

# Electrifying last mile deliveries

A guide for businesses



Department  
for Transport

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# 1. Introduction

The “last mile” refers to the movement of goods from a supplier or an out-of-town warehouse, to the final delivery address, such as offices and homes.

This leg is often undertaken by small diesel vans, contributing to congestion, poor air quality and climate change. The sector is experiencing growth due to increasing online shopping and demand from consumers for convenient, same-day deliveries, amongst other factors.

This guide offers advice on how businesses and organisations can improve the sustainability of their delivery operations. Opportunities include adopting electric vans, ecargo bikes and Powered Light Vehicles (PLVs), and reviewing how deliveries can be better coordinated and consolidated.

This guide will be of interest to businesses who deliver directly to consumers using their own fleet vehicles, who deliver internal mail, parcels or spare parts between company sites, or provide courier

(point-to-point) services. Businesses who subcontract their deliveries or receive goods from suppliers also play a really important role in supporting the electrification of the last mile sector and reducing the overall number of journeys being made.

Case studies from start-ups through to multi-nationals highlight the diverse business opportunities in this sector and best practice. The guide concludes with a flow diagram, summarising key decisions for businesses exploring their options.

## OXWASH ecargo bike.



### Exciting potential

**50%** of motorised trips transporting goods in European cities could be shifted to cargo bikes or ecargo bikes.

**33%** of all urban deliveries could be done by cargo bikes or ecargo bikes.<sup>1</sup>

<sup>1</sup> Cyclelogistics, 2014. Potential to shift goods transport from cars to bicycles in European cities, 2014, [http://one.cyclelogistics.eu/docs/111/CycleLogistics\\_Baseline\\_Study\\_external.pdf](http://one.cyclelogistics.eu/docs/111/CycleLogistics_Baseline_Study_external.pdf)

## 2. Electric vehicle choices for last mile deliveries

Over the last few years, there has been a surge in the availability and popularity of zero emission electric vehicles that are suitable alternatives to petrol or diesel cars, vans and motorbikes for last mile deliveries. Which type of vehicle will best suit your needs will depend on the size and weight of goods you need to transport, and your average daily mileage.

The tables on pages 6 and 7 summarise the options for businesses.

### 2.1 Cargo and ecargo bikes

Cargo bikes are cycles specifically designed to carry cargo. Cargo bikes come in a variety of configurations and can even be custom-built. Configuration options include two-wheels, three-wheels or four-wheels; front-load boxes, rear-load boxes and/or trailers; and the addition of an electric motor which assists the rider whilst pedalling.

A cargo bike with the addition of an electric motor is also known as an ecargo bike and must meet Electrically Assisted Pedal Cycle (EAPC) regulations.<sup>2</sup> To meet these regulations, the electric motor must have a maximum power output of 250W. The electric motor stops providing assistance if the rider stops pedalling, applies the brakes or reaches 15.5mph, although the rider can still continue pedalling beyond this speed. If the ecargo bike does not meet these requirements, it is classed as a motorcycle, moped or PLV (see next page) and needs to be registered and taxed. Legally, the riders of ecargo bikes do not need a driving licence or safety equipment but helmets, appropriate clothing and training are highly recommended.<sup>3</sup>

Batteries for ecargo bikes can be removed for recharging using a three-pin plug, so no additional charging infrastructure is required. eCargo bikes can be recharged in 3.5 to 5 hours<sup>4</sup> and travel up to around 50 miles per charge.<sup>5</sup>

For further detail on ecargo bikes, see the report on cycle logistics from **Element Energy**.<sup>6</sup> For more detailed information on specific ebike models available, their price and battery capacity, please see the **Zero Emission Network's Scooter Switch Toolkit**.<sup>4</sup>

Please see **Bosch's eBike Range Assistant**<sup>7</sup> calculator to simulate real world ranges under a variety of conditions, such as weather, terrain and battery type.

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2 UK Government, Electric bikes: licensing, tax and insurance, <https://www.gov.uk/electric-bike-rules>

3 Department for Transport, The Last Mile Call for Evidence, 2018, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/730081/last-mile-call-for-evidence.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730081/last-mile-call-for-evidence.pdf)

4 Zero Emission Network, Scooter Switch Toolkit, 2019, <https://zeroemissionsnetwork.com/offers/scooter-switch>

5 European Cycle Logistics Federation, January 2020

6 Element Energy, 2019. Cycle Logistics Study (final report) for Cross River Partnership. [https://crossriverpartnership.org/wp-content/uploads/2019/03/20190520\\_Element-Energy\\_Cycling-logistics-study\\_FINAL-REPORT-1.pdf](https://crossriverpartnership.org/wp-content/uploads/2019/03/20190520_Element-Energy_Cycling-logistics-study_FINAL-REPORT-1.pdf)

7 Bosch, eBike Range Assistant, <https://www.bosch-ebike.com/en/service/range-assistant/>

## 2.2 Powered Light Vehicles (L Category)

A wide range of other light electric vehicles exist with two, three or four wheels (i.e. mopeds, motorbikes and quad-bikes), and the vehicles can be open or enclosed. These are known as Powered Light Vehicles (PLVs) or micro vehicles. These vehicles have electric motors with a power output greater than 250W. These vehicles require a driving licence, insurance and safety equipment and are subject to Vehicle Excise Duty and MOTs.<sup>2</sup> The battery can be charged from a three-pin plug.

PLVs are classed as L-category vehicles, which is subdivided into seven groups. For more detail on the technical specifications and regulations on these, please see Motorcycle Industry Association's *The Route To Tomorrow's Journeys L-Category Guide*.<sup>8</sup>

## 2.3 Electric Vans

For transporting larger items and heavier payloads, electric vans are a zero tailpipe emissions option. For more information on electric vans, including a cost analysis and product specifications, please see Energy Saving Trust's '*Lowering van emissions and costs*' guide.<sup>9</sup>

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8 Motorcycle Industry Association, *The Route to Tomorrow's Journeys*, 2019, <https://mci.co.uk/en/the-route>

9 Energy Saving Trust, 2019. *Lower van emissions and costs*, <https://energysavingtrust.org.uk/sites/default/files/23501-EST%20BDFT-Lowering%20van%20emissions%20guide-WEB.pdf>



**Table 1: Last mile delivery vehicles**









Category	Type	No. wheels	Image	Payload (kg)	Purchase cost range
<b>Cargo bikes</b>	Bike	2		50 <sup>10</sup>	<b>£1,000 – £3,000<sup>11</sup></b>
	Trike	3		50 <sup>10</sup>	<b>£2,000 – £4,000<sup>10</sup></b>
<b>eCargo bikes</b>	Bike	2		100 <sup>12</sup>	<b>£3,000 – £6,000<sup>10</sup></b>
	Trike	3		250 <sup>12</sup>	<b>£4,000 – £10,000<sup>10</sup></b>
	Quadracycle	4		250 <sup>12</sup>	<b>£8,000 – £12,000<sup>10</sup></b>
	Trailer	—		300 <sup>12</sup>	<b>£2,000 – £5,000<sup>10</sup></b>
<b>Powered Light Vehicles (micro-vehicles)</b>	—	2–4		200 – 500 <sup>13</sup>	<b>£1,500 – £18,000<sup>13</sup></b>
<b>Electric vans (light commercial vehicles)</b>	—	4		200 – 1,000 <sup>14</sup>	<b>£14,395 – £64,200<sup>15</sup></b>

Image credits: 1 – Team London Bridge, 2 – Zedify, 3 – Doughies, 4 – DPD.

10 European Cycle Logistics Federation, January 2020

11 London Green Cycles, accessed January 2020, <https://www.londongreencycles.co.uk/product-category/bikes/>

12 European Cycle Logistics Federation, eCargo bike webinar, January 2020

13 Motorcycle Industry Association, January 2020.

14 Energy Saving Trust, Lowering van emissions and costs, p11, 2019, <https://energysavingtrust.org.uk/sites/default/files/23501-EST%2BDFT-Lowering%20van%20emissions%20guide-WEB.pdf>

15 Crown Commercial Services, Fleet Portal, accessed February 2020, <https://fleetportal.crowncommercial.gov.uk/home.mth>

## Table 2: Pros and cons of different eCargo bikes

Adapted with kind permission of European Cycle Logistics Federation

eCargo bike type	Pros	Cons
<b>2 wheels</b>	<ul style="list-style-type: none"> <li>✔ Fast and agile in traffic</li> <li>✔ Straightforward to ride</li> <li>✔ Relatively low purchase cost (for manual)</li> <li>✔ Small/medium-sized cargo carried</li> </ul>	<ul style="list-style-type: none"> <li>✔ Maintenance costs</li> <li>✔ Secure storage required when not in use</li> <li>✔ Harder loading and unloading than a bike with panniers</li> <li>✔ Over-loading risks making bike unstable</li> </ul>
<b>3 and 4 wheels</b>	<ul style="list-style-type: none"> <li>✔ Able to carry larger loads than two-wheeled cargo bikes</li> <li>✔ Easy loading and unloading</li> <li>✔ Able to carry preloaded containers</li> <li>✔ May be better suited for consolidation hub use than two-wheel cargo bikes (see section 4.3)</li> <li>✔ Payload comparable to a small van</li> </ul>	<ul style="list-style-type: none"> <li>✔ Higher purchase cost than two-wheel cargo bikes</li> <li>✔ Maintenance costs</li> <li>✔ May not be able to use cycle lanes</li> <li>✔ Slower in traffic than two-wheel cargo bikes</li> <li>✔ Additional controls (brake lights, indicators) compared to two-wheel cargo bikes</li> <li>✔ Secure storage required when not in use</li> <li>✔ Need to park so as not to obstruct traffic</li> </ul>
<b>Trailers</b>	<ul style="list-style-type: none"> <li>✔ Low purchase cost</li> <li>✔ Increases load that can be carried</li> <li>✔ Can be hitched to many bike types</li> <li>✔ Easy loading and unloading</li> <li>✔ Potential to carry preloaded containers</li> </ul>	<ul style="list-style-type: none"> <li>✔ Limited cargo security in open trailers</li> <li>✔ Open trailers exposed to weather</li> <li>✔ Secure storage required when not in use</li> <li>✔ Maintenance of two items of equipment (bike and trailer) required</li> <li>✔ Push/pull effect when riding</li> <li>✔ Makes cargo bike less stable</li> </ul>

# 3. Why choose ecargo bikes or electric vans?

Replacing diesel vans with ecargo bikes or electric vans can be a good business decision, as it can help reduce costs, boost the environmental credentials of the organisation and improve the efficiency of deliveries in congested areas.

## 3.1 Zero emission

Transport is now the largest sector for UK greenhouse gas emissions (27%), of which road transport accounts for over 90%.<sup>17</sup> The Government is consulting on bringing forward an end to the sale of new petrol and diesel cars and vans to 2035, or earlier if a faster transition is feasible.<sup>18</sup>

Carbon emissions may still be produced when generating the electricity used to charge electric vehicles. Many chargepoint networks are committed to using only renewable energy, and businesses and households can also choose a renewable tariff for private chargepoints to overcome this issue. However, even when charging with electricity from the national grid with the current fuel mix, carbon emissions from an electric van are approximately 55% lower compared to a typical diesel panel van.<sup>18</sup> As more renewable energy generation is added to the national grid, these emissions will fall further.

Switching to zero tailpipe emission vehicles, such as electric vans and ecargo bikes, means you are not contributing to air pollution, the health impacts of which from cars and vans costs the UK £5.9 billion a year.<sup>19</sup>

Many UK cities now have, or are planning, Clean Air Zones (CAZs) in which certain older, polluting vehicles are charged a daily fee for entering. For instance, London introduced the Ultra Low Emission Zone (ULEZ) in 2019, with an expansion planned for 2021.<sup>20</sup> Zero emission vehicles do not have to pay the charges, presenting a major saving for a business frequently entering the zones. Some cities introducing CAZs are offering support, such as grants or information events, to help businesses upgrade to compliant vehicles.

Zero tailpipe emission vehicles can enhance brand reputation as sustainability is becoming increasingly important to consumers.

17 BEIS, 2018, Final UK greenhouse gas emissions national statistics: 1990 – 2016, 2018, <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissionsnational-statistics-1990-2016>

18 UK Government, PM launches UN Climate Summit in the UK, Feb 2020. <https://www.gov.uk/government/news/pm-launches-un-climate-summit-in-the-uk>

19 University of Oxford and University of Bath, The health costs of air pollution from cars and vans, 2018, <https://www.cleanairday.org.uk/news/the-health-costs-of-air-pollution-from-cars-and-vans>

20 Transport for London, accessed January 2020, <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone>



### 3.2 Reduced congestion & speedier delivery service

The UK ranked sixth in the world for the most congested cities and British drivers lost £7.9 billion in 2018 due to traffic congestion.<sup>21</sup> Smaller vehicles, such as cargo and eCargo bikes, can help reduce congestion. eCargo bike riders can access cycle lanes, enabling them to bypass traffic and take more direct routes. eCargo bike boxes can often be unloaded safely on the pavement, compared to a van which requires a parking space or in practice, often is parked in such a way which restricts access for other road users and pedestrians whilst unloading.

These factors can result in a 25-50% reduction in journey time.<sup>22</sup> Due to their greater speed in congested areas, eCargo bikes can offer more reliable delivery timings, improving customer satisfaction.

### 3.3 Lower cost

Electric vans can make financial sense for a business due to their lower running costs (see Figure 1).

The higher upfront costs for an electric van can be recouped via significant savings on fuel and maintenance, and discounts or exemptions from congestion and Clean Air Zone charges. The breakeven point will be reached sooner for smaller vans and those undertaking higher mileages. There are also tax incentives and government purchase grants available.

Cargo and eCargo bikes have a significantly lower upfront costs compared to diesel vans. In some circumstances, multiple eCargo bikes may be required to replace one large van, however, many vans are rarely full to capacity.

### 3.4 Healthier & happier workforce

Electric vans are smooth and quiet to drive, with some drivers reporting them to be less stressful than conventional vehicles. This may be more significant when multiple delivery drops and stop/starts in traffic are required.

Many riders find eCargo bikes enjoyable to ride. The physical activity (supported by electric assistance) is beneficial for employee's health, and some companies report that their eCargo bike riders take less sick leave than other drivers.

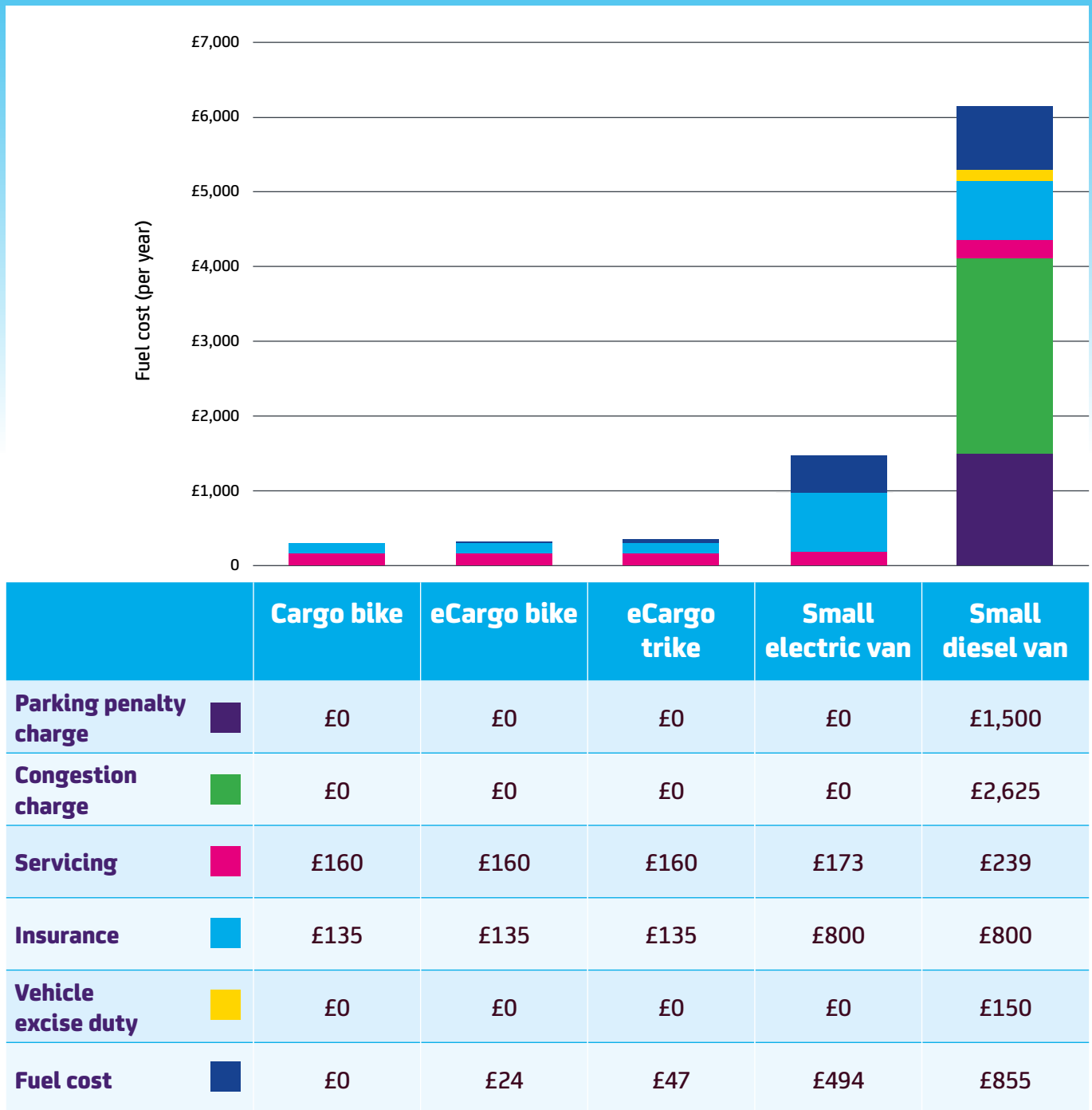
21 Inrix, Traffic Scorecard, 2018, <http://inrix.com/scorecard/>

22 Element Energy, Cycle Logistics Study, 2019, [https://crossriverpartnership.org/wp-content/uploads/2019/03/20190520\\_Element-Energy\\_Cycling-logistics-study\\_FINAL-REPORT-1.pdf](https://crossriverpartnership.org/wp-content/uploads/2019/03/20190520_Element-Energy_Cycling-logistics-study_FINAL-REPORT-1.pdf)

### Zedify eCargo bike on delivery.



**Figure 1: Annual running costs of last mile delivery vehicles**



Assuming vehicles cover 7,500 miles a year (30 miles x 5 days x 50 weeks), 53 mpg diesel van<sup>23</sup>, 500kWh eCargo bike battery, 1000kWh eCargo trike battery, 20% energy losses from eCargo bike batteries, electricity price of 15.75p/kWh<sup>24</sup>, electric van Nissan e-NV200 WLTP 2.39 miles/kWh, diesel 132.74 p/litre<sup>25</sup>, that insurance costs for an electric van are the same as diesel van, electric van servicing costs for 30,000 miles over four years<sup>26</sup> and assuming London Congestion Charge on autopay at £10.50 per day.

23 BEUK Government, Government Response to Call for Evidence: The Last Mile, 2019, p11 provided by Transport for London, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/786879/last-mile-call-for-evidence-government-response.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786879/last-mile-call-for-evidence-government-response.pdf)

Assumptions: vehicles covering 30 miles per day and van parking penalty charge average figure per van, calculated using the median annual cost of penalty charges reported in the FTA PCN Survey 2012 divided by the average fleet size of fleets registered under the Fleet Operator Recognition Scheme (FORS), reported in Van travel trends in Great Britain, RAC Foundation, 2014.

24 <https://energysavingtrust.org.uk/about-us/our-calculations>

25 Department for Business, Energy & Industrial Strategy, average UK pump price as of 20/01/20, <https://www.gov.uk/government/statistical-data-sets/oil-and-petroleum-products-weekly-statistics>

26 Key Resources, accessed January 2020.

# 4. How can businesses use ecargo bikes?

eCargo bikes are a versatile, low-cost, environmentally-friendly way to transport a surprising amount of goods - whether that's parcels or tools, documents or fresh fruit, wine or waste!

There are many applications for ecargo bikes beyond parcel and post logistics. Other sectors include:

- ✔ food deliveries to hospitality businesses, offices or homes
- ✔ servicing, cleaning and maintenance
- ✔ local store-to-customer deliveries in retail

The case studies that follow (pages 14-23) illustrate many exciting possibilities for ecargo bikes across multiple sectors and from start-ups through to global logistic companies.

## 4.1 Starting points for determining ecargo bikes suitability

What needs transporting, where and when should be clarified before selecting the best vehicle for the job. The solution could be off-the-shelf or a highly bespoke design.

If ecargo bikes are used, they should be embedded in an efficient, well-thought-out delivery operation strategy to be a success. eCargo bikes can be integrated into a fleet with a mix of cargo bikes, electric vans and petrol/diesel vehicles.

For ecargo bikes (and other PLVs) to be suitable, typically the following criteria needs to be met:<sup>27</sup>

- ✔ **Small and light goods** as vehicles have a relatively limited space capacity and payload.
- ✔ **High density network** with many stops in a short distance as this is most profitable and vehicles have a limited range but can be parked easily.
- ✔ **Time-critical deliveries** as small vehicles are less affected by congestion, making them more reliable.
- ✔ **Congested or access restricted areas** as ecargo bikes are cheaper to use in Clean Air Zones and easier to move around in pedestrianised zones.

Non-refrigerated goods are easiest to transport. For hot or cold goods, fast delivery is critical, therefore making ecargo bikes an asset. There are a few temperature-controlled electric vehicle solutions and bespoke chiller boxes now on the market.

<sup>27</sup> Balm et al. 2018. The Potential of Light Electric Vehicles for Specific Freight Flows: Insights from the Netherlands [https://www.researchgate.net/publication/317645400\\_The\\_potential\\_of\\_light\\_electric\\_vehicles\\_for\\_specific\\_freight\\_flows\\_insights\\_from\\_the\\_Netherlands](https://www.researchgate.net/publication/317645400_The_potential_of_light_electric_vehicles_for_specific_freight_flows_insights_from_the_Netherlands)

## 4.2 Ways to use ecargo bikes: outsourcing or own operations

For some businesses, owning or leasing their own ecargo bikes for making customer deliveries or providing a courier service, will be the best solution. For others, it may be better to outsource some or all their deliveries, or switch suppliers to ones using ecargo bikes. Outsourcing can be an attractive solution, reducing the need to invest in new vehicles or change delivery patterns, whilst enhancing their sustainability and supporting local businesses.

Table 3 outlines the range of options available to businesses, ordered by increasing complexity and investment required.

## 4.3 Last mile consolidation and distribution hubs

The financial incentive to complete deliveries as efficiently as possible as well as the relatively limited capacity of ecargo bikes means that a strategically placed consolidation or distribution ‘hub’ is highly desirable for many last mile operators using ecargo bikes. Depending on the nature of the business, the riders may return several times a day to the hub to re-fill their cargo boxes.

28 MP Smarter Travel, Maximising business use of cargo bikes, February 2020, <http://www.mp-smartertravel.co.uk/index.php>

**Table 3: Different ways businesses can use cargo bikes**

Adapted with kind permission from MP Smarter Travel<sup>28</sup>

Ways of using ecargo bikes	Description
<b>Courier supplier switch</b>	Business switches to a courier that uses ecargo bikes for ad-hoc, quick turnaround deliveries
<b>Inbound goods supplier switch</b>	Business changes their supplier of inbound goods (i.e. office supplies or food) to one that delivers by cargo bike. Changes may be facilitated by a local ‘supplier directory’
<b>Customer-led supplier behaviour change</b>	Business convinces an existing supplier to use cargo bikes (the supplier either procure a cargo bike or use a third party distribution service)
<b>Third party goods collection</b>	Business uses a third-party courier to collect goods from existing suppliers who don’t currently offer deliveries by cargo bike
<b>Inter-site shuttling</b>	Business uses an ecargo bike courier/distribution company to shuttle deliveries between their own outlets/sites/offices
<b>Multi-tenant outbound consolidation</b>	Tenants within an office building consolidate their deliveries, with items distributed by a single cargo bike operator in a multi-drop journey
<b>Micro-consolidation (last mile)</b>	Supplier delivers their products to a (third party) consolidation centre and cargo bikes complete the last mile of delivery
<b>Micro-consolidation (first mile)</b>	Cargo bikes collect deliveries from businesses/individuals and complete the first mile to a (third party) consolidation centre
<b>Cargo bike fleet and operation</b>	Business leases or buys their own cargo bike(s) and operates them themselves

Unlike 'traditional' logistic models based on an out-of-town warehouse, good locations for last mile hubs include the edge of town/city centres and Clean Air Zones or near key customers, such as hospitals, markets or suppliers. A lack of land with good access for vehicles and high land prices near city centres can be a significant barrier for start-up operations.

Broadly, 'traditional' logistic operations aim to minimise the number of times each parcel is handled in its journey in order to keep delivery times quick and reduce labour costs. Adding a last mile hub to consolidate deliveries or 're-mode' to zero-emission vehicles suitable for congested city centres, adds an extra step in the chain.

From the outset, businesses planning to operate ecargo bikes should consider working with clients to 'batch' goods where possible, and monitor delivery times to demonstrate that these remain satisfactory, or indeed, improve.

The case studies in the following section highlight how different businesses using ecargo bikes have innovatively overcome these 'hub' challenges. Working in partnership with local authorities, landowners, local businesses and others presents a range of options, each suitable for different situations, including:

- ✔ Sharing last mile hubs between several operators to maximise efficiency<sup>29</sup>
- ✔ Harnessing funding from local or national government to establish a hub e.g. Low Emission Neighbourhoods in London<sup>30</sup>
- ✔ Using containerised trailers as mini-hubs in under-utilised car parks e.g. UPS
- ✔ Using planning policies to designate land for freight and logistics operations e.g. City of London
- ✔ Making best use of specialist route-planning software effectively to coordinate drivers and time deliveries
- ✔ Transferring containerised loads between large electric vans and ecargo bikes at a pre-arranged meeting point
- ✔ Repurposing redundant loading bays or sorting rooms in large office buildings.

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29 Velove Bikes, 2016 <https://www.velove.se/news/next-step-in-city-logistics-open-terminals>

30 Greater London Authority, 2020 <https://www.london.gov.uk/press-releases/mayoral/mayor-increases-funding-for-scrappage-scheme>. Also see: <https://tfl.gov.uk/info-for/boroughs/low-emission-neighbourhoods>

## 5. Case studies

eCargo bikes and PLVs have potential in a wide range of sectors and a variety of applications, as illustrated by the following case studies, presented in order from start-ups through to multinational businesses.

Case studies on businesses using electric vans can be found on the Energy Saving Trust<sup>31</sup> and Global Action Plan<sup>32</sup> websites.

31 Energy Saving Trust, Fleet Management Toolkit. <https://energysavingtrust.org.uk/transport/fleet/fleet-management-toolkit>

32 Global Action Plan, <https://www.globalactionplan.org.uk/clean-air/clean-van-commitment>

### Doughies' ecargo trailer.



### 5.1 Doughies

Since September 2019, Adam and Abigail Veitch have used a customised electric cargo trailer attached to a regular bike to make local deliveries of sourdough bread from their micro bakery in the village of Banavie near Fort William, Scotland.

#### Bike beginnings

Doughies started out as an experiment from the Veitch's flat when they were living in Bournemouth in 2010, baking a dozen traditional loaves for local people and delivering them by bike on Saturday morning.

#### Fit for purpose

When they moved to the Scottish Highlands, they decided to continue growing the business. Upgrading to an electric cargo trailer, which can transport up to 150kg, has enabled Doughies to deliver 100 sourdough loaves in a 10-mile roundtrip once or twice a week from the bakehouse to the pedestrianised high street of Fort William.

They estimate their annual electricity costs of running their ecargo bike is £1.35 and generates only 3kg of CO<sub>2</sub> (based on 40 miles per week). This compares to £69 and 140 kg CO<sub>2</sub> if they were running a diesel vehicle.

Not only has their bike and trailer reduced carbon emissions and delivery costs, they can avoid Fort William's busy summer traffic by taking the cycle path. Doughies show that cargo bike deliveries can be an option for both rural and urban settings.

For more information see <https://doughies.blog/>



**The Cycling Sparks ecargo bike.**

## **5.2 The Cycling Sparks**

After years of travelling mainly by van through congestion and pollution, Aaron Fleming-Saheed, a South East London-based electrician, started cycling to clients in August 2016.

This has enormously benefited his business because it saves time, as he is not stuck in traffic, and is cost effective because he is unaffected by rising fuel costs, the introduction of the Ultra Low Emission Zone, parking issues, insurance costs and vehicle hire-purchase costs. Now trading as The Cycling Sparks Ltd, he offers domestic and commercial electrical services from Greenwich to Hackney.

### **Upgrading to electric**

Aaron first started on a bicycle with packed pannier bags and a backpack full of tools. In Summer 2019, he upgraded to an ecargo bike, which has allowed him to travel further and carry more. The cost of the ecargo bike had been the biggest barrier to business growth, but the purchase of an ecargo bike was made possible by a grant from the Department for Transport and administered by Energy Saving Trust.

### **Brand value**

Initially, workmates found the cargo bike amusing, but customers have been enthusiastic and supportive of the ecargo bike. This gives The Cycling Sparks the competitive edge against similar businesses using diesel vans.

### **Impact**

Since August 2017, The Cycling Sparks has travelled over 4,855 miles. The equivalent mileage in a diesel van would have emitted approximately two tonnes of CO<sub>2</sub>.

For more information see

**<https://www.thecyclingsparks.co.uk/>**

## 5.3 OXWASH

OXWASH are an eco-laundry business based in Oxford, established in 2017. As well as being at the forefront of energy efficient, low impact washing techniques, their zero-emission fleet of ecargo bikes efficiently collect and deliver laundry from residents and businesses across the city.

### The fleet

- ✔ three long-wheelbase, front-loader ecargo bikes
- ✔ one ecargo tricycle
- ✔ one non-electric cargo bike

### Why ecargo bikes?

Historic streets, congestion and high numbers of pedestrians makes it difficult to run conventional vehicles in the city centre. As all but one of OXWASH's fleet are no wider than a handlebar width, the bikes can easily navigate the narrow and congested streets, saving time.

The ecargo bikes range from 400 to 1,500 litres in capacity and their batteries are re-charged overnight by solar panels, eliminating emissions and fuel costs.

### Competitive edge

Customers choose a 15-minute laundry delivery slot and track their orders online. OXWASH's software coordinates their riders and manages incoming tasks, allowing them great flexibility - a customer request can often be accommodated within the hour. Due to their agile fleet, OXWASH regularly hit their precise delivery slots; a reliable, convenient service that none of their competitors using vans can offer.

### Impact

Collectively, the riders travel about 100 miles a day, saving 50-60 kg of CO<sub>2</sub> every day.

For more information see  
<https://www.oxwash.com/>







### eCargo bike convoy at London Bridge

Credit: Tomter Photography.

## 5.4 Team London Bridge

Team London Bridge, a business improvement district, set up the 'Bikes for Business' scheme following a successful bid to Transport for London's Healthy Streets for Business Fund.

In early 2018, Team London Bridge conducted a survey which indicated that 24% of businesses were using some form of cycle deliveries, but that 85% were keen to do this in future.

**24%**

of businesses were using some form of cycle deliveries.

**85%**

were keen to use cycle deliveries in the future.

They set an ambitious target of 60 businesses trialling or increasing the use of cargo bikes in the London Bridge areas by early 2020.

## **Bikes for Business**

After spending time understanding the business delivery needs, Team London Bridge match each business with appropriate suppliers using cargo bikes. To support this, they have created a directory of goods and services by cargo bike, including couriers, food and drink, flowers, AV hire, printing and graphic design, tradespeople and even a dog walker.

To encourage local businesses to make the switch to ecargo bike suppliers, they offer a range of subsidies. This acknowledges the effort involved in switching supplier and the risk of service disruption. Larger subsidies are also available for businesses to purchase their own ecargo bike.

### **A professional service**

Prior to the project, cyclists from delivery services were perceived negatively by some businesses in the areas, but the feedback from business on the ecargo bike operators and suppliers has been overwhelmingly positive. All the suppliers on Team London Bridge's directory have signed a Code of Conduct to ensure a professional and safe service.

## **Internal use**

An early success was a trial with Guy's and St Thomas' hospitals' pathology services, who were looking to reduce their impact on air quality. In this instance, the hospital could remain with their existing supplier, CitySprint, but change from using motorbikes to ecargo bikes to transport samples between clinics and labs. Following a successful trial, the service has become permanent.

### **Impact**

With nine daily journeys between sites, Guy's and St Thomas' hospitals have removed 3,200 motor vehicle trips by switching to ecargo bikes, covering 13,600 miles a year. All businesses have continued to use cargo bikes after the initial trial. Team London Bridge now runs all its events using cargo bikes for anything they can carry, including a food festival.

For more information see

<https://www.teamlondonbridge.co.uk/>

With nine daily journeys between sites, Guy's and St Thomas' hospitals **have removed 3,200 motor vehicle trips by switching to ecargo bikes, covering 13,600 miles a year**

## 5.5 Zedify

Established in 2018 when six independent ecargo bike delivery operators came together, Zedify provides businesses with sustainable first and last mile deliveries.

In 2019, they set up three new depots in Edinburgh, Southampton and Central London, added 24 vehicles to their fleet and doubled the number of deliveries to over 300,000 items for over 250 businesses. Their clients include local authorities, traditional logistics carriers and local businesses, and deliveries include anything from food and flowers to medical supplies and library books.

### The fleet

- ✔ 29 small ecargo bikes (two wheel)
- ✔ 40 large ecargo bikes (three and four wheel)
- ✔ five electric vans
- ✔ nine depots

### Bikes over vans

eCargo bikes are significantly lighter than electric vans. This not only reduces the emissions generated in the manufacturing process, but a large ecargo bike requires only 6% of the electricity of the van.

### Consolidation depots

Moving from diesel to electric vans cuts emissions but still contributes to congestion. Zedify's consolidation depots on the edge of cities allows them to make efficient hyper-localised deliveries that cut both emissions and congestion whilst also maintaining the needs of consumers who are increasingly demanding narrow time-windows.

### Impact

Over the past 12 months, their 74 vehicles are estimated to have saved over 426 tonnes of CO<sub>2</sub> emissions and 1001kg of NO<sub>x</sub>, though, due to consolidation, this is likely to be an underestimate.

For more information see <https://www.zedify.co.uk/>



## 5.6 DPD

DPD is a parcel delivery service with a UK fleet of 6,000 vehicles delivering 250 million parcels a year for clients including M&S, ASOS and John Lewis.

With online retail growing at 20% a year, they see the importance of creating a sustainable fleet.

The Smart Urban Delivery Strategy launched in 2017 was the first step towards their goal of becoming the UK's most responsible city centre delivery company.

Since then, they have introduced a total of 94 electric vehicles into their fleet, reducing their CO<sub>2</sub> emissions by 47 tonnes overall from January to October 2019. DPD have now committed to 10% of its fleet to be electric by the end of 2020 and have just taken delivery of another 300 Nissan Leaf EVs.

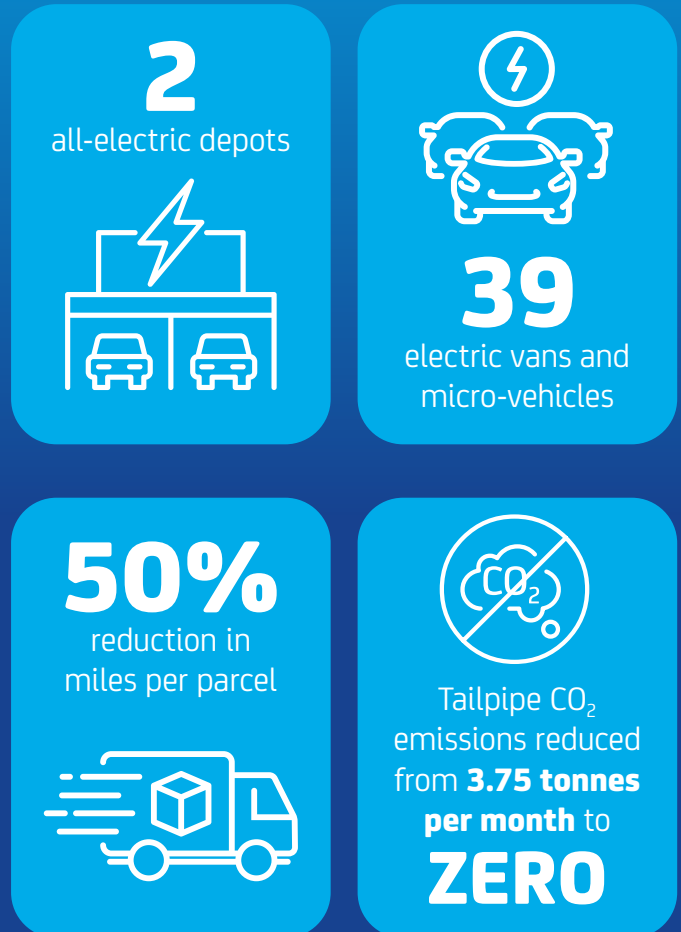
### First electric depots

In October 2018, DPD opened their first £1 million, all-electric depot in a disused TfL-owned site, ahead of the introduction of London's ULEZ.

After trialling 20 different alternatively fuelled vehicles, DPD invested in 10 electric vans and eight specialist micro-vehicles. These nimble micro-vehicles travel just seven to eight miles a day in Westminster to deliver up to 137 parcels per charge.

A second depot was opened in converted railway arches in Shoreditch with a further 21 electric vehicles.

Figure 2: DPD all-electric London depot trial results, 2018



“The environment and climate change are now more important than ever to our customers... Change is difficult, but emerging new technologies give the current generation of leaders the tools to lead a large-scale cultural change.”

Dwain McDonald, DPD CEO

## Revolutionising trunk routes

DPD have 11 depots serving London, mainly on the outskirts due to land cost and space constrictions. This meant there was long daily stem mileage ('trunk routes') for vehicles before they started making deliveries. The 15 diesel vehicles travelling from the large Southwark depot into London daily were replaced with two electric vehicles running between Southwark and Westminster. This halved the unproductive stem mileage and reduced emissions to zero.

## Charging solution

The main obstacle to overcome was charging, due to a lack of on-street chargepoints. DPD invested £50,000 in charging facilities at the two London depots, where the vehicles return every night. Their smart charging systems manage vehicle charging without exceeding the sites' electricity grid capacity, which would necessitate expensive grid reinforcement.

## Results

Switching from diesel to electric operations at the two London depots has reduced miles travelled per parcel by 49.2% and reduced CO<sub>2</sub> emissions from 3.75 tonnes per month to zero.

An additional benefit has been the favourable PR gained. The 81 positive press coverages received was worth the Equivalent Advertising Value of £234,000.

## Next steps

Following the success of the London trial, DPD have added a further 55 electric vehicles to their fleet, across 16 depots nationwide. This reduced their CO<sub>2</sub> emissions by 47 tonnes, which is the equivalent of charging six million smartphones. Another five all-electric depots are now in the pipeline and the 'next small thing' for DPD is their zero-emission cargo bikes, being rolled out nationwide.

For more information see <https://www.dpd.co.uk/>



DPD micro-vehicle

## 5.6 UPS

Delivering over 20.7 million packages and documents a day worldwide, UPS is one of the world's largest logistic companies.

In response to growing concerns worldwide about congestion, air pollution and climate change and the impact this may have on the business,<sup>33</sup> UPS is investing in sustainable solutions, including various projects in the UK.

### Growing the electric fleet

By 2017, UPS had already invested in 52 electric trucks for its 170-vehicle fleet operating from its central London depot. However, they could not find a fully electric equivalent to its large diesel bespoke trucks. Through the Smart Electric Urban Logistics project (SEUL),<sup>34</sup> funded by the Office for Low Emission Vehicles in partnership with Innovate UK, UPS converted a further 20 of their Euro V diesel 7.5 tonne trucks to electric, without compromising on operational efficiency.

The retrofitted vehicles have a payload of three tonnes, a cargo volume of 23m<sup>3</sup> and a range of 100km, easily exceeding their daily urban mileage. The estimated well-to-wheel CO<sub>2</sub>e savings of 65%, approximately 74 tonnes of CO<sub>2</sub> in their first year of deployment.

In 2019, UPS added 15 range-extended electric vehicles to its fleets in Birmingham and Southampton. When they reach a boundary, such as an urban environment or Clean Air Zone, they will automatically switch to pure electric mode.<sup>35</sup>

### Smart Charging System

Further expansion of the EV fleet in London was constrained by the limited power capacity of their Camden depot site, where the vehicles recharge overnight. Rather than investing in physical grid reinforcement, UPS worked closely with UK Power Networks Services to implement a smart charging system, including battery storage, a high-speed power meter (to give second-by-second data) and an Active Network Management System, and sophisticated software which dynamically controls all the elements.<sup>36</sup> The site now has the capacity to charge 170 vehicles, compared to 63 at the start of the project.

33 UPS, 2017 [https://sustainability.ups.com/media/UPS\\_The\\_Road\\_to\\_Sustainable\\_Urban\\_Logistics.pdf](https://sustainability.ups.com/media/UPS_The_Road_to_Sustainable_Urban_Logistics.pdf)

34 More information about the SEUL project in the factsheets produced by Cross River Partnership, 2019 <https://crossriverpartnership.org/projects/smart-electric-urban-logistics/>

35 Commercial Fleet, 2019 <https://www.commercialfleet.org/news/latest-news/2019/09/04/ups-adds-range-extended-evs-to-two-uk-fleets>

36 Cross River Partnership, 2019. Smart Electric Urban Logistics, Factsheet 2 <https://crossriverpartnership.org/wp-content/uploads/2019/03/seul-factsheet-2.pdf>



Credit: Fernhay.com

## Scaling-up fleet electrification

In 2020, UPS committed to purchasing 10,000 purpose-built electric vehicles for deployment in the UK, Europe and North America between 2020 and 2024 as part of a £339 million order from van manufacturer, Arrival,<sup>37</sup> and retains the option to purchase 10,000 more.

## Innovative cycle logistics

UPS have also implemented a range of sustainable solutions in numerous cities worldwide.<sup>38</sup>

Following initial trials in 2017, UPS started using a system of bicycles and bespoke trailers for delivering in the City of London in 2019. Each day, a transfer trailer (Eco Hub II) with six pre-sorted boxes (each with a 200 kg payload) is parked in an under-utilised underground car park. Riders then use this as a mini-hub, returning during their shift to swap their now empty box for the next pre-sorted box.

The trailers and boxes were developed with Fernhay, with the aim of developing a modular solution that could be scaled-up and enable deliveries in a very tight time-window. The standardised 'Fresh' boxes can be moved through the supply chain like shipping containers and fitted onto various vehicles, including a four-wheeled bicycle 'Breathe' and a powered walking trailer 'Air'.<sup>39</sup>

37 Post and Parcel, 2020 <https://postandparcel.info/118327/news/e-commerce/ups-accelerates-fleet-electrification/>

38 UPS, no date <https://sustainability.ups.com/sustainability-strategy/sustainable-solutions>

39 Fernhay, 2019 <https://fernhay.com/>

# 6. Challenges to operating electric vans and ecargo bikes

Swapping petrol or diesel vehicles for ecargo bikes or electric vans will require some changes to how you manage your delivery operations. To make it a success, it's important to ensure you select the most suitable vehicle for your requirements (see earlier in this guide) and think about how you will address the following aspects.

More detail on operating electric vans can be found in the Energy Saving Trust 'Lowering Van Costs and Emissions'.

## 6.1 Vehicle payload

eCargo bikes are versatile but cannot carry bulky or heavy goods such as white goods, construction materials and carpets, for example. Refrigerated goods can be transported with the correct boxes.

Similarly, most electric vans are under 2.5 tonnes gross vehicle weight with payloads around 700 kg. Models from a range of manufacturers with gross vehicle weights above 2.5 tonnes are joining the market but tend to be very expensive compared to diesel, or are in limited supply.

### An electric van fleet





## 6.2 Vehicle range

Compare the real-world range of electric vans with your current average daily mileage and consider how frequently you may exceed the range or if you could alter delivery patterns. It is easier to switch to an electric van which returns to a depot overnight where you can install your own chargepoint.

On an eCargo bike, it is possible to travel relatively long distances between delivery drops with the electric assist, but this will reduce profitability. Apart from town and city centres, places that generate frequent, regular trips are ideal, such as business parks, campuses or hospitals.

## 6.3 Vehicle purchase costs

Electric vans are more expensive to buy but are cheaper to run than diesel vans. There is a better business case where vans regularly enter a clean air or congestion zone and undertake sufficient daily mileages to recoup the initial costs.

To support businesses with the upfront costs of electric vans, the UK Government's Plug-in Van Grant is available, see [gov.uk](https://www.gov.uk)<sup>40</sup> for details. The retailer should complete the paperwork on your behalf if you purchase an eligible vehicle. Most vehicle prices you will see advertised already factor in the grant.

eCargo bikes are cheaper to buy than diesel or electric vans, but in some circumstances, several eCargo bikes may be needed to replace one van, increasing staff costs. However, many delivery vans are rarely full and microhubs could allow eCargo bikes to make the same or more deliveries to be made in a day.

## 6.4 eCargo bike-specific considerations

Aspects to consider include:<sup>41</sup>

- ▶ **eCargo bike-specific routing software:** This is an investment but recommended because it enables integrated driver messaging and improves real-time tracking, benefitting rider safety and customer service.
- ▶ **Regular, proactive maintenance:** This is crucial for reliability and reduces the likelihood of expensive repairs and breakdowns. eCargo bikes require specialist servicing and the availability of spare parts can be an issue.
- ▶ **Security and storage:** Organisations will need somewhere secure to store their bikes and equipment overnight. To protect the bikes and the clients' goods whilst on deliveries, you will need to invest in good locks, an immobiliser, trackers, and well-designed, easily lockable boxes.
- ▶ **Rider training & safety:** While the bikes are straightforward to ride, enhancing the skills of riders is valuable. All riders should have appropriate clothing and organisations should have an inclement weather policy. Several organisations agree a 'Code of Conduct' with their riders, which sets out clear expectations to protect the safety of riders and the organisation's reputation.
- ▶ **Manufacturers:** There are a limited number of UK manufacturers, most are based in Denmark or the Netherlands, and they tend to be small businesses. This can result in delays, high transport costs and reduced post-sale support.

40 UK Government, 2020. <https://www.gov.uk/government/collections/grants-for-plug-in-vehicles>

41 Energy Saving Trust would like to acknowledge the assistance of Gary Armstrong from the European Cycle Logistics Federation and other interviewees for their help compiling this list.

# 7. Reducing the number of incoming deliveries to workplaces

As well as switching to electric vehicles and bikes, another crucial way to reduce the negative impact of last mile deliveries is to reduce the number of journeys being undertaken in the first instance.

Many workplaces and businesses receive high numbers of incoming goods and parcels, including personal deliveries for staff. According to Transport for London,<sup>42</sup> on average, personal deliveries to offices in central London account for up to 40% of the total number of deliveries to the building.

Businesses looking to holistically improve their environmental performance should consider monitoring all in-coming deliveries for a short period, and then updating their policies to encourage better consolidation. This could include:

- ✔ Encouraging colleagues to use nearby parcel lockers (i.e. in supermarkets, train stations or high streets), and 'click and collect' services for personal deliveries
- ✔ Encouraging teams to coordinate orders from common suppliers
- ✔ Using timed courier collection services (i.e. one pick-up a day/week)
- ✔ Avoiding next-day or expedited deliveries
- ✔ Retiming deliveries, for example, to avoid the 7am-10am traffic peak<sup>43</sup>

Further ideas can be found in our Energy Saving Trust blog<sup>44</sup> comparing online and high street shopping, Transport for London's Deliveries toolkits<sup>45</sup> and a thought-piece from JLL on parcel lockers.<sup>46</sup>

Parcel lockers may present an opportunity for some businesses. For example, large workplaces, retailers or residential developments may be able to 'host' parcel lockers on-site, attracting footfall or presenting an added staff/resident benefit.

## A parcel locker



42 Transport for London, 2018 <http://content.tfl.gov.uk/tfl-reducing-personal-deliveries-to-your-business.pdf>

43 Transport for London, 2018 <http://content.tfl.gov.uk/retimingguide.pdf>

44 Energy Saving Trust, 2018 <https://energysavingtrust.org.uk/blog/online-vs-high-street-shopping-%E2%80%93-what%E2%80%99s-more-energy-efficient>

45 TfL, 2018 <https://tfl.gov.uk/info-for/deliveries-in-london/delivering-efficiently/deliveries-toolkits>

46 JLL, 2019 <https://www.jll.co.uk/en/trends-and-insights/cities/how-can-parcel-lockers-improve-last-mile-delivery>

# 8. Decision process for businesses

Whilst they cannot meet every need, ecargo bikes, PLVs and electric vans present many opportunities for businesses to electrify their deliveries, especially in congested, customer-dense areas and locations affected by Clean Air Zones.

As with any innovative or unfamiliar technology, adopting electric vans or ecargo bikes may require an openness to experiment to find the best vehicle design for the job, business model and way of managing operations.

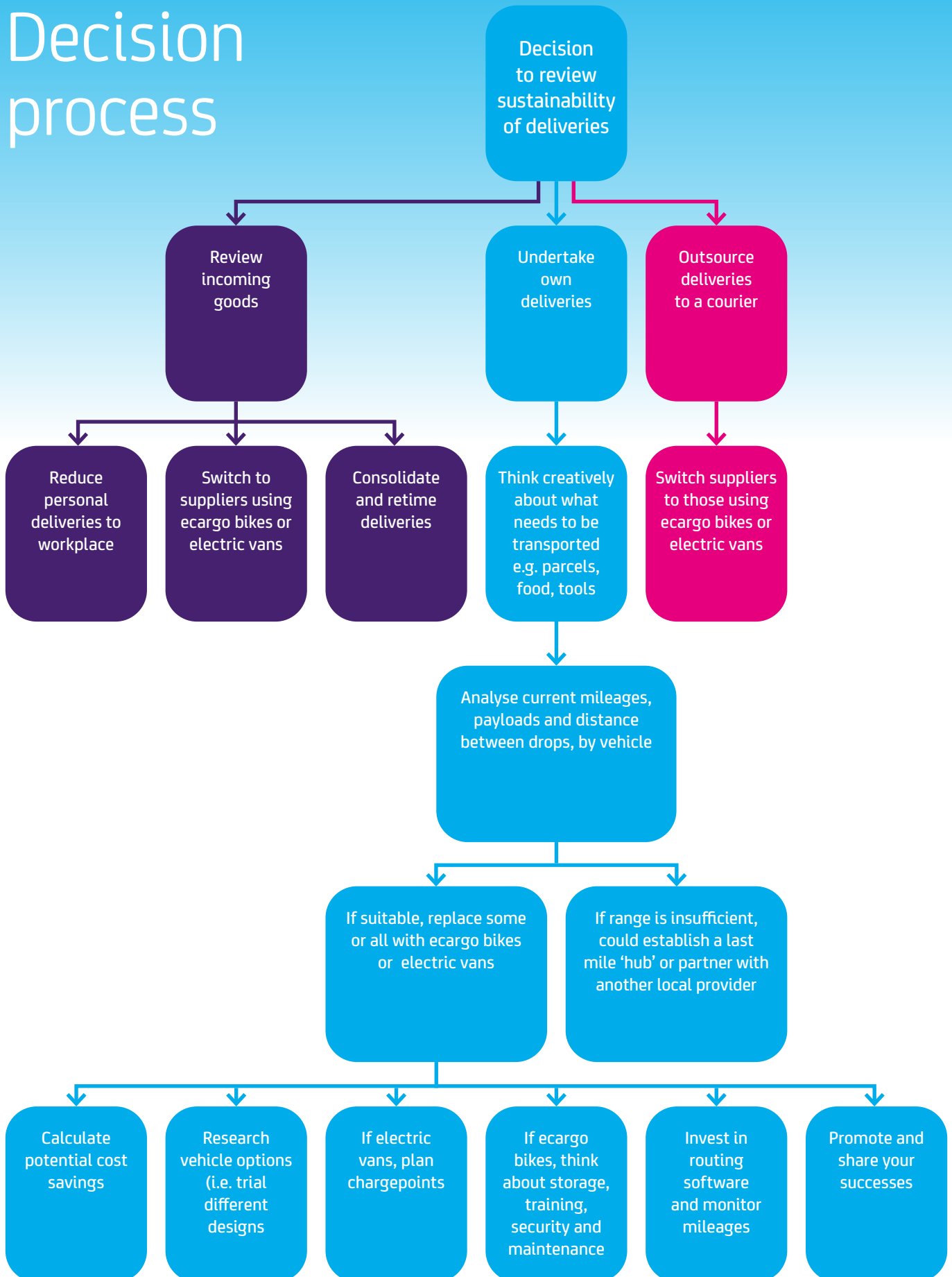
A start-up establishing an ecargo bike courier service will have different priorities and requirements compared to an established business replacing diesel vans with electric to deliver goods from a depot, for example. However, the diagram on the next page summarises the key decision points covered in this guide which any business involved in making deliveries should consider.

As the case studies in this guide, and the successes of many other organisations demonstrate, electrifying last mile deliveries can make our cities and towns better places to live and work, whilst offering exciting business opportunities.

## eCargo bike expo in London Bridge



# Decision process



# 9. Further information

**City Changer Cargo Bikes project**, 2019. Various resources are available from: <http://cyclelogistics.eu/index.php/downloads/source-material>

**Cycle Logistics Study**, Element Energy for Cross River Partnership, May 2019, <https://crossriverpartnership.org/?publications=element-energy-cycling-logistics-study>

**Government Response to Call for Evidence: The Last Mile – delivering goods more sustainably.** UK Government, March 2019 <https://www.gov.uk/government/consultations/the-last-mile-a-call-for-evidence>

**Lower van emissions and costs**, Energy Saving Trust, May 2019 <https://energysavingtrust.org.uk/sites/default/files/23501-EST%2BDFT-Lowering%20van%20emissions%20guide-WEB.pdf>

**The Potential of Light Electric Vehicles for Specific Freight Flows: Insights from the Netherlands**, 2018 [www.citylogistics.info/research/city-logistics-light-and-electric/](http://www.citylogistics.info/research/city-logistics-light-and-electric/)

**Powered Light Vehicles: The Opportunities for Low Carbon L-Category Vehicles in the UK**, Low CVP, <https://www.lowcvp.org.uk/Hubs/powered-light-vehicle.htm>

**The Route to Tomorrow's Journeys, L-category vehicles**, Motorcycle Industry Association, 2019 <https://mcia.co.uk/en/the-route>

**Scooter Switch Toolkit**, Zero Emissions Network, April 2019. To request a copy free of charge, email [zen@hackney.gov.uk](mailto:zen@hackney.gov.uk)

We're here to help people across the UK save energy and reduce fuel bills. It's a big task that we won't solve alone. But by working with partners who share our goals, we believe we can make a real difference.

Underpinned by our independent status and impartial perspective, we offer a depth of energy expertise, but we're not content to stand still. Our goal is to find new and better ways to drive change and reduce UK energy consumption.

**[energysavingtrust.org.uk](https://energysavingtrust.org.uk)**

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