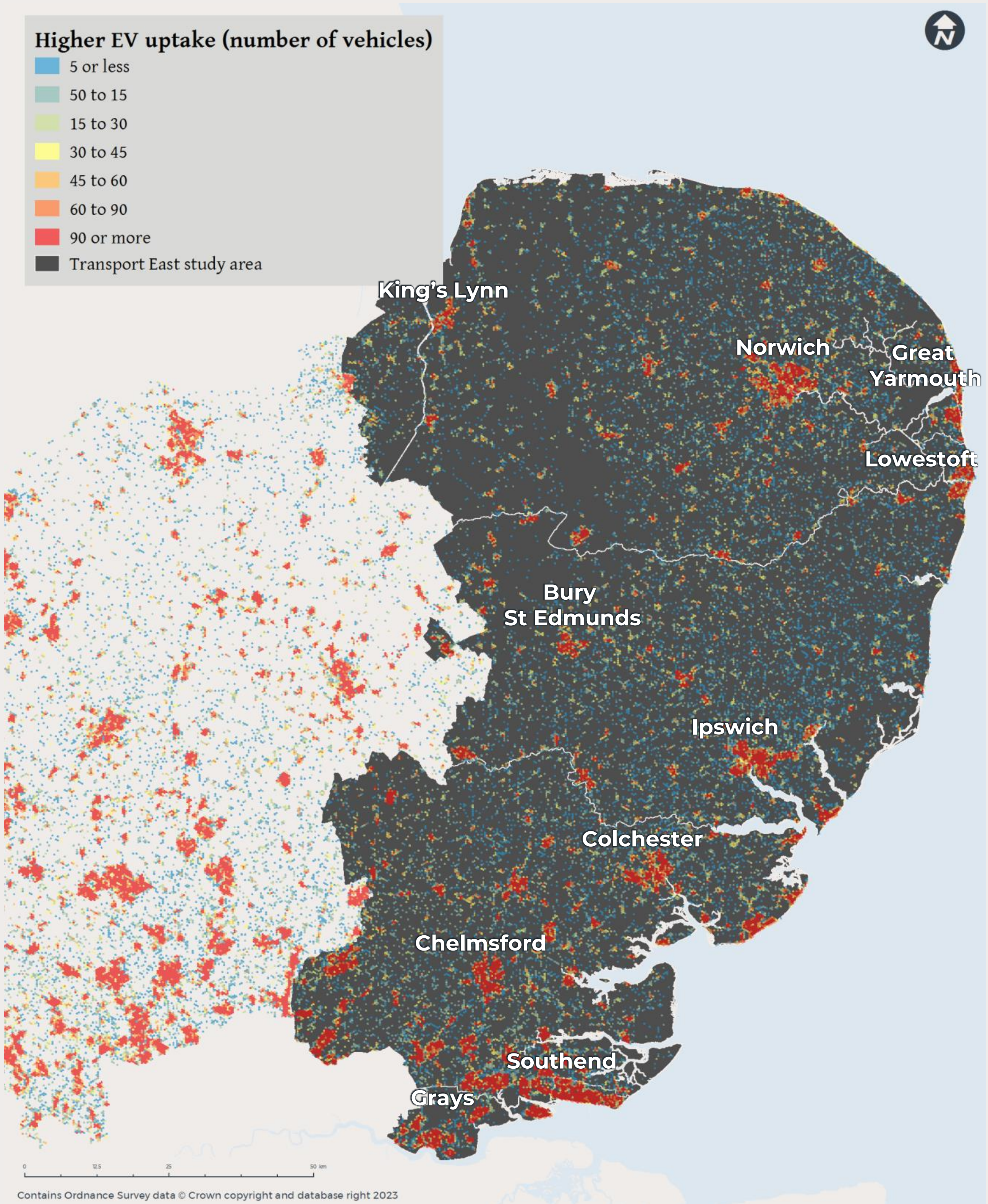


Figure C4: EV uptake high (number of vehicles) - 2030

Source: WSP EV:Ready

EV:Ready Outputs

UPTAKE FORECAST

Figure C5 shows the 2030 low EV uptake forecast as a proportion of total vehicles within each hex across the region.

Uptake as a proportion of vehicles is largely uniform across the Transport East region, with much of the region having an uptake between 20% and 40%. The areas of higher proportional uptake are towards the west of Essex, and south central Norfolk.

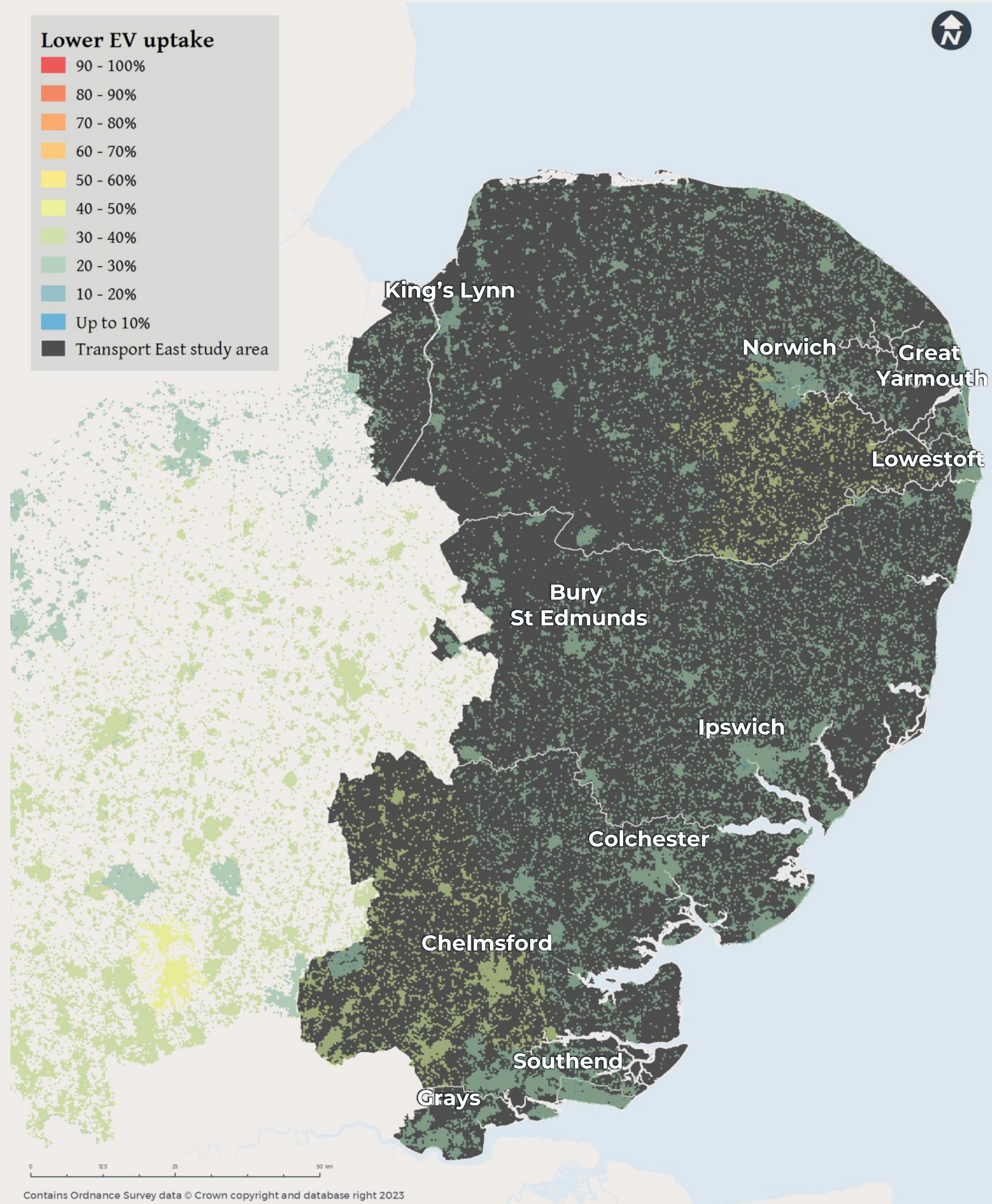


Figure C5: EV uptake low (proportion of vehicles) - 2030

Source: WSP EV:Ready

EV:Ready Outputs

UPTAKE FORECAST

Figure C6 shows the 2030 high EV uptake forecast as a proportion of total vehicles within each hex across the region.

Uptake as a proportion of vehicles in the higher scenario, like the low scenario, is largely uniform across the Transport East area. Uptake ranges from 30% to 60%, with most of the region having an uptake rate of around 40%.

Like the low scenario, the area of highest uptake is west Essex.

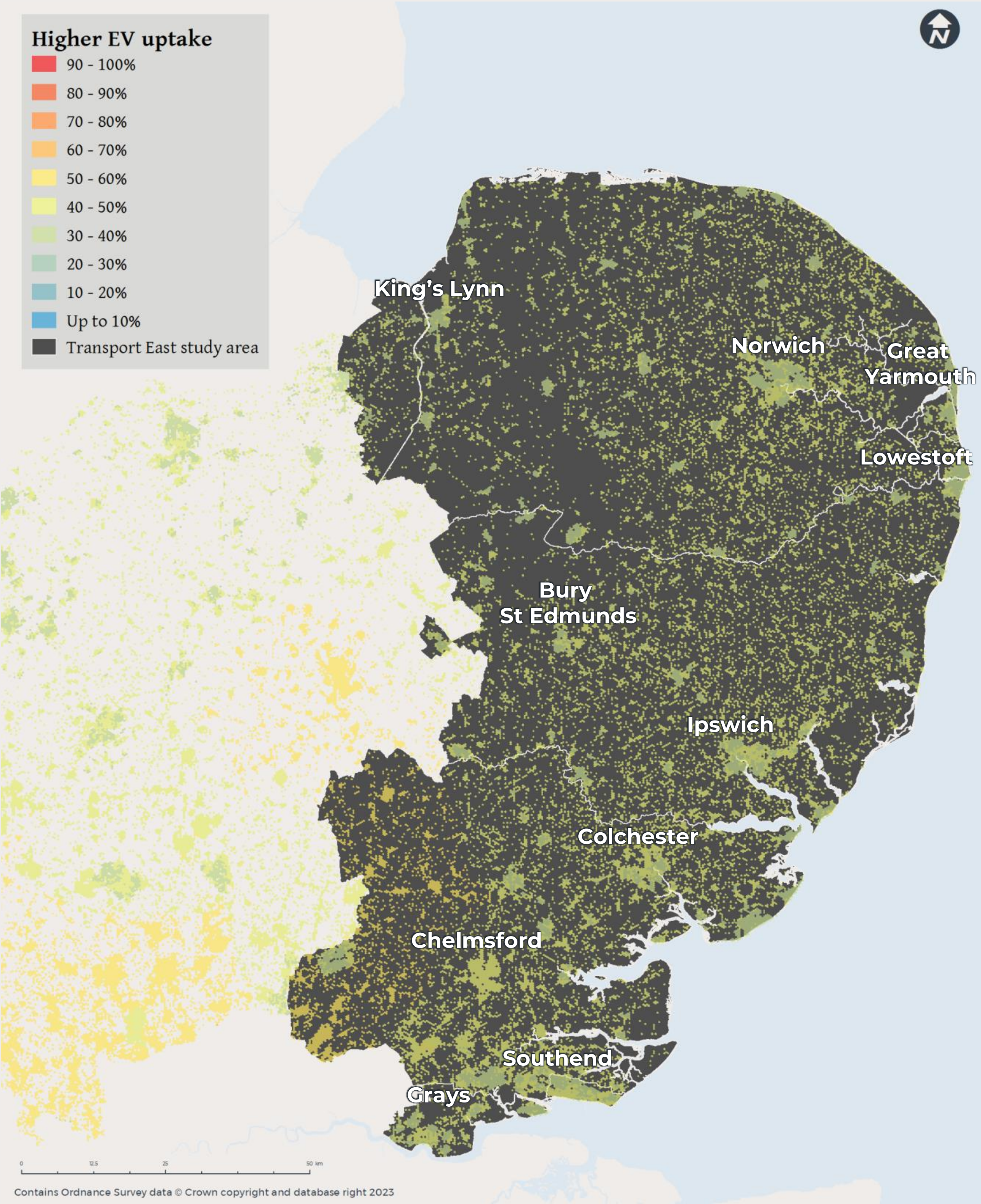


Figure C6: EV uptake high (proportion of vehicles) - 2030

Source: WSP EV:Ready

EV Ready Outputs

EN-ROUTE DEMAND

EV:Ready, integrated with the South East Regional Transport Model (SERTM), has been used to calculate the charging demand for EVs across different stages of a journey: origin, en-route and destination. WSP's high and low EV uptake forecasts were used to split car user class origin / destination demand into trips made by ICEs and EVs separately. The SERTM transport model assignment was then run to obtain the en-route demand that these trips would produce at a link level. It should be noted that the forecast year for SERTM is 2031, and therefore the demand on the network had to be taken from that year. We have applied the 2030 vehicle fleet split to this demand for both the high and low scenarios to calculate the network demand for EVs in 2030.

Figure C7 shows the en-route vehicle demand for EVs for 2030, for the low uptake scenario. This shows the routes where EVs are likely to be travelling throughout the study area. These routes are comprised of journeys made for all purposes including commuting, utility, leisure, and delivery/servicing movements.

For the low scenario, routes with the highest en-route charging demand are the A12 (from Romford to Ipswich), the A14 (from Ipswich to Newmarket), the A11 (from Newmarket to Norwich), the M11 and the A13 and A127 around Greys and Southend-on-Sea. The demand on these routes is mostly between 20,000 and 40,000.

In the more rural areas of the region, such as along the coast of East Anglia, there is a noticeably lower trip demand for EVs.

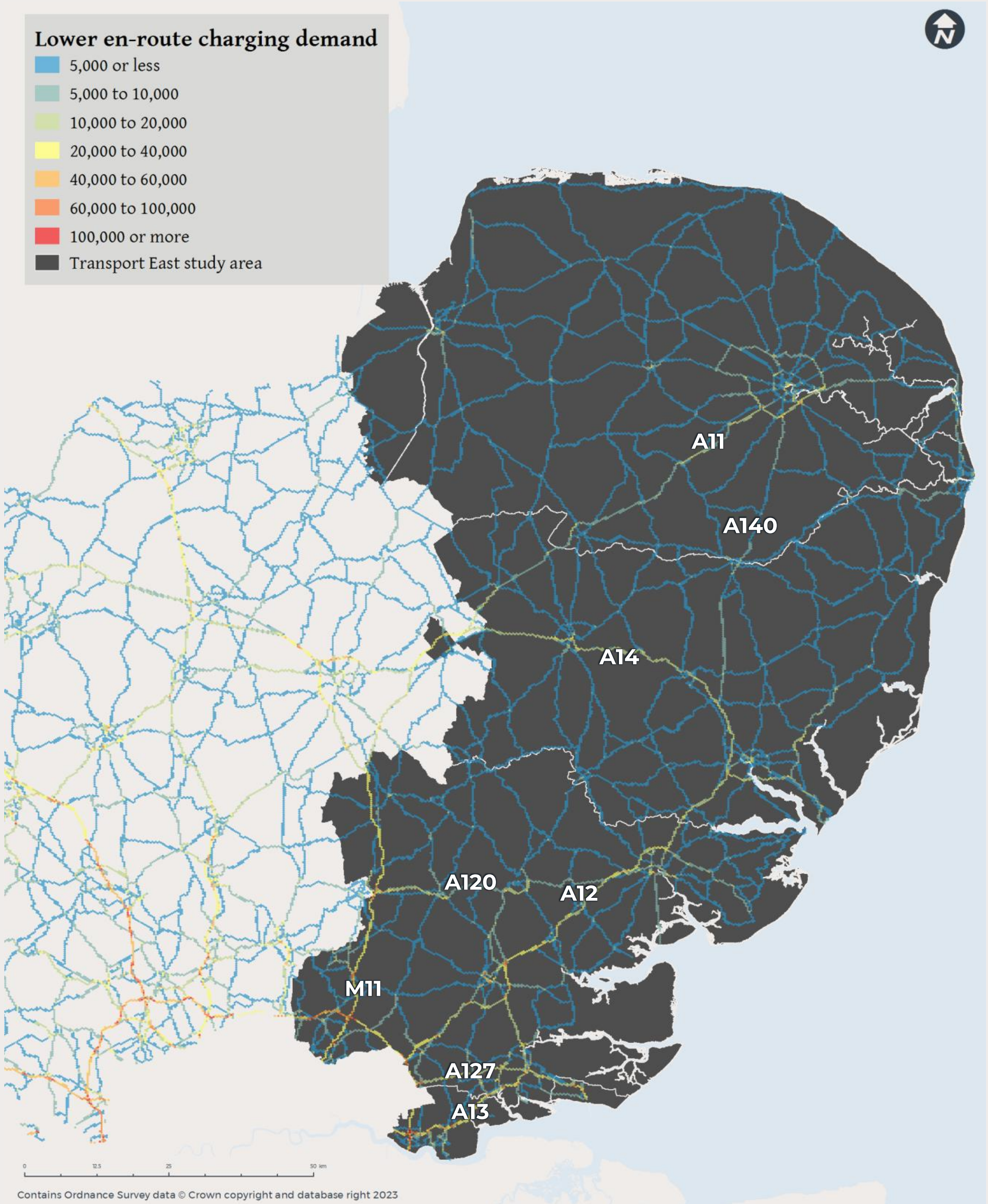


Figure C7: En-route demand low - 2030

WSP EV:Ready

EV Ready Outputs

EN-ROUTE DEMAND

Figure C8 shows the en-route vehicle demand for EVs for 2030 for the high uptake scenario. This shows the routes where EVs are likely to be travelling throughout the study area. These routes are comprised of journeys made for all purposes including commuting, utility, leisure, and delivery/servicing movements.

For the high scenario, routes with the highest en-route charging demand are much the same as the low scenario, with high demand on a few additional routes such as the A130 (from South Benfleet to Chelmsford), the A120 (from Bishop's Stortford to Colchester), the A140 (from Ipswich to Norwich), and there is also higher demand by King's Lynn, Lowestoft and Bury St Edmunds.

This provides Transport East with an initial indication of where to target deployment of the rapid charging infrastructure required for en-route charging. Similarly, it indicates where to focus engagement with private sector CPOs for en-route charging.

It is assumed that those travelling to their destination would require a speedy charge, similar to users stopping at a petrol station for non-EVs. Therefore, demand for rapid chargers is greatest along the route of a journey. Standard chargers are more likely to be utilised at the origin and destination of a journey, where the user usually has a longer dwell time.

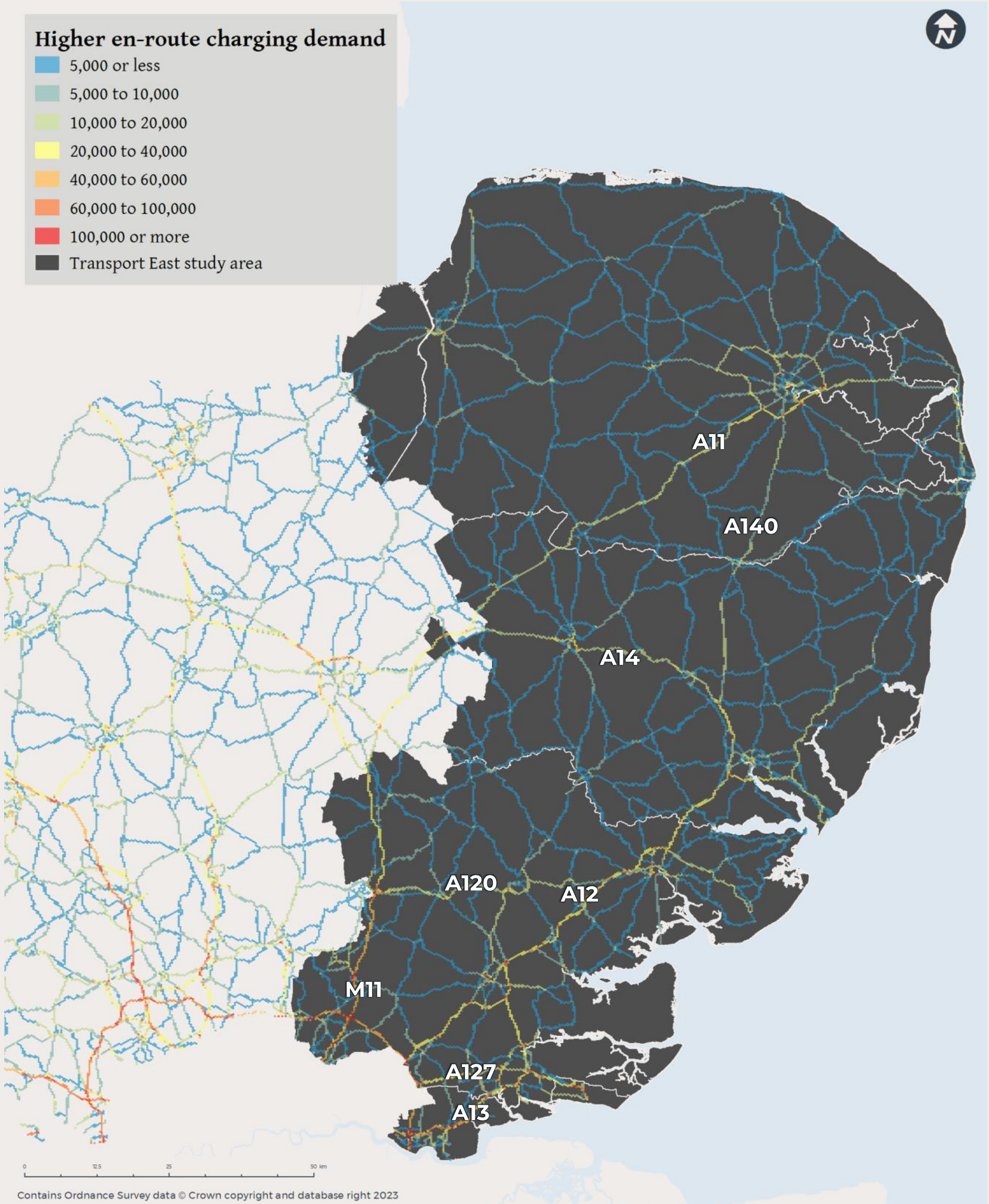


Figure C8: En-route demand high - 2030

WSP EV:Ready

EV:Ready Outputs

STANDARD CHARGING DEMAND FORECAST

The public EV charging eco-system encompasses both standard and rapid charge points which accommodate the different needs of different drivers. Each type of charging has a unique supply and demand profile. These have both been modelled to show an accurate forecast of charge point requirements

The hex-level outputs from the SERTM transport model were compared against one another, with a score from 0 to 1 being assigned for each origin, en-route and destination demand.

Standard charging demand comprises of origin and destination charging. Origin charging for properties with no off-street parking is usually provided on residential streets, with dedicated on-street parking bays for charging.

Destination charging sites are publicly accessible sites where the driver has chosen to go to a site for other purposes, i.e. somewhere they would have already parked such as shopping centres, railway stations and leisure sites. At these sites, vehicles often take the opportunity to top up whilst they are parked.

Both origin and destination chargers are expected to be mostly standard charging points rather than rapid, to reflect the fact that users will tend to be situated in their locations without having a large constraint on time. In some instances, at sites that may not have as long dwell times, for example leisure centres and gyms, it may be appropriate to also provide rapid charging.

Figure C9 shows the standard charging demand score for 2030 across the study area, for the low uptake scenario. Demand is concentrated in urban areas with high housing density across the whole region, such as Norwich, Ipswich Southend-on-Sea and Colchester. There is also demand along the coastal areas of Norfolk and Suffolk, possibly highlighting the need for destination charging at tourist locations.

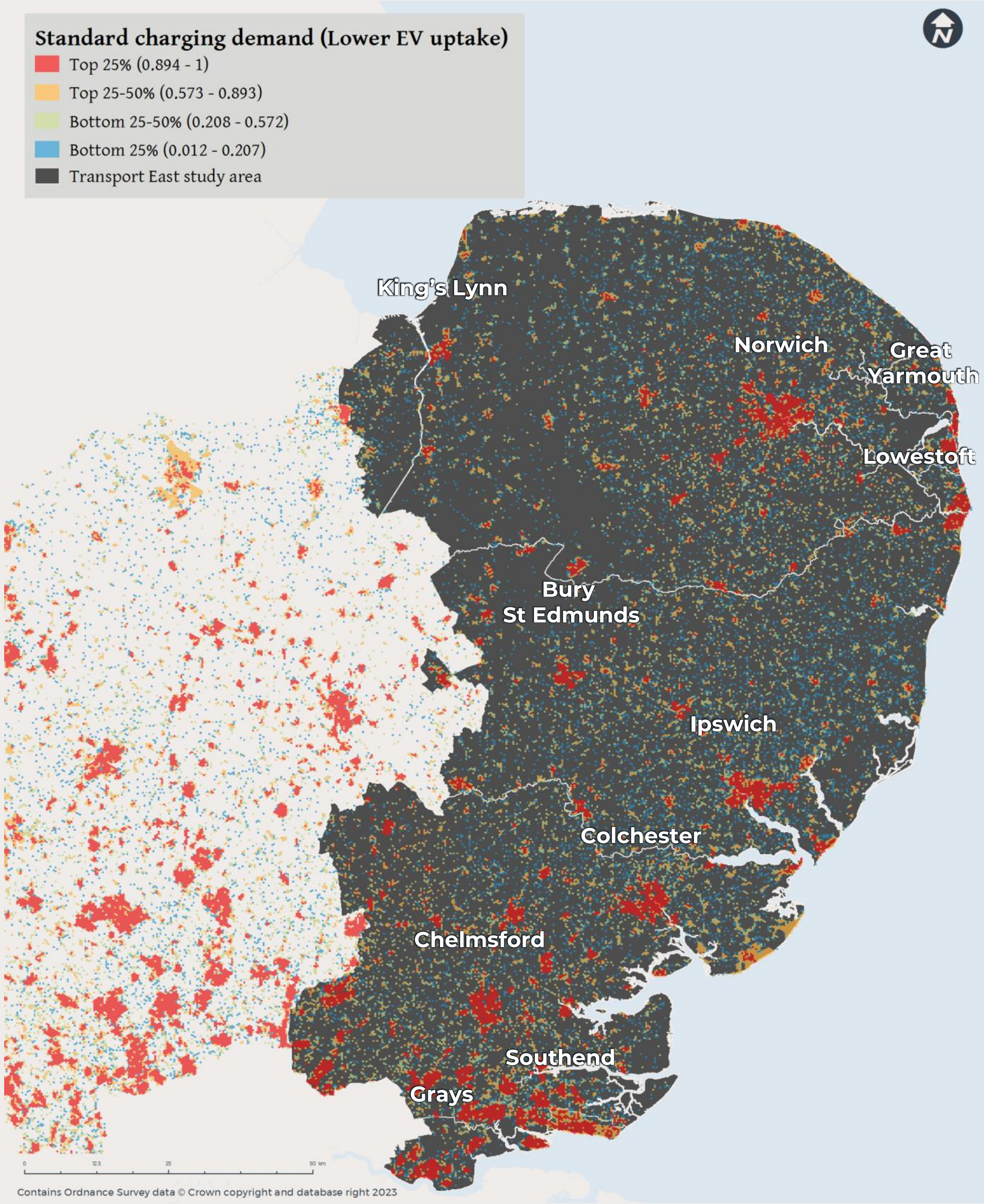


Figure C9: Standard charging demand low - 2030

Source: WSP EV:Ready

EV:Ready Outputs

STANDARD CHARGING DEMAND FORECAST

Figure C10 shows the standard charging demand score for 2030 across the study area, for the high uptake scenario. This is largely the same as the low scenario.

Whilst towns and cities with higher predicted EV uptakes should be prioritised when allocating EVCPs, it is clear that demand for standard charging points is predicted to be very high in all urban centres by 2030. These areas will likely vary in the feasibility of allocating EVCPs both publicly and privately. Care should be taken to communicate with local authorities to capture the individual needs of each area when deciding on the best approach to take.

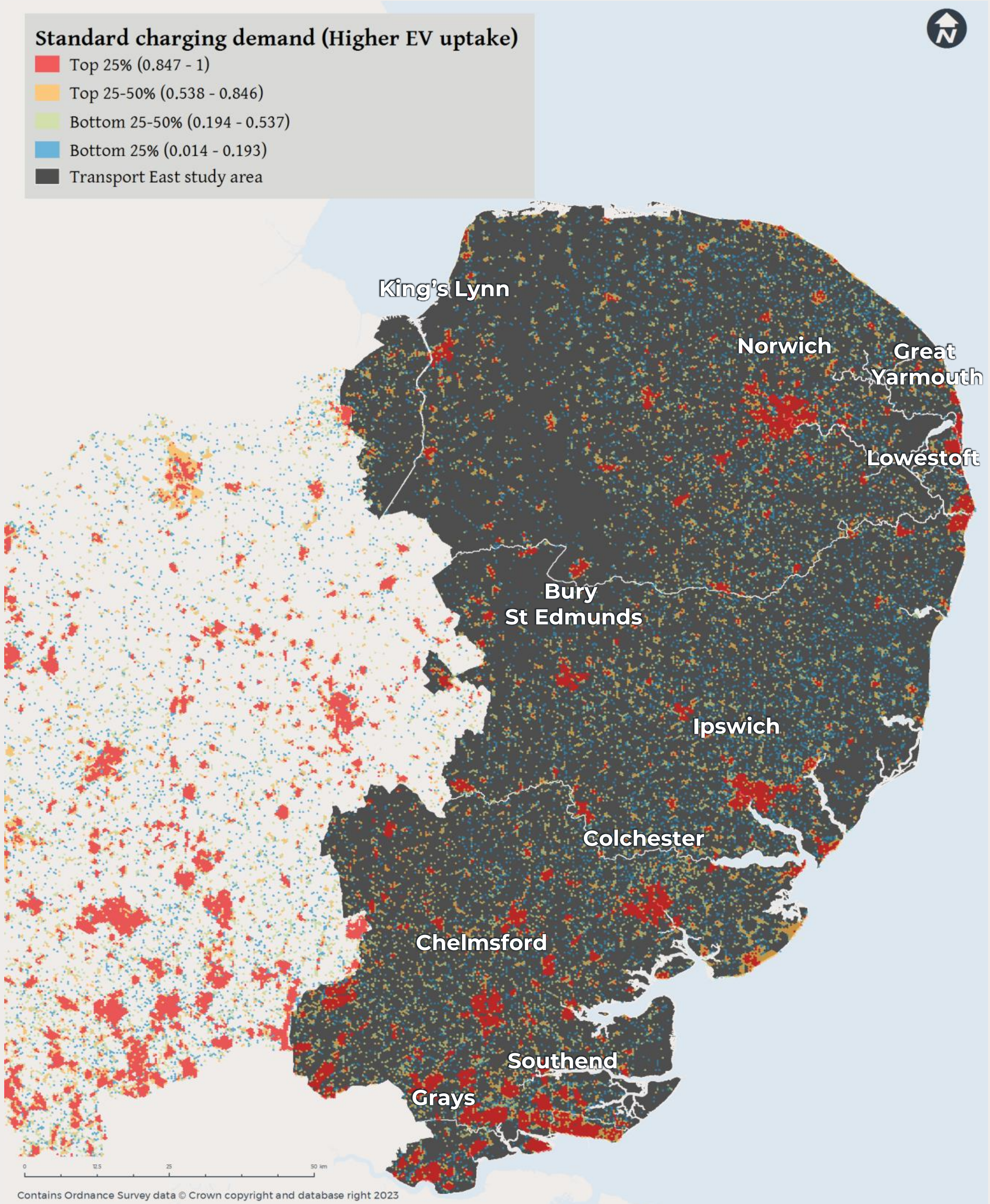


Figure C10: Standard charging demand high - 2030

Source: WSP EV:Ready

EV:Ready Outputs

RAPID CHARGING DEMAND FORECAST

Vehicles travelling long distances, often along the strategic route network, may wish to top up to extend their range and allow them to complete their journey. This is also referred to as intermediate charging.

En-route charging usually takes the form of rapid (occasionally standard) chargers, provided on strategic link roads such as A roads and motorways, mostly at service stations.

Figure C11 shows the rapid charging demand for 2030 on the highway network of the study area, for the low scenario.

Rapid charging demand strongly reflects the en-route demand seen in **Figures C7 and C8.** The top 25% of demand is on the main roads of the region, namely the M11, the A11, A12, A13 A14 and A127

This gives a clear indication that rapid charging infrastructure would be most effectively applied as close to these links as possible, and in a way such that the highest demand trips do not require a detour in order to charge en-route.

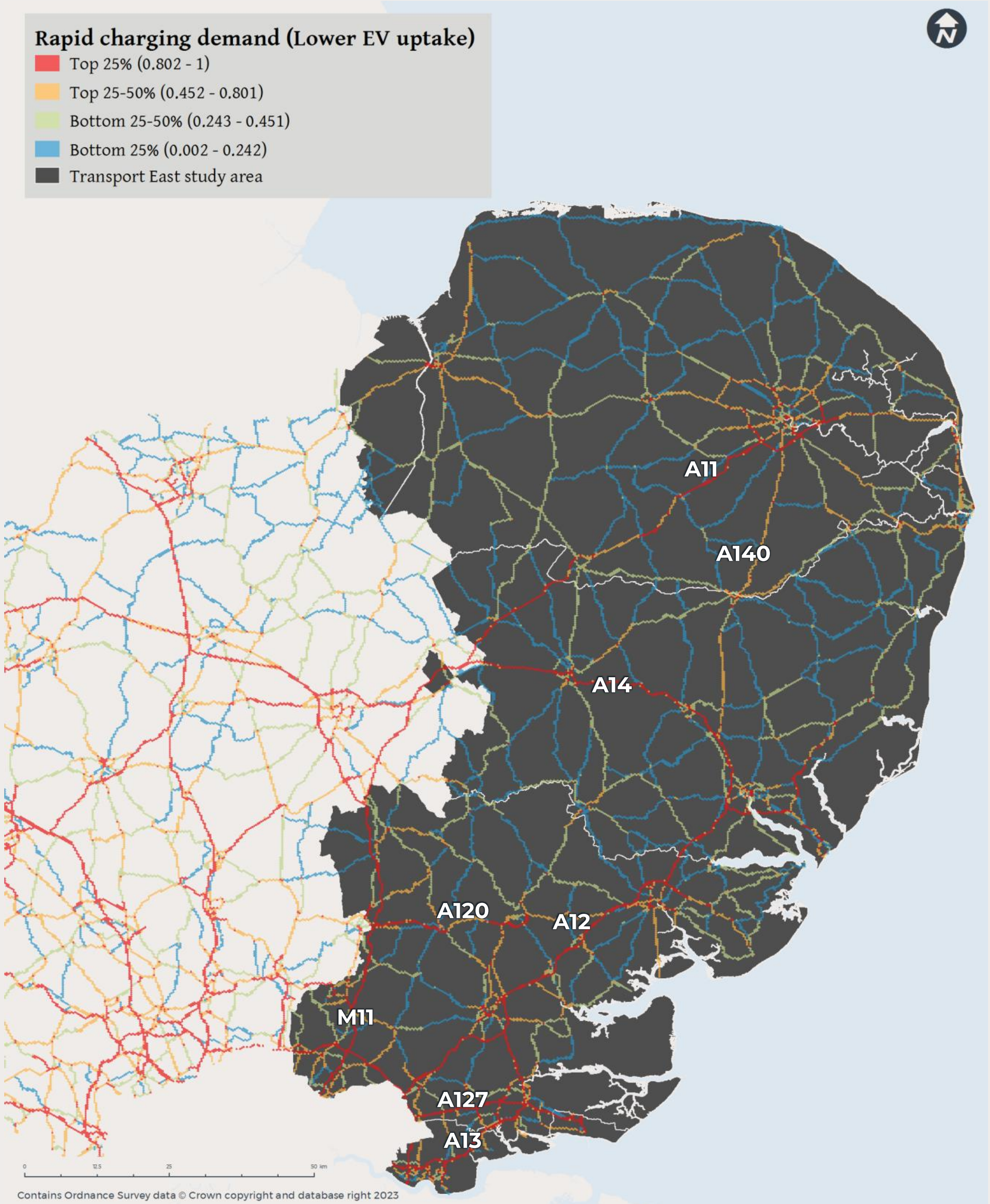


Figure C11: Rapid charging demand low - 2030

Source: WSP EV:Ready

EV:Ready Outputs

RAPID CHARGING DEMAND FORECAST

Figure C12 shows the rapid charging demand for 2030 on the highway network of the study area, for the high scenario.

The high scenario is largely similar to the low scenario, with high demand on the same routes. The difference is that there is a greater extent of higher demand as expected. Demand is high on the same routes as Figure C11, but also high around the key urban centres of Norwich, Ipswich, Colchester, Chelmsford and Southend-on-Sea.

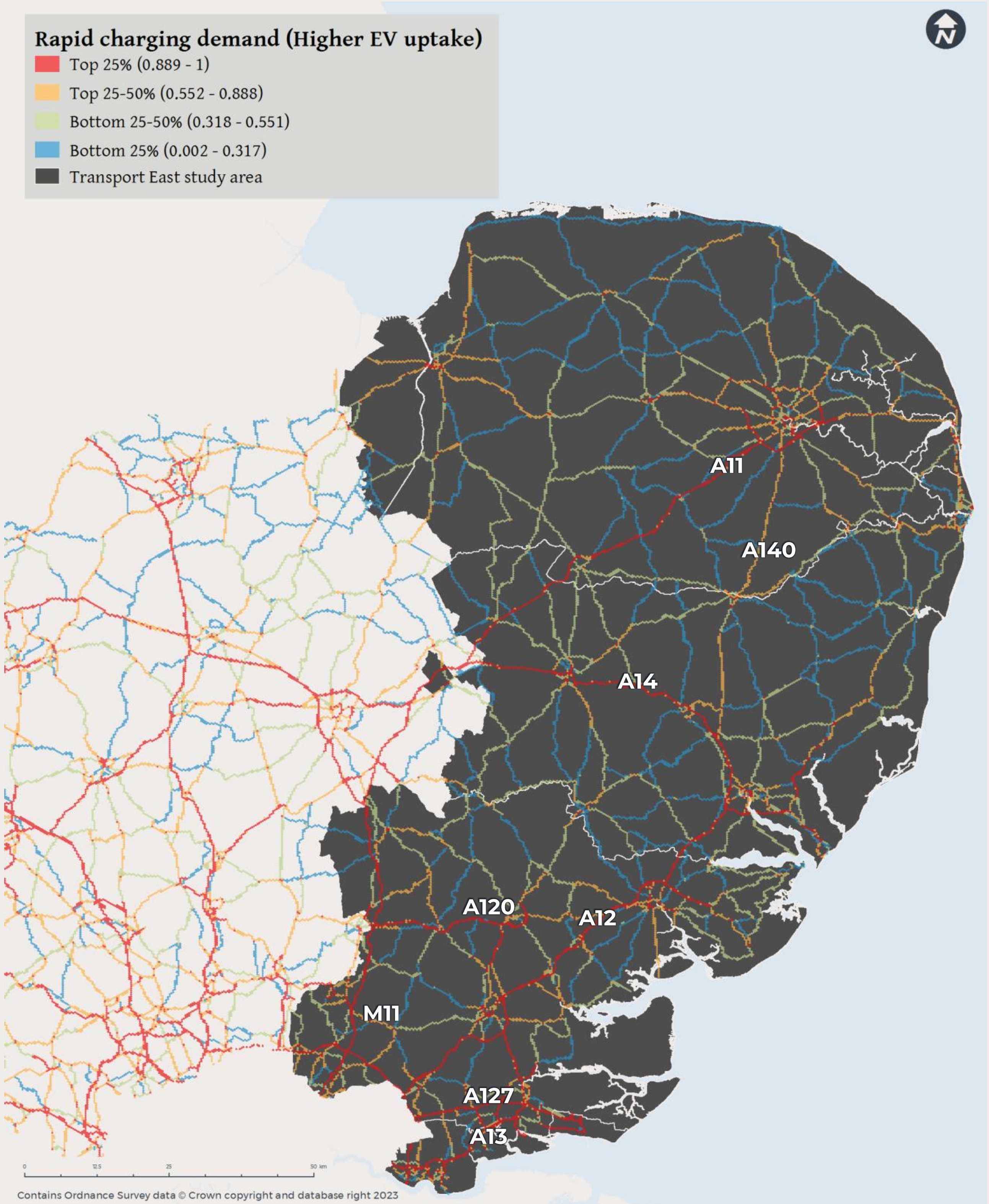


Figure C12: Rapid charging demand high - 2030

Source: WSP EV:Ready

EV:Ready Outputs

SUPPLY FORECAST

Both the public and private sector are actively engaged in the installation of EV charging infrastructure.

For local authorities, it is important to understand where the private sector is likely to invest. This is so limited resources can be appropriately focused on 'plugging the gaps' in the EVCP network and ensuring that equitable access to charging is achieved. This will drive EV uptake and ultimately contribute towards decarbonisation goals.

This approach is supported by the DfT's national EV charging strategy.

Electrical grid capacity is a key determinant of supply. Where headroom in the local electricity network is low, installation of EVCPs could require costly upgrade works which can extend to millions of pounds in extreme cases.

The presence of existing EVCPs in an area, which are already meeting the demand, will be a deterrent to further supply being installed.

SUPPLY SCORING

The supply score is essentially a measure of how attractive a site is to the private sector.

Table C2 below describes the supply score for en-route, origin and destination charging. En-route supply is scored via modelled flow, grid supply, and presence of existing EVCPs. For example, if there is already a rapid EVCP in a hex cell, the en-route supply would be 0.

Origin supply is scored according to EV uptake, reliance on on-street parking, grid supply, origin demand and the presence of existing EVCPs. This means that an area with high EV uptake, high reliance on on-street parking, good connections to the grid, high origin demand and no existing EVCPs present will have a high origin supply score.

Destination supply is scored according to modelled flow, grid supply, relevant land use, destination demand and presence of existing EVCPs. This means that an area with high modelled EV flow, good grid connections, relevant land uses (leisure/office etc), high destination demand score and no existing EVCPs will have a high destination supply score.

The standard charging supply score is the combination of the destination and origin charging supply scores of an area.

PRIVATE SECTOR INVESTMENT AND THE ROLE OF THE PUBLIC SECTOR

In order to create a successful EV charging network, that meets the needs of drivers, both the public and private sectors will need to invest in EVCPs.

The ratio of change of public to private sector investment will change over time. Currently we are in the early stages of the transition to electric vehicles and the number of EVs which require public chargers is relatively low. As a result there are many locations where EVCP installations are not commercially viable for the private sector. The contribution required by the public sector is therefore relatively high. As the number of EVs increases, the commercial viability will improve and the public sector contribution will decrease.

There is a keen appetite to invest in EV charging infrastructure from the private sector, with a number of large operators having established themselves, as well as new entrants and acquisitions by major investors.

However, commercial charge point deployments are typically focused on destinations and intermediate sites (i.e. service stations, roadside cafes), where demand is high, with high traffic volumes or reasonable dwell times. Rapid chargers are more likely to be commercially deliverable by the private sector than standard / fast chargers.

Table C2: Supply score assumptions (weighted)

Assumptions and weightings	EV uptake normalised to 1	Reliance on on-street parking – higher %, higher score	Modelled Flow normalised to 1	Grid supply normalised to 1	Land use normalised to 1	Origin demand normalised to 1	Destination demand normalised to 1	Weighting
En-route Supply Score (out of 1)			50%	50%				Rapid EVCPs - 0 Standard EVCPs - 0.5
Standard Supply Score (out of 2)	Sum of the origin and destination supply calculations							
Origin Supply (out of 1)	25%	25%		25%		25%		Any EVCP - 0.5
Destination Supply (out of 1)			25%	25%	25%		25%	Any EVCP - 0.5

EV Ready Outputs

GAP ANALYSIS

Figures C15 – C18 (overleaf) shows the gap analysis undertaken to identify where the private sector is likely to meet EVCP requirements, and where the public sector will likely have to intervene.

To identify areas where gaps are anticipated in the provision of chargers by the private sector, a gap analysis has been undertaken which consists of comparing supply and demand scores.

It is assumed that the public sector will provide charging where the demand score is greater than the supply score. In the case of rapid charging this would, for example, be in areas that have high modelled flow of EVs, but poor grid supply, and/or existing EVCPs present. In the case of standard charging the public sector would provide charging where there is high levels of EV uptake and high EV en-route demand, but where there is lower reliance on on-street parking, poor grid supply and existing EVCPs present.

The private sector is assumed to provide charging where the supply score is greater than the demand score. In the case of rapid charging, this is where there is high modelled EV flow, good connections to the grid and no existing EVCPs present. The key aspect for the private sector is that they will prioritise investment in areas that are commercially attractive.

For example, it is expected that the private sector would prefer to install rapid chargers along high traffic routes such as motorways and A roads, and therefore the public sector is recommended to install standard chargers in town or village centres.

RAPID EVCP PROVISION

Figure C15 shows the top 200 locations per local authority, for rapid EVCP provision in the low uptake scenario for 2030. It is expected that whilst the private sector will mostly provide for rapid EVCP provision, this does not preclude the involvement of the public sector.

There is demand for rapid EVCPs in the larger urban centres such as Norwich, Ipswich and Southend. There is also demand along the M11, the A12 and the A11. There is also demand shown along key links in more rural areas of Norfolk and Suffolk, and even towards the coast.

Figure C16 shows the top 200 locations per local authority for rapid EVCP provision in the high uptake scenario for 2030.

There are more opportunities for the public sector to provide rapid EVCP provision in the high uptake scenario, which begets revenue opportunities for the public sector.

CHARGING HABITS – PUBLIC VS PRIVATE

Firstly, there is a need to consider the extent to which vehicles will use publicly accessible chargers, as opposed to private residential or workplace charging. At present a large majority of charging takes place at homes and workplaces (~80% of kW delivered). However, this ratio may change over time, with implications for the number of public chargers required.

There are some contrasting and often strongly held views amongst the EV industry as to the whether in the future, EV charging habits and infrastructure will pivot more decisively away from the current model, towards a far larger proportion of charging at ultra-rapid charging hubs, with quick turnaround times which are more akin to the petrol station model. Whilst others anticipate sustained high levels of home and workplace charging, or greater destination charging, with standard chargers proliferating within car parking spaces and supporting a 'grazing' or top-up behaviour.

Public provision: Demand Score > Supply Score

Public or private provision: Demand Score = Supply Score

Private provision: Demand Score < Supply Score

EV:Ready Outputs

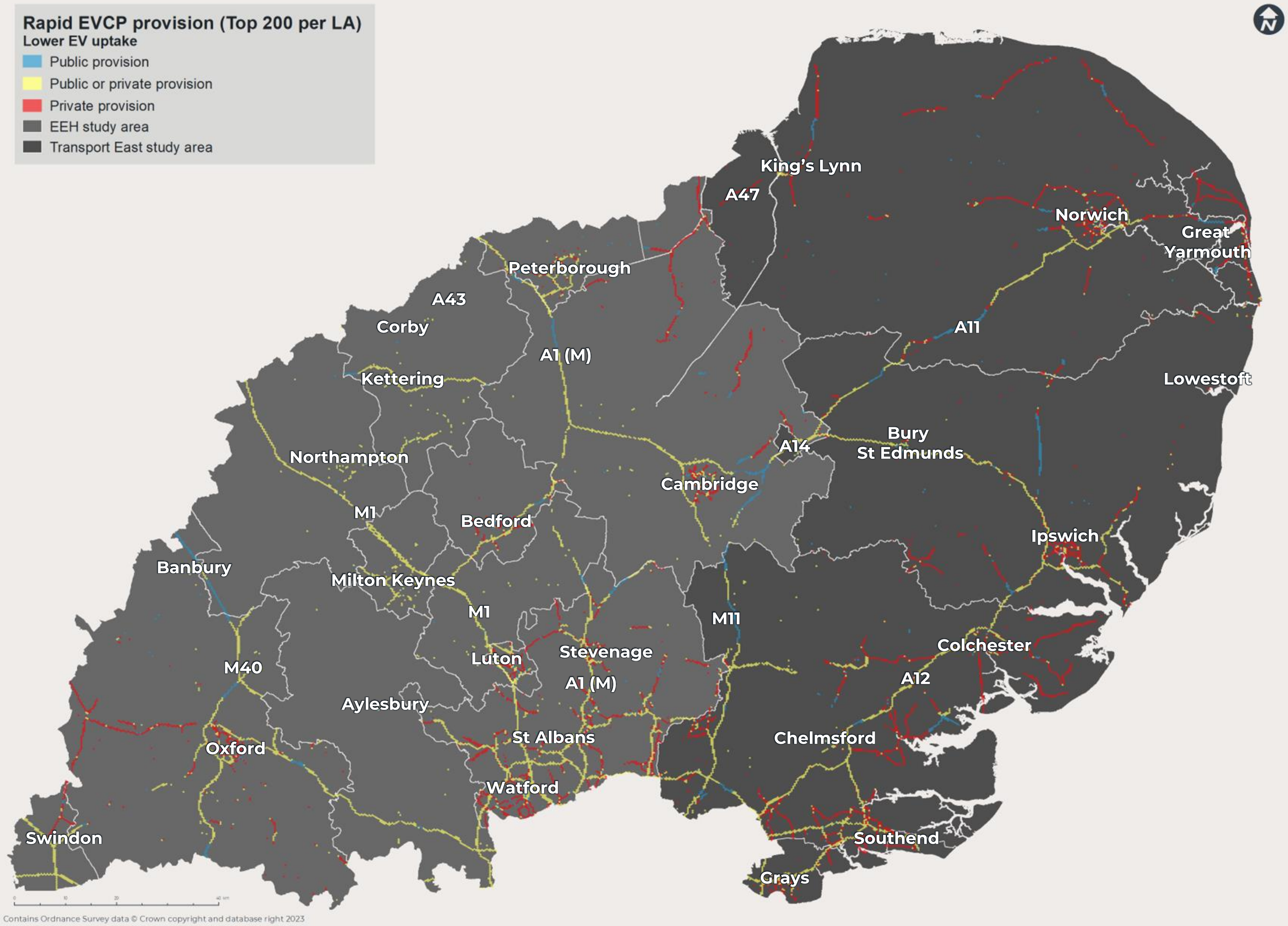


Figure C15: Illustrative rapid charge point locations low - 2030

Source: WSP EV:Ready

EV:Ready Outputs

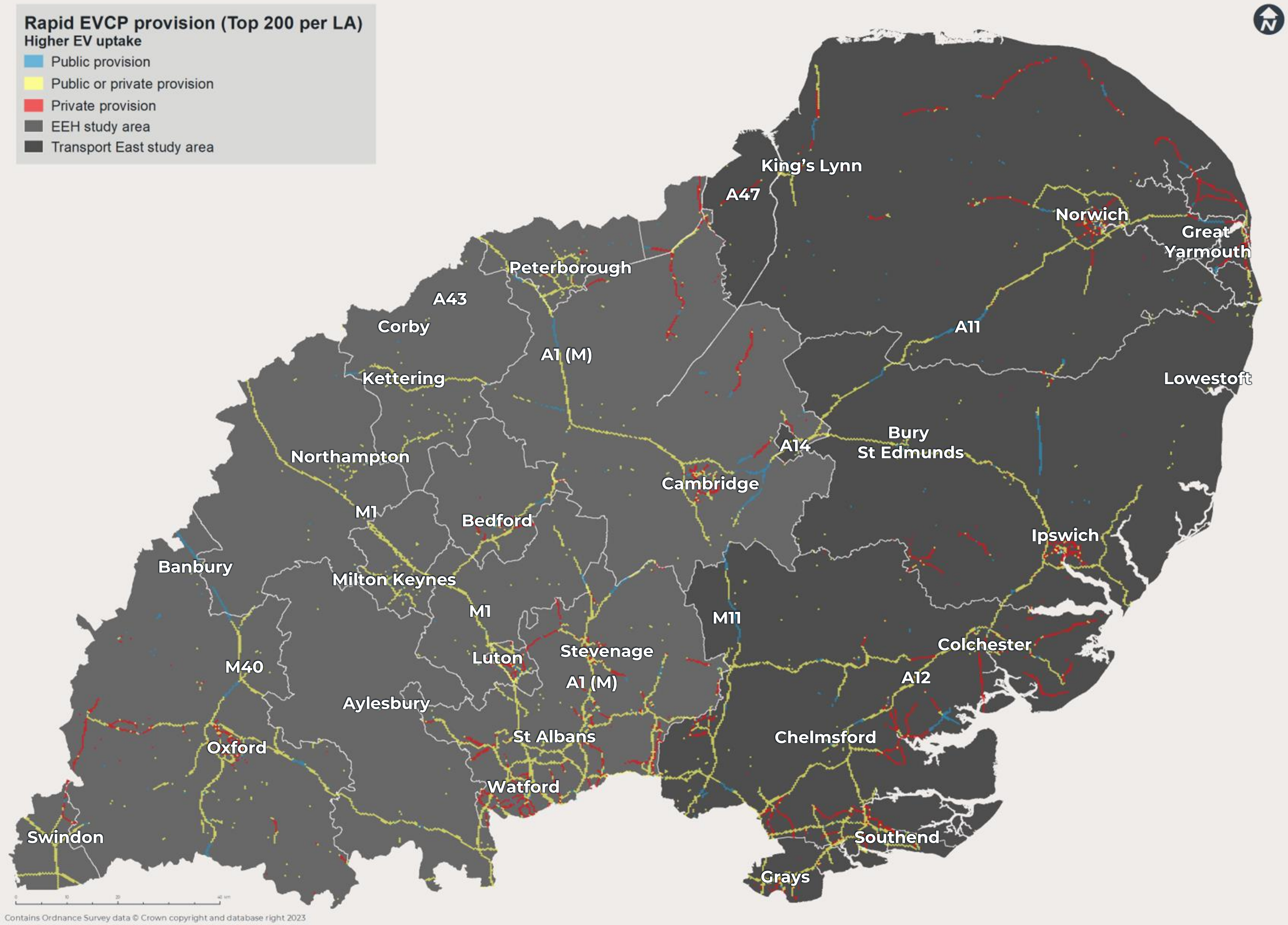


Figure C16: Illustrative rapid charge point locations high - 2030

Source: WSP EV:Ready

EV Ready Outputs

STANDARD EVCP PROVISION

Figure C17 shows the top 200 locations per local authority for standard EVCP provision for 2030 for the low uptake scenario.

When considering standard charging provision, it is mostly the case that the public sector will be required to provide this.

Standard EVCP provision will mostly be required in more urban areas such as Southend-on-Sea, Ipswich and Norwich, but also in less urban areas such as along the Norfolk Coast. This is likely due to a requirement for destination charging at tourist sites.

There is a requirement shown in the more rural areas of the region. It is likely that almost all smaller towns and villages will have some form of standard charging provision by 2030.

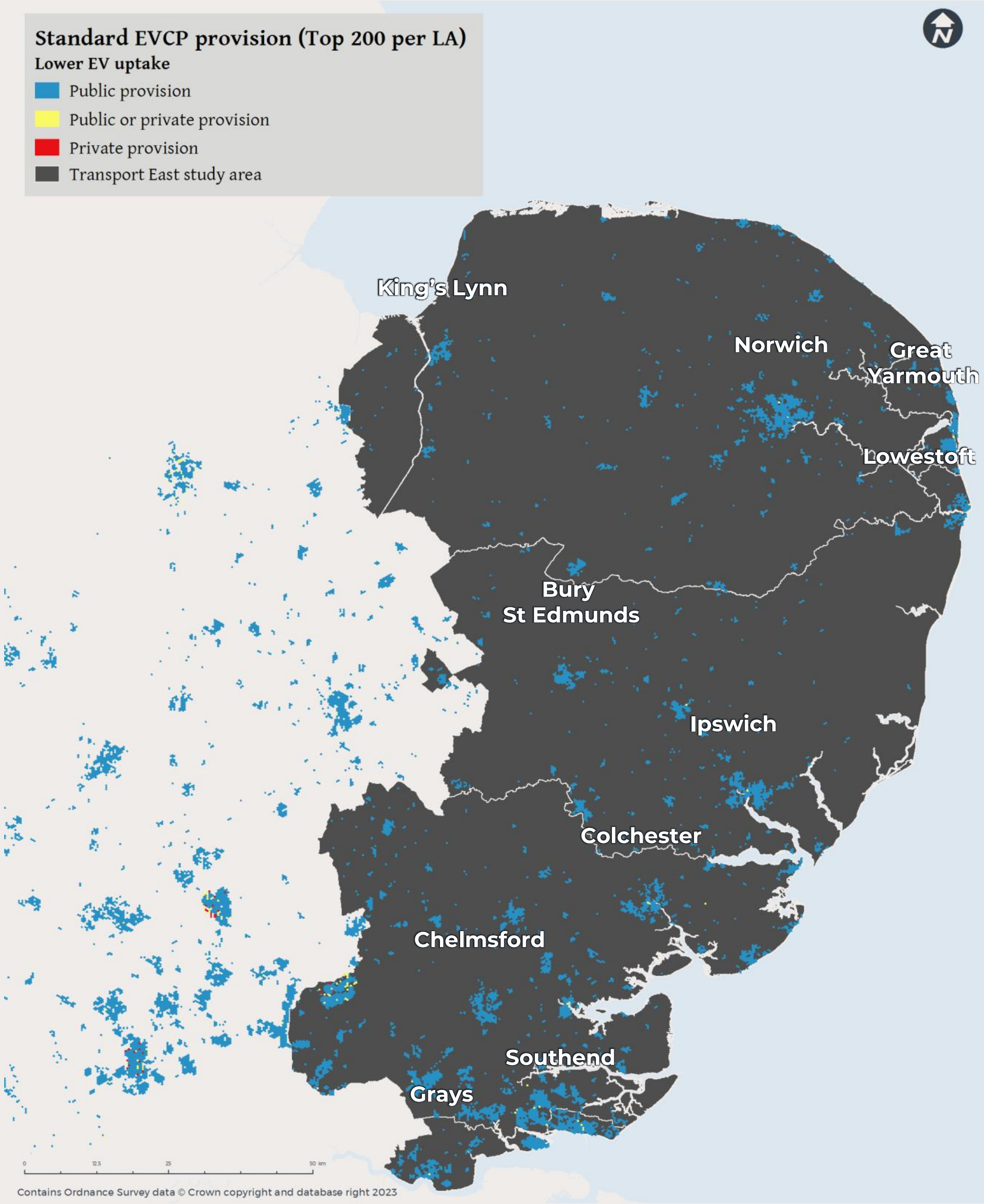


Figure C17: Illustrative standard charge point locations low - 2030

Source: WSP EV:Ready

EV Ready Outputs

STANDARD EVCP PROVISION

Figure C18 shows the top 200 locations per local authority for standard EVCP provision for 2030 for the high uptake scenario.

The expected standard EVCP provision for the high uptake scenario is, as expected, very similar to the low uptake scenario, with the public sector funding most of the provision.

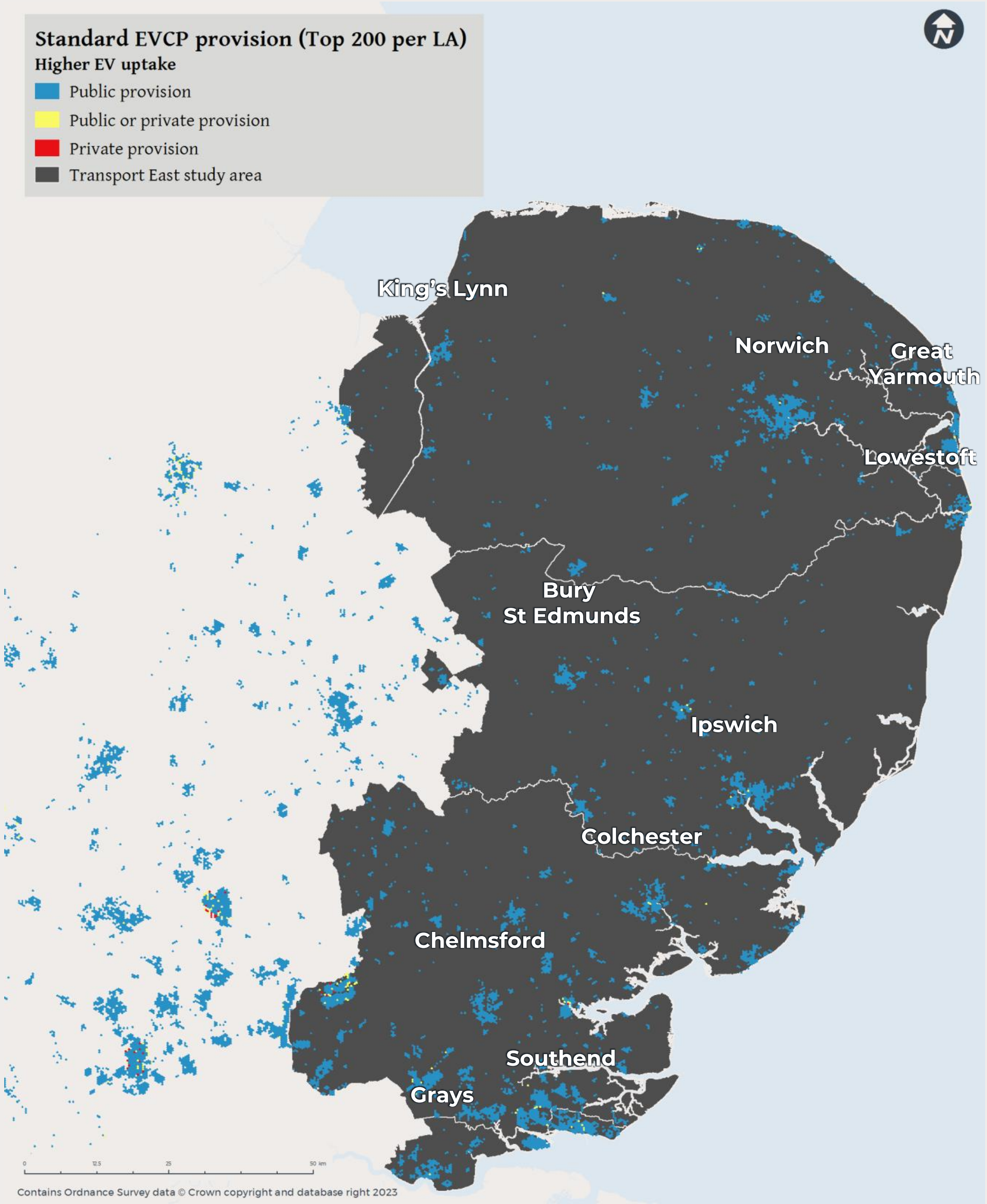


Figure C18: Illustrative standard charge point locations high - 2030

Source: WSP EV:Ready

EV:Ready Outputs

EVCP REQUIREMENTS FORECAST

The forecast uptake of EVs enables an assessment of associated charging infrastructure requirements. A wide range of variables are considered in this assessment, including: charging habits, vehicle mileage and efficiency, access to off-street parking, proportion of charging delivered via public chargers, trends in vehicle and charger technology, and average charge rates.

Table C3 shows the current and forecast EVCP requirements for the study area, for the low and high uptake scenarios in the years 2022, 2025, 2030, 2035 and 2040.

Based on the low and high forecast uptake of EVs in the study area, the estimate is for a requirement of between 14,755 and 24,775 additional publicly funded charge points by 2030.

It is important to recognise that in the low uptake scenario, it is assumed that charge points are deployed optimally and achieve higher utilisation. The low scenario provides a minimum baseline of standard chargers and more high powered recharging in fewer locations.

Conversely, the forecast demand for the number of charge points required in the high uptake scenario is made under the assumption that charge points are deployed more widely and used less intensively. This causes a more modest increase assumed in the average charge rate at an EVCP.

The approach to provide both a low and a high scenario was decided on due to the level of uncertainty in how the EVCP market will develop over the next 10-15 years. Providing a low and a high scenario offers a range to the level of charging predicted, and provides detail to the number of chargers that different charging approaches would require.

Table C3: Total EVCP requirements forecast

District	2022 (Existing)	Low number of EVCPs				High number of EVCPs				
		2025	2030	2035	2040	2022 (Existing)	2025	2030	2035	2040
Essex	363	3,529	6,704	13,979	20,000	363	5,427	10,919	19,173	23,375
Norfolk	341	1,762	3,672	8,287	12,420	341	2,829	6,390	11,921	14,863
Southend-on-Sea	19	233	510	1,213	1,874	19	441	991	1,844	2,295
Suffolk	272	1,562	3,225	7,201	10,686	272	2,423	5,461	10,176	12,679
Thurrock	42	321	644	1,393	2,021	42	450	1,013	1,889	2,354
Total	1,037	7,407	14,755	32,072	47,001	1,037	11,570	24,775	45,002	55,566

EV:Ready Outputs

EVCP REQUIREMENTS FORECAST

Table C19 shows standard versus rapid split for the public EVCP requirement, and the total EVCP forecasts for 2030 in the low and high scenarios.

Roughly 5% of public charge points are forecasted to be rapid, with the rest standard in both scenarios, suggesting public spending on EVCPs should be mainly allocated to urban areas where there is a higher demand for standard charging infrastructure in line with **Figures C17 - C18**.

When privately funded charge points are included, approximately 15% are expected to be rapid charge points in both the low and high scenarios. This reflects the fact that, in general, chargers allocated throughout the strategic road network will be privately funded as shown in **Figures C15 - C16**.

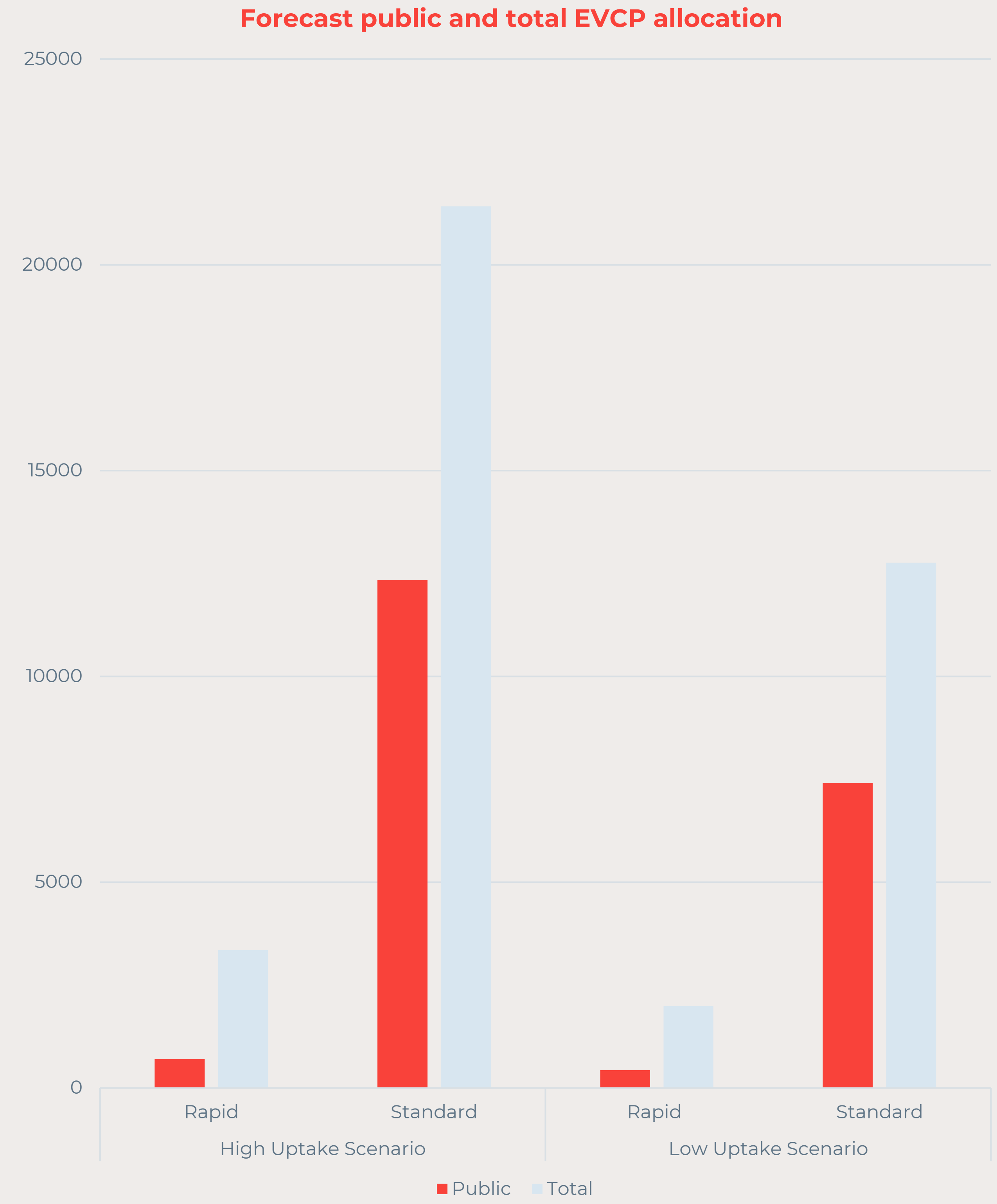


Figure C19: Public EVCP Requirement standard / rapid split

Source: WSP EV:Ready

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