LONDON CYCLING CAMPAIGN

MICROMOBILITY PARKING: LITERATURE REVIEW

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Image: Mobility Corral by Cyclehoop

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EXECUTIVE SUMMARY

Parking for cycles, e-scooters and cargo bikes is an increasingly important and complex topic. Transport strategies at the level both of national government – notably the Department for Transport's Gear Change report (2020b) – and the London Mayoral office (Mayor's Transport Strategy, 2018) recognise that increased walking, cycling and public transport must be accompanied by a reduction in car use to fully address climate change, air quality, traffic congestion and population health (LCC, 2020b).

Government and the Mayor, and indeed politicians and authorities in nearly every city globally, are more and more cognisant of the need for a lot more "active travel." This no longer means only walking and cycling in the traditional sense; it can mean e-scooters and cargo bikes as well, both privately owned and hired – a full range of "micromobility" devices. That has implications not just for our roads, but also for the parking required to help facilitate that shift.

Policies that depend on more walking and cycling, lower car use, to reduce carbon emissions, congestion and air pollution require the allocation or re-allocation of road space to more sustainable modes. Space for wider pavements and protected cycle tracks is often at the forefront of transport strategies, but space for the parking of, and equitable access to, the full range of micromobilities (in the wide sense that includes cycles) is equally essential.

This literature review looks at the scope and scale of parking requirements needed to accommodate a growing and ever more diverse range of micromobility forms. We examine the facilities required for new micromobilities such as shared e-scooters and e-bikes as well as adapted cycles, traditional bicycles and e-cargo bikes.

This report follows on from London Cycling Campaign's (LCC) report, Micromobility and Active Travel in the UK, published in June 2020 (LCC, 2020a), which expanded on LCC's Climate Safe Streets strategy and report (published March 2020) (LCC, 2020b). This report focuses more closely on micromobility parking best practice worldwide, and applications for London.

Below, this Executive Summary provides short- and long-term policy recommendations drawn from the wealth of information now available regarding micromobility parking, which this report condenses. This report, though far from exhaustive and at an early point in the rollout of micromobility, should inspire policy changes by public bodies, provide a basic understanding of micromobility parking and ultimately inspire better practice in London and beyond around the issue.

The key conclusions of the report are:

MEETING THE DEMAND FOR PARKING

1 Parking space for all micromobility must be planned for across all modes, and modes of operation, to anticipate predicted and planned for demand, and to exceed current demand. As a starting point, LCC's Climate Safe Streets recommendation that "by 2024 everyone in London should live and work no further than 300m from their nearest car club bay and shared cycle/e-scooter geo-fenced access point (which should ideally be co-located)" must be realised. The number of parking spaces for privately owned cycles must also be doubled in a similar time period.

2 Space for micromobility parking will need to be found not just by highways departments, but factored into planning beyond residential and workplace parking plans by providing land for last mile and consolidation hubs, as well as micromobility hubs at transport interchanges and other locations, for instance.

SHARED MICROMOBILITY PARKING

1 The rollout and management of commercial and other shared micromobilities must be agreed with local authorities that govern the allocation of parking space. Standards, such as those set by CoMoUK, should be followed.

2 Parking space for all shared micromobility must be defined and well managed. Operators have the technology to deliver and enforce parking regulations using incentives and penalties.

PRIVATE, INSTITUTIONAL AND RETAIL PARKING

1 TfL must study levels of public transport access across London, especially Outer London, taking into account the potential for new micromobility modes to enhance access, and publish the results as a benchmark for planning.

2 Cycle parking designed for existing or future housing and workplaces must cater for a range of vehicles: adapted cycles, cycle trailers, e-cargo bikes, and e-scooters. Secure sheds or shared garages large enough for this purpose should be standard in new developments.

3 Secure micromobility parking needs to include electric points for charging batteries.

4 While smaller spaces for folding cycles must not replace requirements for conventional cycle parking, such spaces are usefully provided in refurbished and new developments.

5 Short-stay cycle parking in new developments, especially schools, must accommodate adapted cycles and cargo bikes.

6 For much existing housing stock in London, as elsewhere, cycle hangars may offer the best secure parking for residents with vehicles that can't conveniently be taken indoors. TfL should assess the density of provision needed and the requirements for larger vehicles such as adapted cycles, cargo cycles, and cycle child trailers; and associated charging points.

PUBLIC PARKING

1 Parking space for all micromobility must be planned for across all modes, and modes of operation, to anticipate predicted and planned for demand, and to exceed current demand. As a starting point, LCC's Climate Safe Streets recommendation that "by 2024 everyone in London should live and work no further than 300m from their nearest car club bay and shared cycle/e-scooter geo-fenced access point (which should ideally be co-located)" must be realised. The number of parking spaces for privately owned cycles must also be doubled in a similar time period.

2 Local authorities should develop strategies for re-purposing car parking spaces, whether in parking lots, rail stations or on-street, as they become available, to maximise sustainable and shared transport.

3 Parking should include allocated spaces for non-standard cycles and be available across the capital.

4 All cycle types should be included in corral-style parking.

5 Design of parklets should include provision for designated, secure micromobility parking.

INTEGRATED PARKING

1 A model shared mobility hub should be installed by 2022 in London and space reserved across all boroughs for a network of similar hubs that will provide access to shared modes for all Londoners.

2 Space must be allocated or reserved for last mile/logistics consolidation hubs in all boroughs and lessons learned from existing hubs should be shared. Where suitable, large new developments should be considered as prime sites for logistics hub locations.

3 Local authorities should develop strategies for re-purposing car parking spaces, whether in parking lots, rail stations or on-street, as they become available, to maximise sustainable and shared transport.

4 Space for micromobility parking will need to be found not just by highways departments, but factored into planning beyond residential and workplace parking plans by providing land for last mile and consolidation hubs, as well as micromobility hubs at transport interchanges and other locations, for instance.

FURTHER CONSIDERATIONS

1 Parking should include allocated spaces for non-standard cycles and be available across the capital.

2 Growing levels of cycle theft must be addressed by a designated police task force to tackle both on-street micromobility theft and sales of stolen cycles and scooters online.

1
MEETING THE DEMAND FOR PARKING

TfL's Cycle Parking Implementation Plan estimates the city needs 36,000 cycle parking spaces immediately and 12,000 over the next four years (TfL, 2019: 12), on top of an existing 145,449 spaces. However, we calculate that this expansion in cycle parking cannot fulfil the demand that will be created if the Mayor's own targets for the growth in cycling journeys are even partly achieved.

London will need a lot more cycle and micromobility parking spaces than currently planned for, even if trajectories of cycling growth continue at pre-Covid levels, rather than exceeding them. The current plan for parking will not even fulfil demand that the Mayor is aiming for – until recently the Mayor and TfL have been working towards a doubling of cycling journeys to 1.5 million trips per day by 2026, and that will exceed parking availability as currently planned.

A lack of parking – both in terms of existing and planned parking – is only likely to get worse, too. The Mayor's Walking and Cycling Commissioner Will Norman, suggested there could be up to a ten-fold increase in cycle trips in the wake of accelerated growth during the pandemic (Groves, 2020). And indeed, cycling levels have significantly risen during the crisis while other modes of transport have fallen sharply, and the government and Mayor, as well as individual boroughs have been rolling out cycling and micromobility infrastructure – "Low Traffic Neighbourhoods", cycle tracks etc. – throughout the crisis, at a rate never seen before in London.

While cycle parking planning is lagging behind infrastructure rollout and predicted cycling levels, e-scooter trips are not currently included in the Mayor's Transport Strategy at all. Assuming e-scooter trials lead to their legalisation as road vehicles, evidence from Paris and other cities shows that allocation of *defined* e-scooter parking spaces can help to successfully manage this new micromobility, and will be required also. This report notes that space for such parking needs to be allocated now, ahead of anticipated growth in shared e-bike and e-scooter programmes. This is why LCC's Climate Safe Streets report (LCC, 2020b) recommends shared mobility locations every 300 metres to facilitate the growth of sustainable transport.

On top of the need for standard cycle and e-scooter parking for both privately owned and hired vehicles, there is also a rising need for parking for other "micromobility" form factors – handcycles, adapted cycles and cargo e-bikes of various form factors for a variety of uses, none of which are widely catered for in existing cycle parking. This means more inclusive forms of parking design as described in the following chapters, in increasing numbers, but it also will likely mean far broader operation planning, and not just highway considerations.

E-cargo bikes, for instance, have a vital role to play in urban goods (and people) transport and space allocated by local authorities or other parties via the planning process is increasingly needed to secure parking spaces both at base and destinations. We note that in the Netherlands cities are already planning to exclude internal combustion engine (ICE) vehicles from urban deliveries by 2025 (Broom, 2021) and LCC's Climate Safe Streets report anticipates similar measures in the UK. The Mayor's target of a net zero carbon London by 2030 cannot be realised while only a small fraction of deliveries is by electric van or cargo bike. And a rising number of e-cargo bikes will not just require more inclusive cycle parking in streets, or at the service entrances to workplaces, it will require more locations to "consolidate" loads from larger motor vehicles to smaller ones, including e-cargo bikes, particularly for "last mile" services.

POLICY RECOMMENDATIONS

- Parking space for all micromobility must be planned for across all modes, and modes of operation, to anticipate predicted and planned for demand, and to exceed current demand. As a starting point, LCC's Climate Safe Streets recommendation that "by 2024 everyone in London should live and work no further than 300m from their nearest car club bay and shared cycle/e-scooter geo-fenced access point (which should ideally be co-located)" must be realised. The number of parking spaces for privately owned cycles must also be doubled in a similar time period.
- Space for micromobility parking will need to be found not just by highways departments, but factored into planning beyond residential and workplace parking plans by providing land for last mile and consolidation hubs, as well as micromobility hubs at transport interchanges and other locations, for instance.

REFERENCES

1. Groves, J. 2020. Mayor's Streetspace Plan could see cycling increased tenfold post-lockdown. Article published by Bikebiz. Available [online] at: https://www.bikebiz.com/mayors-streetspace-plan-could-see-cycling-increased-tenfold-post-lockdown/
2. Broom, D. 2021. These Dutch cities will allow only zero-emission deliveries by 2025. Blog by World Economic Forum. Available [online] at: https://www.weforum.org/agenda/2021/04/zero-emission-deliveries-netherlands-cities/

2 SHARED MICROMOBILITY PARKING

London has got accustomed to TfL and Santander's "docked" cycle hire scheme, but in recent years, "dockless" operators have gained licence to operate in London too. Several waves of these have caused significant issues to Londoners and councils, with operators failing and being replaced by newer operators, with a shift to e-bikes the most recent change. Now, London is also seeing trials (at time of writing) of three dockless e-scooter operators, following rollout of such schemes in other countries and cities. What do these new approaches and mobility forms mean for parking in London?

SHARED CYCLE PARKING

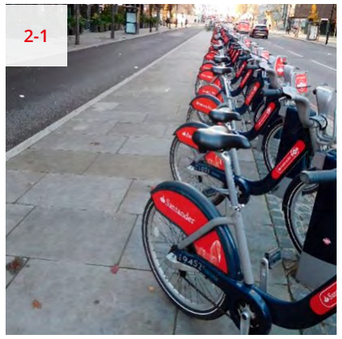
Shared cycles differ from e-scooters as some schemes, notably the docked model, are local authority-led, and land is allocated for the bikes to be retained in a docking station when not in use. The more recent dockless model is often operator-led. This section covers docked, uncontrolled dockless, and semi-docked shared cycle parking.

Docked – the case of Santander in London

London's current docked bikeshare operator is TfL, sponsored by Santander. In its first decade of operation from July 2010 to June 2020, London's Santander Cycles were ridden 93 million times, peaking for annual rides in 2018 (BBC, 2020). The pandemic saw record numbers of winter hires and the scheme crossed the 100 million hire mark in March 2021 (TfL, 2021). Nonetheless the scheme continues to be subsidised by TfL, with infrastructure being the most significant cost (Ponsford and Lee-Zogbessou, 2018).

In 2020, TfL indicated the Santander cycle scheme had been considered for closure as a result of central government financial aid freezes, though this was soon dismissed as an option by London's Cycling and Walking Commissioner Will Norman (Reid, 2020). Today, there are 781 docking stations, more than double the 350 installed at the beginning of the scheme back in 2010. The dispersion of these docking stations is predominantly central, with the great majority north of the River Thames (see Figure 2-2).

At the beginning of the first lockdown in March 2020, Santander cycles were provided free of charge to key workers, which prompted a minimum of 75,000 NHS journeys that year (Reid, 2020). According to Travel in London Report 13, the last weekend of May 2020 saw hires of 70,000 on the Saturday and 63,000 on the Sunday, exceeding the pre-pandemic record for weekend hires (TfL, 2020). Whilst Santander cycle ridership has always climbed in the summer months, the rise in casual riders (as



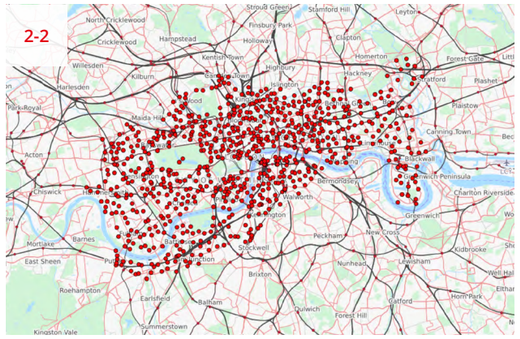


Figure 2-1 Santander docking station alongside Cycle Superhighway 6, Southwark. *Source: LCC*
Figure 2-2 Map displaying location of London's 781 Santander docking stations. *Source: Azimap*

opposed to daily or annual riders) suggests the Santander scheme may continue to record increased usage post-pandemic.

The user costs of the Santander scheme are competitive with London's four dockless operators (Jump, Lime, Beryl, and Freebike). Casual riders pay £2 to unlock a bike, and thereafter they can make unlimited journeys of no more than 30 minutes within a 24-hour period; any journeys that go beyond this initial limit are charged £2 per subsequent 30 minutes. Annual memberships are £90 per year, though these only discount the initial unlocking fee plus 30-minute hire time – the scheme is not compatible with the London Transport Oyster Card (BBC, 2020).

While Santander cycles are not an income generator for TfL, the scheme is very popular and clearly an important cog in London's transport network as a source of reliable short-term cycle rental. The current central distribution is evident: plans to extend operations will be subject to the availability of funds and the logistics of redistribution of bikes to docks. (On the "Brunel Bikes" scheme, see under "Places of Further and Higher Education" in Chapter 3 below.) In May 2021, TfL announced that it would introduce additional electric Santander cycles and also that it aimed to expand the area covered by the scheme.

Uncontrolled dockless parking

A dockless bikeshare system permits users to return a bike to any given location within a predefined geographic region, where GPS technology tracks the bike location, demarcates the boundary "geofence" within which the rider must stay, determines to an extent where the bike can or cannot be parked, and ensures the bike is left upright (Fishman, 2019). The system imposes on users a format similar to that for shared e-scooters (discussed below), with a smartphone and/or debit/credit card payment method a prerequisite to ridership.

Dockless cycles were introduced to the urban realm several years before the e-scooter, in some cases with minimal warning or communication of operators with city officials. Their uncontrolled parking and distribution led to early negative perceptions of dockless bikeshares (Fishman, 2019). Academics have explored British attitudes towards the bicycle as "matter out of place" identifying public perceptions of bikes as threatened or threatening, risky or at-risk and vulnerable to theft and vandalism (Aldred and Jungnickel, 2013).

This impacted early entrants to the market: Mobike reported worldwide losses of up to 205,600 bikes in 2019 to theft or vandalism (Reid, 2019). The firm's short operation in Manchester suffered from some of these issues, as documented in Sherriff et al. (2020). Mobike, Ofo and O-bike, the original dockless operators in London, have all ceased operating in the capital.

Subsequent introductions of dockless shared cycles have followed the semi-dockless format described below.

Controlled dockless parking

This is a half-way between fully dockless and docked cycle parking, whereby city authorities determine specific locations where dockless bikes can be parked on the street, within a defined geofenced perimeter (often a space replacing a car parking bay, for instance). This is analogous to the controlled dockless parking for shared e-scooters described below.

In the UK, Brighton's BTN BikeShare offers a £1 financial incentive for riders who park the bike in or near a designated bay (BTN Bikeshare, 2020), while Seattle's Department of Transportation has opted for a broader definition of where parking is allowed. Their schemes divide up the sidewalk into three zones: (i) frontage zone (area between property line and pedestrian clear zone); (ii) pedestrian clear zone (specifically reserved for pedestrian travel); (iii) landscape/furniture zone (area between roadway kerb [in US "curb"] -face and the front edge of the pedestrian clear zone). This is demonstrated in Figure 2-3, with Seattle bikeshare users allowed to park in any landscaping/furniture zone of the sidewalk, as long as it is more than three foot wide (Shaheen and Cohen, 2019).

2-3

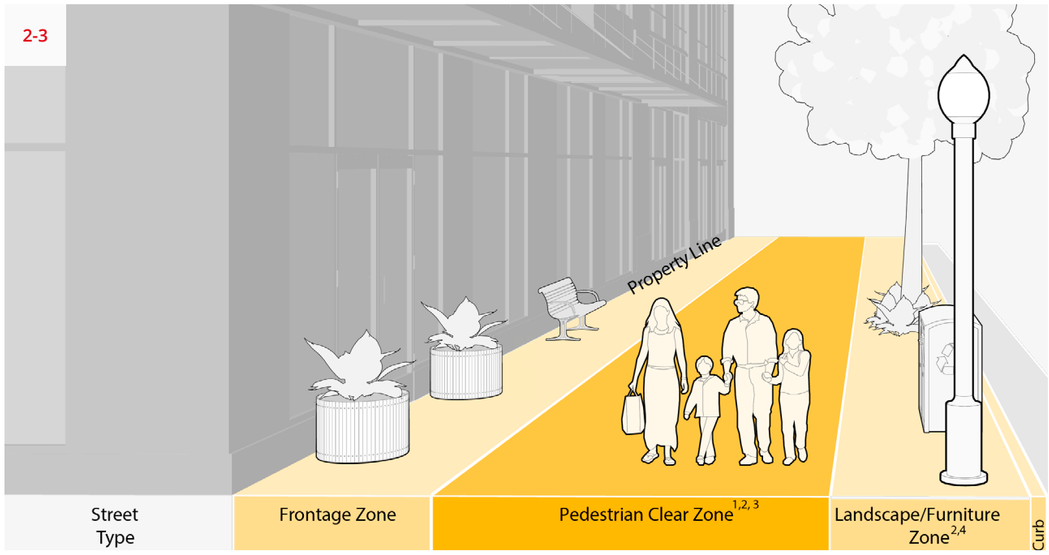


Figure 2-3 Seattle Department of Transportation's rather simplified three-zone sidewalk division.
Source: Shaheen and Cohen / Seattle Department of Transportation

Simple zoning styles of kerb management, however, face problems. For instance, ramps and lower curbs that act as entry points to the road for those with restricted movement must not be blocked in any way. As a result, since September 2018, TfL has had clear instructions in place advising dockless bikeshare operators on parking regulations:

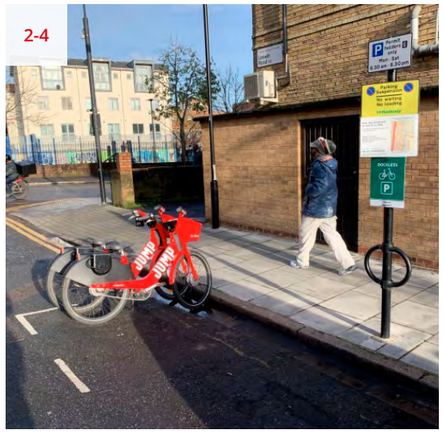
> Dockless bicycles shall not be parked within 2 meters of a junction; Dockless bicycles shall not be parked on a footway where the effective distance between the building line and the kerb is less than 2m wide. This is in addition to a 60cm parking provision for Dockless Bicycles; and Dockless bicycles shall not be ridden or parked within Royal Park premises (TfL, 2018).

The same TfL code of practice states that cycles considered a "danger" or "obstruction" must be removed within two hours, whilst cycles considered a "nuisance" must be addressed within a 24-hour time period (TfL, 2018).

Experience in London shows that this semi-docked model can be successful: Hackney Borough partnered with dockless operators Beryl and Jump to introduce 70 new bike bays to the area in 2019. The bays are funded by the two operators, with the new cycle parking spaces leading to fewer bikes being left on pavements (Hackney Council, 2019). Riders are price-incentivised to finish their trip in these spaces, though this is not mandatory.

A study of dockless bikeshare operators Beryl and Freebike over a six-month trial in the Square Mile (City of London) found that the two operators' average response time to "correct" inappropriately parked bikes was 40 minutes. Parking in designated spots averaged 87-89% across the trial, with parking compliance growing over time (City of London, 2019).

2-4



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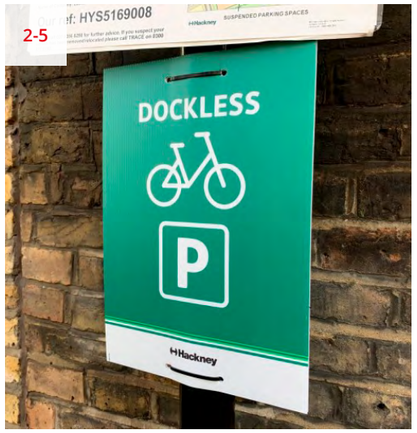


Figure 2-4 & Figure 2-5 Hackney Council provision of dockless bikeshare parking, in collaboration with operators Beryl and Jump. *Source: Hackney Council*

SHARED E-SCOOTER PARKING

All shared e-scooters are dockless, in the sense that they are not locked with a physical lock to an item fixed into the ground. However, there are varying levels of electronic and financial control that companies and local governments can apply to shared e-scooter systems. These controls may include identifying particular geographical areas for e-scooter parking, and the trend is for increasing use of such controlled dockless parking.

Uncontrolled dockless parking

It is argued that e-scooters can go a long way to resolving longstanding transport inequities in cities, providing more accessible and equal transport opportunities for all citizens: e-scooters "open up the physical design of transport systems… [uncovering] aspects that have long been closed" (Tuncer and Brown, 2020: 9), enabling riders to "hack the city" like never before. This spontaneity is undermined by the potential unreliability of dockless e-scooters; by nature of their "free floating" selling point, they are not always found within a walkable distance from the user – though operators have attempted to alleviate this shortcoming by the repositioning and rebalancing of "stagnant" e-scooters within their fleet (Portland Bureau of Transportation, 2018). In the US, e-scooter hire started in abrupt fashion in 2017, going live in 65 cities by the end of that year (James et. al, 2019). Mirroring other "sharing" business platforms, e-scooters were essentially scattered across city streets overnight by various operators, leaving city officials to play regulatory catch-up with this disruptive micromobility mode. Four years on, the strength of dockless e-scooters remains their ability to provide flexible and spontaneous first- and last-mile travel. User constraints are practically minimal, with riders obliged only to park their vehicle "properly" within a geofenced perimeter upon the completion of their journey (Tuncer and Brown, 2020). A key theme that runs through the data, and cultural representations of e-scooters, are the problems associated with dockless e-scooters within the urban landscape, with particular scrutiny coming from pedestrians. Perceptions related to improper parking lie at the centre of these tensions.

Definitions of parking

City definitions of "well parked" vary considerably. The Mineta Transportation Institute (situated in San Jose, California), defines "well parked" rather succinctly as: (i) Standing upright; (ii) Placed on the periphery of pedestrian paths or in areas that are already obstructed, such as by street furniture; (iii) Not blocking pedestrian access (Fang et al., 2018). The Portland Bureau of Transportation adopts a more rigorous interpretation, outlining 19 parking conditions during their 120-day pilot in 2018, though the premise is simple: "administrative rules require companies and riders to park scooters on the sidewalk and close to the curb, in a manner that does not interfere with pedestrian access or travel" (Portland Bureau of Transportation, 2018).

Though no study has yet shown an improper parking rate of e-scooters above 8% of total trips (Brown et al., 2021), improper parking remains one of the most commonly cited reasons for opposing e-scooter hire schemes. The community most affected by improper parking on the sidewalk or pavement is those with visual and physical impairments, requiring prudent kerb space management to make sure ramps or access points to the road are not blocked, and sufficient pavement space is retained (Cross River Partnership, 2021).

The literature suggests city regulations and guidelines on parking are not the main problem; rather it is how this information is relayed to the e-scooter user. Conducting an online survey with Lime e-scooter riders across five cities – Auckland, Cologne, Milton Keynes, Nashville, Rome – Brown et al. (2021) found that 68% of the cases of improper parking were due to a lack of knowledge over rules. Further, when confronted with their city's parking rules, the share of respondents who admitted to "mis-parking" at least once rose from 8.6% to 26%. In a separate observational study of Rosslyn's e-scooter pilot in 2019 (Arlington, Virginia), the most frequent cases of improper parking were as follows: vehicle not parked upright (28%), vehicle blocking pedestrian right-of-way (23%), and vehicle parked on private property (22%) (James et al., 2019: 8). The researchers subsequently published a table of improper parking conditions (see Figure 2-8).

2-6

2-7

2-8

Table 2. Observed E-Scooter Conditions.

Scooter Condition Code	Description
Blocking pedestrian right-of-way	Scooter is impeding pedestrian access or crosswalks. This includes any e-scooter that does not leave at least five feet of traversable walkway
Blocking vehicle right-of-way	Scooter is (even partially) in the street
On private property	Scooter is (even partially), for example, in a driveway, yard, on a stoop, in a restaurant outdoor seating area, or in a building nook
Damaging property (i.e., plants or trees)	Scooter is leaning against or on top of vegetation or otherwise in a planter
Not upright	Scooter is laying on its side or leaning against another object
Obstructing access to fire hydrant or valve	Scooter is within two feet of a fire hydrant or valve
Obstructing access to street furniture	Scooter is within two feet of the side of a piece of furniture a furniture user must access (e.g., for a bench with a back and armrests, the obstructing side would only be the front of the bench)
Obstructing access to bus stop	Scooter is between the bus stop and the street or within two feet of either side of the bus stop
Obstructing access to bikeshare station	Scooter is within two feet of the side of a bikeshare station a bikeshare user must access to (un)dock a bike

Figure 2-6 E-scooter parking gone wrong; Lime e-scooters stacked up in a pile. *Source: Shaheen and Cohen*

Figure 2-7 E-scooter parking done right; Lime e-scooters parked upright in designated spaces in Sofia, Bulgaria. *Source: Trending Topics*

Figure 2-8 Examples of "improper" e-scooter parking. *Source: James et al (2019)*

Operator enforcement

Parking enforcement for dockless e-scooters varies between cities. For instance, the San Francisco Municipal Transportation Authority (SFMTA) "requires operators to respond to parking issues in under two hours and uniquely fines operators $100 for each incorrectly parked scooter" (Spin, 2021). Researchers advise operator penalisations for a slow response rate to poorly parked vehicles, imbalanced fleets or poor handling of consumer complaints (Shaheen and Cohen, 2019), although a best-practice case of parking enforcement that manages the tension between strict policing and laidback governance remains to be found.

Policy implications

Three themes quickly become apparent in the literature.

1. There is a user tension between the spontaneity of a dockless e-scooter set against the possibility that one might not be available at a preferred location.

2. The mis-parking of e-scooters on city streets and pavements is considered undesirable by many, and disproportionately affects communities with visual and physical impairments.

3. There is insufficient dissemination of clear information from city officials and e-scooter operators to users on what is considered "well parked" when it comes to finishing a trip.

Concerning the last point, in-app reminders using photographic confirmation have been shown to help enforce parking compliance, though this (once again) requires a certain level of tech savvy and smartphone accessibility that many do not have. Though unforeseen technical solutions may emerge, this report suggests the role of designated e-scooter parking bays/locations can largely address the shortcomings of dockless e-scooter parking.

Controlled dockless parking

In a study of Dott e-scooters in Paris, transport consultants Momentum and 6t concluded by advising that London "ditches free floating for smart parking" when it comes to e-scooters (2020). The Parisian case is in many ways a useful model for London; the city introduced regulation to reduce the number of e-scooters operators from twelve to three in 2019 (as is the case in London's 2021 trial) and introduced 2,500 parking bays across the city – six e-scooters per bay – matching the city's set maximum capacity of 15,000 e-scooters. Each bay was approximately 100 metres from its neighbour, based on the finding that 90% of riders would walk an extra two minutes to pick up a scooter, but more than a third wouldn't walk more than two minutes. A survey conducted in Munich recorded similar numbers, finding that 83% would be happy to walk an extra two minutes if it meant "free minutes" (i.e. discounted fare) for riders (Sellaouti et al., 2020).

In London's 2021 trial of shared e-scooters, boroughs are themselves responsible for selecting parking locations for the vehicles. Careful consideration should be given to e-scooters' parking locations to ensure sufficient uptake for a valid trial. The potential stakes are high in light of the finding from Momentum and 6t that 97.63% of Inner London and 77.96% of Outer London can be reached from a rail or tube station by a 10-minute e-scooter journey. Best summarised by O'Rourke (2020), planning for

parking at scale means that "riders get a convenient service, non-riders are not impacted by clutter, authorities can design parking into the urban infrastructure, and operators can work more efficiently when vehicles are corralled."

It is not merely a case of quantity of parking, but quality. "Mobility corrals" have taken on many forms and designs since their initial conception in 2011, and can be as simple as the reclamation and conversion of a car parking space on the street into a designated e-scooter spot (see **Figures 2-9** and **2-10**). Note: such designs have evolved exponentially to accommodate multimodal parking, and will be touched on in more detail in Chapter 4.

Figure 2-9 & Figure 2-10 Simplified on-street micromobility corral. *Source: Shaheen and Cohen*

Parking and charging

Whereas Paris covered parking bay costs through annual €50-per-e-scooter operator costs, other cities have placed the onus entirely on the operators to provide e-scooter parking. This has prompted innovative parking solutions, especially considering that operators are keen to reduce the carbon footprint associated with e-scooter recharging: an estimated 43% of e-scooter greenhouse gas emissions currently come from the trips made to collect, recharge and relocate e-scooters (Liao and Correia, 2020). In a study of perceptions of e-scooters in Munich, Sellaouti et al (2020) found that only 13% of survey respondents deemed e-scooters an environmentally-friendly mode of travel. Consequently, the authors concluded that "parking spaces with charging facilities could save the bad reputation of electric scooters" (Liao and Correia, 2020). E-scooter operator Tier's solution to the charging conundrum has been to invest $250 million into installing battery charging stations inside 4,500 designated shops, where riders will be rewarded with a free-trip for switching e-scooter batteries out themselves (Shead, 2021). An alternative future for e-scooter charging in cities lies with smart parking.

Smart parking serves the dual purpose of e-scooter parking and charging, with Spin's proposed "Spin Hub(s)" trial in Milton Keynes considered a potential blueprint (see Figure 2-11). Spin Hubs will take the form of identifiable parking hubs with on-site, 24/7 e-scooter charging, largely mitigating earlier issues of pavement "clutter" and user unavailability (Spin, 2021b). Riders are not required to terminate their journeys at the Spin Hubs, though doing so will be rewarded with a 50 pence discount off their next ride. Voi have opted for a similar price-led incentivisation in four German cities, where parking in designated zones will halve the price of the journey (Sellaouti et al., 2020). It's likely that this combination of physical infrastructure and small financial incentives will be a central trend in UK's micromobility parking in the coming years.

In addition to smart parking, technological innovations are also addressing other issues associated with e-scooters. We are in a "third wave" of e-scooter design, where models are increasingly robust and durable: in 2018, e-scooter operator Skip unveiled scooters with rear-facing cameras, swappable batteries and retractable locks (Dickey, 2018), whilst Spin themselves have announced a pilot for three-wheeled, self-parking scooters, set to take place in 2021 in Boise, Idaho (Spin, 2021a).

In the short term, smart parking is unlikely to be a solution for schemes such as the London trial, especially if London boroughs are funding e-scooter parking themselves (O'Rourke, 2020), and also because of the temporary nature of the trial. A more pressing issue for the trial is likely to be the quantity of e-scooter parking, which could determine the accessibility and viability of the trial schemes.

Figure 2-11 Proposed Spin Hub outside Milton Keynes station, providing a dual parking-charging purpose. *Source: Spin*

SHARED MICROMOBILITY BUSINESS MODELS

While investment in e-scooter companies has been exceptional, with several firms exceeding the "unicorn" level of one billion dollars, the long-term profitability of the sector remains an unknown. As described above, the short existence of shared cycles and e-scooters has been both turbulent and unpredictable, which makes planning for long-term shared micromobility parking far from straightforward.

Regarding the future of e-scooters, Catapult Connected Places, an "innovation accelerator", sits on the fence: "it is debatable whether they [e-scooters] are a flash in the pan fad or a serious transport option that will profoundly change travel behaviours and needs" (2020). During online event Micromobility World (February 2021), Lime CEO Wayne Ting said the operator made its first profit in Q1 of 2020 (Ting and Weinberg, 2021) but other firms in the sector, which are invariably privately owned, have yet to deliver especially promising figures (Shulman, 2019). This has not stopped or curtailed investment into the industry, and the extra surge towards more sustainable urban travel globally following the Covid-19 pandemic may boost the growth of shared micromobilities.

Any consideration of policy recommendations for shared micromobility parking must bear in mind the potential for financial turbulence in the sector, which may lead to takeovers, failures and new entrants.

Figure 2-12 Spin S-200 scooters on-street in North America. *Source: Spin*

CHAPTER CONCLUSION

A common theme between shared e-scooters and shared cycles is that the key launch problems arising with both modes can be alleviated through the provision of designated parking spaces or zones.

London stands in a position of strength regarding e-scooters: unlike cities facing problems caused by loopholes in their road laws that allowed multiple operators to deposit e-scooters on streets simultaneously, London has been able to choose when the time is right to embrace e-scooters, and to demand of operators responsible parking behaviour by users.

The city's 12-month e-scooter trial, which started in June 2021, will contribute data and lessons beyond those contained in this report. The London trial will feature designated parking areas in the boroughs that are supporting the trial.

With widespread adoption of privately owned e-scooters – even before hire trials and when they remained effectively illegal in London – and with government clearly signalling support for e-scooters, it's likely e-scooters are here to stay. What remains unknown thus far is what the potential for e-scooters, privately owned or hired, is in London and to what extent users will come from which other modes – including cycling. It is feasible e-scooters could prove popular enough to drive out e-bike hire operators, given their smaller weight and size for redistribution logistics, and users' ability to carry foldable models on public transport etc.

Whatever the final mix of shared vs private, e-scooter vs e-bike etc. all shared modes will depend on the provision of parking, which will largely be allocated and administered by local authorities. LCC's Climate Safe Streets report recommends the provision of mobility hubs to cater for shared vehicles every 300 metres. Allocation of land for such use needs to be a priority for local transport strategies as we work toward a low-carbon transport system.

POLICY RECOMMENDATIONS

- The rollout and management of commercial and other shared micromobilities must be agreed with local authorities that govern the allocation of parking space. Standards, such as those set by CoMoUK, should be followed.

- Parking space for all shared micromobility must be defined and well managed. Operators have the technology to deliver and enforce parking regulations using incentives and penalties.

REFERENCES

1. BBC, 2020. 'Boris bikes': The facts behind 10 years of London's cycle hire scheme. Available [online] at: https://www.bbc.co.uk/news/uk-england-london-53577750
2. Transport for London (TfL), 2021. TfL's popular Santander Cycles scheme reaches 100 million hires. Press release by TfL. Available [online] at: https://tfl.gov.uk/info-for/media/press-releases/2021/march/tfl-s-popular-santander-cycles-scheme-reaches-100-million-hires
3. Ponsford, D., and Lee-Zogbessou, J., 2018. London's Boris bikes cycle hire scheme has cost UK taxpayers nearly £200 million, FoI disclosure reveals. Published by Verdict. Available [online] at: https://www.verdict.co.uk/londons-boris-bikes-scheme-has-cost-taxpayers-nearly-200m-foi-disclosure-reveals/
4. Reid, C., 2020. Ripping Out 'Boris Bikes' Would Be Insane Says London's Cycling And Walking Commissioner. News Article Published by Forbes. Available [online] at: https://www.forbes.com/sites/carltonreid/2020/12/14/ripping-out-boris-bikes-would-be-insane-says-londons-cycling-and-walking-commissioner/?sh=2b-63f2073ebe
5. Azimap, 2021. Interactive map displaying London Santander Cycle Stations. Available [online] at: https://www.azimap.com/explore/view/20/london-santander-cycle-stations
6. Transport for London (TfL), 2020. Travel in London Report 13. Available [pdf] at: https://content.tfl.gov.uk/travel-in-london-report-13.pdf
7. Fishman, E., 2019. Bikeshare. Chapter 8: The Challenge of Dockless Bike Share Parking, (pp.61-71). Available [online] at: https://www.taylorfrancis.com/chapters/mono/10.4324/9781315545127-7/challenges-dockless-bike-share-parking-elliot-fishman?context=ubx&re-fld=69c84905-42b9-46eb-bd6c-0c4fcce08d5d
8. Aldred, R. and Jungnickel, K., 2013. Matter in or out of place? Bicycle parking strategies and their effects on people, practices and places. Social & Cultural Geography, 14(6), (pp.604-624). Available [pdf] at: https://westminsterresearch.westminster.ac.uk/download/070956b1b6afb8c678e7e911618a95e6d-d2cdc6b8577f8c9539d78445c797332/315928/Aldred_Jungnickel_2013_final_author_version.pdf
9. Reid, C., 2019. Mobike Loses 200,000 Dockless Bicycles To Theft And Vandalism. News Article published by Forbes. Available [online] at: https://www.forbes.com/sites/carltonreid/2020/12/30/mobike-loses-200000-dockless-bicycles-to-theft-and-vandalism/?sh=50c0d60c41ca
10. Sherriff, G., Adams, M., Blazejewski, L., Davies, N. and Kamerāde, D., 2020. From Mobike to no bike in Greater Manchester: Using the capabilities approach to explore Europe's first wave of dockless bike share. Journal of Transport Geography, 86, (p.102744). Available [online] at: https://www.sciencedirect.com/science/article/pii/S0966692319310531
11. BTN Bikeshare, 2020. Available [online] at: https://www.btnbikeshare.com/#about
12. Shaheen, S. and Cohen, A., 2019. Shared micromobility policy toolkit: Docked and dockless bike and scooter sharing. Available [pdf] at: https://escholarship.org/content/qt00k897b5/qt00k897b5.pdf
13. Transport for London (TfL), 2018. Dockless bike share code of practice for Operators in London. Available [pdf] at: http://content.tfl.gov.uk/dockless-bike-share-code-of-practice.pdf
14. Hackney Council, 2019. Over 70 new on-street dockless bike bays installed in Hackney. News Report. Available [online] at: https://news.hackney.gov.uk/over-70-new-on-street-dockless-bike-bays-installed-in-hackney/
15. City of London, 2019. City Corporation tackles inappropriate dockless bike parking in Square Mile. Available [online] at: https://news.cityoflondon.gov.uk/city-corporation-tackles-inappropriate-dockless-bike-parking-in-square-mile/
16. Tuncer, S. and Brown, B., 2020, April. E-scooters on the ground: Lessons for redesigning urban micro-mobility. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, (pp.1-14). Available [online] at: https://dl.acm.org/doi/abs/10.1145/3313831.3376499
17. Portland Bureau of Transportation, 2018. E-Scooter Findings Report. Available [pdf] at: https://www.portlandoregon.gov/transportation/article/709719
18. Fang, K., Agrawal, A.W, Steele, J., Hunter, J.J. and Hooper, A.M., 2018. Where Do Riders Park Dockless, Shared Electric Scooters? Findings from San Jose, California. Mineta Transportation Institute Publications. Available [pdf] at: https://core.ac.uk/download/pdf/216856096.pdf
19. Trending Topics, 2019. Official Statement Says No Lime E-Scooters Have Been Stolen In Sofia. Yet. News Report. Available [online] at: https://www.trendingtopics.eu/official-statement-says-no-lime-e-scooters-have-been-stolen-in-sofia-yet/
20. Brown, A., Klein, N.J., Thigpen, C. and Williams, N., 2020. Impeding access: The frequency and characteristics of improper scooter, bike, and car parking. Transportation research interdisciplinary perspectives, 4, (p.100099). Available [online] at: https://www.sciencedirect.com/science/article/pii/S2590198220300105
21. James, O., Swiderski, J.I., Hicks, J., Teoman, D. and Buehler, R., 2019. Pedestrians and e-scooters: An initial look at e-scooter parking and perceptions by riders and non-riders. Sustainability, 11(20), (p.5591). Available [online] at: https://www.mdpi.com/2071-1050/11/20/5591
22. Spin, 2021a. Spin Valet: Addressing Improper Parking and Improving Accessibility in Cities. Blog. Available [online] at: https://blog.spin.pm/spin-valet-addressing-improper-parking-and-accessibility-in-cities-327696e6a8e3
23. Momentum and 6t, 2020. A sound launch for micromobility services in the UK: The challenge of parking. Available [online] at: https://6-t.co/en/lenjeu-du-stationnement-pour-le-developpement-des-services-de-micromobilite-au-royaume-uni/
24. Sellaouti, A., Arslan, O. and Hoffmann, S., 2020, September. Analysis of the use or non-use of e-scooters, their integration in the city of Munich (Germany) and their potential as an additional mobility system. In 2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC), (pp.1-5). IEEE. Available [online] at: https://ieeexplore.ieee.org/abstract/document/9294224
25. O'Rourke, J., 2020. Smart parking will be key to London's e-scooter trial – analysis shows how it could be implemented. News Article published by TransportXtra. Available [online] at: https://www.trans-portxtra.com/publications/local-transport-today/news/67339/smart-parking-will-be-key-to-london-s-e-scooter-trial/
26. Liao, F. and Correia, G., 2020. Electric carsharing and micromobility: A literature review on their usage pattern, demand, and potential impacts. International Journal of Sustainable Transportation, (pp.1-30). Available [pdf] at: https://www.tandfonline.com/doi/pdf/10.1080/15568318.2020.1861394
27. Shead, S., 2021. SoftBank-backed Tier plans to charge its e-scooter batteries in local shops. News Article published by CNBC. Available [online] at: https://www.cnbc.com/2021/02/10/tier-plans-to-charge-its-e-scooter-batteries-in-shops.html
28. Spin, 2021b. Looking Back: Lessons from Milton Keynes. Blog. Available [online] at: https://blog.spin.pm/looking-back-lessons-from-milton-keynes-e8d557051b08
29. Cross River Partnership, 2021. Mobility Justice and Transport Inclusivity. Available [pdf] at: https://crossriverpartnership.org/wp-content/uploads/2019/06/Mobility-Justice-and-Transport-Inclusivity-Healthy-Streets-Everyday-CRP-FINAL.pdf
30. Dickey, M.R., 2018. Skip unveils scooters with cameras and locks. Featured Article published by Techcrunch. Available [online] at: https://techcrunch.com/2018/12/18/skip-unveils-scooters-with-locks-and-cameras/
31. Catapult Connected Places, 2020. Micro-eMobility global shareable e-scooter schemes. WP2 – Commercial and Operational Aspects. Available [pdf] at: https://s3-eu-west-1.amazonaws.com/media.cp.catapult/wp-content/uploads/2020/06/09125952/DfT_Micromobility-Commercial-report_FINAL.pdf
32. Ting and Weinberg, 2021. Where's Shared? The Rise, Fall, and Remarkable Comeback of Scooters. Online discussion as part of the Micromobility World event Jan 27-29, 2021.
33. Shulman, Sophie. 2019. Scooter-Sharing Companies Don't Make Money, They Grow. Article on CTECH. Available [online] at: https://www.calcalistech.com/ctech/articles/0,7340,L-3764203,00.html

3
PRIVATE, INSTITUTIONAL AND RETAIL PARKING

Chapter 3 considers micromobility parking in several private and institutional spaces: *the workplace, residential spaces, educational spaces, health spaces, and the supermarket and other retail businesses*.

For micromobility to be a realistic option for all, and to help cut climate-changing emissions, users don't just need safe routes from A to B, but also the confidence that there will reliably be suitably secure parking at both ends of the journey.

This chapter draws considerably on the TfL 2019 Cycle Parking Implementation Plan (TfL, 2019), which focuses on the need for a mass rollout of parking in spaces near official cycle routes on the Strategic Cycle Network being developed. This report, however, places more emphasis on the need for general provision across London, to allow all Londoners reasonable access to active travel for everyday purposes. That includes areas, particularly in Outer London, away from the Strategic Cycle Network, but where there is potential for local trips (to shopping centres, transport interchanges etc.) to be swapped from motor vehicles.

The TfL report deals primarily with cycles, and mainly standard cycles. As noted at the outset, TfL's plan also underestimates future demand for micromobility parking very significantly. This report, however, addresses provision for a wider range of small vehicles, whether purely human-powered or electrically assisted.

MICROMOBILITY PARKING GENERAL PRINCIPLES

The London Cycling Design Standards outlines three parking principles for cycles (LCDS, 2016: Section 8.1.2), though these can be applied to parking of all micromobility vehicles:

1. **Fit-for-purpose**: meeting identified current and future demand, with an appropriate balance of short-stay and longer-stay provision, and accommodating all types of cycle.

2. **Secure**: stands in secure private or indoor spaces, or in visible, well-lit places that have high levels of natural surveillance.

3. **Well located**: convenient, accessible, as close as possible to the destination, and preferably sheltered.

The LCDS echo the call to "plan for 20% spare capacity", a figure that appears almost unanimous across the literature.

PARKING AT THE WORKPLACE

The biggest barrier to commuting via a micromobility vehicle remains the provision of parking at both ends of the journey: ***"Almost half of Londoners say that their employers do not provide cycle parking"*** (TfL, 2019: 39).

A recent report by transport consultant Momentum goes beyond the frequent call for more workplace cycle parking, and instead demands an uptake of parking that caters for all micromobility modes: ***"at present, only standard cycle parking is provided in most developments … if buildings fail to provide specific space and infrastructure for these new modes, users will be discouraged to use them, perhaps returning to private cars"*** (2020: 3). The report suggests ten micromobility parking principles that workplaces can strive for (see Figure 3-1), such as providing all e-scooter spaces with charging facilities and/or the provision of complementary facilities (such as showering and changing facilities with accessible features), storage (e.g. lockers) and equipment for basic maintenance (like pumps); together these principles make commuting via micromobility modes more appealing.

3-1

Figure 3-1 Ten principles for micromobility parking at the workplace. *Source: Momentum*

Recent designs for workplace parking include lockers. Cyclehoop's vertical bicycle locker, for instance, allows a bike to be parked upright on its back wheel, with space spare for other items (see Figure 3-2). However, many private micromobility vehicles are foldable, and can be stored in much smaller lockers, such as one designed for this purpose by Five At Heart (see Figure 3-3). Many other locker designs are available. Those designing parking should note that these types of lockers are not suitable for all cycles, nor all users, as they require some upper body strength to lift and retain the cycle at a height whilst it is inserted into the locker.

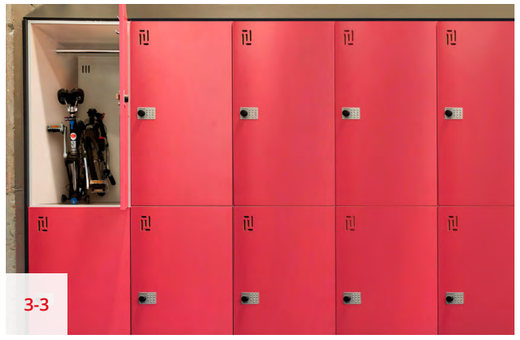
Many other designs for workplace parking have been developed. They range from highly-engineered stacking systems for standard bicycles such as The Arc, a two-tier system from Five at Heart (see Figure 3-4), to very low-tech props or stands for cycles such as the same maker's Minaf (see Figure 3-5).

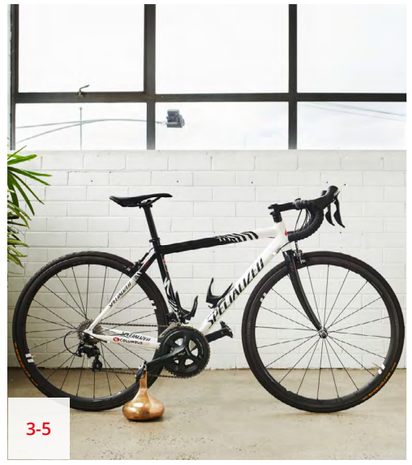
Double-decker stands are increasingly popular amongst developers as the London Plan's cycle parking ratios increase (Mayor of London, 2021). However, as above, they require considerable upper body strength to lift the bike onto the top tier, while the bottom layer requires users to bend double to lock in. Despite their space-saving advantages, stands of this kind may end up putting off female or less mobile users. They do not provide for a wider range of cycles including cargo bikes, trikes, or even heavier Dutch-style bikes.

Waltham Forest Council have devised an especially innovative workplace parking solution in the form of a Container Cycle Hub, partnering with Cyclehoop in 2019 to provide two-tiered parking for council staff (Cyclehoop, 2019). Given that 6 million containers – predominantly single-use according to Cyclehoop – enter the UK annually, this re-use has a high potential (Cyclehoop, 2019). Built off site and "dropped off" via a crane or lorry it has a range of innovative elements: 24 parking spaces are provided; a high-security sliding gate is opened via a mechanical code (keyless); motion sensor lighting is generated from rooftop solar panels; and its initial purpose as a shipping container guarantees durability (see Figures 3-6 and 3-7).

Firms engaged in this growing market look well placed to capture an expected rise in demand for micromobility commuting in the near future, although there remains (for now) limited design provision for non-standard cycle parking.

Certainly, more focus should be directed towards parking provision for workplace visitors (i.e. short-term parking). Parking nearby may be limited or not always a feasible option, whilst disabled visitors will most likely need to access parking with step-free access at the site. Guidance currently appears concentrated on providing for employees with insufficient attention paid to provision for visitors.





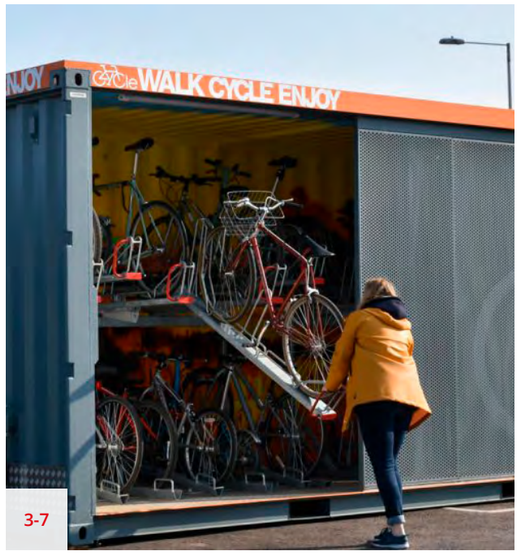


Figure 3-2 Cyclehoop vertical locker for standard cycles. *Source: Cyclehoop*

Figure 3-3 Five At Heart Folding Bike Locker. *Source: Five At Heart*

Figure 3-4 The Arc; mass cycle parking. *Source: Five At Heart*

Figure 3-5 Minaf; an in-house brass object that holds the bike upright. *Source: Five At Heart*

Figures 3-6 & 3-7 Container Cycle Hub, designed for Waltham Forest Council staff in 2019. *Source: Cyclehoop*

RESIDENTIAL PARKING

"In residential developments, designers should aim to make access to cycle storage at least as convenient as access to car parking"
(Cambridge Cycling Campaign, 2016).

In order to achieve large-scale micromobility use, including a significant modal shift to cycling, local authorities must provide permanent micromobility parking space in residential areas either in an immediate residential space or in a public space very close by with sufficient security. TfL's Cycle Parking Implementation Plan (2019) acknowledges this fully: ***"for many Londoners, parking their cycle at home currently means keeping it [their cycle] on a balcony, in a hallway or in a garden"*** – this has to change (TfL, 2019: 32).

As noted within the London Cycle Design Standards, under-used internal spaces – notably garages or bin stores – can be transformed into micromobility parking spaces through relatively straightforward infrastructure work (LCDS, 2016). However, the extent to which this is being carried out is unknown, and likely low. Unless such changes of use in existing developments are made mandatory through planning requirements, or encouraged through additional funding, it is unlikely that estate managers will follow such guidance.

The London Cycle Design Standards guidance on cycle parking, coupled with the minimum parking requirements set out in the new London Plan (Mayor of London, 2021), appear to be succeeding in incorporating cycle parking into planning for new developments. Areas of concern, though, include increasingly widespread use of double and even triple bike stackers, which will not cater for many disabled cyclists, among others, as they don't provide parking for non-standard cycles, mobility scooters, or e-scooters, let alone cycle trailers.

For older residential areas without internal cycle parking provision, cycle "hangars", which are very common in the Netherlands, are considered a partial solution. Cyclehoop's "bikehangar" model (see Figure 3-8) provides parking for six standard bikes within half the space of a car parking bay, though the hangar can be designed without racks to accommodate cargo, family or all-ability cycles. The FalcoPod bike hangar mirrors these features, though it has often been rolled out in non-carriageway spaces (see Figure 3-9). To increase security, hangar users must be registered, with designers developing a locking system that runs through a mobile app, as opposed to a physical key or code locking system. More thought needs also to be given to providing step-free use of such hangars, particularly where the hangar is configured for cargo bikes, all-ability cycles etc.

The Cycle Parking Implementation Plan has a distribution map of cycle hangars across London boroughs (see Figure 3-10). Currently, the concentration of bike hangars reduces according to distance from central London. When TfL's report was published, Hackney Borough had the highest density of hangars: just 138 per 100,000 residents (TfL, 2019). Considering that 70% of Hackney residents do not own a motor vehicle (Living Streets, 2020), this statistic suggests there is a strong argument for far more hangars in the carriageway.

It is difficult to determine how far cycle hangars – which can be designed to be "rackless" to cater for all micromobility vehicle types – can address London's evident lack of secure residential cycle parking. LCC members report that, politically, it is an uphill battle in boroughs to have them implemented in sufficient numbers to meet the demand, in part due to a consultation process which, essentially, only measures opposition.

3-8

3-9

3-10

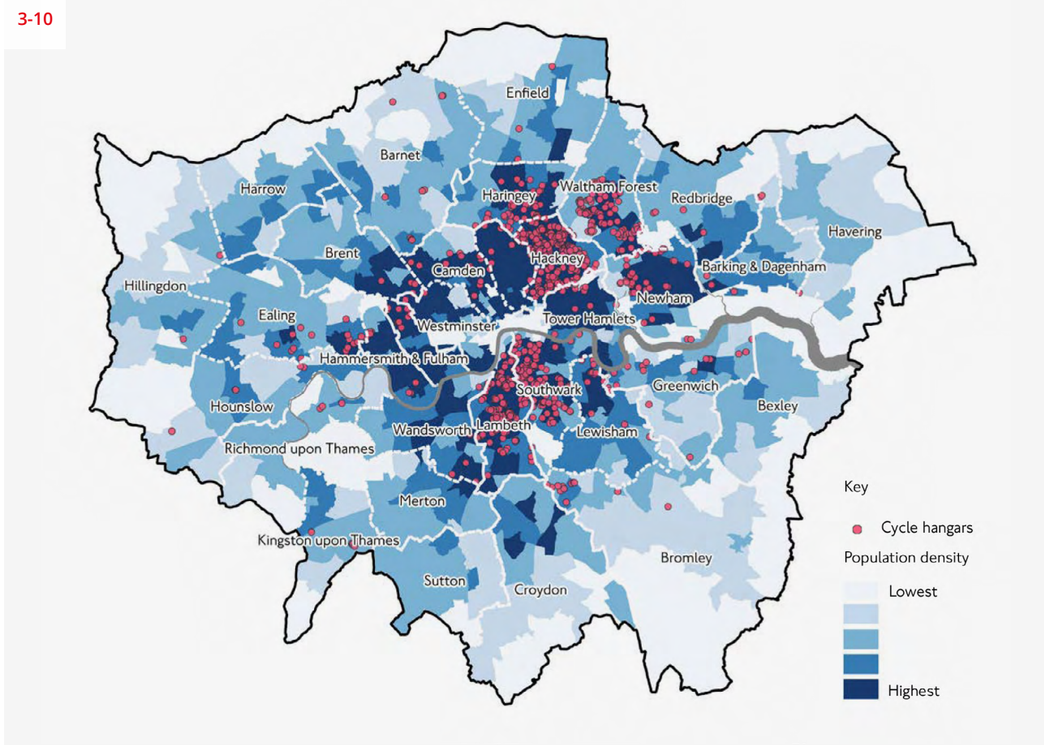


Figure 3-8 Cyclehoop Bikehangar on the roadside, Hackney. *Source: Cyclehoop*
Figure 3-9 FalcoPod Bike Hangar. *Source: Falco*
Figure 3-10 London population density and distribution of cycle hangars across the city. *Source: TfL Cycle Implementation Plan*

EDUCATION SECTOR SPACES

With the rollout of Low Traffic Neighbourhoods around schools, along with the very rapid and high growth of "School Streets" (timed closures), cycling to school is gradually becoming a safer and more pleasant journey option for students.

This requires both long-stay parking spaces, for students/pupils, and short-stay parking, for parents or carers dropping off younger children.

Educational institutions invariably prioritise outdoor cycling facilities, which require appropriate sheltering and security. Examples of cycle parking typically placed within educational spaces include: Cycle Canopy (**Figure 3-11**); Mesh Bike Shelter; Custom Enclosure; Wooden Bike Shelter; and Cycle Compound (**Figure 3-12**). Many schools also have installations suited to locking micro-scooters used by younger children.

These parking facilities are targeted towards micromobility vehicles parked for the duration of the school day. Additional short-stay facilities, such as Sheffield stands and more inclusive stands are required for parents who drop off children and leave their cycles outside the school while entering school premises.

Schools should seek to demarcate designated drop-off spaces for parents travelling on (e-)cargo bikes. Such drop-off spaces should be designed with other non-standard cycles in mind, including adapted cycles for disabled parents who might wish to accompany children to or from school. Parking for disabled pupils may also need more thought; certainly, they can more often cycle than is generally assumed. Where permitted, e-scooters provide another option for young people or parents and staff wishing to avoid public transport or driving for the school run. Their small size allows them to be taken inside most buildings, although options should be explored for providing secure parking on the school premises for those students or staff members without big enough lockers to accommodate them.

Places of Further and Higher Education

Some of the above points apply to parking at colleges and universities. However, much of the parking needed there is for relatively short-term use, as students and staff, and visitors of various kinds, come and go during the day (and often in the evening, too, especially when school facilities are rented out for sports, and other clubs).

Providing space for private e-scooter parking could well be an even higher priority for colleges and universities than schools. Early data of shared and private e-scooter ridership in North America depicts a majority use by those in the "millennial" age bracket (Liao and Correia, 2020). University campuses have been identified as areas of high demand by shared e-scooter companies, yet many students and staff may wish to purchase their own private e-scooter vehicle, opting for greater reliability and long-term savings. There is potential to create demand through targeted supply: where micromobility parking is provided for, and the demand will likely follow. The case of Brunel University in West London shows that institutions may be able to meet some of the demand for travel by cycles or other forms of micromobility through specific shared micromobility schemes. Brunel University led a Santander Cycle Universities Challenge campaign in 2017 to crowdsource sufficient funding for six shared cycle hire docking stations – comprising four docks on the campus itself, one at Hillingdon hospital, and one at Uxbridge tube station (Brunel University, 2017). A spin-off from the larger Santander Cycle Hire network (See Chapter 2 above), the scheme represents commendable practice for other Outer London educational institutions in meeting local student demand.

3-11

3-12

Figure 3-11 Cycle Canopy parking. *Source: Cyclehoop*
Figure 3-12 Cycle Compound. *Source: Cyclehoop*

HEALTH SECTOR SPACES

Hospitals

It is disheartening to see the many reports of stolen bikes of hospital and key workers during the pandemic (Stolen Ride, 2021). Though counter-initiatives such as Tour de Thanks have been set up to alleviate this problem through the community provision of cycles to those essential workers who have lost theirs to theft, this issue can only be truly countered through sufficient long-term high-quality secure staff parking at hospitals.

North Middlesex Hospital is an example of good practice, and marks the first time the NHS have been granted funding by TfL (via Enfield Council – see short clip in references). The hospital has installed three cycle parking facilities, together providing 56 cycle parking spaces in a space that would fit just six cars (see **Figure 3-13**). There are lockers, changing rooms and shower facilities available, with a new level of assurance for overnight parking – critical given that many hospital staff work on variable timetables.

Information from other hospitals, provided by LCC volunteers, shows a large range of good and bad provision. Hospital staff say that the absence of secure cycle parking is a key barrier to cycle use. While hospital workers at some locations have access to lockers and gated compounds others have to make do with publicly accessible open stands, which are vulnerable to thieves. In light of growing cycle use, hospital authorities should review their cycle parking facilities to ensure they meet the standards set in LCDS and the forthcoming Cycle-Rail group (DfT-led) guidance on cycle parking at publicly accessible locations.

Staff parking should be in fully enclosed facilities that require card, code or key-fob access and CCTV should be in operation and checked by security staff. We note that there have been reports of thieves tailgating hospital workers into private parking spaces.

Visitor micromobility parking, typically short term, which has to be publicly accessible at all times should be made separate to staff parking. Locations need to be convenient and clearly signposted for visitors as well as over-looked by CCTV and securely installed.

Figure 3-13 North Middlesex Hospital Cycle Hubs. *Source: Active Commuting*

SUPERMARKETS AND OTHER RETAIL

There have been some moves toward using more sustainable travel modes for shopping deliveries (see below), yet little has been done to encourage *shoppers* themselves to come and go by more sustainable travel modes.

In the case of mini-supermarkets, located in often central or dense urban spaces that mostly cater for small-scale "necessity" shops, the provision of a handful of micromobility parking spaces can be sufficient given the usual short-stay of most shoppers. It is medium to large supermarkets with large car parks that require substantial micromobility parking: supermarket car parks are typically low-speed environments making it easier to install micromobility parking facilities. Mobility corrals, explored in greater detail in Chapter 4, could be effectively integrated into these spaces, and should be designed for larger micromobility vehicles that can carry a higher volume of goods, as well as adapted cycles.

More supermarkets are changing to cater for electric vehicles with charging points. It would make sense to also add provision for inclusive micromobility that is well located and visible near the entrance, not tucked away or entirely absent as is often the case.

There have been some attempts to use more sustainable modes for local deliveries by supermarkets, an issue that has grown in importance greatly during the coronavirus epidemic. Sainsbury's e-cargo bike deliveries from its Streatham Common store is presented by the company as an example of sustainable change to the supermarket business model (Sainsbury's, 2018). Supermarkets will often have compounds where such vehicles can be kept, though some covered parking may still be needed. However, many smaller shops and businesses have nowhere to keep a vehicle such as a cargo cycle.

A trial is planned in Waltham Forest to provide secure parking on the street for e-cargo cycles that will be shared between several businesses, using the FalcoPod Bike Hangar, (Landor Webinar, 2021b). Waltham Forest's Zero Emissions Delivery company also provides micromobility delivery options as a service to small businesses across the borough to those who can't or don't want to use their own riders.

CHAPTER CONCLUSION

This chapter has reviewed the need for parking at the home, workplace, school or college, hospital and the shop or supermarket. For the majority, these sites constitute the cornerstones of everyday life.

Journeys nearly always begin from the home, which for many Londoners, makes private micromobility a difficult option, given the shortage of safe and secure long-stay parking at most places of residence. Bike hangars address this issue, though the scale-up required to correct the current under provision of cycle parking (and micromobility parking generally) is substantial. Whilst local authorities continue to search for space and funding to "retrofit" solutions, micromobility parking must be at the centre of any new developments, especially in London.

Spaces of work and education must continue to attract more sustainable commutes, for which parking provision is a core ingredient, whilst LCC has identified supermarkets, in particular, as sites of untapped potential when it comes to discouraging motor vehicle travel by providing alternative parking facilities. Indeed, one of the issues covered in greater depth in our Climate Safe Streets report is the need to switch motor vehicle parking in such locations to micromobility parking to reduce demand for car use and boost it for other modes.

POLICY RECOMMENDATIONS

- TfL must study levels of public transport access across London, especially Outer London, taking into account the potential for new micromobility modes to enhance access, and publish the results as a benchmark for planning.
- Cycle parking designed for existing or future housing and workplaces must cater for a range of vehicles: adapted cycles, cycle trailers, e-cargo bikes, and e-scooters. Secure sheds or shared garages large enough for this purpose should be standard in new developments.
- Secure micromobility parking needs to include electric points for charging batteries.
- While smaller spaces for folding cycles must not replace requirements for conventional cycle parking, such spaces are usefully provided in refurbished and new developments.
- Short-stay cycle parking in new developments, especially schools, must accommodate adapted cycles and cargo bikes.
- For much existing housing stock in London, as elsewhere, cycle hangars may offer the best secure parking for residents with vehicles that can't conveniently be taken indoors. TfL should assess the density of provision needed and the requirements for larger vehicles such as adapted cycles, cargo cycles, and cycle child trailers; and associated charging points.

REFERENCES

1. Landor, 2021a. Achieving Net Zero Commuting Webinar (26.02.21). Part of The Green Transport Recovery Webinar Series. Available [online] at: https://www.youtube.com/watch?v=R2-9i5chYTg
2. Transport for London (TfL), 2019. Cycle Parking Implementation Plan. Available [pdf] at: http://content.tfl.gov.uk/cycle-parking-implementation-plan.pdf
3. London Cycling Design Standard (LCDS), 2016. Chapter 8: Cycle Parking. Available [pdf] at: http://content.tfl.gov.uk/lcds-chapter8-cycleparking.pdf
4. Mayor of London, 2021. The London Plan. Available [pdf] at: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf
5. Momentum, 2020. Designing for micromobility: Parking in offices. Available [pdf] at: https://momentum-transport.com/wp-content/uploads/2020/12/201218_Micromobility-Parking-by-Momentum.pdf
6. (PRODUCT) Cyclehoop Locker: https://www.cyclehoop.com/product/lockers/vertical-locker/
7. (PRODUCT) Five At Heart Folding Bike Locker: https://fiveatheart.com/products/flexible-locker/
8. (PRODUCT) Five At Heart product range: https://fiveatheart.com/our-products/
9. Cyclehoop, 2019. Introducing our latest product – The Container Cycle Hub: https://www.cyclehoop.com/news/april-2019/introducing-cyclehoops-latest-product-the-container-cycle-hub/
10. Cambridge Cycling Campaign, 2016. Cambridge Cycle Parking Guide. Available [online] at: https://www.camcycle.org.uk/resources/cycleparking/guide/
11. (PRODUCT) Cyclehoop Bikehangar: https://www.cyclehoop.com/product/shelters-canopies/bikehangar/
12. (PRODUCT) FalcoPod Bike Hangar: https://www.falco.co.uk/products/cycle-parking/cycle-lockers/falcopod-bike-hangar.html
13. Living Streets, 2020. Parklets: Your Guide To Creating A Pop-Up Park On Your Street. Available [pdf] at: https://www.livingstreets.org.uk/about-us/our-work-in-action/campaigning-for-parklets
14. (PRODUCT) Cyclehoop Bike Shelters: https://www.cyclehoop.com/category/shelters-canopies/
15. Becker, S. and Rudolf, C., 2018. Exploring the Potential of Free Cargo-Bikesharing for Sustainable Mobility. Available [online] at: https://www.researchgate.net/publication/325607142_Exploring_the_Potential_of_Free_Cargo-Bikesharing_for_Sustainable_Mobility
16. Department for Transport (DfT), 2020a. Guidance for e-scooter users. Available [online] at: https://www.gov.uk/guidance/e-scooter-trials-guidance-for-users
17. Liao, F. and Correia, G., 2020. Electric carsharing and micromobility: A literature review on their usage pattern, demand, and potential impacts. International Journal of Sustainable Transportation, (pp.1-30). Available [pdf] at: https://www.tandfonline.com/doi/full/10.1080/15568318.2020.1861394
18. Brunel University, 2017. Brunel Bikes. Available [online] at: https://www.brunel.ac.uk/Santander-crowdfunding/Home
19. Stolen Ride, 2021. Keeping key workers cycling during coronavirus. Available [online] at: https://www.stolenride.co.uk/tourdethanks/
20. Enfield Council, 2021. North Middlesex Hospital cycling hub with Enfield Council and TfL. Available [video] at: https://www.youtube.com/watch?v=mG06zK7SRzE
21. Sainsbury's, 2018. Sainsbury's trials UK's first grocery delivery service by electric cargo bike. News Report. Available [online] at: https://www.about.sainsburys.co.uk/news/latest-news/2018/18-04-2018-electriccargobiketrial
22. Landor, 2021b. E-cargo bikes in action: local authority case studies Webinar. Another in The Green Transport Recovery Webinar Series. Available [online] at: https://www.youtube.com/watch?v=FqRUnjU2XbY

4 PUBLIC PARKING

Chapter 4 focuses in particular on high street micromobility parking. The Covid-19 pandemic has instigated a reconsideration of city streetscapes worldwide, with the 15-minute city concept gaining traction, including in London. For this vision to become a reality, people must be able to begin their journey to the high street in the knowledge that they have secure and reliable micromobility parking awaiting them.

HIGH STREET RECOVERY

The business case for secure and reliable micromobility parking on the high street is underpinned by the increased footfall it can provide to aid high street business recovery following the Covid-19 pandemic: "the retail spend per square metre for cycle parking is five times higher than the same area of car parking" (TfL, 2019: 8).

Where on the high street?

The London Cycling Design Standards guidance (LCDS, 2016) maintains that cycle parking on the footway (i.e. the pavement) should be a last resort; cycle parking on the carriageway is the preferable solution. The guidance calls for highly visible and sufficiently lit cycle parking that steers well clear of pedestrian and vehicle sight lines. For short- stay cyclists, parking should be no more than 25 metres from the destination; with parking infrastructure always placed adjacent to the kerb (LCDS, 2016).

For further parking design considerations, see Chapter 8 of the LCDS guidance (link in references).

Types of high street parking

This chapter contains a large amount of imagery to visually display the multitude of micromobility options that London high streets have. High street parking can be as simple as a "cyclehoop" (see Figures 4-1 and 4-2), developed by its namesake firm.

Traditional bike "racks" include car bike ports, bike ports, planter racks, high density cycle racks, two-tier racks, and toast racks (see Figures 4-3 to 4-6), varying in playfulness, aesthetics, and creativity in design. Such features reaffirm the LCDS call for thoughtful design: ***"cycle parking can also serve a place-making function as part of an integrated approach to public realm improvement"*** (2016, Section 8.4.5).

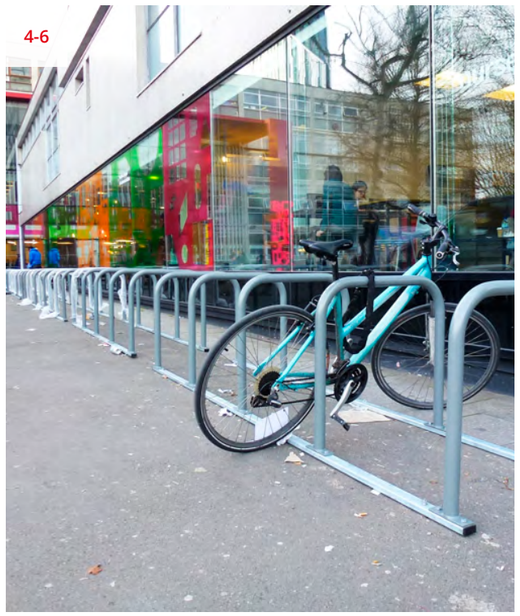


Figure 4-1 Cyclehoops spelling out Forest Gate on Forest Gate High Street, Newham. *Source: LCC*
Figure 4-2 The "Lovehoop", another Cyclehoop design. *Source: Cyclehoop*
Figure 4-3 Car Bike Port, Figure 4-4 Bike Port, Figure 4-5 Planter Rack, Figure 4-6 Toast rack. *Source: Cyclehoop*

MOBILITY CORRALS

Mobility Corrals are a specialised design of bike "rack". As stated in Chapter 2, mobility corrals were first introduced back in 2011 as simple, designated parking spots for cycles – quite literally marked by paint on the street. Designs of mobility corrals have evolved exponentially since then, with London-based firm Cyclehoop popularising the concept and its implementation across the capital; Cyclehoop's flagship mobility corral can be found in the London Borough of Westminster (see Figure 4-7).

Considerations

Mobility corrals constitute an on-street parking system that is flexible, expandable, easy to build or take apart according to demand (Lau, 2021). These corrals are not limited to standard cycles, with the design flexible enough to accommodate different types and sizes of micromobility vehicle (see Figures 4-8 to 4-10). The two-bay version of the corral takes up the room of one car-parking space and can be installed within a matter of hours, simply bolting the corral to the road or other surface in a way that does not sacrifice sturdiness or durability.

Corrals provide much more protection from passing traffic for parked micro-vehicles than open cycle stands do, without costly infrastructure. Cyclehoop quotes the cost of a six-stand corral (fitting 12 standard cycles) at £2,155. The corral is made of mild steel 3mm thick – the same as the more secure amongst Sheffield stand designs.

However, questions have already been raised as to whether mobility corrals may facilitate crime, allowing thieves more cover within its barrier design. Indeed, on Cyclehoop's website, corral designs appear typically fenced on three out of the four sides, yet this contrasts to the open design of the Westminster Corral, suggesting an "open versus closed" design is optional. Either way, long stay micromobility parking (i.e. overnight) is ill advised.

On busy roads, the mobility corral typically faces away from the carriageway. With planters or barriers at either end, the user must access the corral from the footway. As shown in Figure 4-11, this creates different ground levels between the corral and pavement, failing to consider disabled users. The ad-hoc installation of a nearby ramp is possible, but non-standard cycles cannot easily cope with a short, steep ramp. An alteration to the pavement can present a gentler ramp, though this is neither quick nor cheap. Raising corrals facing the pavement to the level of the pavement is a better solution; although this would negate the corral's principles of "temporary" and "expandable", it would enable more cyclists to access it safely.

Where those cycling and scooting are likely to be arriving from the road, such as in Low Traffic Neighbourhoods (LTNs), accessing the corral from the carriageway would be a potentially better arrangement. Further, corrals may seek to incorporate electric charging points, and may find ways to "outgrow" the problems listed above. Finally, it will be interesting to monitor how corrals may manage any tensions between shared and private micro-vehicle parking, given that corrals pose desirable end-points for all micromobility forms.

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Figure 4-7 Cyclehoop Mobility Corral on Barrett Street, London Borough of Westminster.
Figure 4-8 E-scooter parking, Figure 4-9 cargo bike parking, Figure 4-10: all-ability cycle parking.
Figure 4-11 Installation of a mobility corral, portraying the difference in level between pavement and the carriageway.
Source: Cyclehoop

OONEE PODS

One design of parking enclosure or pod which is still at the design stage is the ***Oonee*** from Oonee, a start-up founded to address repeated bike theft in New York. Whereas mobility corrals blend fairly subtly into a street setting, that cannot be said for the Oonee Pod, to judge from early designs (see **Figures 4-12** and **4-13**). It is designed to be a highly-adaptable pod that provides secure parking for scooters and various cycle vehicles. But its stated purpose extends beyond parking: the aim is that it can be adapted to also provide benches, seating, greenery and other place-making features. Part of the idea of the loud designs is that such parking need not hide away, which is unlikely to find favour on London's streets. However, the adaptability and place-making features reflect wider developments discussed in this chapter. Whether any Oonee pods appear on New York streets remains to be seen, but we can expect many other designs of street parking pod or corral to appear over the coming years. The designs in **Figures 4-12** and **4-13** suggest that such pods might bring in some funding, either through sponsorship and branding, or through showing advertisements (as bus shelters etc. often do). Whether that is intended for Oonee pods is unclear, but the possibility should be borne in mind when designing or procuring such facilities.

PARKING AND PARKLETS

There is an opportunity for micromobility parking in London to take advantage of the increasing popularity of parklets described below. The design of parklets should include secure, designated micromobility parking, partly in order to insert new parking spaces where there might otherwise be opposition to more conventional on-street cycle parking.

The legalisation and regulation of parklets was initially developed as a community initiative by Hackney resident Brenda Puech (Puech, 2020) instigating a debate over the use of kerbside space. The parklet premise is simple: the conversion of a car parking space into one of communal furniture and natural greenery, ***"altogether enhancing the aesthetics and sustainability of the cityscape"*** (London Living Streets, 2020).

The initial grassroots and participatory roots behind *community parklets* were, to an extent, overtaken during the pandemic by *business parklets* erected under the July 2020 Business and Planning Act, which legalises the spillover of café and restaurant (removable) furniture onto the streets. This pavement licence fee costs just £100, with the policy pushed through in a matter of weeks. Our understanding is that legislation across London boroughs for community parklets continues to stall, however. Micromobility parking can successfully tie in with the growing institutionalisation and mainstreaming of business parklets across London boroughs. Cyclehoop collaborated with Hammersmith and Fulham Borough Council to install an award-winning parklet outside Brackenburys Deli (Hammersmith) in 2017, transforming two car parking spaces into a "small urban park", fitted with cycle parking (see **Figures 4-14** and **4-15**). Although only a handful of cycle spaces are provided, there is a clear opportunity for a parklet-parking collaboration transforming London's streets; here lies a potentially more subtle proposition for micromobility parking provision, associating with a movement equally in pursuit of more liveable and healthier streets.

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Figure 4-12 & Figure 4-13 Oonee micromobility parking pods. *Source: Oonee*
Figure 4-14 & Figure 4-15 Parklet installed in Hammersmith with cycle parking in 2017. *Source: Cyclehoop*
Figure 4-16 Community parklet installed in Islington by London Borough of Islington. *Source: Eilidh Murray*

CHAPTER CONCLUSION

This chapter provides a glimpse of the wide variety of designs and considerations for micromobility parking on London's high streets. Indeed, mobility corrals seem the new trend when it comes to high street micromobility parking, though questions remain over access for adapted cycles and possible facilitation of bike theft.

The rollout of micromobility parking coincides with a wider re-purposing of London's streets towards more sustainable and liveable spaces, and high street parking solutions can successfully integrate with this process. The micro-scale parklet-parking collaboration feeds into the next chapter, which examines the large-scale integration of micromobility parking and the wider transport system.

POLICY RECOMMENDATIONS

- Parking space for all micromobility must be planned for across all modes, and modes of operation, to anticipate predicted and planned for demand, and to exceed current demand. As a starting point, LCC's Climate Safe Streets recommendation that "by 2024 everyone in London should live and work no further than 300m from their nearest car club bay and shared cycle/e-scooter geo-fenced access point (which should ideally be co-located)" must be realised. The number of parking spaces for privately owned cycles must also be doubled in a similar time period.

- Local authorities should develop strategies for re-purposing car parking spaces, whether in parking lots, rail stations or on-street, as they become available, to maximise sustainable and shared transport.

- Parking should include allocated spaces for non-standard cycles and be available across the capital.

- All cycle types should be included in corral-style parking.

- Design of parklets should include provision for designated, secure micromobility parking.

REFERENCES

1. Transport for London (TfL), 2019. Cycle Parking Implementation Plan. Available [pdf] at: http://content.tfl.gov.uk/cycle-parking-implementation-plan.pdf
2. London Cycling Design Standards (LCDS), 2016. Chapter 8: Cycle Parking. Available [pdf] at: http://content.tfl.gov.uk/lcds-chapter8-cycleparking.pdf
3. (PRODUCT) Cyclehoop's "The Lovehoop": https://www.cyclehoop.com/product/cyclehoops/lovehoop/
4. (PRODUCT) Cyclehoop racks: https://www.cyclehoop.com/category/racks/
5. (PRODUCT) Cyclehoop mobility corral: https://www.cyclehoop.com/product/racks/mobility-corral-escooters-bicycles/
6. Lau, A., 2021. Founder and Design Director of Cyclehoop speaking at Landor Webinar: A 'once-in-a-generation' opportunity to build back better: innovation showcase. Available [online video] at: https://www.youtube.com/watch?v=NUrM5YOawks&feature=youtu.be
7. London Living Streets, Living Streets and London Cycling Campaign, 2018. Low Traffic Neighbourhoods. Available [online] at: https://www.lcc.org.uk/campaigns/low-traffic-neighbourhoods/
8. (PRODUCT) Oonee: https://www.ooneepod.com/
9. Puech, B., 2020. Putting the park in parking. Living Streets. Available [online] at: https://www.livingstreets.org.uk/news-and-blog/blog/putting-the-park-in-parking
10. Living Streets, 2020. Parklets: Your Guide To Creating A Pop-Up Park On Your Street. Available [pdf] at: https://www.livingstreets.org.uk/about-us/our-work-in-action/campaigning-for-parklets
11. Business and Planning Act, 2020. Available [online] at: https://www.legislation.gov.uk/ukpga/2020/16/enacted
12. Cyclehoop, 2017. Cyclehoop introduce latest parklet to Hammersmith and Fulham. Available [online] at: https://www.cyclehoop.com/case-studies/2017-hammersmith/

5 INTEGRATED PARKING

The Department for Transport (DfT) Future of Mobility Report states that ***"new mobility services must be designed to operate as part of an integrated transport system combining public, private and multiple modes for transport users"*** (DfT, 2019: 8).

This chapter firstly reviews two types of integrated parking necessary to fulfil the synergy between micromobility modes and the wider transport system: transport hubs and mobility hubs. Secondly, it considers the emergence of logistics hubs as a solution to currently unsustainable urban delivery systems, concluding that reserving the required space will be key to their expansion.

Whereas many of the micromobility solutions listed so far are characterised by quick installation, flexibility and low-costs, the provision of these "hubs" requires considerably more planning, time and investment.

RAILWAY STATION HUBS

"Micromobility can offer flexibility and efficient door-to-door accessibility, while public transport is characterised by higher speeds and greater spatial reach … the resulting synergy of high speed (and thus spatial reach) of public transport with the door-to-door accessibility provided by micromobility creates a degree of access, speed and comfort that can compete with that of private motorised vehicles"
(Kager et al., 2016; cited by Oeschger et al., 2020: 2)

The aim of cycle-rail integration is simple: "enhance the interchange" (TfL, 2019: 22). Pre-pandemic, 80,000 cycle trips were being made to and from public transport stations everyday (TfL, 2019); when this is combined with London's growing cycle network, the case for multi-modal journeys only increases as London moves towards a more sustainable transport system. TfL have recognised this potential, targeting a new cycle parking benchmark at all stations outside Zone 1: "to provide a minimum of 20 cycle parking spaces within 50 metres of the station and a minimum 30 per cent spare capacity" (TfL, 2019: 25). The importance of micromobility-rail integration in Outer London boroughs cannot be overstated.

So what does this look like in practice? There are many examples of cycle hubs located at rail stations both in Inner and Outer London. Figure 5-1 shows the classical cycle hub design for a suburban station (installed by Teddington station in 2016, southwest London) where adequate space was available, providing two-tiered cycle parking and 24/7 access and security. Figure 5-2 contrastingly portrays an on-platform solution to Paddington station's heightened demanded for cycle parking back in

2013, when a 380-cycle space facility was constructed outside normal hours over a four-day period, collaborating with Network Rail and Westminster Council. Public bike pumps and bike stands cater for emergency repairs.

Much literature about transport hubs focuses on private, standard cycles. This lack of attention to non-standard cycles is being addressed to some extent by the forthcoming guidance on rail station parking from the Cycle-Rail group . But there are also the opportunities offered by rail integration with shared micromobility schemes mentioned in Chapter 2 and a possibility to integrate urban logistics centres with rail stations (see later in this chapter). The organisation Freight on Rail reported to Parliament that the average freight train takes 50 HGV journeys off the road and produces 70% fewer emissions than road freight (Freight on Rail, 2010).

Transport consultancy Momentum recently joined with London School of Economics (LSE) to issue a report calling for investment in *micromobility parking* at stations, specifically targeting London rail termini (2021). Such an integration would reduce the "friction" of first- and last-mile travel, providing the ultimate opportunity for seamless, multi-modal travel. The report calls for the renting out of retail units within rail stations, particularly those that open directly onto the street, in order to limit micromobility vehicles passing through crowded pedestrian spaces. Whilst the report acknowledges Network Rail as a key stakeholder and partner, the absence of any cost calculations makes it hard to assess the report's proposals (Figures 5-3 and 5-4).

Figure 5-1 Two-tiered Cycle Hub installed just outside Teddington Station. *Source: Teddington Town*
Figure 5-2 Fenced-off perimeter for cycle parking on Platform 9 at Paddington Station. *Source: Cyclehoop*
Figure 5-3 & Figure 5-4 Designs of micromobility parking "hubs" in London rail termini. *Source: Momentum and LSE*

Momentum consultancy also collaborated with consultancy 6t to conduct research into the increased accessibility options that shared e-scooters would offer to Londoners, if they were fully integrated into TfL's current system. Their data on time savings was notable (see Figure 5-5); for example, the introduction of e-scooters could halve the multi-modal journey time from Forest Gate (inner East London) to King's Cross (central London).

We note that the government's recent Great British Railways programme (DfT, 2021) advocates improved integration of cycling and rail travel with more cycle parking at stations, safer routes to stations and more spaces for cycle carriage on trains. This is doubly true of London: the capital must look to integrate all micromobility types within its current transport system, as the two are mutually enhancing, rather than in competition.

5-5

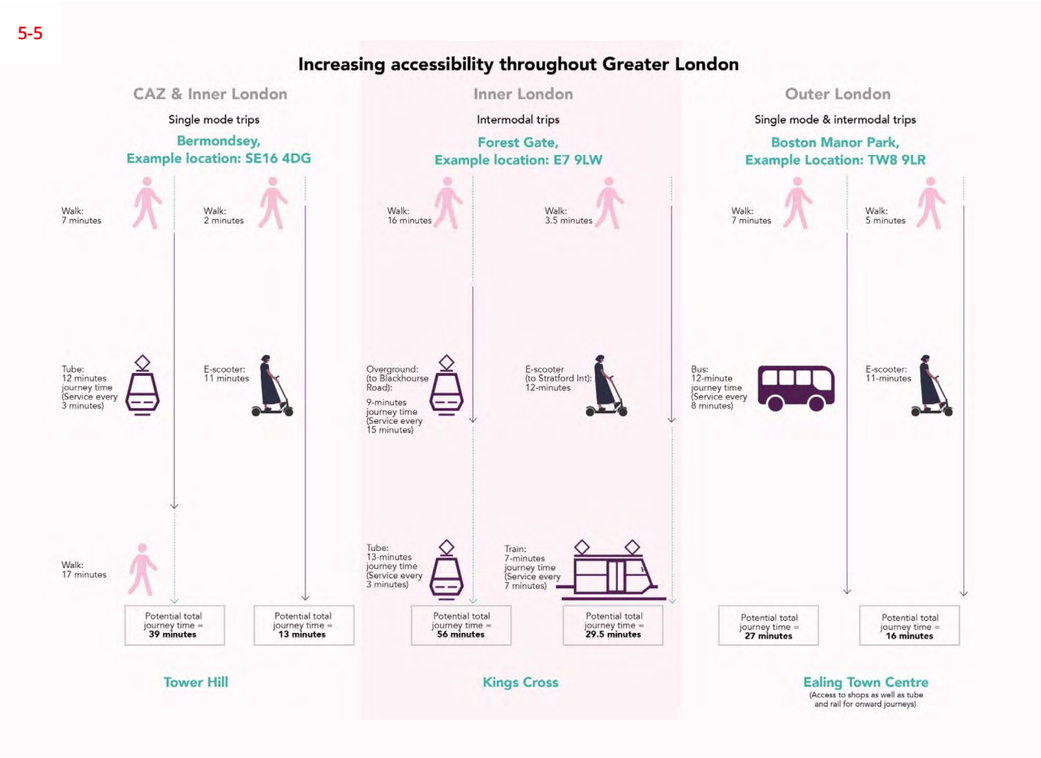

Figure 5-5 Figure displaying time savings and increased accessibility of London travel through the co-integration of e-scooters and TfL's current system. *Source: Momentum and 6t*

MOBILITY HUBS

Mobility hubs present the ultimate form of on-street multi-modal transport integration. CoMoUK (Collaborative Mobility UK), a charity partnering with cities in the design and installation of mobility hubs in the UK and abroad, defines them as follows:

"A mobility hub is a recognisable place with an offer of different and connected sustainable and active transport modes supplemented with enhanced facilities and information features to both attract and benefit the traveller"
(CoMoUK, 2020: 5)

There are different types of mobility hub within a network: city centre large interchange hubs; transport corridor linking hubs; suburban mini hubs; business park or housing development hubs; rural market town hubs; and tourism hubs. In our Climate Safe Streets report we talk about everyone living within 300 metres of their "nearest car club bay and shared cycle/e-scooter geo-fenced access point". This would be a suburban mini-hub – combining electric car hire with dockless micromobility parking. Larger hubs could involve lockers or other internet delivery infrastructure, be located at a transport interchange (bus stop, station, tube station) and/or include consolidation services.

Regardless of size or spatial surroundings, mobility hubs maintain three core characteristics: (i) co-location of shared mobility modes; (ii) redesign of space to reduce private car space and improve the surrounding public realm; (iii) A pillar or sign which identifies the space as a mobility hub which is part of a wider network and ideally provides digital travel information (CoMoUK, 2021) – see Figures 5-6 and 5-7 (overleaf).

5-6

Figure 5-6 CoMoUK's flagship design for visually marketing mobility hubs. *Source: CoMoUK*

5-7

Figure 5-7 Graphic design of a proposed "small" mobility hub in Plymouth. *Source: Plymouth Council*

CoMoUK cite the German city of **Bremen** as an exemplary mobility hub network, with 10 large hubs and 33 smaller hubs combining to offer users a fully integrated mobility system with 24/7 first- and last-mile connections (Nadkarni, 2020). The birth of Bremen's "mobility point" network was in fact to cater for ridesharing, though micro-mobility modes have since been designed into the hubs.

Meanwhile **Plymouth** is the latest UK city to commit to mobility hubs, partnering with CoMoUK to install a fully operational network of 30-50 hubs – of varying sizes (small, medium, large) – by 2023 (Plymouth Council, 2021). The Plymouth network will be fully integrated with electric vehicle charging infrastructure (up to 300 charging points), with the hubs designed to be adaptable to a continually evolving micromobility market. Digital information boards and kiosks at the hubs will be complemented by a Mobility as a Service (MaaS) application to aid users with mode switching and journey planning.

Considerations

Larger mobility hubs, in particular, go beyond merely providing mobility solutions, placing a real impetus on improving the surrounding urban realm: green roofs, planting, solar panels, pop-up cafés etc. make mobility hubs a true destination. The implementation of mobility hubs mainly entails a re-use of current street space, for which there is competition with other micromobility parking solutions listed in this report, as well as non-parking uses.

Mobility hubs almost appear benign; they have received almost no negative press – though that does not mean they are flawless. It will be interesting to observe how Plymouth – as well as Manchester and Scotland (Tooze, 2021) – build their mobility hub networks in somewhat similar urban contexts to developments in London; certainly, the capital is well placed to install a mobility hub system through retrofitting its existing transport network.

LOGISTICS HUBS

There is no escaping that urban sites must reconsider their current practice when it comes to logistics: ***"As customer demands evolve, city logistics is becoming more and more intricate and delivered more often just-in-time, leading to more and more trucks and vans. This is not sustainable. Truck technology for city logistics needs to become smarter, cleaner, quieter, smaller and safer; almost invisible, in fact"*** (Van Amstel et al., 2018: 7).

A proposed solution to tackle unsustainable urban delivery systems is the concept of logistics hubs: these are ***"distribution facilities located within an urban area to fulfil the 'last mile' of the supply chain"*** (Cross River Partnership and Steer, 2020: i). Micro-logistics hubs are smaller sites within the urban area that typically focus more on cycle freight and pedestrian porters for last mile deliveries (Cross River Partnership and Steer, 2020). *Micro*-logistics hubs are more flexible than logistics hubs regarding lease duration and access hours, and need less space, amongst other considerations. Both kinds of site, however, require facilities such as suitable electricity supply for vehicle charging, toilets and other staff welfare facilities, 24/7 site security and relevant fencing, cameras etc. Logistics hubs, particularly of the micro type, can reduce carbon emissions to ultra-low or net zero, whilst taking motor vehicles off the road.

5-8

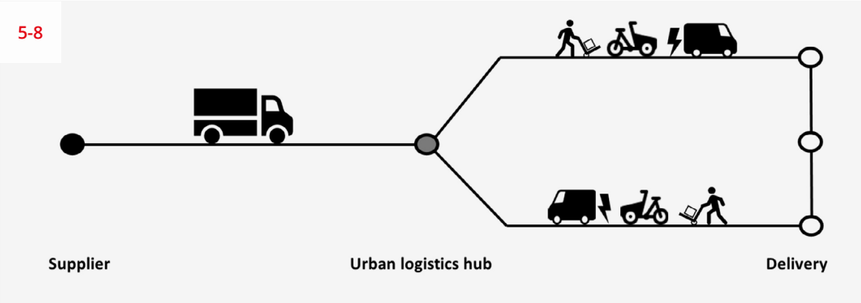

Figure 5-8 Simple sketch portraying the "last mile" delivery system via urban logistics hubs. *Source: Cross River Partnership and Steer, 2020*

Logistics hubs should not be conflated with Urban Consolidation Centres (UCCs), which are delivery warehouses on the outskirts of cities, though the premise is similar: the centre collates and consolidates goods and delivers them on to Micro Consolidation Centres or larger developments, often at night by "trunk lorries". The London boroughs of Camden, Enfield, Islington and Waltham Forest are currently experimenting with UCCs (London Boroughs Consolidation Project, 2014).

Why are these hubs important?

"Transport for London suggests that up to 14% of vans could be replaced by cycle freight by 2025 in areas where LGVs contribute to more than 60% of traffic" (Cairns and Sloman, 2019: 13). There is evidence to suggest that if implemented properly, logistics hubs will change the game for what is a polluting and inefficient delivery system currently operating in the capital. Ecofleet's current small-scale operation in London Zones 1 and 2 (Cross River Partnership and Steer, 2020: 20) uses a sustainable same-day delivery logistics model. Their current operation model brings in consignments at night, which are delivered first thing in the morning via their mixed e-fleet, comprising 20 large e-cargo bikes (120-mile battery range) and one

Figure 5-9 Ecofleet e-cargo delivery bike in action, central London. *Source: Ecofleet*

Finding the spaces for these hubs, however, remains an ongoing issue. In their study, Cross River Partnership and Steer identify 29 spaces in inner London that could be transformed into urban logistics hubs: 23 of these spaces are car parks, of which the majority are underground and have varying vehicle height restrictions.

In December 2020, the City of London Corporation announced the approval of its first Last Mile Logistics Hub, transforming 39 car parking spaces within the underused London Wall Car Park into an Amazon Logistics hub (City of London, 2020). From this hub, Amazon will conduct parcel deliveries via pedestrian porters (i.e. on foot) or e-cargo bikes to all residents within a 2 kilometre radius (which covers the entirety of "the City"), taking a projected 85 vehicles off the road daily, equating to 23,000 vehicle journeys annually. This announcement has not catalysed a flurry of Logistic Hub activity in the Square Mile; rather, the City of London's target of five Logistics Hubs by 2025 implies a steady approach.

For more information on types of light electric freight vehicles (LEFVs) that could clean up city logistics, see the paper by Van Amstel et al (2018).

CHAPTER CONCLUSION

All three types of hub covered in this chapter are targeted towards enacting long-term sustainable change to personal and freight mobility, requiring perhaps more strategic and deliberative considerations than other parking solutions put forward in this report.

The argument for micromobility and rail stations has a simple takeaway: London needs to fulfil this synergy and provide station parking that both addresses current and future demand, and also goes beyond designing for standard cycles alone. Mobility hubs have the potential to reach all corners of a city through a well-planned network, though there are various questions regarding their "fit" into London's urban context. Logistics hubs constitute one solution to London's unsustainable delivery system, and will need wholesale support if they are to overcome significant barriers to greening London's logistics.

POLICY RECOMMENDATIONS

- A model shared mobility hub should be installed by 2022 in London and space reserved across all boroughs for a network of similar hubs that will provide access to shared modes for all Londoners.
- Space must be allocated or reserved for last mile/logistics consolidation hubs in all boroughs and lessons learned from existing hubs should be shared. Where suitable, large new developments should be considered as prime sites for logistics hub locations.
- Local authorities should develop strategies for re-purposing car parking spaces, whether in parking lots, rail stations or on-street, as they become available, to maximise sustainable and shared transport.
- Space for micromobility parking will need to be found not just by highways departments, but factored into planning beyond residential and workplace parking plans by providing land for last mile and consolidation hubs, as well as micromobility hubs at transport interchanges and other locations, for instance.

REFERENCES

1. Department for Transport (DfT), 2019. Future of Mobility: Urban Strategy. Available [pdf] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846593/future-of-mobility-strategy.pdf
2. Oeschger, G., Carroll, P. and Caulfield, B., 2020. Micromobility and public transport integration: The current state of knowledge. Transportation Research Part D: Transport and Environment, 89, (p.102628). Available [online] at: https://www.sciencedirect.com/science/article/pii/S1361920920308130
3. Transport for London (TfL), 2019. Cycle Parking Implementation Plan. Available [pdf] at: http://content.tfl.gov.uk/cycle-parking-implementation-plan.pdf
4. Teddington Town, 2016. Station Cycle Hub. Available [online] at: https://teddingtontown.co.uk/2016/10/20/station-cycle-hub/
5. Cyclehoop, 2014. Two Strikes for Cyclehoop in Paddington Station. Available [online] at: https://www.cyclehoop.com/2013-networkrail/
6. Freight on Rail, 2010. Written Evidence from Freight on Rail (TE 70). Available [online] at: https://publications.parliament.uk/pa/cm201011/cmselect/cmtran/473/473vw48.htm
7. Momentum and London School of Economics, 2021. Investing in Micromobility at Stations: A London study of benefits and design options. Available [pdf] at: https://momentum-transport.com/wp-content/uploads/2021/02/210217_Investing-in-Micromobility-by-Momentum-1.pdf
8. Momentum and 6t, 2020. A sound launch for micromobility services in the UK: The challenge of parking. Available [online] at: https://6-t.co/en/lenjeu-du-stationnement-pour-le-developpement-des-services-de-micromobilite-au-royaume-uni/
9. Department for Transport (DfT), 2021. Great British Railways: Williams-Shapps plan for rail. Government policy announcement. Available [online] at: https://www.gov.uk/government/publications/great-british-railways-williams-shapps-plan-for-rail
10. CoMoUK, 2020. Mobility Hubs Guidance. Available [pdf] at: https://como.org.uk/wp-content/uploads/2019/10/Mobility-Hub-Guide-241019-final.pdf
11. Nadkarni, R., 2020. The Multimodal Future of On-Street Parking. A Strategic Approach to Curbside Management. Available [online] at: https://repository.difu.de/jspui/handle/difu/579071
12. Plymouth Council, 2021. Mobility/Journey Hubs. Available [online] at: https://www.plymouth.gov.uk/parkingandtravel/transportplansandprojects/transportplans/transforming-citiesfund/mobilityjourneyhubs
13. Tooze, E., 2021. Scotland set to introduce mobility hubs. News report by Smart Transport. Available [online] at: https://www.smarttransport.org.uk/news/latest-news/scotland-set-to-introduce-mobility-hubs
14. Van Amstel, W.P., Balm, S., Warmerdam, J., Boerema M., Altenburg, M., Rieck, F. and Peters, T., 2018. City Logistics: Light and Electric. LEFV-Logic: Research on Light Electric Freight Vehicles. Published by Amsterdam University of Applied Sciences. Available [pdf] at: https://www.hva.nl/binaries/content/assets/subsites/kc-techniek/publicaties/lefv-logic.english.pdf
15. Cross River Partnership and Steer, 2020. The Potential for Urban Logistics Hubs in Central London. Available [pdf] at: https://crossriverpartnership.org/wp-content/uploads/2021/01/Central-London-Hubs_Final-report.pdf
16. London Boroughs Consolidation Centre Project, 2014. Available [pdf] at: https://ec.europa.eu/environment/gpp/pdf/01_07_2014/LBCC%20-%20Webinar%20-%20Tuesday%201st%20July%202014_Kevin%20Churchill.pdf
17. Cairns, S. and Sloman, L., 2019. Potential for e-cargo bikes to reduce congestion and pollution from vans in cities. Available [pdf] at: https://www.cistoustopou.cz/sites/default/files/article/2020-11/potential-for-e-cargo-bikes-to-reduce-congestion-and-pollution-from-vans-final.pdf
18. Ecofleet: https://ecofleet.co.uk/about/
19. City of London, 2020. City of London Corporation teams up with Amazon to cut delivery vehicles and improve air quality. News Article. Available [online] at: https://news.cityoflondon.gov.uk/city-of-london-corporation-teams-up-with-amazon-to-cut-delivery-vehicles-and-improve-air-quality/

6 FURTHER CONSIDERATIONS

This chapter seeks to draw out themes emerging from the previous chapters and engage with them in more detail.

PARKING AND EQUITY

Micromobilities have a high potential; there is little dispute around this point. To fulfil their significant potential as sustainable travel alternatives, micromobility travel modes must be made available to all urban citizens. This cannot be done without carefully considered parking provision.

Regarding shared micromobilities, Sherriff et al. (2021) found the geofencing of Mobike's dockless bikeshare system in Manchester to be discriminatory towards already less-deprived areas, reinforcing existing inequities in the transit system as opposed to resolving them. The GPS technology determining where shared cycle or e-scooter vehicles can travel or terminate should not be viewed as apolitical, technical matters, but as the result of deliberate policy decisions. Similar criticisms have been made in various North American cities where citations of threats or vandalism all too quickly lead to the exit of shared micromobility provision in low-income, non-white neighbourhoods (Wilson, 2020).

Lime is notable for countering this narrative: ***"Transportation has been historically used as a way to perpetuate systemic racism, and Lime believes it plays a central role in helping Black and Latino residents, particularly in disenfranchised neighbourhoods, to access bikes as scooters"*** (Lime CEO Wayne Ting, 2020). Inclusivity must be addressed when considering micromobility parking in London, notably addressing the question of whether initiatives being put forwards – for shared or private vehicles – are actually levelling up prior disparities in London's transport network.

PARKING AND ACCESSIBILITY

Questions concerning equity merge with those concerning accessibility – that is, how are disabled groups, defined as those with "a physical or mental impairment that has a substantial or long-term negative effect on your ability to do normal daily activities" (Cross River Partnership, 2020) – catered for in the rollout of micromobility parking on London's streets? Chapter 2 highlights the disproportionate effects of improperly parked dockless micromobility vehicles on disabled communities in particular, whilst Chapters 2, 3 and 4 consider the need for private micromobility parking that caters for all vehicle types.

The emphasis on planning for disabled communities has been mainstreamed in the DfT's report, Gear Change: A bold vision for cycling and walking (2020b), whilst TfL acknowledges ***"cycles come in all shapes and sizes, and cycle parking needs to be accessible and useable for all types of cycle. This includes larger cycles such as cargo bikes and adapted cycles such as handcycles and tricycles, which many Londoners rely on for mobility"*** (2019: 46). Though this is promising, disabled communities have long been victims of "ad hoc" transport planning. Working with organisations, such as Wheels for Wellbeing, and putting disabled community members at the forefront of discussions about micromobility parking is imperative.

This report advises Cross River Partnership's 2021 report, Mobility Justice and Transport Inclusivity, as a must-read for readers seeking accounts of what mobility justice means for different people.

PARKING AND THEFT

The international theft and vandalism of shared micromobility vehicles has received substantial media attention, possibly because imagery of e-scooters and bikes being pulled out of bodies of water en masse makes for compelling photojournalism.
The theft of private micromobility vehicles hasn't gained such traction, though that doesn't mean the problem is any less rife. Reported thefts of pedal cycles in London exceeded 24,000 in 2020 according to the Metropolitan Police Crime data dashboard, with un-reported thefts estimated at three to four times higher. Given that many riders stop cycling after their cycle is stolen, this could significantly undermine the projected growth of cycle use unless theft and the sale of stolen cycles is addressed. Provision of more cycle stands and secure enclosed parking for all micromobilites obviously helps deter theft.

PARKING AND PLACEMAKING

Placemaking as a term is little mentioned in this report, yet it relates to much of the content. From mobility hubs to Lovehoops and from parklets to Oonee pods, the argument for placemaking through parking traverses all chapters in this report. Placemaking also links to the "greening" of micromobility parking, where something as simple as bordering a mobility corral with plant pots can instigate more sustainable and conscientious user-behaviour.

This report is purposefully littered with colourful imagery of various parking initiatives, both in design and in practice. The opportunity to improve urban landscapes through creative design should not get lost in more heavyweight discussions over micromobility parking.

This report senses an opportunity to move away from functionalist attitudes towards parking; rather micromobility parking can truly enhance and reinvigorate London's streets.

POLICY RECOMMENDATIONS

- Parking should include allocated spaces for non-standard cycles and be available across the capital.
- Growing levels of cycle theft must be addressed by a designated police task force to tackle both on-street micromobility theft and sales of stolen cycles and scooters online.

REFERENCES

1. Sherriff, G., Adams, M., Blazejewski, L., Davies, N. and Kamerāde, D., 2020. From Mobike to no bike in Greater Manchester: Using the capabilities approach to explore Europe's first wave of dockless bike share. Journal of Transport Geography, 86, (p.102744).
   Available [online] at: https://www.sciencedirect.com/science/article/pii/S0966692319310531
2. Wilson, K. 2020. A Black and White Issue: Lime Confronts the Scooter Racial Divide. Blog Published by Streetsblog. Available [online] at: https://usa.streetsblog.org/2020/07/24/a-black-and-white-issue-lime-confronts-the-scooter-racial-divide/
3. Ting, W., 2020. Rethink Your Ride with Lime. Blog Published by Lime.
   Available [online] at: https://www.li.me/second-street/rethink-your-ride-with-lime
4. Cross River Partnership, 2021. Mobility Justice and Transport Inclusivity.
   Available [pdf] at: https://crossriverpartnership.org/wp-content/uploads/2019/06/Mobility-Justice-and-Transport-Inclusivity-Healthy-Streets-Everyday-CRP-FINAL.pdf
5. Department for Transport (DfT), 2020b. Gear Change: A bold vision for cycling and walking.
   Available [pdf] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904146/gear-change-a-bold-vision-for-cycling-and-walking.pdf
6. Transport for London (TfL), 2019. Cycle Parking Implementation Plan.
   Available [pdf] at: http://content.tfl.gov.uk/cycle-parking-implementation-plan.pdf
7. Metropolitan Police crime data dashboard, 2021
   Available [online] at: https://www.met.police.uk/sd/stats-and-data/met/crime-data-dashboard/

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APPENDICES

APPENDIX I – REFERENCES FOR THE EXECUTIVE SUMMARY

1. Department for Transport (DfT), 2020b. Gear Change: A bold vision for cycling and walking. Available [pdf] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904146/gear-change-a-bold-vision-for-cycling-and-walking.pdf
2. Mayor of London, 2018. The Mayor's Transport Strategy. Available [pdf] at: https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf
3. London Cycling Campaign (LCC), 2020b. Micromobility and Active Travel in the UK. The Rise of Smaller Modes, and Resulting Infrastructure, Safety and Regulation Implications. Available [pdf] at: https://www.lcc.org.uk/wp-content/uploads/2021/03/Micromobility_mainreport.pdf
4. London Cycling Campaign (LCC), 2020a. Climate Safe Streets Report Launch. Available [pdf] at: https://www.lcc.org.uk/wp-content/uploads/2021/03/LCC-Climate-Safe-Streets-Report-2020.pdf

APPENDIX II – BIBLIOGRAPHY

5. (PRODUCT) Cyclehoop Bike Shelters: https://www.cyclehoop.com/category/shelters-canopies/
6. (PRODUCT) Cyclehoop Bikehangar: https://www.cyclehoop.com/product/shelters-canopies/bikehangar/
7. (PRODUCT) Cyclehoop Locker: https://www.cyclehoop.com/product/lockers/vertical-locker/
8. (PRODUCT) Cyclehoop mobility corral: https://www.cyclehoop.com/product/racks/mobility-corral-escooters-bicycles/
9. (PRODUCT) Cyclehoop racks: https://www.cyclehoop.com/category/racks/
10. (PRODUCT) Cyclehoop's "The Lovehoop": https://www.cyclehoop.com/product/cyclehoops/lovehoop/
11. (PRODUCT) FalcoPod Bike Hangar: https://www.falco.co.uk/products/cycle-parking/cycle-lockers/falcopod-bike-hangar.html
12. (PRODUCT) Five At Heart Folding Bike Locker: https://fiveatheart.com/products/flexible-locker/
13. (PRODUCT) Five At Heart product range: https://fiveatheart.com/our-products/
14. (PRODUCT) Oonee: https://www.ooneepod.com/
15. Aldred, R. and Jungnickel, K., 2013. Matter in or out of place? Bicycle parking strategies and their effects on people, practices and places. Social & Cultural Geography, 14(6), (pp.604-624). Available [pdf] at: https://westminsterresearch.westminster.ac.uk/download/070956b1b6afb8c678e7e911618a95e6dd2cd-c6b8577f8c9539d78445c797332/315928/Aldred_Jungnickel_2013_final_author_version.pdf
16. Azimap, 2021. Interactive map displaying London Santander Cycle Stations. Available [online] at: https://www.azimap.com/explore/view/20/london-santander-cycle-stations
17. BBC, 2020. 'Boris bikes': The facts behind 10 years of London's cycle hire scheme. Available [online] at: https://www.bbc.co.uk/news/uk-england-london-53577750
18. Becker, S. and Rudolf, C., 2018. Exploring the Potential of Free Cargo-Bikesharing for Sustainable Mobility. Available [online] at: https://www.researchgate.net/publication/325607142_Exploring_the_Potential_of_Free_Cargo-Bikesharing_for_Sustainable_Mobility
19. Broom, D., 2021. These Dutch cities will allow only zero-emission deliveries by 2025. Blog by World Economic Forum. Available [online] at: https://www.weforum.org/agenda/2021/04/zero-emission-deliveries-netherlands-cities/
20. Brown, A., Klein, N.J., Thigpen, C. and Williams, N., 2020. Impeding access: The frequency and characteristics of improper scooter, bike, and car parking. Transportation research interdisciplinary perspectives, 4, (p.100099). Available [online] at: https://www.sciencedirect.com/science/article/pii/S2590198220300105
21. Brunel University, 2017. Brunel Bikes. Available [online] at: https://www.brunel.ac.uk/Santander-crowdfunding/Home
22. BTN Bikeshare, 2020. Available [online] at: https://www.btnbikeshare.com/#about
23. Business and Planning Act, 2020. Available [online] at: https://www.legislation.gov.uk/ukpga/2020/16/enacted
24. Cairns, S. and Sloman, L., 2019. Potential for e-cargo bikes to reduce congestion and pollution from vans in cities. Available [pdf] at: https://www.cistoustopou.cz/sites/default/files/article/2020-11/potential-for-e-cargo-bikes-to-reduce-congestion-and-pollution-from-vans-final.pdf
25. Cambridge Cycling Campaign, 2016. Cambridge Cycle Parking Guide. Available [online] at: https://www.camcycle.org.uk/resources/cycleparking/guide/
26. Catapult Connected Places, 2020. Micro-eMobility global shareable e-scooter schemes. WP2 – Commerical and Operational Aspects. Available [pdf] at: https://s3-eu-west-1.amazonaws.com/media.cp.catapult/wp-content/uploads/2020/06/09125952/DfT_Micromobility-Commercial-report_FINAL.pdf
27. City of London, 2019. City Corporation tackles inappropriate dockelss bike parking in Square Mile. Available [online] at: https://news.cityoflondon.gov.uk/city-corporation-tackles-inappropriate-dockless-bike-parking-in-square-mile/
28. City of London, 2020. City of London Corporation teams up with Amazon to cut delivery vehicles and improve air quality. News Article. Available [online] at: https://news.cityoflondon.gov.uk/city-of-london-corporation-teams-up-with-amazon-to-cut-delivery-vehicles-and-improve-air-quality/
29. CoMoUK, 2020. Mobility Hubs Guidance. Available [pdf] at: https://como.org.uk/wp-content/uploads/2019/10/Mobility-Hub-Guide-241019-final.pdf
30. Cross River Partnership and Steer, 2020. The Potential for Urban Logistics Hubs in Central London. Available [pdf] at: https://crossriverpartnership.org/wp-content/uploads/2021/01/Central-London-Hubs_Final-report.pdf
31. Cross River Partnership, 2021. Mobility Justice and Transport Inclusivity. Available [pdf] at: https://crossriverpartnership.org/wp-content/uploads/2019/06/Mobility-Justice-and-Transport-Inclusivity-Healthy-Streets-Everyday-CRP-FINAL.pdf
32. Cyclehoop, 2014. Two Strikes for Cyclehoop in Paddington Station. Available [online] at: https://www.cyclehoop.com/2013-networkrail/
33. Cyclehoop, 2017. Cyclehoop introduce latest parklet to Hammersmith and Fulham. Available [online] at: https://www.cyclehoop.com/case-studies/2017-hammersmith/
34. Cyclehoop, 2019. Introducing our latest product – The Container Cycle Hub: https://www.cyclehoop.com/news/april-2019/introducing-cyclehoops-latest-product-the-container-cycle-hub/
35. Department for Transport (Dft), 2019. Future of Mobility: Urban Strategy. Available [pdf] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846593/future-of-mobility-strategy.pdf
36. Department for Transport (DfT), 2020a. Guidance for e-scooter users. Available [online] at: https://www.gov.uk/guidance/e-scooter-trials-guidance-for-users
37. Department for Transport (Dft), 2020b. Gear Change: A bold vision for cycling and walking. Available [pdf] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904146/gear-change-a-bold-vision-for-cycling-and-walking.pdf
38. Department for Transport (DfT), 2021. Great British Railways: Williams-Shapps plan for rail. Government policy announcement. Available [online] at: https://www.gov.uk/government/publications/great-british-railways-williams-shapps-plan-for-rail
39. Dickey, M.R., 2018. Skip unveils scooters with cameras and locks. Featured Article published by Techcrunch. Available [online] at: https://techcrunch.com/2018/12/18/skip-unveils-scooters-with-locks-and-cameras/
40. Ecofleet: https://ecofleet.co.uk/about/
41. Enfield Council, 2021. North Middlesex Hospital cycling hub with Enfield Council and TfL. Available [video] at: https://www.youtube.com/watch?v=mG06zK7SRzE
42. Fang, K., Agrawal, A.W, Steele, J., Hunter, J.J., and Hooper, A.M., 2018. Where Do Riders Park Dockless, Shared Electric Scooters? Findings from San Jose, California. Mineta Transportation Institute Publications. Available [pdf] at: https://core.ac.uk/download/pdf/216856096.pdf
43. Fishman, E., 2019. Bikeshare. Chapter 8: The Challenge of Dockless Bike Share Parking, (pp.61-71). Available [online] at: https://www.taylorfrancis.com/chapters/mono/10.4324/9781315545127-7/challenges-dockless-bike-share-parking-elliot-fishman?context=ubx&refId=69c84905-42b9-46eb-bd6c-0c4fcce08d5d

44. Freight on Rail, 2010. Written Evidence from Freight on Rail (TE 70).
Available [online] at: https://publications.parliament.uk/pa/cm201011/cmselect/cmtran/473/473vw48.htm
45. Groves, J. 2020. Mayor's Streetspace Plan could see cycling increased tenfold post-lockdown Article published by Bikebiz.
Available [online] at: https://www.bikebiz.com/mayors-streetspace-plan-could-see-cycling-increased-tenfold-post-lockdown/
46. Hackney Council, 2019. Over 70 new on-street dockless bike bays installed in Hackney. News Report.
Available [online] at: https://news.hackney.gov.uk/over-70-new-on-street-dockless-bike-bays-installed-in-hackney/
47. James, O., Swiderski, J.I., Hicks, J., Teoman, D. and Buehler, R., 2019. Pedestrians and e-scooters: An initial look at e-scooter parking and perceptions by riders and non-riders. Sustainability, 11(20), (p.5591).
Available [online] at: https://www.mdpi.com/2071-1050/11/20/5591
48. Landor, 2021a. Achieving Net Zero Commuting Webinar (26.02.21). Part of The Green Transport Recovery Webinar Series.
Available [online] at: https://www.youtube.com/watch?v=R2-9i5chYTg
49. Landor, 2021b. E-cargo bikes in action: local authority case studies Webinar. Another in The Green Transport Recovery Webinar Series. Available [online] at: https://www.youtube.com/watch?v=FqRUnjU2XbY
50. Lau, A., 2021. Founder and Design Director of Cyclehoop speaking at Landor Webinar:
A 'once-in-a-generation' opportunity to build back better: innovation showcase.
Available [online video] at: https://www.youtube.com/watch?v=NUrM5YOawks&feature=youtu.be
51. Liao, F. and Correia, G., 2020. Electric carsharing and micromobility: A literature review on their usage pattern, demand, and potential impacts. International Journal of Sustainable Transportation, (pp.1-30).
Available [pdf] at: https://www.tandfonline.com/doi/pdf/10.1080/15568318.2020.1861394
52. Living Streets, 2020. Parklets: Your Guide To Creating A Pop-Up Park On Your Street.
Available [pdf] at: https://www.livingstreets.org.uk/about-us/our-work-in-action/campaigning-for-parklets
53. London Boroughs Consolidation Centre Project, 2014. Available [pdf] at: https://ec.europa.eu/environment/gpp/pdf/01_07_2014/LBCC%20-%20Webinar%20-%20Tuesday%201st%20July%202014_Kevin%20Churchill.pdf
54. London Cycling Campaign (LCC), 2020a. Climate Safe Streets Report Launch.
Available [pdf] at: https://www.lcc.org.uk/wp-content/uploads/2021/03/LCC-Climate-Safe-Streets-Report-2020.pdf
55. London Cycling Campaign (LCC), 2020b. Micromobility and Active Travel in the UK. The Rise of Smaller Modes, and Resulting Infrastructure, Safety and Regulation Implications.
Available [pdf] at: https://www.lcc.org.uk/wp-content/uploads/2021/03/Micromobility_mainreport.pdf
56. London Cycling Campaign (LCC), 2021. Climate Safe Streets: One Year On.
https://www.lcc.org.uk/wp-content/uploads/2021/03/LCC-Climate-Safe-Streets-one-year-on-2.pdf
57. London Cycling Design Standard (LCDS), 2016. Chapter 8: Cycle Parking.
Available [pdf] at: http://content.tfl.gov.uk/lcds-chapter8-cycleparking.pdf
58. London Living Streets, Living Streets and London Cycling Campaign, 2018. Low Traffic Neighbourhoods.
Available [online] at: https://www.lcc.org.uk/campaigns/low-traffic-neighbourhoods/
59. Mayor of London, 2018. The Mayor's Transport Strategy.
Available [pdf] at: https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf
60. Mayor of London, 2021. The London Plan.
Available [pdf] at: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf
61. Metropolitan Police crime data dashboard, 2021.
Available [online] at: https://www.met.police.uk/sd/stats-and-data/met/crime-data-dashboard/
62. Momentum and 6t, 2020. A sound launch for micromobility services in the UK: The challenge of parking. Available [online] at: https://6-t.co/en/lenjeu-du-stationnement-pour-le-developpement-des-services-de-micromobilite-au-royaume-uni/
63. Momentum and London School of Economics, 2021. Investing in Micromobility at Stations: A London study of benefits and design options. Available [pdf] at: https://momentum-transport.com/wp-content/uploads/2021/02/210217_Investing-in-Micromobility-by-Momentum-1.pdf
64. Momentum, 2020. Designing for micromobility: Parking in offices. Available [pdf] at: https://momentum-transport.com/wp-content/uploads/2020/12/201218_Micromobility-Parking-by-Momentum.pdf
65. Nadkarni, R., 2020. The Multimodal Future of On-Street Parking. A Strategic Approach to Curbside Management.
Available [online] at: https://repository.difu.de/jspui/handle/difu/579071
66. O'Rourke, J., 2020. Smart parking will be key to London's e-scooter trial – analysis shows how it could be implemented. News Article published by TransportXtra. Available [online] at: https://www.transportxtra.com/publications/local-transport-today/news/67339/smart-parking-will-be-key-to-london-s-e-scooter-trial/
67. Oeschger, G., Carroll, P. and Caulfield, B., 2020. Micromobility and public transport integration:
The current state of knowledge. Transportation Research Part D: Transport and Environment, 89, (p.102628).
Available [online] at: https://www.sciencedirect.com/science/article/pii/S1361920920308130
68. Plymouth Council, 2021. Mobility/Journey Hubs. Available [online] at: https://www.plymouth.gov.uk/parkingandtravel/transportplansandprojects/transportplans/transformingcitiesfund/mobilityjourneyhubs
69. Ponsford, D., and Lee-Zogbessou, J., 2018. London's Boris bikes cycle hire scheme has cost UK taxpayers nearly £200 million, FoI disclosure reveals. Published by Verdict. Available [online] at: https://www.verdict.co.uk/londons-boris-bikes-scheme-has-cost-taxpayers-nearly-200m-foi-disclosure-reveals/
70. Portland Bureau of Transportation, 2018. E-Scooter Findings Report.
Available [pdf] at: https://www.portlandoregon.gov/transportation/article/709719
71. Puech, B., 2020. Putting the park in parking. Living Streets.
Available [online] at: https://www.livingstreets.org.uk/news-and-blog/blog/putting-the-park-in-parking
72. Reid, C., 2019. Mobike Loses 200,000 Dockless Bicycles To Theft And Vandalism. News Article Published by Forbes.
Available [online] at: https://www.forbes.com/sites/carltonreid/2020/12/30/mobike-loses-200000-dockless-bicycles-to-theft-and-vandalism/?sh=50c0d60c41ca
73. Reid, C., 2020. Ripping Out 'Boris Bikes' Would Be Insane Says London's Cycling And Walking Commissioner. News Article Published by Forbes. Available [online] at: https://www.forbes.com/sites/carltonreid/2020/12/14/ripping-out-boris-bikes-would-be-insane-says-londons-cycling-and-walking-commissioner/?sh=2b63f2073ebe
74. Sainsbury's, 2018. Sainsbury's trials UK's first grocery delivery service by electric cargo bike. News Report.
Available [online] at: https://www.about.sainsburys.co.uk/news/latest-news/2018/18-04-2018-electriccargobiketrial
75. Sellaouti, A., Arslan, O. and Hoffmann, S., 2020, September. Analysis of the use or non-use of e-scooters, their integration in the city of Munich (Germany) and their potential as an additional mobility system. In 2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC) (pp. 1-5). IEEE.
Available [online] at: https://ieeexplore.ieee.org/abstract/document/9294224
76. Shaheen, S. and Cohen, A., 2019. Shared micromoblity policy toolkit: Docked and dockless bike and scooter sharing.
Available [pdf] at: https://escholarship.org/content/qt00k897b5/qt00k897b5.pdf
77. Shead, S., 2021. SoftBank-backed Tier plans to charge its e-scooter batteries in local shops. News Article published by CNBC.
Available [online] at: https://www.cnbc.com/2021/02/10/tier-plans-to-charge-its-e-scooter-batteries-in-shops.html
78. Sherriff, G., Adams, M., Blazejewski, L., Davies, N. and Kamerāde, D., 2020. From Mobike to no bike in Greater Manchester: Using the capabilities approach to explore Europe's first wave of dockless bike share. Journal of Transport Geography, 86, (p.102744). Available [online] at: https://www.sciencedirect.com/science/article/pii/S0966692319310531
79. Shulman, Sophie. 2019. Scooter-Sharing Companies Don't Make Money, They Grow. Article on CTECH.
Available [online] at: https://www.calcalistech.com/ctech/articles/0,7340,L-3764203,00.html
80. Spin, 2021a. Spin Valet: Addressing Improper Parking and Improving Accessibility in Cities. Blog.
Available [online] at: https://blog.spin.pm/spin-valet-addressing-improper-parking-and-accessibility-in-cities-327696e6a8e3
81. Spin, 2021b. Looking Back: Lessons from Milton Keynes. Blog.
Available [online] at: https://blog.spin.pm/looking-back-lessons-from-milton-keynes-e8d557051b08
82. Stolen Ride, 2021. Keeping key workers cycling during coronavirus.
Available [online] at: https://www.stolenride.co.uk/tourdethanks/
83. Talbot, 2018. 4 problems with dockless bike schemes, and how to solve them. Joyride. Available [online] at: https://joyride.city/hitting-the-wall-4-problems-with-dockless-bike-schemes-and-how-to-solve-them-html/
84. Ting, W., 2020. Rethink Your Ride with Lime. Blog Published by Lime.
Available [online] at: https://www.li.me/second-street/rethink-your-ride-with-lime
85. Ting and Weinberg, 2021. Where's Shared? The Rise, Fall, and Remarkable Comeback of Scooters. Online discussion as part of the Micromobility World event Jan 27-29, 2021.
86. Teddington Town, 2016. Station Cycle Hub. Available [online] at: https://teddingtontown.co.uk/2016/10/20/station-cycle-hub/
87. Transport for London (TfL), 2018. Dockless bike share code of practice for Operators in London.
Available [pdf] at: http://content.tfl.gov.uk/dockless-bike-share-code-of-practice.pdf

88. Transport for London (TfL), 2019. Cycle Parking Implementation Plan.
Available [pdf] at: http://content.tfl.gov.uk/cycle-parking-implementation-plan.pdf
89. Transport for London (TfL), 2020. Travel in London Report 13.
Available [pdf] at: https://content.tfl.gov.uk/travel-in-london-report-13.pdf
90. Transport for London (TfL), 2021. TfL's popular Santander Cycles scheme reaches 100 million hires. Press release by TfL.
Available [online] at: https://tfl.gov.uk/info-for/media/press-releases/2021/march/tfl-s-popular-santander-cycles-scheme-reaches-100-million-hires
91. Tooze, E., 2021. Scotland set to introduce mobility hubs. News report by Smart Transport.
Available [online] at: https://www.smarttransport.org.uk/news/latest-news/scotland-set-to-introduce-mobility-hubs
92. Trending Topics, 2019. Official Statement Says No Lime E-Scooters Have Been Stolen In Sofia. Yet. News Report. Available [online] at: https://www.trendingtopics.eu/official-statement-says-no-lime-e-scooters-have-been-stolen-in-sofia-yet/
93. Tuncer, S. and Brown, B., 2020, April. E-scooters on the ground: Lessons for redesigning urban micro-mobility. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (pp.1-14).
Available [online] at: https://dl.acm.org/doi/abs/10.1145/3313831.3376499
94. Van Amstel, W.P., Balm, S., Warmerdam, J., Boerema M., Altenburg, M., Rieck, F. and Peters, T., 2018. City Logistics: Light and Electric. LEFV-Logic: Research on Light Electric Freight Vehicles. Published by Amsterdam University of Applied Sciences.
Available [pdf] at: https://www.hva.nl/binaries/content/assets/subsites/kc-techniek/publicaties/lefv-logic.english.pdf
95. Wilson, K. 2020. A Black and White Issue: Lime Confronts the Scooter Racial Divide. Blog Published by Streetsblog. Available [online] at: https://usa.streetsblog.org/2020/07/24/a-black-and-white-issue-lime-confronts-the-scooter-racial-divide/

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