



# E-liveable

Unlocking the potential of electric micromobility through e-bikes, e-cargo bikes and e-scooters

An overview of findings from the ELEVATE project



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# 1. Summary

The ELEVATE project assessed the potential for expanding the household use of e-bikes, e-cargo bikes and e-scooters – forms of travel collectively known as e-micromobility.

We did this through a comprehensive research programme, including household e-cargo bike trials based in the suburbs of three UK cities, national and local surveys on e-bike, e-cargo bike and e-scooter use, and stakeholder workshops. Our research demonstrates the capacity of these vehicles to substantially replace car journeys while bringing multiple benefits to their users and the places where they live. It also identifies key issues and barriers to their uptake and the changes needed to overcome these.

To realise the potential of e-micromobility in contributing to climate change and public health goals, we need to create a supportive environment that combines promotion, loan schemes and targeted grants with safer infrastructure and traffic restraint. Our recommendations for this are set out in Section 6. Our findings relate to active travel and electric vehicle policy, decarbonisation and other aspects of health and wellbeing policies in the UK. They are also relevant to those engaged with the UN Decade of Sustainable Transport, Vision Zero, net zero and other major international policy initiatives.

Project highlights:

- During trials of household e-cargo bikes, over half the mileage ridden substituted for car use.
- Over 50% of people in England would like to try using an e-bike, e-cargo bike or e-scooter. As of summer 2023, 11% of people owned at least one of these, and 9% of people were using one at least once a month.<sup>1</sup>
- E-bikes and e-cargo bikes make it much easier to cycle up hills and undertake longer journeys, removing key deterrents to cycling.<sup>2,3</sup>
- Some people feel safer on the road using an e-cargo bike than using a normal bike,<sup>3,4</sup> but for others, road traffic remains a major barrier.
- In surveys, more safety concerns were raised about shared e-scooters than e-bikes and e-cargo bikes.<sup>1</sup>
- Household e-cargo bikes can enhance everyday life for their users, allowing them to take part in activities they could not otherwise access, while supporting economic, social, and environmental sustainability goals.<sup>5</sup>
- Some key barriers to increased e-bike use are cost, lack of parking facilities or cycling infrastructure, and concerns about vehicle theft.<sup>4,6</sup>



## 2. Scope of the ELEVATE research

The ELEVATE project focuses on the use of e-bikes, e-cargo bikes\* and e-scooters by households in suburbs, towns and rural areas.

These places are generally car dependent, meaning that e-micromobility has potential to improve accessibility and health for their residents, while reducing their transport costs, energy consumption and emissions, which are typically high. The areas we studied have also received little research interest in the past. Most e-micromobility studies focus on large cities, such as London in the UK, that feature a comprehensive e-micromobility offer, higher cycling rates and higher levels of investment in cycling infrastructure. In such locations, e-cargo bikes are already a more mainstream option than in other areas of the UK.

ELEVATE involved large-scale surveys, assessment of a trial loan scheme, and stakeholder interviews and workshops, including discussions with industry specialists and local authorities.<sup>8</sup> Through these diverse forms of engagement, the project aimed to understand the capacity of these vehicles to reduce car use while supporting household mobility and the needs of everyday living.

Research activities included:

- A national survey of 2,000 people in England, conducted by YouGov, exploring their opinions on e-bikes, e-cargo bikes and e-scooters, as well as their use of these vehicles and their wider travel behaviour.

- Summer trials of household e-cargo bikes, loaned, with accessories and training, to residents, for one month in suburbs of Brighton, Leeds and Oxford. Research with participants included interviews, travel diaries, and GPS bike tracking data.
- Winter trials of household e-cargo bikes – in which participants borrowed these bikes for a further three to six months over the winter.
- Surveys in the e-cargo bike trial study areas (996 responses), before the trials and one year after, together with parallel city-wide surveys conducted by YouGov in Brighton, Leeds and Oxford, to match the national YouGov survey.
- A study of the private use of e-scooters (currently illegal in the UK), involving interviews with 18 people using their own e-scooters on the road.
- A pilot e-cargo bike loan scheme with six participants in a Cumbrian village to understand the potential for further research on rural e-cargo bike use.
- Survey research to understand e-bike use and ownership, by residents and visitors, in a rural tourist area (the Lake District).
- Stakeholder interviews with a range of cycle and policy specialists, early in the project, to help plan further research.
- Stakeholder workshops on finance options for increasing access to e-bikes and e-cargo bikes, including presentations from seven external specialists and over 50 participants.

\* Our research on e-bikes and household e-cargo bikes (not commercial/logistics e-cargo bikes) relates to those which meet Electrically Assisted Pedal Cycle (EAPC) requirements, with pedal assist up to 15.5mph (25km/h) and 250W maximum continuous rated power.<sup>7</sup>



## Research reach

- Through surveys, interviews, trials and workshops, our research engaged with over 4,000 participants.
- In the course of running the cargo bike trials, our research team had conversations with over 200 people whilst out and about with the bikes and also engaged with residents in the study areas through Facebook.
- We have presented to and met with a wide range of stakeholders, from local authorities, the Department for Transport, and Active Travel England, to transport consultants, shared mobility and active travel charities, and cycle industry groups. We have also presented at public events, science fairs and university campus events.
- Our work has featured in the mainstream press, online news and Youtube channels, such as Global Cycling Network.<sup>9</sup> We have presented the project's work at research conferences in the UK and Europe.



## 3. Change in the making?

### Electric bikes attract growing acceptance and interest

ELEVATE's 2023 national survey demonstrates high levels of public acceptance of e-bikes, with strong personal interest in opportunities for future use.

Among our 2,000 respondents, half said they would like to try using an e-bike, e-cargo bike or e-scooter. In terms of current experience:

- 11% of people owned at least one of these vehicles, while 9% were using one at least once a month.
- 8% of people belonged to households that already owned an e-bike and 14% had ridden an e-bike at least once.

Among those who were not riding an e-bike monthly or more frequently, there were signs that a considerable number might do so in future:

- 46% agreed that it would be enjoyable if they did start riding an e-bike regularly.
- 56% agreed that they would find it easy to ride an e-bike if they wanted to.
- 25% agreed that they could see themselves as being the kind of person who might regularly ride an e-bike, while 32% agreed that people who were important to them would approve of them doing so.

The survey also points to interest among the same group in 'try before you buy' loan schemes to encourage uptake:

- 45% were interested in the free loan of an e-bike for a month.
- Just over half (52%) agreed that the Government should do more to support e-bike use.

While people had less experience of e-cargo bikes – with just 3% using an e-cargo bike at least monthly – there was an appetite to know more, with a quarter of all respondents expressing interest in the free loan of an e-cargo bike for a month.

Surveys highlighted perceived barriers to using e-bikes, such as cost, lack of storage, risk of theft, and road danger.<sup>14</sup> There was some variation between our study areas: Oxford had higher levels of e-bike ownership and use than the national average, whereas in Leeds and Brighton these were lower than nationally. Brighton residents had higher awareness of and access to e-bike hire opportunities.<sup>10</sup>

**“I am seriously considering buying an e-bike as there’s quite a few hills around my neighbourhood.”**

Survey respondent

## E-bikes in a rural tourism area

Enthusiasm and potential for growth in e-bike use are also apparent from ELEVATE's work in a rural tourist area. Research on e-bike use in the Lake District found high use by e-bike owners, including both residents and visitors. During summer 2021 owner-residents averaged 50 miles a week and owner-visitors 40 miles a week. Hilliness and rainy weather were not barriers to use. The distances covered suggest that, even with electrical assistance, these riders were engaging in substantial amounts of physical activity. Some users said they might not have cycled at all if they had not had access to an e-bike, underlining the value of mobility that is both electric-assisted and active in supporting healthy lifestyles.

Amongst both e-bike users and non-users there was some support for car restraint in tourist hotspots. Among e-bike users there was also a desire for the provision of secure e-bike storage and charging.

**“E-biking is so much more pleasurable for me than unpowered cycling ... I love the feeling of freedom it gives me. I can cycle up hills with full panniers, which means that I can shop ... then cycle back up the hill to my home.”**

E-bike owner living on the edge of the Lake District

Visitors, whether e-bike users or not, were interested in integration between e-bike hire and improved public transport. E-bike owners surveyed during Covid felt the e-bike benefited their physical and mental health.



# The role of e-scooters

In our 2023 national survey, 4% of respondents reported that their household owned an e-scooter (even though public use is illegal) while 5% were using an e-scooter monthly or more (at least partly through public hire schemes). Of non-users, 29% of respondents agreed that the Government should legalise e-scooters, whilst 31% were neutral or said 'don't know'. In contrast, 60% of non-users agreed with the statement 'using an e-scooter is dangerous in my neighbourhood'. Wider research also highlights concerns both for e-scooter riders themselves and for other road users, particularly pedestrians. Safety concerns were considerably higher for e-scooters than for e-bikes or e-cargo bikes. At the same time, e-scooters were seen as more affordable, easier to store and less likely to be a theft risk.

The first trials of shared scooter schemes started in the UK in 2020 and schemes are now in place in many UK cities. Illegal use of personally-owned scooters has also grown. A review of academic studies found that privately-owned e-scooters are used more for 'utility' journeys such as commuting and shopping, rather than for fun. In shared schemes initial use is often more recreational but becomes more focused on utility trips over time. Privately owned scooters may also be used to save on transport costs such as bus fares or car use. Our interviews with 18 UK owners of private e-scooters in 2022 also found that this was a motivation for their use of e-scooters. However, half of these owners had stopped using their e-scooters due to worry about, or experience of, police stops.

Legalising private e-scooters could generate a lot of use for everyday trips, though any change to regulations would need to be accompanied by measures to ensure that safety concerns were also addressed in the process.<sup>1,11</sup>



**“I keep it in the hall. I can be out the door in 15 seconds ... You're there and back again, far quicker than a car.”**

E-scooter owner



## 4. From interest to use

### How a household e-cargo bike affects everyday life

In ELEVATE's summer e-cargo bike trials 49 households in suburban areas of Brighton, Leeds and Oxford were offered free use of a cargo bike for one month.

Participants were recruited through local surveys, promoted through social media and contacts in schools and community centres. They were typically educated to degree level with high levels of car ownership, and children at home. All bikes loaned were insured and participants were offered training and provided with accessories such as child seats.

In our trials we used two types of household e-cargo bike: long johns with a cargo/passenger area at the front, and longtails with a long rack at the back for panniers and child seats.

The trials' impact was assessed through participant interviews and travel diaries, GPS tracking data for bikes, and car mileage records. Following the summer trials 11 participants went on to borrow a bike through the winter months.

The research found:

- Participants used the cargo bikes for a wide range of purposes, most commonly to escort children to education, and for shopping and commuting, travelling an average of 38-42km per week.
- Over half of the e-cargo bike mileage ridden during trials substituted for car use.
- After the trial 20% of participants went on to buy a cargo bike – showing that 'try before you buy' schemes can encourage longer term take up.


**“We spend time together, we interact together, we have fun, we laugh together, that helps with our bond, helps socially, we meet other people doing it.”**


Oxford trial participant


An important finding from our winter trials was that, despite the change in weather, households mostly continued to use the cargo bikes frequently, with the help of rain covers for passengers.

## Where were our trials?


### Preston Park and Hove Park: Neighbourhoods of Brighton


 8,970 inhabitants/km<sup>2</sup>


 35% live in detached or semi-detached houses

 10% of households do not own a car


### Guiseley and Otley: Satellite towns of Leeds


 2,158 inhabitants/km<sup>2</sup>


 64% live in detached or semi-detached houses

 11% of households do not own a car


### Kennington: Suburb of Oxford


 4,033 inhabitants/km<sup>2</sup>


 50% live in detached or semi-detached houses

 10% of households do not own a car

### England: Comparable data

 434 inhabitants/km<sup>2</sup>

 54% live in detached or semi-detached houses

 24% of households do not own a car

In our trials we used two types of household e-cargo bike



## Benefits and barriers

Participants reported many benefits from taking part in the scheme. The bikes enabled new trips and experiences, for example, making it easier for families to travel together and spend time outdoors. Interviewees also reported physical and mental health benefits such as opportunities to be more active and to interact with children and connect with people around them.<sup>5</sup>

**“It’s allowed us to do more things outdoors than ... we would have done previously and to go to places that we wouldn’t have gone to together.”**

Oxford trial participant

Our research also found that e-cargo bikes help cycle culture move from being seen as just a sporty activity mainly for men to being something for

everyone (especially families, who tend to be more car-dependent) and for everyday or ‘utility’ travel.<sup>12</sup> This is part of why trials are effective: they increase the visibility of cycling and active travel in a positive way.

Aside from generally raising awareness, trials are valuable because they enable people to experience the bike and to practically determine whether they will benefit. Several winter trial participants stated that being able to try more than one type of e-cargo bike or being able to trial an e-cargo bike for a longer time period, was important in enabling their household to make a decision about whether to buy one.

Participants in the trials perceived fewer barriers than those respondents to our surveys who had never used an e-cargo bike.<sup>4</sup> We think this is because practical experience lets people work out how to do things differently and how to fit e-cargo bikes into their lives.<sup>4,13</sup> Perceived social difficulties like “it’s not for me” and “it doesn’t fit with my lifestyle” were largely overcome by participants after direct experience of using e-cargo bikes.

Some of the barriers experienced were more difficult to overcome. For example, some of our participants said fears for their personal safety on roads were a barrier to use.<sup>6</sup> Some said improved cycling infrastructure, better on-street cycle parking and policies to limit car use would be needed for them to use e-cargo bikes more.



Other difficulties included accessing secure parking and storage – one participant was banned from parking their e-cargo bike at work due to safety fears around illegal e-bikes and motorbikes. The purchase cost and finding appropriate insurance were also identified as barriers to buying an e-cargo bike.

Several of the more experienced cyclists found that an e-cargo bike was easier to ride on the road than a normal bike. The motor helped them keep up with other traffic, and, because the bike was bigger and being used for practical activities like transporting children, car drivers gave it more space and respect.<sup>14</sup>

The provision of cycling infrastructure helped shape how bikes were used. Where this was lacking, as in Leeds, some of our experienced cyclists felt able to use main roads, while, in contrast, less confident cyclists avoided main roads and used the bikes less. GPS data gathered from the Leeds bikes showed that major roads (A roads) were used for 44% of kms travelled and that only 10% of kms travelled were on segregated cycleways. E-cargo bikes are quite big and barriers at the entrance to some cycle paths prevented use by one of the Leeds participants. In Oxford, where there is more segregated cycle infrastructure, this was used for 37% of kms travelled, with only 6% of kms travelled on A roads.<sup>3</sup>

## Initial training and bike type

All participants were shown by the ELEVATE team how to use motor controls, charge the battery and safely secure the cargo bike. They were also offered a training session from a Bikeability cycling instructor. The participants were mostly regular cyclists and not all of them felt they needed this. Training was welcomed by less experienced cyclists, and the instructor provided both initial and follow-up sessions where needed.

Experienced cyclists found riding a longtail bike was relatively straight-forward. Long john bikes, with the carrying facilities at the front, appeared to take more getting used to and some smaller women found them too cumbersome.

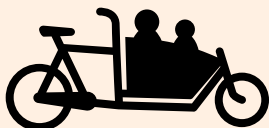
**“Riding on this, I feel people do actually give you a lot of space compared to when I’m in Lycra on my road bike ... when somebody sees that it’s a bloke stood upright with two kids in the front clearly doing a chore rather than a pleasure ride, I think people do give you more space and patience.”**

Leeds trial participant



# Which households are likely to benefit from cargo bike trials?

Families where adults are cyclists with young children.



Households in both large and small towns and cities, particularly in car-dependent suburban or peri-urban areas where fewer trips are possible by walking or public transport.

Households that have space to store a cargo bike at home – which may be easier in suburban areas than city centres.



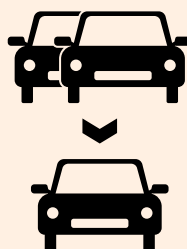
Households that regularly make trips with larger loads to carry.

Rural households within about ten miles of a town.



Car dependent households in transport-related economic stress (if a suitable finance or access model can be made available to support them in later buying an e-cargo bike).

People who could make use of e-cargo bikes with the benefit of more training.



Households wanting to go from two cars to one (or one to none).

In some densely populated urban areas e-cargo bike share schemes may be more appropriate than a long-term loan, due to difficulties with storage as well as a greater proportion of trips being possible by walking or public transport. Share scheme models

could also be adapted to rural and tourist areas, and some work has been done by others to consider ways community groups could operate them,<sup>15</sup> but careful thought needs to be given to how the bikes are accessed and the business model.



## Security and insurance

- While there is insurance for individuals it is less common to find insurance for a small fleet that might be used by a social enterprise or local authority trial. ELEVATE identified specialist insurers who were able to provide cover for theft and public liability.
- Batteries are easily stolen. Our participants were advised to carry them with them in a backpack or similar when they left the bike. Better secure storage would reduce the need for this.
- Trackers increase the chance of recovery after theft but are expensive: installation cost ~£150 plus annual subscription. Trackers are also helpful in monitoring and evaluating scheme use.<sup>3</sup>
- Thieves use angle grinders to cut even higher-quality locks. Angle grinder resistant locks are available but are expensive. Police recommend a secondary lock of a different type for extra security. Insurers may require specific types of lock.
- Researchers found police responses to bike theft varied – we experienced negative attitudes from a police call handler but positive attitudes from neighbourhood officers. Organisations such as Cycling UK have stressed the need to take cycle crime seriously.



## 5. Paths to net zero

### How a shift to e-cycling could help reach climate targets

Participants in our trials made an average saving of 154kg CO<sub>2</sub> a year from substituting e-cargo bike use for other types of transport.

Those who made the greatest reductions in car use made savings equivalent to 500kg CO<sub>2</sub> a year. Additionally, a year after the trials, at least one household got rid of a second car, showing the potential for even larger long-term carbon reduction.

To assess system-wide impacts over 25 years we used the Transport Energy Air Pollution Model<sup>16</sup> to consider the effects of three electric micromobility scenarios – featuring e-bikes, e-cargo bikes and e-scooters – each under progressively more ambitious policy and market conditions designed to facilitate their use. In each case, the modelling assessed the impact of an expansion in the use of these vehicles, taking into account the types of trips they typically replace and likely patterns of ownership and use.

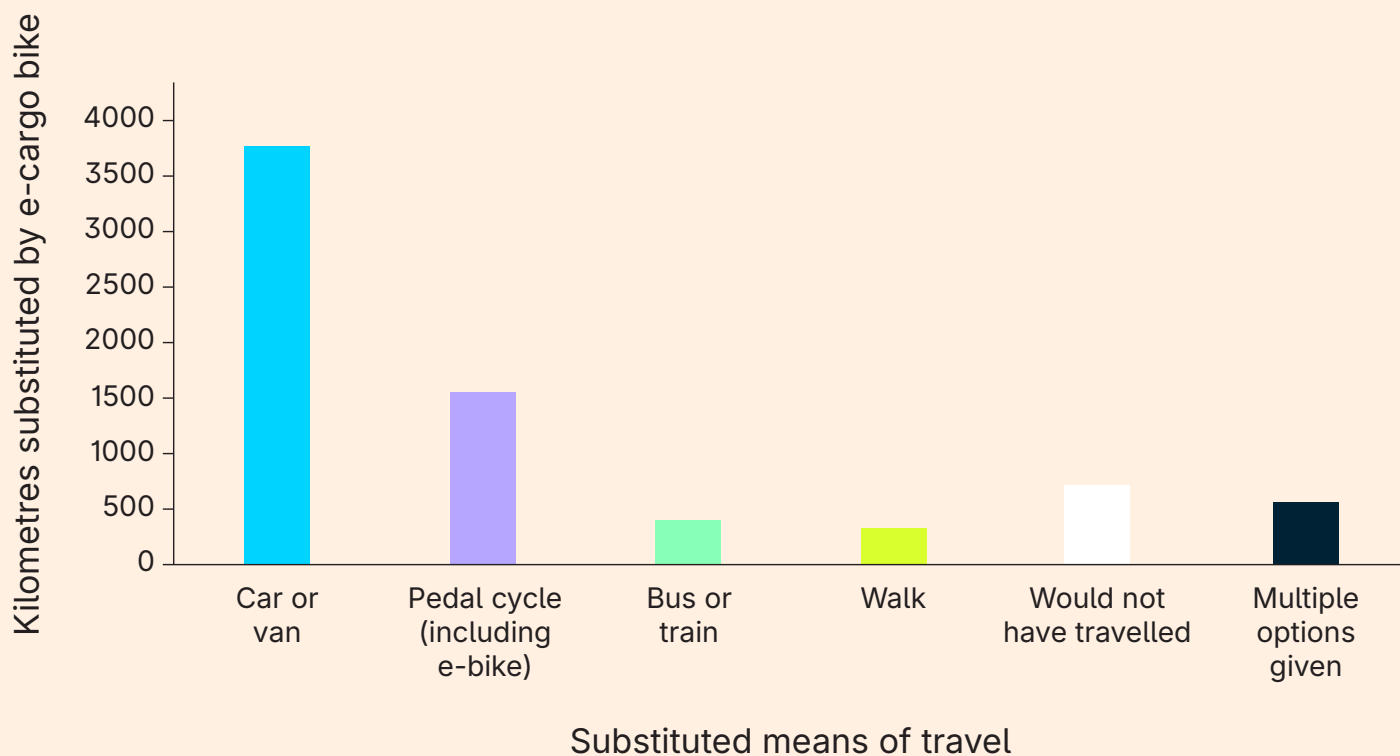
In each of these scenarios the ongoing electrification of motor vehicles emerges as the dominant driver of long-term tailpipe CO<sub>2</sub> and NO<sub>2</sub> emission reductions, with direct CO<sub>2</sub> falling by around 90% or more by 2050.

By this date differences in direct emissions between strategies that do or do not support e-micromobility narrow, because combustion engines have largely disappeared. However, scenarios that enable substantial replacement of medium-distance car trips (particularly 2-10 miles) reduce cumulative emissions more strongly during the critical 2025-2040 transition period. This matters because it makes this vital transition less vulnerable to disruption from catastrophic climate events and potential tipping points.

**“I’ve barely driven these last four weeks at all [during the trial] ... I think I’ve been averaging around 20, 23 miles a week. So that’s ... 100 miles of car travel that I haven’t done.”**

Oxford trial participant

# How trial participants would have travelled if they had not used an e-cargo bike



Note: Information relates to our 47 participants who completed travel diaries during the trials and who travelled 7,442km by cargo bike in total.

When life cycle emissions are considered, accounting for energy supply and vehicle manufacturing, maintenance and disposal, differences between scenarios become more marked because the emissions generated when creating an e-bike, e-cargo bike or e-scooter are only a few percent of those generated from building an electric car.

Future scenarios in which e-bikes play a larger role consistently deliver the lowest overall emissions, because they displace car kilometres and reduce energy demand at scale. E-cargo bikes provide particular benefits where they replace car trips to carry people and things in or between urban areas. E-scooters are useful for short journeys and first and last-mile connectivity, though they generate more modest carbon reductions because they substitute fewer car kilometres overall.<sup>16,17</sup>

A similar pattern is seen in air quality results. While electrification eliminates car tailpipe pollutants, non-exhaust particulates from brakes and tyres continue to be generated. More radical, car-light e-bike futures reduce non-tailpipe particulate emissions by around a quarter compared to the Business-as-Usual scenario based on existing policies. Cargo bikes provide smaller but meaningful reductions while scooters offer additional but marginal improvements.

In conclusion, the findings suggest that, in addition to the electrification of cars, we need to reduce overall car use and the size of the car fleet to meet climate goals and improve public health. Reducing car dependency also reduces costs to households and contributes to resilience to fuel price shocks. E-bikes provide an alternative to car use that can support this transition. Meanwhile e-cargo bikes can offer a practical low-carbon option for households routinely travelling with children and luggage.



## 6. ELEVATE's recommendations

### A transition to lighter travel

To best realise the benefits that electric micromobility can offer in meeting climate change targets and improving public health, we need to create a supportive environment for the affordable and practical use of these vehicles.

This means combining promotion with targeted financial support for lower-income households, ensuring that the benefits are widely shared. It also calls for far more supportive infrastructure and traffic restraint.

#### Promotion

- Run more trial schemes for both e-bikes and e-cargo bikes. Trials are a key tool on the pathway to awareness and uptake and are most useful where there are purchase mechanisms at the end of the trial. Trials promote the visibility and popularity of such bikes across communities, especially when they are currently a novelty.

Further, trial participants act as ambassadors who can promote new types of bikes and cycling culture more generally. Trials help identify further potential user groups and locations. Industry and trade bodies should encourage 'try before you buy' through the retail sector, and long-term lease options, for both e-bikes and e-cargo bikes.

- Promote e-bikes widely as they have potential to deliver substantial climate and air quality benefits by replacing car kilometres.
- Promote e-cargo bikes especially to households with a need for greater carrying capacity, for example, parents of younger children in suburban areas, and other groups suggested in Section 4.
- Combine household promotion for e-bikes and e-cargo bikes with promotion for other local services, such as car club membership and bus season tickets. Together these will provide a more comprehensive sustainable travel package that helps to reduce the need to use a car.

## Design and policy

- Provide secure e-bike, e-cargo bike and e-scooter parking and charging at common destinations and travel interchange points, including schools, workplaces, universities, hospitals, urban centres, rail stations, bus stations and park and ride sites.
- Swap some on-street car parking spaces for on-street e-bike/e-cargo bike adapted cycle hangars, especially in areas where home storage is difficult.
- Ensure workplace regulations permit legal and safe e-bike/e-cargo bike charging, and encourage the use of resources such as the Bicycle Association's guidance.<sup>18</sup>
- Make it easier for purchasers to identify whether their e-bike or e-cargo bike is safe and legal, and to ensure batteries – especially those from online marketplaces – are safe, referring to advice on safe e-bikes and safe batteries from the Bicycle Association<sup>19</sup> and the All-Party Parliamentary Group on Cycling and Walking.<sup>20</sup>
- Make road infrastructure safer for e-bikes, e-cargo bikes, e-scooters, pedestrians and cyclists, for example with reduced speed limits, better maintenance and more dedicated cycle lanes and spaces.
- Design infrastructure to avoid conflicts between pedestrians and e-bikes, e-cargo bikes and e-scooters, and ensure cycle infrastructure, including entry and exit points, can accommodate e-cargo bikes.
- Ensure that any change to e-scooter regulations considers private and share scheme e-scooters and is accompanied by measures to ensure that safety concerns are addressed.





## Cost of living

- Offer grants for e-bike and e-cargo bike use where the benefit is not dependent on income (as in the current Cycle To Work scheme) and spend is not capped below e-cargo bike costs.<sup>21</sup> Grants can be an effective way of generating interest and enthusiasm as well as mitigating cost, so design grant schemes with a view to raising awareness and making the most of their wider promotional value.
- Consider schemes that improve access to e-bikes and e-cargo bikes alongside other policies to tackle vulnerability to motoring costs as the cost of e-bikes/e-cargo bikes can be substantially lower than the cost a car.
- Consider whether and where the legalisation of private e-scooters could contribute to reducing transport related social exclusion.

## Training

- Provide cycle training on demand, tailored to the needs of those using domestic e-cargo bikes. For new cyclists and those wanting training for e-cargo bikes, two phases of training, with time to practice in between, may be well received – as in the staged approach of Bikeability, or structured adult training programmes offered by some local authorities. Training in riding a conventional bicycle also acts as a useful pre-cursor to e-bike and e-cargo bike training.
- Train building managers at large employers to distinguish legal e-bikes from illegal two-wheelers, and to understand the sustainability and health benefits of legal use. We suggest the Bicycle Association's guidance<sup>18</sup> as a start point.
- Train police to take cycle crime seriously, increasing awareness of the value of e-bikes and e-cargo bikes and the action required from police to combat theft, for example, in the recovery of stolen bikes located through tracking devices.



## 7. More from the ELEVATE project

All outputs from the ELEVATE research – including journal articles, presentations, webinars, workshop summaries, videos and blogs – can be found on the **ELEVATE website**.

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\* denotes references to work by others. Those without an asterisk are outputs from the ELEVATE project.

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