A sound launch for micromobility services in the UK: the challenge of parking

Transferring knowledge from Paris to London for

dott

A study by

(6-t)

momentum
transport consultancy

October 26th 2020 – Issue 2

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1. INTRODUCTION

1.1 Context

PARIS, FRANCE

Paris has emerged as a laboratory for micromobility services. Between October 2017 and September 2018, about 15,000 shared dockless bicycles were deployed in 8 different French metropolises. Only a year later, these new mobility services represented 20% of the shared bicycle offer in the country. A similar boom was observed for shared dockless e-scooters: since a few hundred e-scooters were launched in Paris in June of 2018, e-scooter services kept on growing, reaching 12 operators and 15,000 to 20,000 vehicles in April of 2019. The growth of these services was backed by user demand: a recent study conducted by 6t allowed us to estimate that by the end of 2019, shared dockless e-scooters had reached a modal share between 0.8 et 1.9 % in Paris[1]. This is a non-negligible figure given that the modal share for bicycles in Paris is only 3%[2]. Results from this same survey suggested that end-users valued the door-to-door nature and time efficiency of shared e-scooters.

This micromobility boom raised a number of questions in Paris, the majority of them being related to clutter and service efficiency, all boiling down to parking regulation. The French legal system implies that new services, such as shared e-scooters, are allowed as long as they are not officially prohibited. As a result, French local authorities experimented with a variety of parking regulation mechanisms, before reaching the stabilised situation that is in operation today. Learning from these experiments offers important takeaways as to how shared dockless e-scooter services could be managed so as to ensure service efficiency for end-users while limiting negative externalities such as street clutter.

LONDON, UK

The Department for Transport (DfT) is collaborating with local authorities and e-scooter operators in conducting e-scooters trials in various UK cities. The trials are intended to inform the DfT's decision to fully legalise their use by testing the potential for e-scooters to reduce motor traffic and integrate with existing transport networks. In July 2020, DfT announced that e-scooter trials would be fast-tracked to assist with a green recovery from COVID-19, and trials have commenced in some cities in the UK. To reach these goals, both private operators

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[1] 6t, (2019), *Usages et usagers de services de trottinettes électriques en free-floating en France*, 158 p., URL : https://6-t.co/trottinettes-freefloating/ (consulté le 13/09/22019)

[2] EGT 2010 – STIF – OMNIL – DRIEA. http://www.omnil.fr/spip.php?article81

and local authorities need to reach a common parking strategy through which end-users' demand for an efficient, door-to-door mobility service would be satisfied.

Trials in London have been delayed but are expected to commence in the spring of 2021. Transport for London (TfL) is coordinating with London's boroughs and London Councils the implementation of London-wide trials and are expected to contract two or three e-scooter operators through a tender process. TfL has accepted the Government's decision to fast-track e-scooter trials as part of a green recovery from the pandemic. The use of e-scooters on London's roads would also support the Mayor's Transport Strategy's (2018) long-term objective of reducing the city's dependence on cars for more sustainable and space efficient modes of transport.

The framework developed for the parking of e-scooters throughout London is considered to be fundamental to the success of the trials. Operators will be required to ensure that e-scooters are fitted with the requisite technology to park in designated areas or bays, due to concerns about dockless e-scooters being parked randomly on footways or other areas where they can become safety hazards and obstructions. It is expected that networks of parking areas will be established across all boroughs participating in the trials, with boroughs maintaining ultimate control in determining where e-scooter parking areas will be specifically located. The adopted parking strategy will greatly influence end-users' experience, and the efficiency of these services in contributing to modal shift, intermodality and social distancing in London.

THIS STUDY

This *report identifies the opportunities and constraints regarding e-scooter parking. It then uses learnings from Dott e-scooters in Paris and transfers them to London whilst considering contextual differences.*

As with any case study approach, results from the French micromobility boom cannot be immediately transferred to the British case given contextual differences. The success of the e-scooter trials will be dependent on establishing a parking strategy that is cognizant to the unique context in London, with its varying density, transport accessibility, demographics and car ownership rates across the vast metropolis. The purposes and destinations of potential user trips will also need to be understood to optimise the selection of parking locations.

Dott is a dockless e-scooter operator, currently offering services in France, Belgium, Germany, Italy and Poland. It has recently been selected by the Paris City Hall to be one of the three operators to offer shared dockless e-scooters in the city, along with Lime and Tier. It now wishes to expand its operations to the UK, starting with the trials that have been announced following the COVID-19 outbreak and lockdown. Dott believes the lessons learnt from the experiences of rental e-scooter use in Paris and other French municipalities should be used to guide the development of London's e-scooter parking strategy, and have thus

commissioned 6t and Momentum to explore this topic. The following report will start with user experiences to identify good practices for sound and efficient e-scooter parking management.

1.2 Methods

This study is structured as featured in the following diagram. In a short introductory part, issues related to parking are mapped to guide the following analysis. Then, data from French shared e-scooter user surveys is analysed to understand what users' expectations regarding parking are and how parking fits within user experience. A third part presents a history of parking regulation since the beginning of the French micromobility boom and provides takeaways for efficient and relevant regulation to ensure orderly parking while maintaining service efficiency. The fourth and fifth part apply these principles to the context of London and develop an e-scooter parking strategy for Inner London, as well as Outer London.

Mapping the issues related to parking Fleet sizes, vehicle density, parking density, intermodality, user demand and reliability of the micromobility service, public space management and healthy streeets	**METHOD** Literature and press review Local authority interviews conducted by 6t Momentum's expert local knowledge
What do user declarations and use patterns in Paris tell us about the demand for parking ? How does parking fit into the decision to use a shared e-scooter service ? what are users expectations regarding shared e-scooters and what does it imply for parking ?	**METHOD** User surveys conducted by 6t
How were these issues tackled by key stakeholders in France ? How did local authorities tackle parking and related issues in France? What were the outcomes? How do different solutions fit with operators' business model constraints? How do different solutions impact end-users' experiences ?	**METHOD** Local authority interviews conducted by 6t Press and literature review
What do these takeaways mean for London ? London v. Paris: confronting density and travel patterns. What relevant models can be applied when it comes to parking ? A Metropolitan strategy : how can one translate user catchments into parking locations whilst reflecting boroughs disparities (last mile journeys, stations, new urban mobility zones etc) ?	**METHOD** Urban analysis Travel survey data Cartographic analysis
Aligning the e-scooter offer with policy expectations in London Constraints and opportunities to meet user preferences : Healthy streets / masterplanning and public realm opportunities Bridging the implementation gap : understanding key misaligments between key players	**METHOD** Policy analysis Stakeholder sentiment analysis Press and literature review Sstakeholders' interview
Recommendations Governance arrangements, physical arrangements, short/long term perspective	**METHOD** Internal workshop between 6t and Momentum

Figure 1 – Structure of the study and methods

2. MAPPING THE ISSUES RELATED TO E-SCOOTER PARKING

E-scooter parking is a multi-faceted issue, and devising sound guidelines to manage shared dockless vehicles implies exploring a variety of interrelated topics. These topics have been defined based on 6t's and Momentum's expertise on these issues, acquired through past studies and interactions with key stakeholders. They will be used to guide the development of this report and will thus be further substantiated in the following chapters.

9 related themes have been identified; these have been classified depending on whether they should be expected to be the end-user's, the local authority's, or the operator's main concern.

First, a sub-set of associated themes can be expected to be **end-users' key concerns**:

- **Convenience**: dockless mobility services allow end-users to do away with the constraints of owning a private micromobility engine. This aspect should be kept in mind for dockless e-scooter services to play a key role in the mobility ecosystem;
- **Door-to-door mobility**: dockless e-scooters are an individual mode, contrary to public transport, and may be attractive because of the door-to-door trips they allow. This needs to be kept in mind when regulating parking.
- **Vehicle availability**: Parking regulation measures may impact vehicle density. For instance, a system relying on a limited number of docking areas will limit the number of vehicles available at an acceptable walking distance for end-users, and may impact service attractivity;

A second sub-set of related topics can be expected to be **local authorities' main concerns**:

- **Clutter and user conflicts**: a key negative externality observed by local authorities around the world after the arrival of dockless e-scooters was footway clutter, and a resulting lack of comfort and safety for pedestrians, especially mobility-impaired and visually impaired pedestrians[3,4,5].

[3] https://www.alternatives-economiques.fr/velos-responsables-velos-predateurs/00083550 (consulté le 13/09/22019)

[4] Frenken K., Schor, J. (2017), "Putting the sharing economy into perspective", *Environmental Innovation and Societal Transitions*, 23, pp. 3-10.

[5] 6t-bureau de recherche, (2019), *Livre blanc de la mobilité en free-floating : Pour une régulation efficace et pertinente des services*, URL: https://6-t.co/livre-blanc/ (accessed on 06/10/2020)

- **Intermodality**: using dockless e-scooter services as a lever to encourage modal shift from private cars to public transport has been a key goal for local authorities around the world[6]. Parking management around stations is thus key.
- **Regulation**: ensuring safe, well-managed, efficient parking implies specific regulatory measures. Local authorities can choose between a wide variety of options, and choosing the best-suited one may be challenging.
- **Urban design and infrastructure**: parking vehicles implies specific infrastructure. This infrastructure might fit into current urban design guidelines, or imply a revision of key guiding principles.

A last sub-set of related topics can be expected to be **service operators' main concerns**; however, these different themes also directly interact with the local authorities' goal of safety, orderliness, and suitable urban design.

- **Efficiency**: operators' business models may rely on a certain vehicle density or fleet size to ensure service efficiency. Parking regulations may be incompatible with these business model-related constraints, forcing the service operator to retreat;
- **Vehicle charging and fleet management**: parking regulations and eventual "parking station" design will impact the way operators can charge their vehicles, and manage their fleet.

These topics will be used to structure the findings in this report and will guide final recommendations.

[6] 6t-bureau de recherche, (2019), *Livre blanc de la mobilité en free-floating : Pour une régulation efficace et pertinente des services*, URL: https://6-t.co/livre-blanc/ (accessed on 06/10/2020)

Key themes related to e-scooter parking

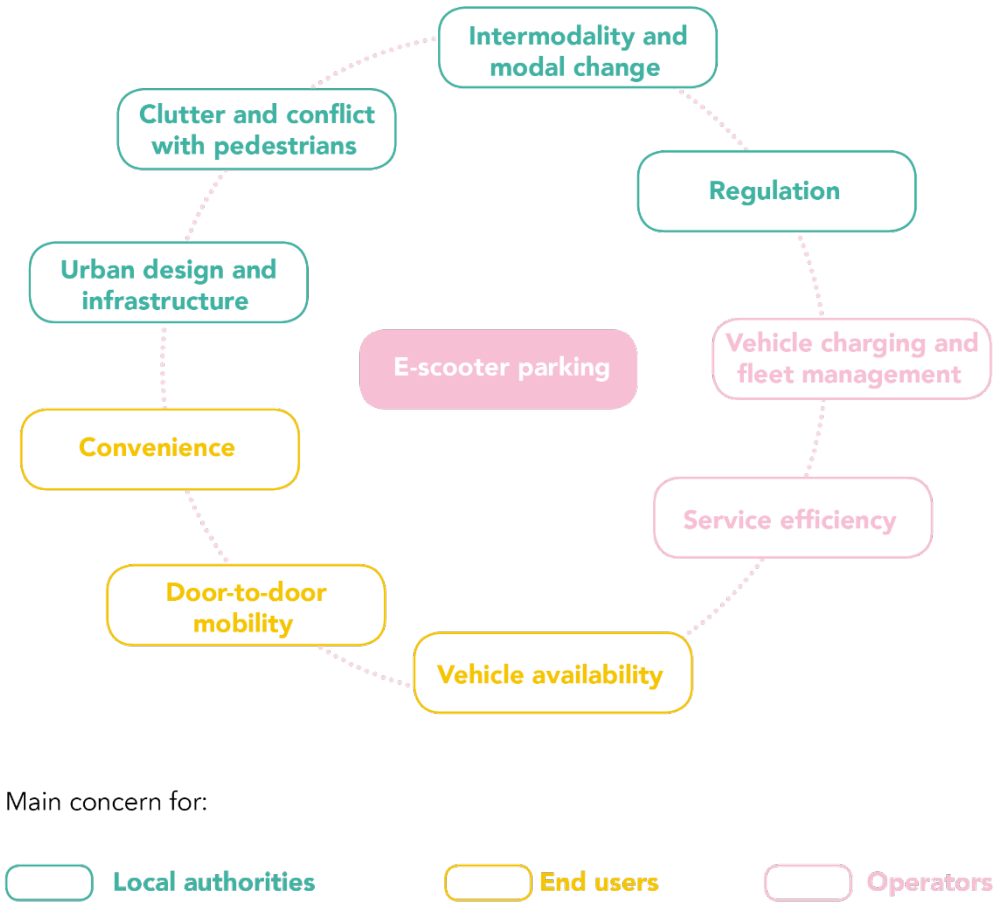

Figure 2 – Key themes related to e-scooter parking

3. THE DEMAND FOR PARKING: LEARNING FROM END-USERS

3.1 Introduction

CONTEXT AND GOALS

The British government has decided to launch e-scooter trials for three key reasons. First, they appear to answer a latent demand[7]. Second, they might be a way to provide safe, individual modes of transport to mitigate pressures on public transport during the COVID-19 pandemic[8]. Third, they could contribute to reducing motor traffic[9].

The end-user point of view is thus key in designing the future of these services: should they fail to answer customers' needs, they will not deliver expected public health and sustainability results. At the moment, in the absence of data on the British case, lessons learnt in other contexts can provide Dott with valuable insights.

France, and especially Paris, can be regarded as a laboratory for shared mobility and dockless e-scooters. A recent study conducted by 6t, allowed us to estimate that by the end of 2019, shared dockless e-scooters had reached a modal share between 0.8 et 1.9 % in Paris[10]. By comparison, the modal share of cycling in Paris was of only 3% in 2010, when the latest Household Travel Survey (*Enquête Global Transport*, or EGT) was conducted, and the public bicycle scheme Vélib' only reached a 0.8% modal share[11]. While these figures might be expected to have grown today, especially in light of the current COVID-19 outbreak, they still allow us to conclude that in less than a year, shared dockless e-scooters had found a greater demand than affordable, public-private venture Vélib' had after two years of existence (at the time of the last household travel survey). This illustrates the relevance of using Paris' data to better understand dockless e-scooter demand and use patterns, so as to plan for such uses to manifest in the UK.

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[7] See for example: https://www.independent.co.uk/news/uk/home-news/electric-scooters-legal-ride-uk-roads-law-protest-downing-street-a9038016.html (accessed on 06/10/2020)

[8] See for example: https://www.forbes.com/sites/davekeating/2020/05/11/covid-prompts-uk-rethink-on-shared-scooters/ ; https://www.ft.com/content/becb4445-1062-41c8-9ffa-5732a6e55ae8 (accessed on 06/10/2020)

[9] https://www.gov.uk/government/news/rental-e-scooter-trials-to-be-allowed-from-this-weekend (accessed on 07/10/2020)

[10] 6t, (2019), *Usages et usagers de services de trottinettes électriques en free-floating en France*, 158 p., URL : https://6-t.co/trottinettes-freefloating/ (consulté le 13/09/22019)

[11] STIF-OMNIL-DRIEA, (2013), *Le renouveau du vélo en Île-de-France*, Fiche vélo, EGT 2010, 4 p., URL : http://www.omnil.fr/IMG/pdf/egt2010_velo_bd-2.pdf (consulté le 19/09/2019)

This section focuses on end-users' perspective and highlights the importance they grant to convenience and the possibility to make door-to-door trips. Parking therefore arises as a major issue in user experience: given that e-scooter trips are rather short, the walking time necessary to access an e-scooter or one's final destination from the parked e-scooter will have a determining impact on this mode's time efficiency. It will be argued that dedicated parking areas will be perceived as acceptable and will not negatively affect user experience as long as they do not induce too long a total walking time (access + egress), 5 minutes being a limit.

METHODS

The first e-scooter services were introduced in France in the summer of 2018. 6t was the first research institute to produce independent, academic-standard user surveys[12] on shared dockless e-scooters, in the spring and autumn of 2019.

The spring 2019 survey was conducted by 6t using own funds and a support grant from the French Environment and Energy Management Agency (ADEME), a public institution active in the fields of environment, sustainable development and energy. Given that Lime was the main operator in the city of Paris at the time in terms of fleet size, the choice was made to focus on Lime users. Lime agreed to send the questionnaire to its users out of interest for the independent nature of the research. To fully understand the unprecedented phenomenon of e-scooter services, 6t used a mixed methods approach, including:

- An international benchmark of e-scooter services to contextualise the research and delineate its object and scope;
- A dozen exploratory interviews with shared dockless e-scooter users to provide a first insight on users' perception and shape the questionnaire for the quantitative survey;
- A quantitative survey of shared e-scooters users in France, which was the core of the study. Lime, then the first e-scooter provider in France (active in Paris, Lyon and Marseille), agreed to send the online questionnaire to its users, which made it possible to obtain a representative sample. Nearly 4,400 responses were collected (among which more than 2,600 in Paris). Only answers from Paris are considered here, to ensure compatibility with the second survey.
- A qualitative survey to complement the quantitative approach, with a series of 21 semi-structured interviews with Lime users, to explore hypotheses formulated after data survey analysis.

This study, the results of which were entirely novel and public, aroused a great interest and, to date, the report has been downloaded on 6t's website more than 2,500 times, quoted 30

[12] 6t-bureau de recherche, (2019), *Usages et usagers des trottinettes électriques en free-floating en France*, URL : https://6-t.co/trottinettes-freefloating/ (accessed on 06/10/2020)

times in the French press, 6 times in the international press, and cited once in a peer-reviewed scientific journal[13]. In the following section, this survey is referred to as "spring 2019 survey".

Following this first survey, 6t conducted a second study on shared e-scooters in the autumn of 2019, commissioned by Dott France. Nearly 1,500 Dott users in Paris were surveyed. The service provider sent the online questionnaire to its users via email and also included a link in its smartphone application. Note that respondents were offered an incentive (one free ride, that is no unlock fee + 20 minutes free). 6t had an independence agreement, ensuring the neutrality of analyses: Dott agreed to publish all results, which are available on 6t's website[14]. In the following section, this survey is referred to as "autumn 2019 survey".

This second survey used the same protocol that had been developed in the initial, self-funded survey; the basis of the questionnaire remained the same, with a few additional questions being added for Dott. This was a way to allow for comparison, as well as to ensure neutrality and rigour of results. Results from these two studies are, overall, consistent and can thus be considered as robust.

Note that Paris's shared e-scooters regulation has undergone a number of changes since the first survey (see following chapter): in July 2019, that is, in between the two surveys, the City of Paris inaugurated its first e-scooters' parking spots and prohibited e-scooters from parking on the footway or the roadway. This will be taken into account in the analysis.

3.2 Users' subjective perceptions of e-scooters: the importance of convenience and door-to-door trips

Exploring the key advantages and drawbacks users find in using dockless e-scooters is key to understanding how parking conditions may impact user demand and satisfaction.

In the spring of 2019, shared e-scooter users were invited to spontaneously give three words to describe shared dockless e-scooters. The most frequently mentioned term is by far "*convenient*", used by half of respondents. It is followed by the terms "*fast*" and "*leisure*". In comparison, the bicycle is above all perceived as "*sporty*", public transportation as "*convenient*" but also "*crowded*", and the car is first described as "*polluting*".

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[13] Bortoli, Christoforou, (2020), "Consequential LCA for territorial and multimodal transportation policies: method and application to the free-floating e-scooter disruption in Paris", *Journal of Cleaner Production*, 273.

[14] 6t-bureau de recherche, (2019), *Comprendre les usages d'un service de trottinettes en free-floating. Enquête auprès des utilisateurs du service Dott à Paris*, URL https://6-t.co/utilisateurs-trottinettes-dott/ (accessed on 06/10/2020)

This finding is corroborated by qualitative users' interviews, dockless e-scooter riders stressing the convenience of this new option.

> *"E-scooters offer more freedom than walking or public transportation. You can go farther, it takes less time, you can take it whenever you want and leave it wherever you want." Dockless e-scooter user in Paris*

As explained by this user, e-scooters' convenience is linked to the concept of freedom and refers to a "package" of functional advantages: being able to make longer trips than walking, being able to travel fast, being able to use it anytime and being able to leave the vehicle wherever one wants at the time of this first survey. These two last points are directly linked to availability and parking conditions, as this trip efficiency is only possible when parking is easy to access and offered in sufficient quantity.

Users were also invited to select and prioritise, out of a closed list, the three main perceived advantages of shared dockless e-scooter services. Electric scooters being a new mode of transportation, users first mention the pleasant or fun character of e-scooters, as well as time saving. The possibility to make door-to-door trips arrives in third position in both surveys and is mentioned by 58% of Parisian shared e-scooter users in the spring 2019 survey, and 40% of users in the autumn 2019 survey. In addition, survey results show that the more a user rides a dockless scooter, the more he or she values the possibility to make door-to-door trips.

Main motivations for dockless e-scooter use

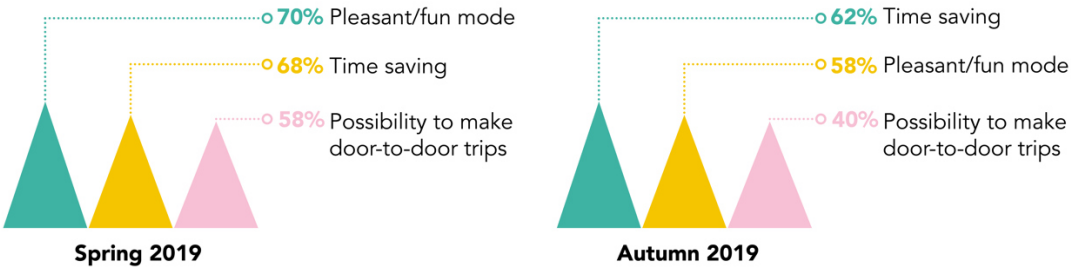


Figure 3 – Users' main motivation for using dockless e-scooters. Source: 6t

This finding was corroborated by focus groups conducted by 6t for the Institut Paris Région[15], the Île-de-France urban planning agency. Among shared e-scooter users, the possibility to make door-to-door trips is the most commonly mentioned advantage, along with speed. This

[15] Institut Paris Région DRIEA 6t, (2020), *Retours d'usagers sur les services de mobilité en free-floating*, URL : https://www.institutparisregion.fr/fileadmin/NewEtudes/000pack2/Etude_2430/etudeFF_FG6t_29sept20.pdf (accessed on 06/10/2020)

is a relative advantage compared to public transportation, which implies access and egress trips that may be more or less long, and thus a lever to encourage modal shift to e-scooters in light of the current COVID-19 outbreak.

No main perceived drawback refers to parking. However, questions about the problems encountered by users point to the issue of parking network and availability. Lack of available vehicles nearby is the main issue encountered by e-scooter users, and concerns about half of them. In the spring 2019 survey, 57% of respondents have already encountered this barrier, and 49% in the autumn 2019 survey.

This highlights the necessity to provide users with an important vehicle density per square kilometre to limit e-scooter access trips, as well as to ensure parking-related measures are not so restrictive that the trip is no longer perceived to be door-to-door. It is worth underlining that, at the time of these studies, the Paris City Hall was developing an extensive network of e-scooter parking areas, and parking was allowed on any bicycle, motorcycle or car parking area, allowing for great flexibility. Hypotheses about the new user experience entailed by this organisation will be developed in the following part; to understand how it may compare to the pre-regulation situation, the "door-to-door" nature of these trips is further documented below.

3.3 Parking practices and acceptability of dedicated parking

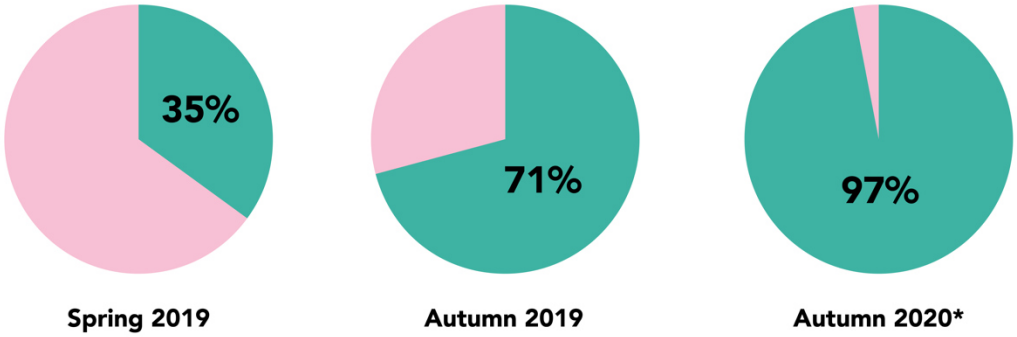
Given the importance they attach to dockless e-scooters' convenience and the possibility their offer to make door-to-door trips, how long do users have to walk to find an e-scooter? How do they actually park, and how close do they park from their destination? How do they perceive potential parking constraints?

A CHANGE IN PARKING BEHAVIOURS OVER TIME

Users were asked about the way they parked their e-scooter at the end of their last trip in Paris. In the spring of 2019, 65% of shared e-scooter users left the vehicle on the footway, while only 29% shared e-scooter users did so a few months later, in the autumn of 2019. To put it another way, parking compliance among users (share of users who did not park on the footway) increased over time, from 35% in the spring of 2019, to 71% in the autumn of 2019 and, according to Dott, 97% in the autumn of 2020.

It is worth noting that in between the two surveys conducted by 6t, the Paris City Hall defined its e-scooter service code of conduct – with participation from operators, see following chapter – and had operators commit to parking safely in dedicated parking areas, or bicycle or motorcycle parking spaces. This element, as well as the provision of dedicated parking spots for e-scooters, can explain the increasing parking compliance. It can also be interpreted as a growing attention to parking among users, thanks to awareness raising campaigns from public authorities as well as operators. This link between parking compliance and regulation is developed in the following chapter.

Parking compliance evolution in Paris over time



Share of users who did not park on the footway at the end of their last e-scooter trip in Paris

Share of users who parked on the footway at the end of their last e-scooter trip in Paris

** data provided by Dott*

Figure 4: Parking compliance evolution in Paris over time. Source: 6t and Dott

In the fall of 2019, 23% of Dott users parked their scooter close to other dockless mobility devices such as other e-scooters or bicycles, and 16% parked it near a bicycle hoop or a Vélib' station. This can be regarded as attempts to avoid public space cluttering. 18% used a motorbike parking space and 4% a car parking space. Only a marginal share of users (4%), dropped the e-scooter on one of Paris' dedicated e-scooters' parking spots, but this can be related to the fact that those were still scarce when the survey was conducted.

Parking at the end of e-scooter last trip in Paris in the autumn of 2019

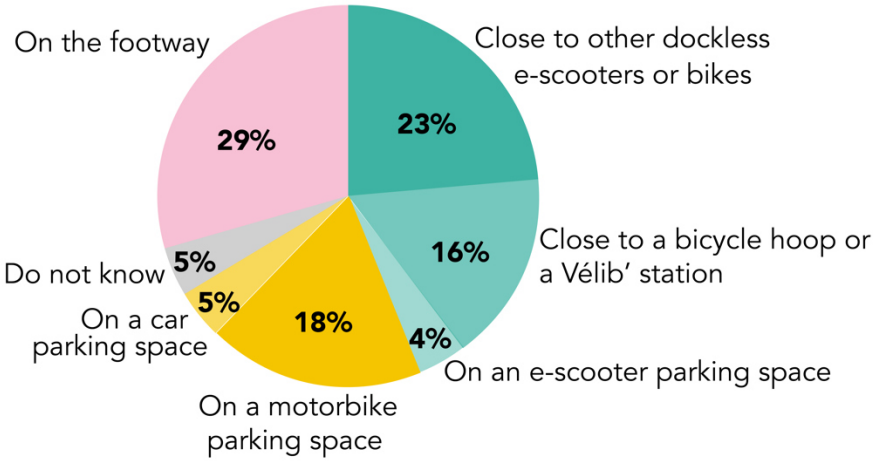


Figure 5 – Parking at the end of e-scooter last trip in Paris in the autumn of 2019. Source: 6t

FINDING A DOCKLESS E-SCOOTER

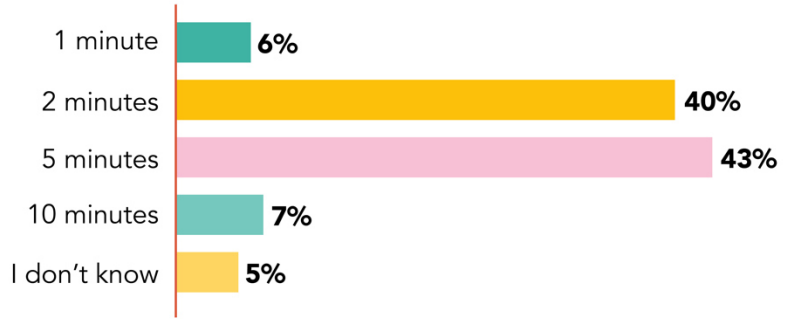
Users were asked about their satisfaction with various aspects of the service. In both surveys, the availability of e-scooters appears rather satisfactory. In the spring of 2019, 19% of shared e-scooter users in Paris declare themselves "very satisfied" with availability and 51% "rather satisfied" (according to Lime, there were about 950,000 users when the survey was conducted). In the autumn of 2019, satisfaction is slightly higher in the autumn 2019 in Paris, with 25% of users declaring themselves "very satisfied" with availability and 49% "rather satisfied".

This raises the question of the acceptable walking time: how long are users ready to walk to pick up an e-scooter? On average, and in both surveys, users surveyed walked about 5 minutes, with a median time of 3 minutes, to reach an e-scooter. The majority of users consider this to be satisfying or acceptable.

In addition to observed practices, users have been surveyed about the maximum time they would be willing to walk to access an e-scooter. In the autumn of 2019, the largest group of Parisian users (46%) were not willing to walk more than 2 minutes to find an e-scooter; a second group (43%) mentioned they would accept to walk up to 5 minutes but no more than that. Only a small minority (7%) would accept to walk a maximum of 10 minutes. The rest of respondents (5%) felt unable to answer this question (Figure 6).

Walking time acceptability

Maximum acceptable walking time to find an e-scooter among users in Paris (autumn 2019)



Share of e-scooter users ready to walk...

Figure 6: Walking time acceptability among users in Paris in the autumn of 2019. Source: 6t

All in all, a2-minute walking time would suit almost all users (90%), and then appears as ideal, while a 5-minute walking time would only be acceptable to half of users. 5 minutes therefore appears as an absolute maximum when it comes to finding an e-scooter, and a 2-minute access time would be recommended to ensure the majority of users can rely on the service for their daily mobility.

This should be put into perspective with the average trip duration in Paris, which is 20 minutes in the spring of 2019 and 13 minutes in the autumn of 2019, with medians of 12 and 10 minutes respectively. A five-minute walking time to find the vehicle represents half to a quarter of the time actually spent riding an e-scooter, confirming that it should be interpreted as an absolute maximum for access and egress time combined.

Results from these different types of data thus suggest that **parking should be planned so as to ensure a 2-minute access trip and 2 min egress trip to a shared e-scooter, so as to maintain service efficiency** (Figure 7).

Walking time to access an e-scooter and reach one's final destination: a key issue

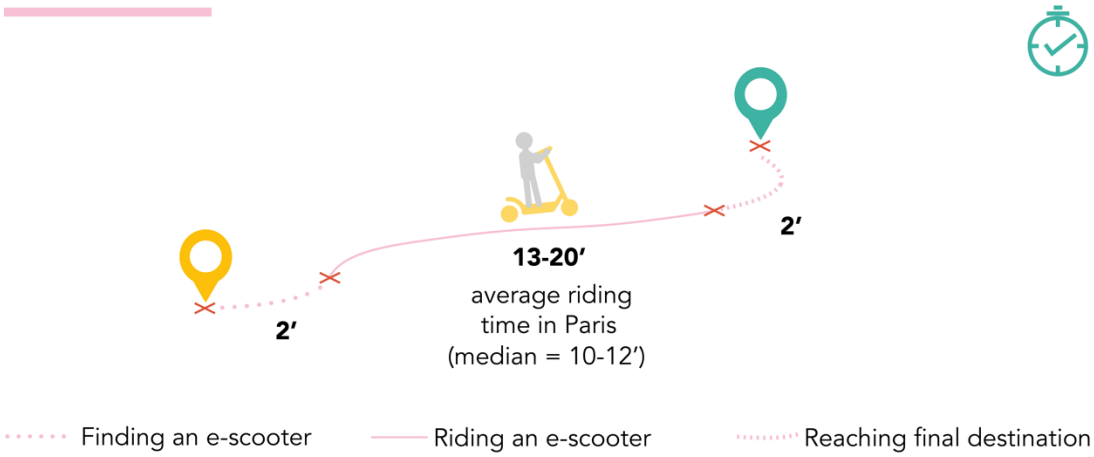


Figure 7: Average riding time among e-scooter users in Paris and acceptable additional walking time. Source: 6t

It is worth underlining that a lack of availability can lead users to engage in forbidden and dangerous behaviours. Indeed, among those who rode with a passenger on the same vehicle, the lack of available vehicle nearby is the most frequently mentioned reason. In the autumn of 2019, 46% of users who rode an e-scooter with a passenger in Paris mentioned the lack of availability, which made it the first motivation out of a closed list of 6 items, before the "pleasant or fun" aspect (mentioned by 43% of users, several possible answers), the possibility to reduce the cost of their trip by splitting it (27%) and the possibility to travel with someone who had not downloaded any e-scooter application (also 37%).
Even if respecting the rules is a question of individual responsibility, providing a dense enough parking network can contribute to preventing such behaviour, or at least allow users to take collective trip safely, that is each on a different vehicle.

3.4 Intermodality: a need to provide parking near public transport

ONE-SIXTH OF E-SCOOTER TRIPS ARE COMBINED WITH PUBLIC TRANSPORTATION

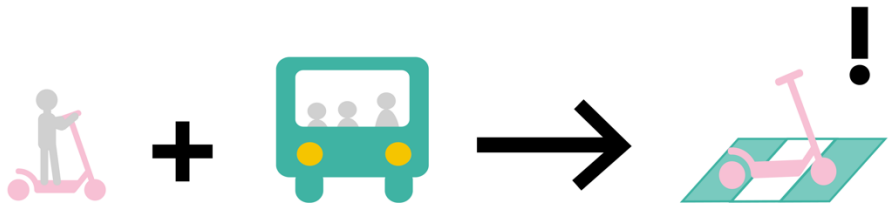
As a flexible and practical mobility solution, dockless e-scooters are often combined with other modes of transportation. To this regard, the two surveys show very similar results, with about a quarter of last e-scooter trips being intermodal trips: 24% in the spring of 2019 and 27% in the autumn of 2019. The intermodal nature of such trips implies specific needs regarding parking.

The key finding is that, when intermodal, e-scooter trips very often include public transportation: in the spring of 2019, 69% of intermodal trips include taking a bus, a metro or a suburban train, as do 61% of trips in the autumn of 2019. All in all, in both surveys, 16%-17% of all trips are made using a dockless e-scooter in intermodality with public transports. This points to the challenge of ensuring enough parking provision near public transport hubs; this is actually where the first parking areas were developed in Paris (see following chapter).

But intermodality is not the only challenge: when asked about the other mode they would have used had shared e-scooters not been an option, 32% of users answered they would have used public transportation in the spring of 2019 and 35% in the autumn of 2019. This public transport trip captured may be perceived as being negative but put into perspective with the 0.8 to 1.9% modal share of e-scooters, it remains limited. It might even be an asset in face of the current COVID-19 pandemic. In any case, it points to the importance of all providing a parking infrastructure supportive of a variety of origins and destinations.

On that point, it is worth underlining that trip capture from private cars has been limited in Paris: in both surveys, 2% would have used their personal car and less than 1% a shared car. However, only 10% of all trips conducted by Parisians are done using a private car[16], meaning there are fewer car trips to capture in Paris than there are in many other metropolises. This should be kept in mind when exploring the case of London.

With one-sixth of e-scooter trips combining it with PT, a need for parking at bus or subway stations



DOCKLESS E-SCOOTERS AND PUBLIC TRANSPORTATION: A TWOFOLD ISSUE

According to users, dockless e-scooters can ease access to public transport stations, or even enable access to previously inaccessible stations. It can also enable users to avoid transfers between two lines.

[16] EGT 2010 – STIF – OMNIL – DRIEA. http://www.omnil.fr/spip.php?article81

"There are some trips I would have walked or used public transportation, but it [shared dockless e-scooter] allows me to avoid a transfer." Dockless e-scooter user in Paris

Dockless e-scooters' intermodality with public transportation can foster public transport use and thus meet the goals of local authorities. Moreover, it raises the issue of providing e-scooter parking near public transportation stations, so as to allow users to make their first or last mass transit miles with this micromobility solution.

However, regarding public transportation, the impact of shared dockless e-scooters is twofold: if they can foster public transportation use, they can also replace it: in Paris, more than 30% of e-scooter trips replace public transport use. This may be considered to be a negative result when modal shift from cars is a key goal. However, in the context of overcrowded public transport in large metropolises, and adding COVID-19 into the mix, e-scooters can provide an interesting solution to make public transport safer.

3.5 Conclusion: Parking, a watermarked issue in users' concerns

Users appreciate shared dockless e-scooters for their rapidity and their convenience, with the possibility to make door-to-door trips. Availability and parking network are thus a central aspect of the service's attractiveness. As e-scooter trips are quite short, walking more than 5 minutes to find an e-scooter or to reach one's final destination considerably lengthens the overall trip duration, eroding the attractivity of this solution. At the time of both surveys, about 15,000 e-scooters were deployed in Paris, that is, about 142 e-scooters per square kilometre. This vehicle density appeared to be satisfactory to users, as the majority of them declared to be satisfied with availability.

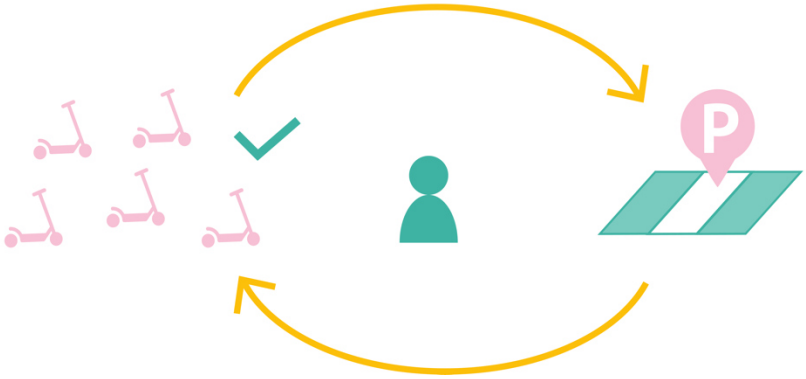
Shared e-scooters appear to offer two key opportunities for local authorities. First, they ease intermodal trips: 27% of trips conducted in Paris in the autumn of 2019 were intermodal, while it is only the case of 9% of regular bicycle trips in Paris[17]. Their asset for intermodality appears obvious: it frees users from the worry of finding a secured parking spot to lock their bicycles – bike hoop provision being limited around public transport stations – and from fear of theft. Parking provision close to public transport thus appears key for this benefit to materialise.

Second, shared dockless e-scooters can also provide an alternative to public transport. While the net sustainability impact of these two contradictory dynamics warrants further investigation, this is a key asset to limit pressure on public transport during the COVID-19 outbreak.

[17] Enquête Globale Transports 2010, STIF-OMNIL-DRIEA, http://www.omnil.fr/spip.php?article81

Finally, results from these two users surveys conducted in Paris suggests that limited vehicle availability, which may be entailed by fleet caps or very restrictive parking regulations, encourages illegal and dangerous behaviour, such as that of carrying a passenger on a bicycle. Parking provision thus also has indirect impacts on the way these services will be used.

Availability and parking: interrelated issues for users



4. DESIGNING A SOUND PARKING MANAGEMENT SYSTEM: VIEWS FROM KEY STAKEHOLDERS

4.1 Introduction

CONTEXT AND GOALS

The previous section has showed that users value door-to-door mobility and limited access times to shared e-scooters, suggesting that dense parking is a key aspect of a positive customer experience. How does the imperative for widely available parking areas interact with local authorities' goals and constraints?

According to lawyers Carine Staropoli and Benoît Thirion[18], the emergence of dockless mobility operators creates a new situation for local authorities. Before, they were faced with two options when planning for transport: either "doing", that is, operating the service themselves directly, or "having someone do", that is, delegating service operation to a private actor, or offering it jointly through a public-private partnership. Now, with smart mobility services, local authorities have to learn to "let do", or "*laissez faire*", which means creating operating conditions through norms and contracts without being involved in managing operations. As noted by Docherty et al. (2018:115)[19], we now need to think about "*how the state might effect its own strategic transition from the traditional task of carrying out 'public management' to instead ensuring the capture of 'public value' in order to approach the challenge of governing the Smart Mobility transition effectively*".

This key transition has been observed in France from the launch of services in the summer of 2018 to today, and will be analysed in this chapter. As will be demonstrated, "*laissez faire*" implies developing strategies to acquire the knowledge that can only be developed through day-to-day service operations. Those local authorities that realised it, such as Paris or Lyon, decided to (1) leverage private operator's expertise to regulate efficiently while maintaining quality of service; (2) develop city-wide parking strategies.

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[18] Staropoli C. et Thirion B., (2019), « Action publique locale et transformation digitale : les collectivités face au tryptique « faire, faire-faire ou laisser-faire » », *Third*, n° 2, mai 2019, pp. 14-18. URL : https://third.digital/numero-2-a-la-recherche-de-la-smart-city/a-la-recherche-de-la-smart-city/ (consulté le 05/09/2019)

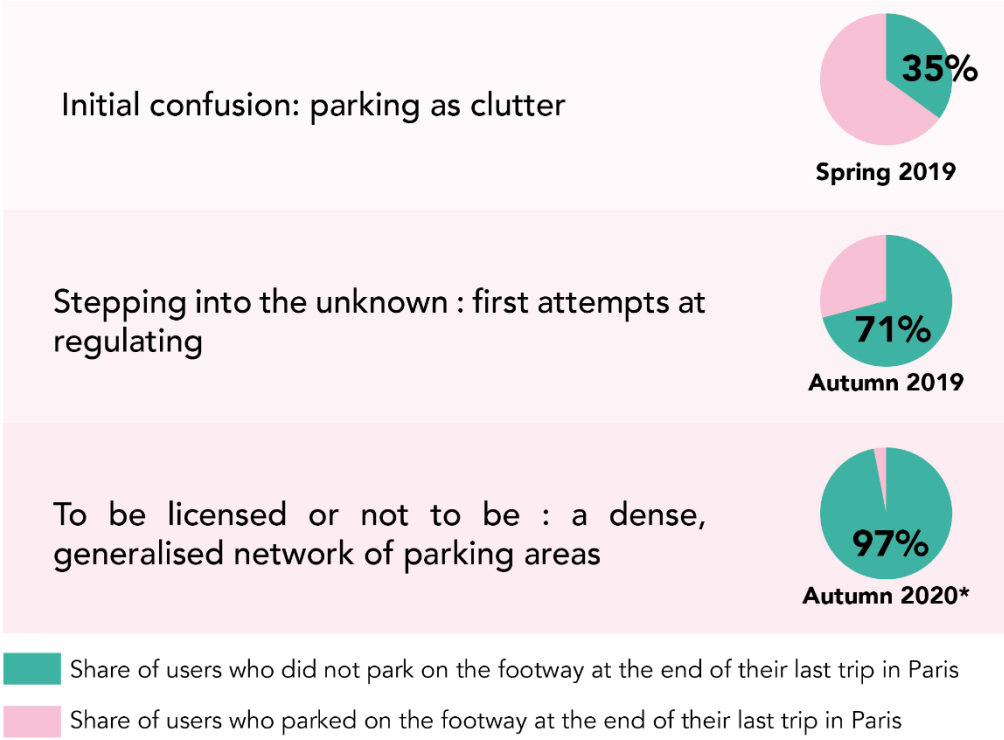
[19] Docherty I., Marsden G., Anable J., (2018), "The governance of smart mobility", *Transportation Research Part A* 115, pp. 114-125.

The regulatory process in France can be structured in three key periods:

- **Initial confusion (June 2018-May 2019)**: a period of unregulated operations and an association of e-scooter parking with clutter
- **Stepping into the unknown (May 2019 - December 2019)**: a period of knowledge-acquisition and experimentation within the pre-existing legal framework. In this period, some local authorities experimented with sometimes misguided regulations (e.g. fleet caps) while others developed unbinding regulations that would soon be formalised by law.
- **To be licensed or not to be (December 2019 – Today)**: the current period of stabilising parking management practices following the adoption of the New Mobility Guidance Law.

These three periods can be confronted with the evolution of e-scooter parking practices: in Paris, the share of dockless e-scooters parked on the footway decreased from 65% in spring 2019 (period of transition between the initial confusion and the first attempts at regulating) to 29% when local authorities first attempted regulating, and reached the very low figure of 3% in autumn 2020, when a thorough parking network had been delivered and parking practices had been regulated through licensing.

Regulation and parking compliance



** data provided by Dott*

METHODS

The following section will rely on two key sources of information. The first is a thorough press review and literature review to document stakeholders' stance towards parking, as well as to document the attempts at regulation from the arrival of dockless e-scooters in France to today.

The second is a set of interviews previously conducted by 6t with 20 French local authorities in France. These interviews were organised in the summer of 2019 as part of one of 6t's self-funded research campaigns, supported by a grant from the French Environment and Energy Management Agency (ADEME)[20]. At that time, shared e-scooter services had been operating in France for about a year, but the new mobility law (*Loi d'orientation des mobilités*, December of 2019) had not yet been passed, meaning that local authorities did not yet have any guidelines as to how to regulate these services. These interviews are thus very helpful to document different approaches to e-scooter parking before the situation stabilised. Interviews were conducted with three groups of local authorities:

- Local authorities that had dockless micromobility services operating on their territory at the time of the interviews: Lyon, Marseille, Toulouse, Bordeaux, Nice, Strasbourg, Grenoble, Tours, Angers, Metz and Perpignan. While Paris was not included in the interviews, 6t works closely with the Paris city hall and is thus able to present their approach, with the support of press sources. These local authorities started thinking about parking regulation from the very early stages of the micromobility boom;
- Local authorities that previously had dockless micromobility services operating on their territory, but no longer had any at the time of the survey due to service failure (Lille, Reims, Montpellier), or forceful removal of vehicles (Nantes);
- Local authorities that never had such services operating on their territory, either because they had stalled the arrival of such services (Strasbourg), or were currently discussing with operators and trying to define the proper conditions for their operation (Rennes, Rouen, Orléans).

To understand how local authorities' demands were resonating with operators' constraints, we also interviewed dockless mobility service operators (beyond shared e-scooter operators), including Pony Bikes, Lime, Dott, and JUMP.

[20] 6t, (2019), *Livre blanc de la mobilité en free floating*, 144 p., URL : https://6-t.co/etudes/livre-blanc-de-la-mobilite-en-free-floating/

4.2 Initial confusion unregulated operations and perceptions of parking as clutter

Contrary to the British legal system, the French legal system implies that anything that is not explicitly prohibited is allowed. The initial period following the launch of shared dockless e-scooters was thus one of unregulated operations: these services were new to local authorities, and French law provided them with a limited number of tools to regulate parking, and with no guidance regarding the proper conduct to follow. The start was even rougher for certain local authorities, who saw these services emerging on their territories without any prior, informal consultation. This was the case Bordeaux and Toulouse, which saw Lime launch its e-scooter service without having been informed beforehand; this launch was quickly followed by the local authorities' demand for removal.

The Chinese dockless bicycle experience, conveying the image of street clutter and massive bicycle dumping sites, was very present in local authorities mind at that time, especially by local authorities that did not yet have dockless e-scooters on their territory such as Strasbourg, Nantes, or Rennes.

> *"We were worried about parking from the very onset, even though nothing prevents us from materialising parking spaces on the ground. But our big question was: how can we enforce these rules?"*
> *Guillaume Porcher, Rennes Métropole*

Several local authorities, such as that of Toulouse or Tours, underlined that fear regarding e-scooters' place in the public space was accentuated by these vehicles' novelty: public space has already been planned to accommodate the mobilities of pedestrians, cyclists, and cars, but where would these new vehicles fit? This raises a new challenge: that of integrating these new services in urban design.

4.3 Stepping into the unknown? First attempts at parking management

After an initial period of wariness, a subset of cities, the majority of them being among the largest metropolises in the country, started realising the extent of public demand for these services, and experimenting within the pre-existing regulatory system.

THE DANGER OF REGULATING THROUGH QUANTITIES

Interviews conducted with local authorities in France showed that the initial image local authorities had of e-scooter parking was the following: too many scooters had flooded onto their streets, and some should be removed. This led the majority of French local authorities

to initially consider quantity to be the main issue, and to tackle the negative externalities induced by unregulated parking by acting on fleet sizes.

This 'regulating through quantities' approach presents a certain number of risks: by imposing an arbitrary fleet cap, local authorities risk limiting the efficiency of the services they are trying to integrate in their mobility system. This dynamic has been well documented in the textbook case of Autolib', Paris's former carsharing system that went bankrupt in spite of its popularity (see Lagadic et al.'s [21] analysis in the box below). Analysing Autolib's open data, 6t linked the service's bankruptcy to a growing number of registered users per car, leading to a decrease in frequency of use that was not corrected when vehicles became more easily available: users had been disappointed, and would not come back to the service. [22] While this situation was not linked to a regulatory fleet cap, it shows the impact of inappropriate fleet sizes on uses.

Autolib case study: illustrating the importance of vehicle availability (Lagadic et al., 2019)[23]

Initiated by the City of Paris itself through a public tender, Autolib' was launched by service provider quickly became the most successful carsharing service in the world in terms of car rentals per day. Yet, it went bankrupt in 2018[24, 25]. What went wrong ?

Several studies published by 6t[26] have revealed that, while the number of registered users kept growing, fleet size stalled, and the frequency of use per registered users decreased. This data is telling: **as an increasing number of registered users competed for a relatively stable number of cars, it became more difficult for users to easily find an available car**. As they faced more and more failed attempts, their reflex-use of Autolib' was eroded. Not only was that trend measured when the number of vehicle per registered users was too low, but it also maintained through time. It appears that **those users who had stopped using the service did not come back when cars became more easily available**.

This situation was not due to a publicly enforced fleet cap, but to the company's managing decisions. However, it provides a useful illustration of the damages an inappropriate number of vehicles per registered user ratio can cause.

This imperative of vehicle availability to retain users is true not only for carsharing, but for all shared mobility services, as illustrated by the case of Cityscoot (shared e-motorcycle service) in Toulouse. This shared mobility service operator started discussion service launch with the

[21] Lagadic, M., Verloes, A., Louvet, N., 2019. Can carsharing services be profitable? A critical review of established and developing business models. *Transport Policy*, 77 (2019), pp.68-78.
[22] Ibid
[23] Ibid
[24] Le Parisien, 2018. Ile-de-France: cette fois, Autolib' c'est fini !. June 15th 2018. Available at : http://www.leparisien.fr/paris-75/cette-fois-autolib-c-est-fini-15-06-2018- 7774590.php.
[25] Lagadic, M., Verloes, A., Louvet, N., 2019. Can carsharing services be profitable? A critical review of established and developing business models. *Transport Policy*, 77 (2019), pp.68-78.
[26] 6t, 2017, « Autolib' n'est pas rentable et ne le sera peut-être jamais ». Available at : http://6t.fr/autolib-nest-toujours-pas-rentable-et-ne-le-sera-peut-etre-jamais/

city of Toulouse following a "call for expressions of interest" launched by the local authority. Interviews conducted with the Toulouse Metropolis as well as Cityscoot revealed a mismatch between the regulatory approach adopted by the local authority, and the operator's business model constraints. The city of Toulouse decided that each dockless mobility service on its territory would be limited to 100 vehicles for an undetermined time length. The firm estimated it would need at least 500 vehicles to ensure a good quality of service in the initial stages[27] and thus, hope for profitability in the longer run. They thus decided not to launch, rather than launching a sub-optimal service, and losing customers' trust. Moreover, one can assume that, should the service have been launched in this sub-optimal model, this would have resulted in rather bad press for the local authorities, as it would have sanctioned the arrival of an inefficient service through an official selection process. This is a key point given that interviews with French local authorities suggested that many saw e-scooter services as a city branding device.

Toulouse was not the only city to adapt that approach, it was also the case of Bordeaux. In June of 2019, the city decided to adopt a code of conduct limiting e-scooter fleet sizes to 100 vehicles per operator, a fleet cap which led to discontent on the part of operators[28]. Due to this fleet cap, the Bordeaux micromobility market displays a great variety of operators, with 7 currently offering a total fleet of 700 vehicles in the city[29]. This may, arguably, lead to a lack of convenience for end-users and a need to switch from one app to the other to find a vehicle. Let us also note that this fleet cap appears quite low compared to the fleet sizes currently available in major cities (see following part for details): Lyon's 4,000 parking spots amount to a 83 vehicle per square kilometre ratio, Paris' 15,000 parking spots ensures a 142 vehicles per square kilometre ratio, while Bordeaux's only currently allows for 14 vehicles per square kilometre, leading to a much lower vehicle availability. The local authority has recently announced that these fleet caps might be lifted by the end of the year, suggesting that his strategy is no longer perceived to be relevant in the long run [30].

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[27] CityScoot, 2018, Communiqué de Presse, Toulouse, https://www.cityscoot.eu/wp-content/uploads/2018/08/20180825-CP-Cityscoot-Toulouse.pdf (consulté le 09/07/2019)

[28] La Tribune, 2019, « Vélos, scooters et trottinettes en libre-service : Bordeaux débute une expérimentation jusqu'en septembre ». https://objectifaquitaine.latribune.fr/business/2019-05-27/velos-scooters-et-trottinettes-en-libre-service-bordeaux-debute-une-experimentation-jusqu-en-septembre-818547.html

[29] 20 minutes, 2020, « Bordeaux : un septième opérateur de trottinettes électriques s'installe », https://www.20minutes.fr/bordeaux/2852023-20200902-bordeaux-septieme-operateur-trottinettes-electriques-installe#:~:text=Aujourd%27hui%20il%20existe%20environ,flotte%20de%20200%20scooters%20%C3%A9lectriques

[30] Sud Ouest, 2020, « Le free floating fait carton plein » https://www.sudouest.fr/2020/08/11/le-free-floating-fait-carton-plein-c-est-simple-et-agreable-a-utiliser-7737776-10414.php

WORKING WITH OPERATORS TO ACQUIRE KNOWLEDGE

On the other hand, other local authorities decided right away to get to know the unknown by experimenting with participatory regulatory frameworks. In the autumn of 2018, when shared e-scooter services had only been operating for some months, the Paris City Hall commissioned 6t to gather all available data on shared e-scooter services to get a preliminary understanding of these services. At the same time, it started discussing regularly with all operators present in the city to develop relevant parking plans. In Paris, parking-related discussions between operators and the local authority happened both at the level of the city and at the level of the boroughs (*arrondissements*) that have a local expertise about the most practical parking spots.

> *"The 13th district neighbourhoods councils received me. […] Each neighbourhood is represented by a person who is able to suggest relevant deployment areas, and to point out those areas where it would not be practical to put vehicles […] I received concrete proposals as to where they should be deployed […]. It was a successful initiative for both parties as we were happy to be given an opportunity to express our point of view, and received precious information. […] A key feedback we received was about intermodality with buses. Before, we were focusing on metro station and we understood that in peak hour, micromobility can offer a fast and pleasant way to go somewhere [note: alternative to buses]". Nicolas Gorse, Dott France*

Similar discussions were reported in other French cities, such as Toulouse. Our contact at the Toulouse Metropolis reported that parking areas were defined jointly with dockless e-scooter and bicycle operator IndigoWeel.

> *"Our contact person at IndigoWeel came and we worked together on a map. They asked us where we wanted them to but the bicycles. We suggested about 15 different spots". Arnaud Turlan, Toulouse Metropolis*

In most cities, these discussions were followed by the definition of a code of conduct, Paris acting as a trailblazer. By signing the May 2019 Paris dockless e-scooter code of conduct, operators committed to ensuring that end-users do not park e-scooters in a way that would obstruct pedestrians' mobility on footways, and to favour parking in the dedicated parking areas that were being developed at the time. Developing these parking spaces took some time; to ensure convenience and efficiency, especially in the earlier stages of service deployment, the Paris local authority allowed shared e-scooter users to park in bicycle, car or motorcycle parking spaces, when dedicated e-scooter parking areas were not available

nearby[31]. As the number of dedicated parking areas increased, this "exception" was restricted to motorcycle parking areas only[32]. Finally, operators committed to corrective measures to remove wrongly parked vehicles. In addition to this non-legally binding code of conduct, the city of Paris adopted a city by-law allowing it to impound those vehicles that were illegally parked[33].

Figure 8 – Dedicated parking spaces for shared e-scooters in the Paris 4th district, July 2019 (source: Paris City Hall, 2019).

4.4 To be licensed or not to be : the current regulatory framework

These initial informal discussions and unbinding regulatory frameworks – codes of conduct having no legal value – happened while local authorities were expecting France's new guidance mobility law. Following its adoption in December of 2019, major cities switched to a system of operator selection and licensing; these licenses are conditional on the respect of certain rules, many being related to parking. In this final period, the largest French metropolises such as Paris, Lyon or Bordeaux have become directly involved in developing dedicated e-scooter parking spaces at their own expense. The British legal system prevented these services from being launched before proper regulation was in place; London thus faces the opportunity to enter the micromobility era directly into this stabilised situation.

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[31] Paris City Hall, 2019, "On ne gare pas sa trottinette électrique n'importe où [One cannot park an e-scooter just anywhere]", https://www.paris.fr/pages/le-saviez-vous-on-ne-gare-pas-sa-trottinette-electrique-n-importe-ou-6745

[32] Dott, 2020, « Comment et où se garer – France [How and where to park – France] », https://help.ridedott.com/hc/fr/articles/360012182039-Comment-et-o%C3%B9-se-garer-France

[33] Ville de Paris, 2019, Bulletin officiel de la ville de Paris du mardi 30 juillet 2019, https://www.api-site.paris.fr/paris/public/2019%2F6%2F2019_07_30_BOVP_060.pdf

THE NEW MOBILITY GUIDANCE LAW

The new guidance law on mobility (*Loi d'orientation des mobilités*, or LOM) was passed in December 2019 after more than a year of discussions, the crux of the matter being dockless mobility and e-scooter regulation. Rather than offering local authorities with strict guidelines, it allows them to sanction service operation through the granting of a licence, this licence implying the respect of certain conditions. These conditions may be related to:

- Fleet size
- Service area
- Parking rules
- Vehicle type
- Publicity
- Neighbourhood tranquillity

This law thus allows local authorities to regulate parking, but do not provide them with a recommend way to follow. In spite of this, the largest French cities all seem to have adopted the same way forward: that of designated parking areas. The mechanism was experimented before the LOM was passed and has been maintained since then. As early as December 2018, the French National Railway Company defined the first dockless micromobility parking areas around a large railway station (Gare de Lyon). This initiative aimed at limiting public space clutter, given the importance of intermodal trips with trains. The local authority soon followed suit: the City of Paris started inaugurating its first dedicated e-scooter parking spaces in July of 2019.

Following the adoption of the LOM, the City of Paris launched a competitive bidding process to select operators that would be granted a licence. Operators were selected following three key criteria[34]:

- User safety (30%) including accident prevention, vehicle reliability, user insurance, and protection of privacy;
- Fleet management, maintenance and charging (30%) including the spatial equilibrium of fleet development, vehicle revision and removal of broken vehicles, and management of unduly parked vehicles;
- Environmental responsibility (40%) including the durability of vehicles, of maintenance dispositions, or energy used, as well as multimodal integration.

Dott, Lime and Tier were selected to operate in Paris starting from September 2020. The licences they have been granted give them access to 2,500 e-scooter parking areas that have been planned and created by the Paris City Hall on its own funds; operators are not allowed to alter public space. The fees paid by operators (50€/e-scooter/year) contributes to funding infrastructure delivery and maintenance. Parking outside of these dedicated zones has now

[34] Ville de Paris, 2020, « Remisage sur le domaine public de flottes d'engins de déplacement personnel motorisés en libre-service sans station d'attache. Appel à candidatures ». https://cdn.paris.fr/paris/2019/12/19/638d1f516fc9be79d7a7b3c80f1b6871.pdf

become forbidden. Selected operators commit to ensuring their users park in these dedicated zones: due to geofencing technologies' lack of precision, most operators have chosen to ask end-users to take a photo of their parked vehicle at the end of each ride.

Figure 9 – Dedicated e-scooter parking spaces in the Paris 12th arrondissement (source: 6t, 2019)

Each of the 2,500 parking areas, most being created on former car parking spaces, can fit 6 e-scooters, leading to a total of 15,000 e-scooter parking spots. These parking areas have been created by prioritising those parking spots that are close to intersections and pedestrian crossing areas, thus contributing to improving visibility and safety for all road users. It is important to note that the December 2019 new mobility law makes limiting car parking at intersections mandatory ; the Paris City Hall started this transition before the law was adopted, and used it as an opportunity to develop shared micromobility service parking areas. These zones have to be equally shared between operators, meaning that each operator can only park a maximum of 2 vehicles on each 6-vehicle parking area, as that each operator has a maximum fleet of 5,000 vehicles, that is, 47 vehicles per square kilometre. The 'regulating through quantity' discourse is still adopted by some representative at the Paris City Hall, such as Green Party's David Belliard, who declared that "*we were in a jungle-type of situation, now we are opening a new chapter: we regulated, we limit the number of vehicles*"[35]. However, it is worth underlining that the publicly sanctioned parking spots allow 15,000 shared e-scooters to park, that is, the highest fleet size attained since shared e-scooters arrived in Paris. It thus appears that the local authority has aligned with operators' choices regarding fleet sizes, suggesting that both of these stakeholders' found their goals to be aligned. This choice appears to be fitting in light of 6t's user survey results: in 2019, a 15 000 e-scooter fleet in the city was considered to be satisfactory for users. While this total fleet size was shared, as it is today, between a variety of operators, it is worth underlining that end-users tend to subscribe to a variety of services to increase vehicle accessibility: in the autumn of 2019, 85% of Dott users had already used another app. This share was of only 29% for lime users in the spring

[35] France Bleu, 2020, « Paris choisit Dott, lime et Tier pour déployer des trottinettes en libre service » https://www.francebleu.fr/infos/transports/paris-choisit-dott-lime-et-tier-pour-deployer-des-trottinettes-en-libre-service-1595512763

of 2019, a discrepancy that can be explained by the fact that, at that time, Lime allegedly managed the largest e-scooter fleet in the city.

Figure 10 – E-scooter parking areas in Paris. Source of data : Paris open data, https://opendata.paris.fr/explore/dataset/emplacements-de-stationnement-trottinettes/information/?disjunctive.code_postal&disjunctive.categorie. Production: 6t.

How do these new mandatory parking areas impact end-users' experience, compared to the situation surveyed by 6t in 2019? It has been noted in the previous chapter that, before parking regulation, end-users walked an average of 5 minutes to reach an e-scooter. They were also willing to walk a maximum of 5 minutes from the e-scooter to their final destination after parking; it was unclear whether these 5 minutes would be added to a 5-minute access trip, it will thus be assumed that an end-user should walk no more than 5 minutes, access and egress, to reach an e-scooter. The city of Paris's open GIS data (Figure 10; Figure 11) allows us to estimate that this system ensures an average of 32 stations per square kilometre within Paris, and that each station is, on average, situated only 102 meters away from the next, that is, 1-minute walking time. The regulated system thus appears not to limit the quality of users' experience in any way.

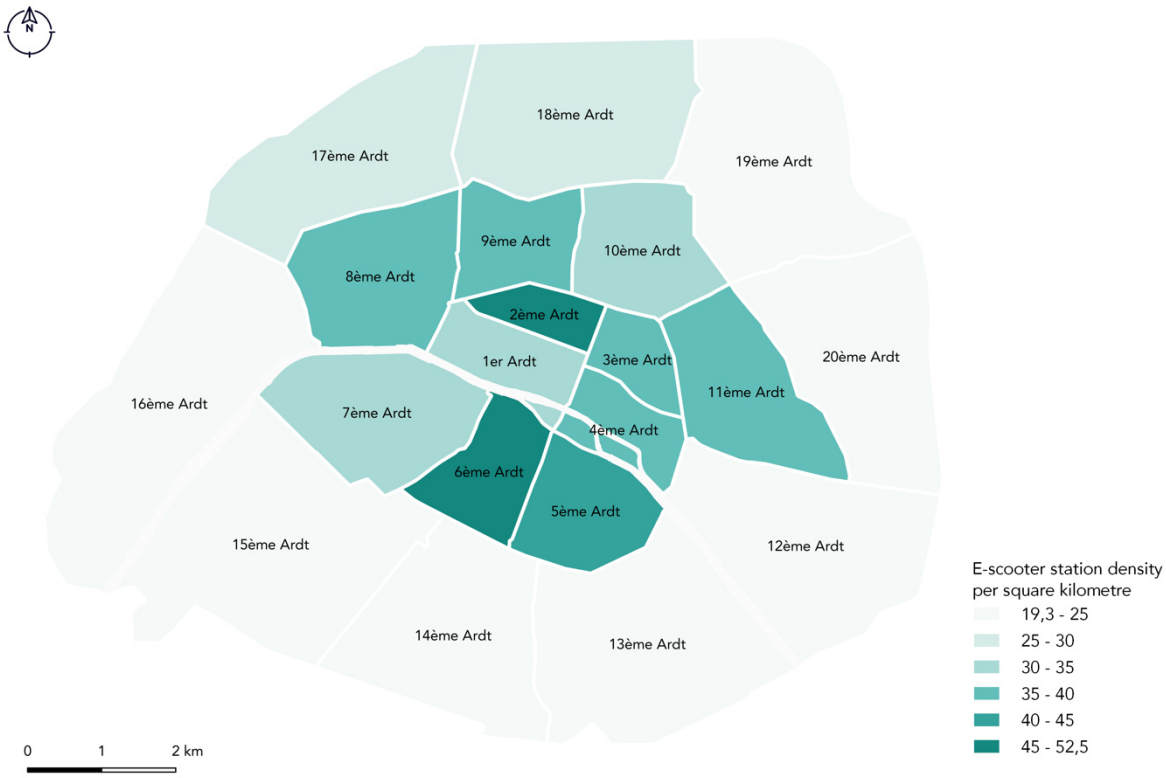

Figure 11 – E-scooter station density per square kilometre. Source of data: Paris open data https://opendata.paris.fr/explore/dataset/emplacements-de-stationnement-trottinettes/information/?disjunctive.code_postal&disjunctive.categorie. Production: 6t.

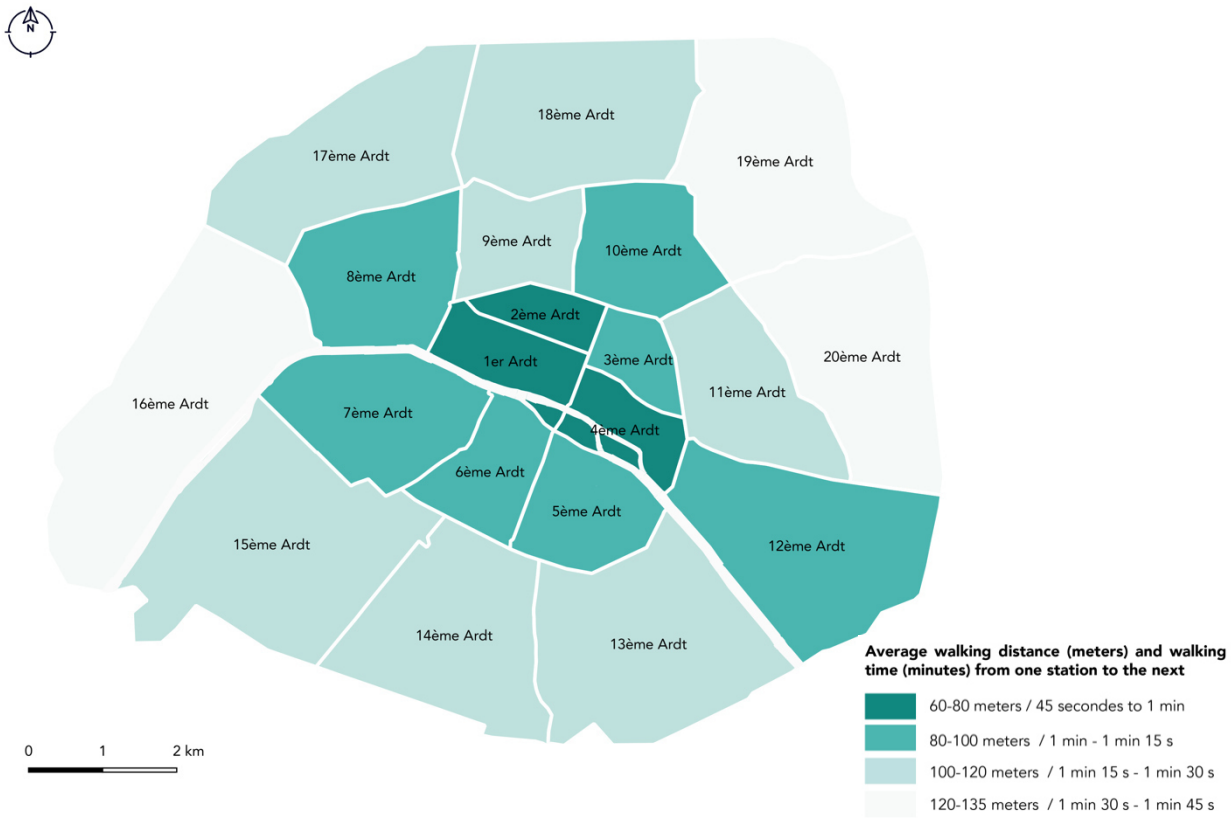

Figure 12 – Average walking distance to the nearest shared e-scooter parking station, per borough

Lyon also launched its own selection process, using rather similar criteria, but adding that of multimodal data integration[36]. Drawing inspiration from the LADOT (Los Angeles Department of Transportation) "mobility data specification"[37] solution, Lyon is developing a transparent data-sharing platform using APIs to standardise data and ease its sharing. This project is explicitly aimed at developing smart regulation measures, instead of sustaining former "*hit or miss approaches*", as explained by Lyon Metropolis' Pierre Soulard.

> *"We cannot force operators to share their data, but our discourse is the following: help us prepare the framework that will regulate your service tomorrow. We can either use a hit or miss approach, like today. But we will be way of the mark, and that will neither suit us, nor suit you [the operators]. Or you can make your data available*

[36] Ville de Lyon, 2020, Règlement de l'appel à projets. Pour l'occupation temporaire du domaine public en vue d'une activité de location de trottinettes électriques en libre-service, sans station et sans attache. https://www.lyon.fr/sites/lyonfr/files/content/documents/2020-03/Appel%20%C3%A0%20projet%20location%20de%20trottinettes_1_0.pdf

[37] https://slate.com/business/2019/04/scooter-data-cities-mds-uber-lyft-los-angeles.html?TrucksFoT= (consulté le 02/07/2019)

for 3 months, maybe 6 months, we process it on our data platform, and we can have a clearer idea and build the best suited regulatory framework for your activity." Pierre Soulard, Lyon Metropolis

In Lyon, the selection followed the definition of a city-wide parking plan, aimed at "*answering the needs of end-users and organising vehicle parking in the public space while respecting pedestrians and other transport modes*"[38]. Using data shared by operators, the City Hall identified and grouped main e-scooter origin and destination areas so as to define priority sectors for dedicated parking development. The selection process itself aimed at selecting two operators, each with a maximum fleet of 2,000 vehicles.

The Bordeaux City hall adopted the same mechanism, and also transformed pre-existing car-parking spots into e-scooter parking spaces. These three local authorities appear to be convinced that the future of dockless mobility is, in fact, to "re-dock".

"The 'dockless' service format was born out of a wish to limit the constraints associated with docking. It may endure through a return to more docked solutions that are more visible and better regulated" Pierre Soulard, Lyon Metropolis

The definition of dedicated parking spaces and conditioning the licence on the respect of this norm makes private operators responsible for the behaviour of their end-users. In an interview with Dott, Nicolas Gorse explained that this led Dott, in Paris, to integrate sensitisation messages to its app, ask end-users to take a picture of their vehicle once parked (10€ fine for incorrect parking or improper picture), as well as to dedicate its operations team to re-positioning cumbersome e-scooters.

"We need to both prevent and correct." Nicolas Gorse, Dott France

To some local authorities, such as Bordeaux, educating end-users is key. Bordeaux Metropolis' Nicolas Fontaine, for instance, noted that "*service operators ensure that vehicles are parked in dedicated spaces, but end-users are far less careful*". This brings us back to our previous point about convenience: parking provisions should be defined by keeping the end-user in mind, as an end-user who finds parking to be too far or impractical will be more likely to leave its vehicle in an inappropriate spot.

A FREE PUBLIC SERVICE?

Several local authority representatives suggested that dockless e-scooter services amounted to a free public service: it would offer their constituents a new mobility option, without them needing to invest in it. It nevertheless appears that those French local authorities that have

[38] Ville de Lyon, 2019, « Trottinettes électiques : les nouvelles obligations ». https://www.lyon.fr/actualite/deplacements/trottinettes-les-nouvelles-obligations

offered a stable operating ground for these services, and thus ensured their end-users with continuity of service while limiting negative externalities, were those local authorities that invested in parking management. Before the new mobility law, Marseille was the first local authority to launch a call for tender to select three operators in October 2019: Bird, Voi (now Blablaride) and Circ[39]. In this call for tender, operators were asked to design the type of stations they could use to organise parking, as well as to lay out measures to control and incentivise proper parking on the part of customers ("bonus" points, cost reduction, etc.)[40]. However, these do not appear to have been delivered. Due to users' continued unruly parking, the three operators have announced the launch of a joint patrol to re-position badly parked e-scooters[41]. Let us note that the city of Marseille did not plan nor deliver dedicated parking areas, which may have contributed to this situation.

4.5 Takeaways to ensure an efficient service for end-users

Users surveys in Paris demonstrated shared dockless end-users especially value the service's convenience, that is the possibility to travel fast and make direct, door-to-door trips. Vehicle availability and parking conditions are thus key aspects of users' experience. These features are directly impacted by measures such as fleet caps, or by scarce parking space provision.

Local authorities are particularly concerned with user safety and street clutter, which led many French cities, in the early stages of the micromobility boom, to experiment with low fleet caps. These measures discouraged some operators to launch, as they would have eroded the quality of customers' experience. One can also argue that such measures may be risky for local authorities who place the launch of shared e-scooter within their city branding strategy, should they be found inefficient by constituents. This does not mean that any fleet cap is detrimental; rather, it suggests that local authorities need to engage closely with operators so as to develop efficient measures that appear satisfactory for all parties involved in this new, public-private ecosystem.

The case of Paris suggests that allowing reasonable fleet sizes while limiting parking clutter is possible: the new system, relying on dedicated parking areas, has not eroded users' experience, as it is dense enough to limit access/egress times to about a minute. This efficient strategy has been made possible by the dialogue between the local authority and operators,

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[39] Les Échos, 2109, « Marseille régule le marché de la trottinette électrique », https://www.lesechos.fr/industrie-services/tourisme-transport/marseille-regule-le-marche-de-la-trottinette-electrique-1137099

[40] Ville de Marseille, 2019, « Appel à projet pour l'occupation du domaine public en vue d'une activité de location de trottinettes en libre-service. Règlement de consultation. » https://centraledesmarches.com/marches-publics/Marseille-Cedex-20-Ville-de-Marseille-Appel-a-projet-pour-l-occupation-du-domaine-public-en-vue-d-une-activite-de-location-de-trottinettes-electriques-en-libre-service/4534848

[41] Made in Marseille, 2020, « A Marseille, une patrouille va surveiller le stationnement anarchique des trottinettes », https://madeinmarseille.net/76318-patrouille-stationnement-circ-brid-blabla-ride/

leading to a fleet size and station density that appears acceptable for the Mayor's office, licenced service operators (Dott, Lime and Tier), as well as end-users.

This parking strategy also fits within the Paris City Hall's wider active mobility strategy: e-scooter parking areas have been created by transforming car-parking areas, especially those located close to intersections and pedestrian crossings. Exchanging cars for e-scooters improves visibility, and thus pedestrians' and active mobility users' safety.

Contrary to the discourses developed in early stages, French local authorities no longer see dockless e-scooter services as a free public service. Rather, they realised that limited investments in parking are necessary to ensure the benefits of these services manifest, while limiting externalities. Operators' participation through fees supports infrastructure development. The generalisation of regulatory measures, as well as of data sharing agreements, allows public actors to closely monitor operators' compliance with these rules. At the same time, it allows operators to engage in hands-on discussions with regulators. Their right to operate is "precarious", as noted in the Paris call for tenders, and conditional on sound management. In the case of Paris, this sound management appears to benefit all parties involved. All in all, since the summer of 2018, French local authorities have enacted their shift from being mobility providers to being mobility managers.

5. E-SCOOTER PARKING IN LONDON

5.1 Introduction

London is one of the largest developed cities in the world with incredible diversity in terms of density, land uses and demographics across the metropolitan area. The consequences of this reality are that the city has a highly complex and already constrained transport network, with substantial variation in transport accessibility between the boroughs and wards that constitute Greater London. This also sets London apart from Paris, which has the densest metro network in the world, with stations being separated by an average of 600 meters[42]. Car usage in London is considered to be particularly detrimental to the health and efficiency of the city, due to congestion adversely affecting air quality and effectively forming "barriers" within communities. These concerns have been further amplified with the COVID-19 pandemic reducing public transport accessibility and increasing the attractiveness of private car journeys. Rental e-scooters have the potential to positively improve the existing transport mix in London, and the development of an effective parking strategy would achieve this. This strategy can be informed by the experiences of a comparable city in Paris, while being mindful of these cities' differences in terms of population, transport density and urban structure.

While the impacts of car usage are well documented, car trips remain stubbornly high in London. According to TfL's Travel Demand Surveys, which is an annual questionnaire of 8,000 randomly selected households, the mode share for cars reduced by just 0.5% between 2016/17 and 2017/19. Since public transport accessibility varies considerably across the metropolis, the inversely related rate of car trips and car ownership also varies considerably. A study by Chng et al (2019)[43] found that cars in London were viewed as a necessity due to the perceived lack of accessible alternative modes of transport in areas underserviced by public transport. This is particularly relevant in Outer London, where the Travel Demand Surveys indicate that as many as 45% of trips in 2018/19 were completed by car. Even in Inner London with closer proximity to the Central Activity Zone (CAZ) and better public transport accessibility and cycling infrastructure, the mode share for cars was 19%. By comparison, according to the 2010 French Household Travel Survey, only 10% of journeys taken by Parisians occurred by car, meaning that the potential for modal change is limited. Clearly in

[42] Les Echos, 2020, A Paris le metro le plus dense du monde. https://www.lesechos.fr/weekend/voyages/a-paris-le-metro-le-plus-dense-du-monde-1213980

[43] Chng, S., Abraham, C., White, M. and Skippon, S. (2019) "To drive or not to drive? A qualitative comparison of car ownership and transport experiences in London and Singapore," Transportation Research Interdisciplinary Perspectives.

London there is an opportunity for e-scooters to assist in shifting mode share from cars to more sustainable and space efficient ways to travel.

TfL is focusing on shifting mode share away from cars to more sustainable modes of transport, with the Mayor's Transport Strategy (2018) outlining an ambition to have a target of 80% of trips in London to be completed by sustainable modes of transport (public transport, walking and cycling) by 2041. While e-scooters were not specifically referenced in this target since they were not part of the available mix of transport in London at the time the Strategy was published, e-scooters have the potential to assist with this mode shift away from cars. The purpose of the rental e-scooter trials in London is ultimately to test the veracity of this claim. To maximise the success of the trials and improve the chances of rental e-scooters becoming fully legalised in London, it is integral that a parking strategy is developed to support the objective of mode shift away from cars.

The e-scooter parking strategy should be designed to not only optimise patronage, but to encourage mode shift specifically away from cars. The travel speed, minimal physical requirements and convenience of e-scooters means that they could provide a practical alternative to cars for short or medium distances trips in London (such as to retail precincts, leisure facilities or employment clusters). Additionally, e-scooters should be complementary to the public transport network. E-scooters have the ability to "expand" the public transport network, as users could travel by e-scooter to and from residential areas to Tube and rail stations for long-distance journeys in London. As in Paris, the use of cycles for intermodal trips is similarly low in London, at approximately 10% (2017).[44] It is also expected that this low number is due to the inconvenience of having to find cycle parking infrastructure at stations and the fear of theft. E-scooters provide additional convenience. The locations of e-scooter parking areas are therefore critical for the feasibility of e-scooters facilitating these types of journeys.

The COVID-19 pandemic has added further layers of complexity to how people move in London. Social distancing requirements and reduced services have impacted the capacity and attractiveness of public transport in the short-term. This situation risks encouraging people to drive and reverse the decades-long and gradual trend toward increased use of sustainable modes of transport. TfL have responded to the crisis by reallocating road space from cars to bikes and pedestrians, partly to restrict the capacity and convenience of driving, and partly to improve the safety and attractiveness of cycling and walking. However, cycling is not a practical mode of transport for all Londoners due to the requisite physical abilities and necessity to own a bike or live near a Santander bike docking station, while walking is not an appropriate option for all trip distances. Consequently, rental e-scooters could provide

[44] http://content.tfl.gov.uk/travel-in-london-report-11.pdf

additional and much needed short-term relief to the public transport network, especially in Inner London, by providing more Londoners with an alternative and socially-distanced mode of transport than what focusing on just cycling and walking could achieve. A correctly planned strategic network of e-scooter parking areas thus has the potential to increase inclusion and accessibility to outdoor modes of transport.

Overall, the objectives of the e-scooter trials in London should be to demonstrate how e-scooters can provide relief to the public transport network in the short-term during the COVID-19 pandemic with social distancing measures in place, and reduce the mode share for cars (and thus air pollution and congestion) in the long-term. The parking strategy must be designed to facilitate the accomplishment of these ambitions.

5.2 A diverse city: variations across London

CONTEXT

Population density and transport provisions and accessibility vary considerably across London. Macroscopically, the differences are particularly acute between Inner London and Outer London. According to the Mayor's open database, in 2018 the average population density of the boroughs of Inner London (11,352 people per square kilometre) was nearly three times higher than Outer London (4,291) people per square kilometre). Figure 10 depicts TfL's Public Transport Accessibility Levels (PTAL), which assesses the access level to public transport of geographical areas, across London and demonstrates that access is unequal across the city as the highest scoring areas are mostly centralised. Therefore, the transport requirements of residents and the existing deficiencies in the transport networks of Inner London and Outer London vary considerably. Consequently, the operational constraints associated with rental e-scooters and their associated parking would also vary across London.

However, population density and transport accessibility also vary within Inner London and Outer London, due to different land uses and demographics. As shown in Figure 10, Pockets of areas with high PTAL scores exist in Outer London, primarily around transport hubs and town centres with higher population densities. Meanwhile, some areas of Inner London, notably within the boroughs of South London, have low PTAL scores, despite comparatively high densities.

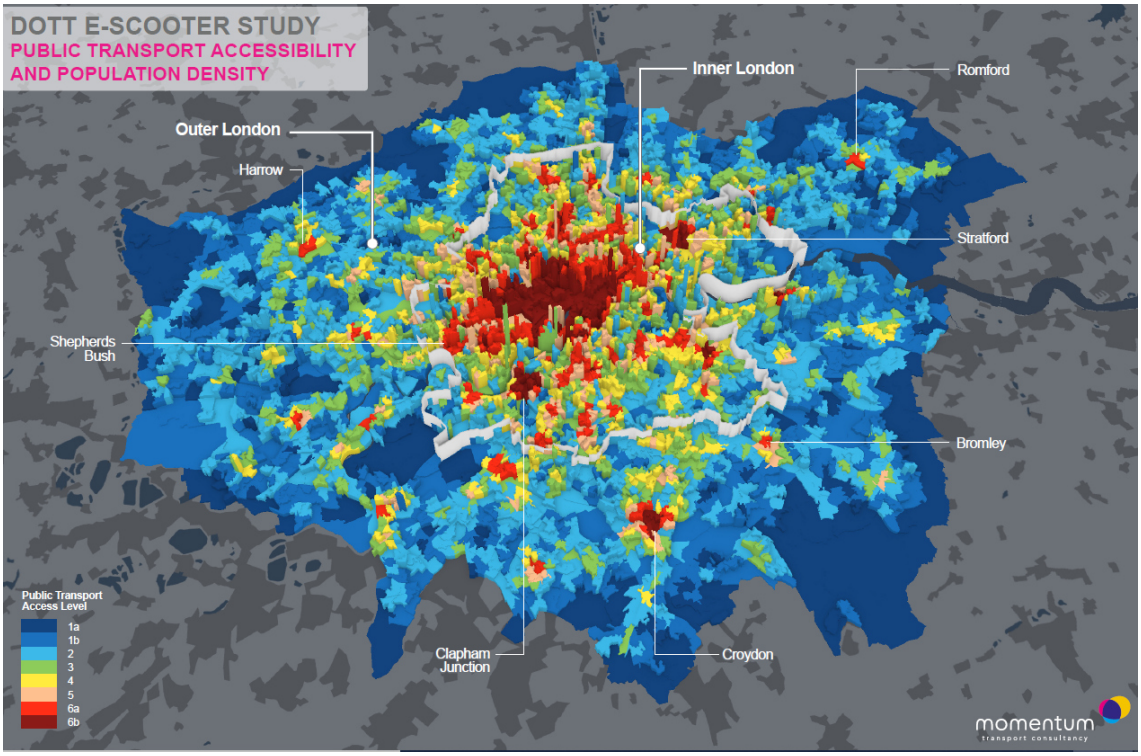

Figure 13 – Population density and PTAL scores across Greater London

HOW THIS TRANSLATES TO IDENTIFYING TARGET AREAS FOR E-SCOOTER PARKING

Understanding the disparities in population density, public transport accessibility and the relationships between them are critical in identifying appropriate locations for e-scooter parking areas to be concentrated, because the associated strategies should vary.

Areas with high population densities, high PTAL scores and proximity to the CAZ are not necessarily areas where car mode share is high or "expansions" of public transport catchment through the intermodal use of e-scooters is particularly beneficial to improving mobility. Instead, in these areas rental e-scooters would likely be used as a single mode alternative to public transport or potentially car ride-sharing services. Consequently, rental e-scooters in these locations would serve as a space-efficient and socially distanced alternative to the public transport network, thus relieving pressure on services where they are busiest (approaching or departing the CAZ).

In areas with high population density and proximity to the CAZ but low PTAL scores, such as Bermondsey and Battersea in South London, there are clearly opportunities for rental e-scooters to dramatically improve accessibility via sustainable modes of transport. Areas such as these should be particularly targeted for the implementation of e-scooter parking.

In areas with low population density and low PTAL scores, but proximity to areas with high PTAL scores such as around Tube and rail stations, the parking strategy could be devised to "expand" the public transport catchment area. This

would involve facilitating e-scooter trips from low PTAL scoring areas, such as residential areas, to Tube and rail stations to provide the opportunity for intermodal, long-distance trips within London to occur without the use of a car.

In isolated areas with low population densities and low PTAL scores, the viability of rental e-scooter parking areas would be more constrained. However, there could still be locations suitable for e-scooter parking for purposes discussed in subsequent sections.

5.3 Characteristics of e-scooter trips in London

PURPOSES OF USER TRIPS

The potential purposes of user e-scooter trips, both predicted and intended, should be considered for establishing an effective parking strategy in London.

Experiences in Paris indicates that demand for rental e-scooter trips in London would partly be derived from leisure trip purposes. Consequently, locating dedicated parking areas within close proximity of retail precincts, parks, tourist attractions or entertainment venues would facilitate these predicted types of trips. As discussed in Section 3, survey results in Paris indicate that if parking in dedicated areas is required, users would be more inclined to use rental e-scooters for leisure purposes and on weekends. This potential inconvenience associated with parking is perhaps more easily acceptable for non-demanding pursuits, such as shopping, travelling to the park or attending entertainment venues, where the time taken to locate a dedicated parking area and subsequently walk to the intended destination is not critical.

This approach alone would not fully utilise the potential e-scooters could have on reducing car trips and relieving pressure on the public transport network in London. Journeys to work or to services concentrated in town centres should also be targeted. In spring 2019, workplaces or educational institutions accounted for 19% of origins and 11% of destinations for Dott e-scooter trips in Paris, while 32% of both origins and destinations were linked to homes. Clearly, home-work trips are critical elements of e-scooter utilisation. However, to ensure the viability and attractiveness of e-scooter trips, the perception of "inconvenience" needs to be confronted by satisfying user expectations with an effective and dense parking strategy.

USER EXPECTATIONS

Journeys to work and services are time critical. While the travel time from using a rental e-scooter would be competitive with other transport modes in London, the unknown time associated with finding dedicated parking areas and walking to the intended destinations could create the impression that e-scooters are unreliable for such journeys. Nevertheless, there is a desire among stakeholders for e-scooters to be used for commuter journeys. The

parking strategy developed must therefore contest the perception of inconvenience of dedicated parking areas before rental e-scooters are implemented in London and perceptions are entrenched.

At a macroscopic level, town centres and areas with high workplace populations should be assessed as potential areas for e-scooter parking to be concentrated. These areas are shown in Figure 11. This would facilitate journeys to work and services by rental e-scooters and develop user confidence that parking will be located in close proximity to their destination.

The type of industries operating in areas with high workplace population should also be assessed to determine the appropriate locations to target. For example, commercial, retail and hospitality employment dominate the CAZ, and these would be the type of work journeys that could be suitable for rental e-scooters. Conversely, rental e-scooters would not be as appropriate in areas where employment is primarily associated with industrial land uses, such as adjacent to the Thames in Barking and Dagenham.

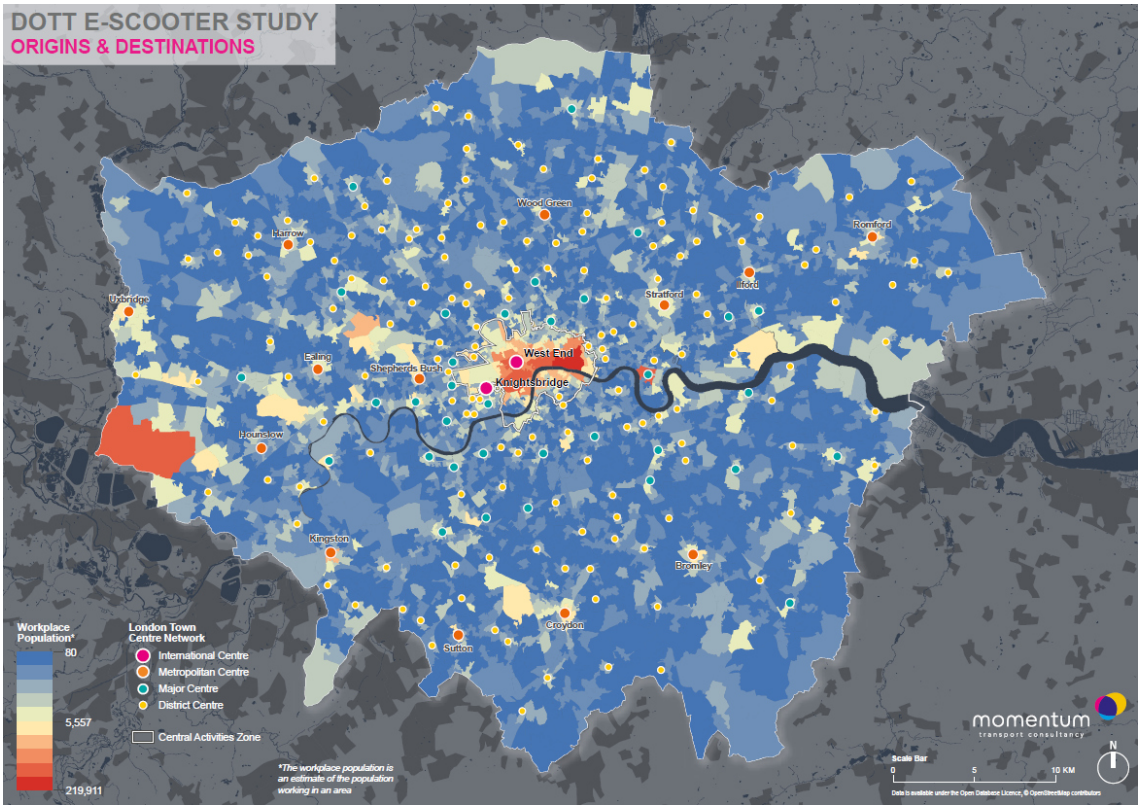

Figure 14 – Key destinations for e-scooters in Greater London

Within the target areas, such as the CAZ, the parking strategy implemented must convey to users the "convenience" of rental e-scooters to achieve their ultimate effectiveness and utilisation. In Paris, a network of 32 parking areas per square kilometre that are approximately on average 1 minute walking apart was considered satisfactory for availability according to the user experience surveys. A significant percentage of users indicated that they would accept a 5-minute walk to or from an e-scooter parking area. The parking strategy for London, particularly in target areas, should be responsive to

these impressions in order to establish a network of dedicated parking areas considered to "convenient" for use. This means strategically defined and consistent densities and distances between parking areas, and not ad-hoc locations.

5.4 Where, how and why e-scooter parking areas should be focused

OVERVIEW

Understanding the characteristics and variability across Greater London is integral to developing an effective parking strategy that is viable, convenient for users, complements the public transport network and encourages mode shift from cars. An indicative suitability analysis has been conducted for the focus areas across London for the location of e-scooter sites, as shown in Figure 15. The most suitable areas for e-scooter parking are shown in yellows and oranges. The variables used to assess suitability are as follows:

- Population density
- Public transport accessibility (PTAL scores)
- Proximity to the CAZ and town centres
- Proximity to key employment areas
- Proximity to infrastructure that would improve user sense of safety (i.e. cycling lanes)

It is noted that this suitability analysis is not exhaustive and numerous other variables should be considered in a more detailed assessment.

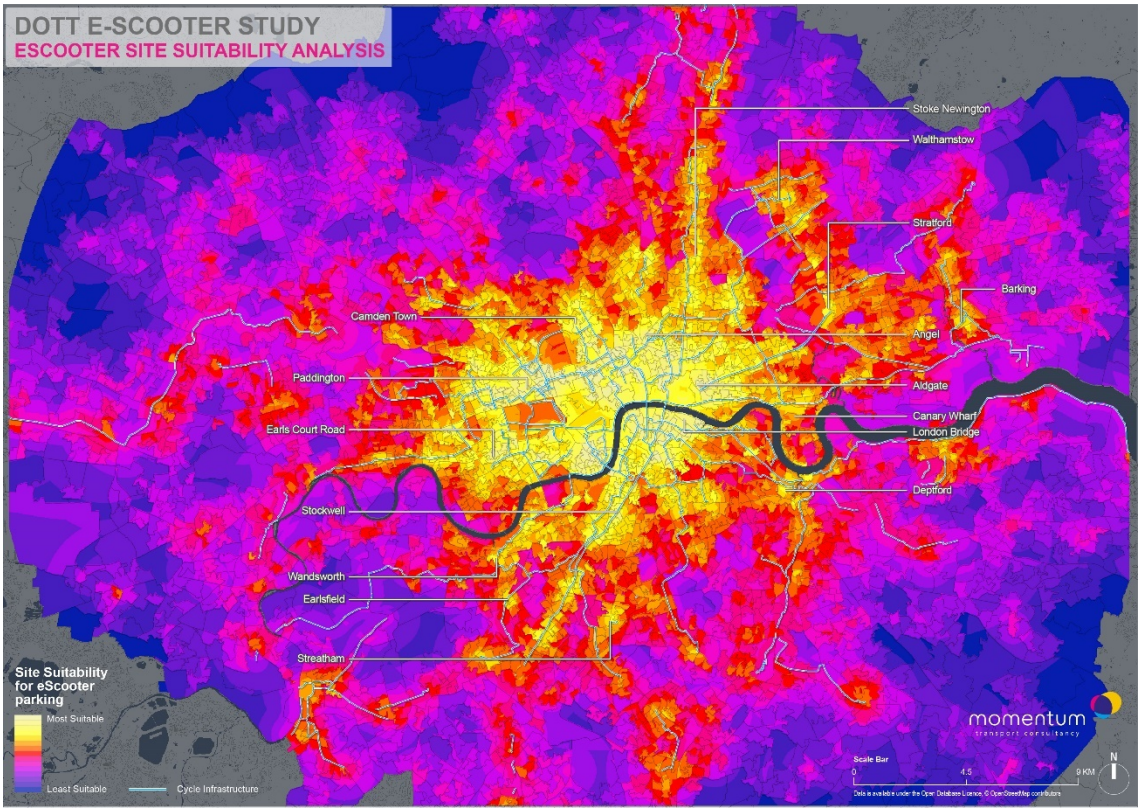

Figure 15 – E-scooter parking hotspots

It is important to understand that because of the substantial variations in population density, public transport accessibility and user trip purposes, the characteristics of user trips and the benefits rental e-scooters could deliver to London's transport network are diverse.

The Office for National Statistics defines Inner London as consisting of 13 central boroughs and the City of London Corporation. All other boroughs of Greater London form Outer London. Considering population and employment densities are much higher, public transport more constrained, spatial and health impacts of car use more acute, and distances comparatively shorter than Outer London, logically rental e-scooters usage would be most compatible for user trips in Inner London. This is demonstrated in Figure 15, which highlights the CAZ and surrounding neighbourhoods as the key areas for e-scooter parking to be implemented. Nevertheless, feasible opportunities exist for rental e-scooter use in selective areas of Outer London also.

In subsequent sections, the potential type of trips within Inner London, Outer London and between them and the parking strategies required to support them are further discussed. The potential benefits of a dense network of e-scooter parking sites, approximately equidistance and 2 minutes apart in key areas, are depicted in Figure 16, which compares target trip types with existing journeys.

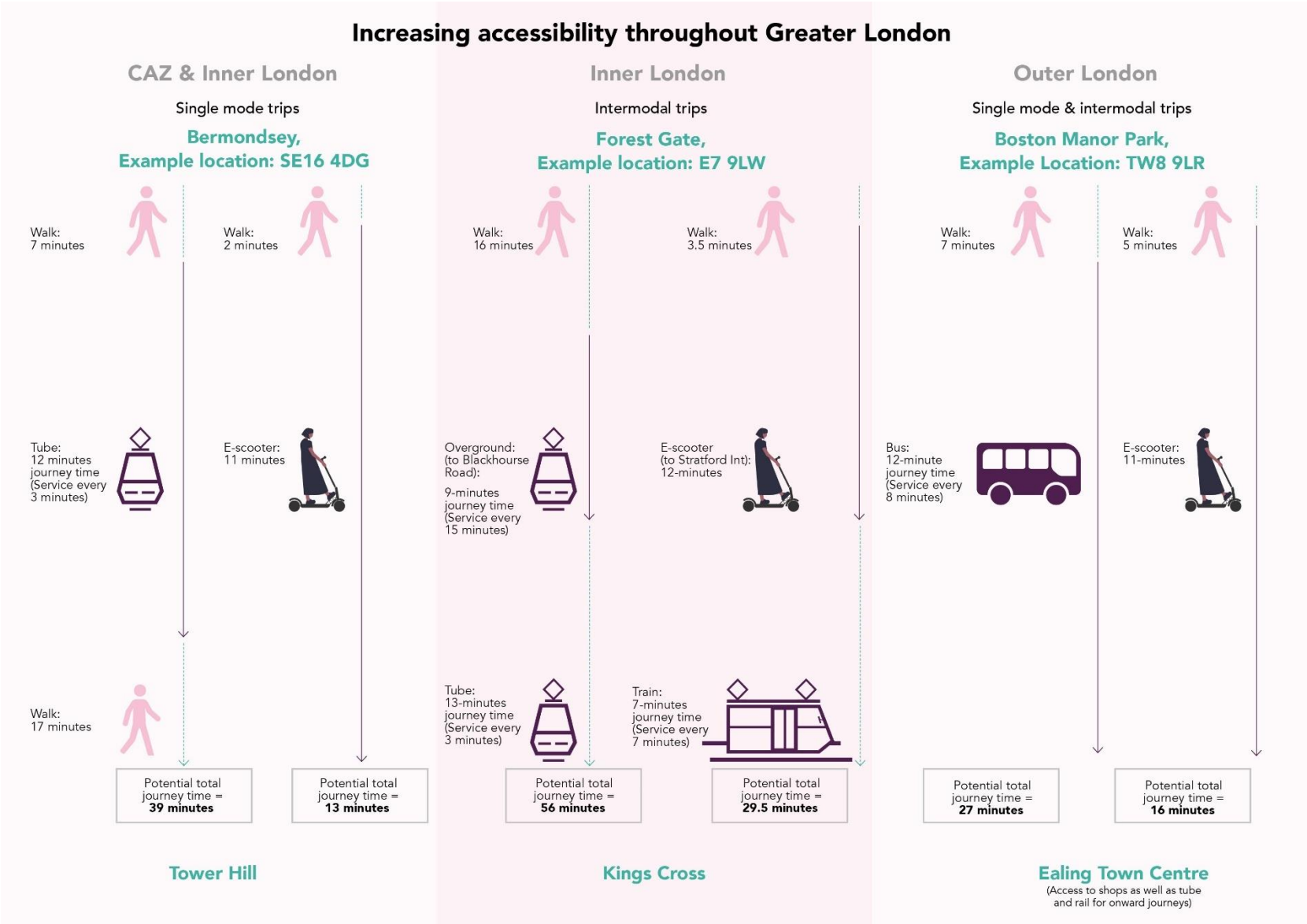

Figure 16 – Potential e-scooter trip types in London

SINGLE MODE TRIPS IN INNER LONDON

Users that live in densely populated areas near their place of employment (particularly the CAZ) or intended leisure destinations could be targeted to travel by rental e-scooter on single mode trips. This option would be designed to alleviate pressure on public transport services where they are busiest (CAZ) and discourage car use (either private or car sharing journeys). The parking strategy would need to support this and require a dense network of roughly equally distanced parking areas to ensure convenience, as implemented in Paris. Inner London is roughly analogous to the jurisdiction of the City of Paris, which forms the boundaries of Dott's operation in the French capital region, although population density is lower (approximately half) and the geographical size larger (triple). Therefore, the feasibility of a Parisian-style network of densely located parking areas may be limited to a smaller scope than the entirety of Inner London. The areas surrounding the CAZ (user origins) and the CAZ itself (user destination) would be a suitable scope for a very dense network of parking areas that facilitate single mode e-scooters between any origins and destinations. This scope is generally well served by public transport, and these e-scooter trip types could potentially reduce demand on the busiest and most constrained services on the public transport network. However, some areas in close proximity to the CAZ have relatively poor public transport accessibility, such as areas in Bermondsey. As demonstrated in Figure 16, e-scooters could also substantially improve accessibility to the CAZ from such areas.

INTERMODAL TRIPS IN INNER LONDON

The scope required to make all journeys in Inner London suitable for single mode e-scooter trips is enormous, considerably more so than in the City of Paris. Consequently, the next target trip type could be intermodal trips within Inner London, ideally attracting users away from car use. As discussed in Section 3, survey results in Paris indicated that intermodality occurs frequently with rental e-scooter use. The corresponding parking strategy in the remaining areas of Inner London should support this objective and essentially allow the public transport catchment area to "expand". As demonstrated in Figure 17, approximately 91% of Inner London is accessible from Tube and rail stations by e-scooters within 6 minutes, and 98% within 10 minutes. The parking strategy should be responsive to this opportunity and seek to locate parking areas adjacent to the stations and within these catchment ranges. As shown in Figure 16, providing e-scooter parking sites a reliable distance from user origins can effectively expand the public transport catchment area and substantially reduce travel time.

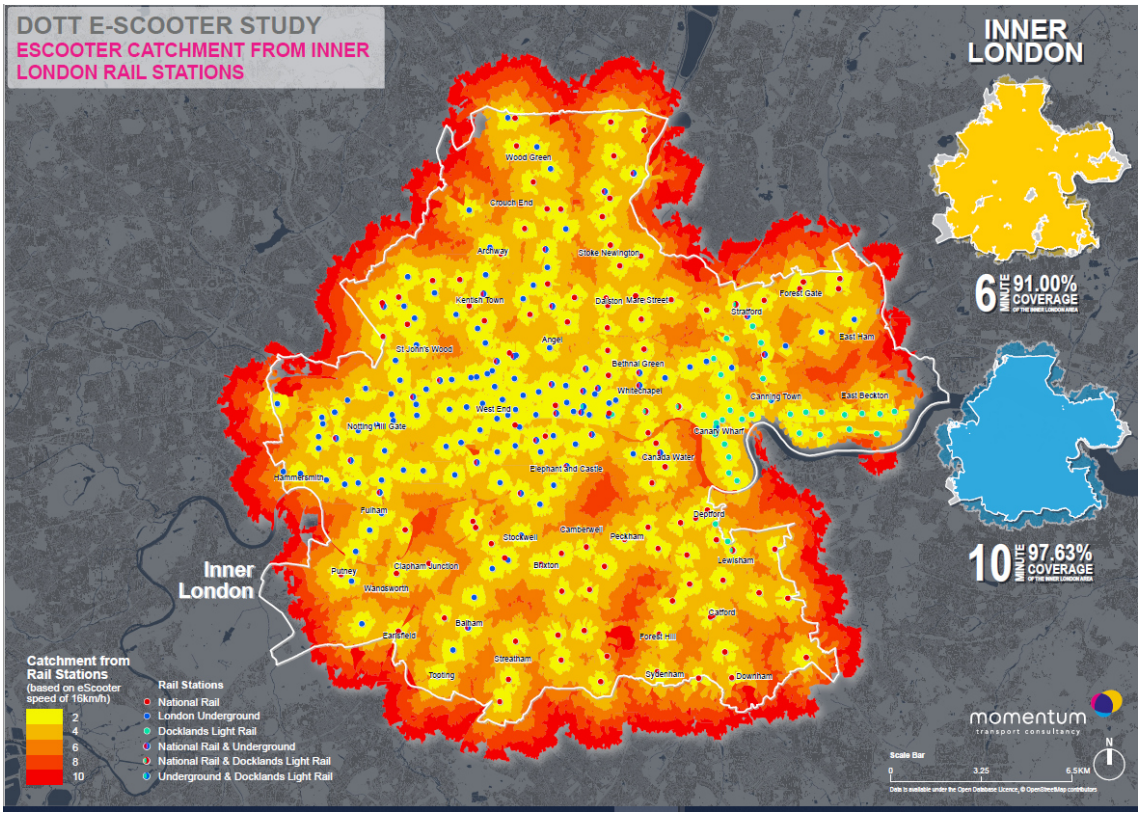

Figure 17 – E-scooter catchment from Inner London stations

INTERMODAL TRIPS FROM OUTER LONDON

Intermodal trips for long-distance journeys from origins in Outer London and destinations in Inner London is another potential trip type to target. Currently, people that live in Outer London and work in Inner London would likely travel to their place of employment by either driving as a single mode trip, or take a Tube or rail service. To access the nearest station for the Tube or rail services, many commuters would drive. This presents an opportunity for e-scooters. As discussed previously, rental e-scooters can essentially "extend" the catchment area of the public transport network. Opportunities exist to implement dedicated parking areas in residential areas within 10-minute rides of stations and at the stations to facilitate intermodal trips. As demonstrated in Figure 18, approximately 54% of Outer London is accessible from Tube and rail stations by e-scooters within 6 minutes, and 77% within 10 minutes. A parking strategy in these areas could thus be implemented that targets these trip types by locating them appropriate distances from Tube and rail stations, which would both improve access to the public transport network and facilitates access to the stations by a sustainable mode of transport.

However, it is acknowledged that competing with the convenience of cars would be challenging for e-scooter operators in Outer London. The origins and destinations of trips in Outer London are varied and scattered. Consequently, the feasibility of establishing an

effective parking strategy targeting these trips would be challenging, due to the substantial management costs and difficulties attracting enough rental trips per vehicle and per day.

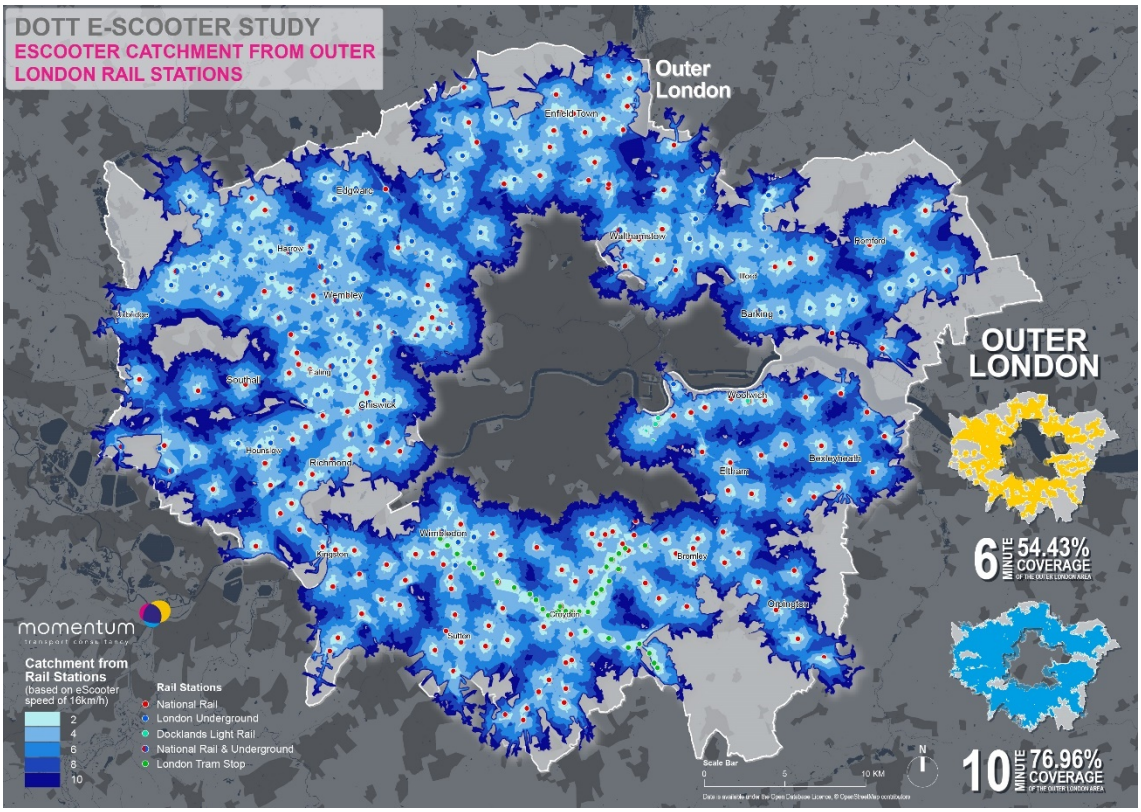

Figure 18: E-scooter catchment from Outer London stations

SINGLE MODE TRIPS IN OUTER LONDON

The final trip type that could be targeted is short-distance single mode trips to town centres in Outer London. Because of the substantial distances, users originating in Outer London could not be expected to travel to destinations in London by single mode rental e-scooter trips. However, these trip types could be possible from residential areas to town centres, where employment, retail and services are clustered. E-scooters could provide a viable alternative for these trip types to car usage, which is particularly high in Outer London. Figure 19 demonstrates that almost 65% of Outer London is within 10 minutes of town centres by e-scooters. A parking strategy to capture this potential could be implemented, with dedicated parking areas located in suitable catchment distances from town centres in residential areas. Since stations are often located in town centres, this parking strategy would essentially complement the aforementioned intermodal trips in Outer London.

As discussed in the previous section, it is acknowledged that establishing an effective parking strategy catering for these trip types in Outer London could be operationally constraining.

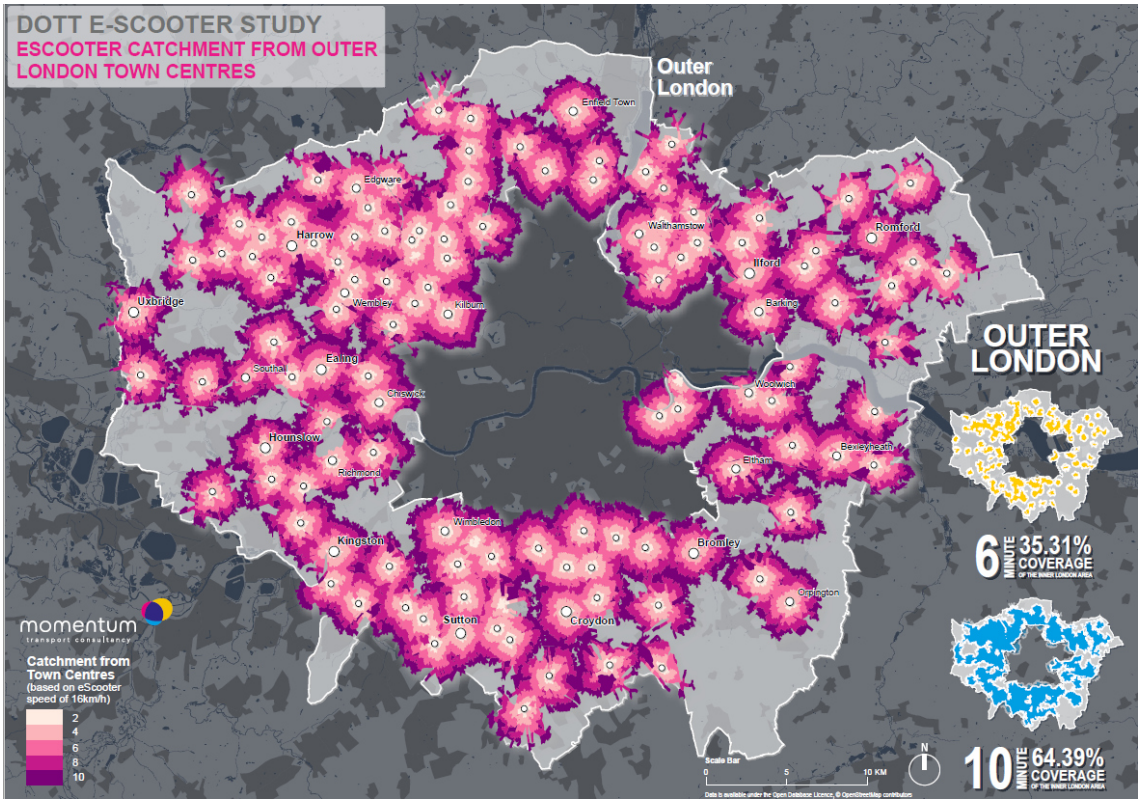

Figure 19 – E-scooter catchment from Outer London town centres

6. ALIGNING THE E-SCOOTER OFFER WITH POLICY EXPECTATION IN LONDON

6.1 Introduction

A PARTNERSHIP BETWEEN STAKEHOLDERS

In a large, complex city such as London, the web of stakeholders involved in the city's large transport system is particularly important to ensure that the system remains integrated with all aspects. Stakeholders aim for success, be that through keeping services running on time, meeting revenue targets or by achieving sustainability goals. Indeed, in a progressive city such as London, targets which incorporate all of the above and beyond are required, so it is important that the whole system remains integrated throughout, reaping benefits from each other. It is important that opportunities for integration are identified to minimise the disruption of new trends and patterns, particularly to ensure all stakeholders remain satisfied.

Partnerships between stakeholders are required. The vision of a sustainable, equitable city is supported through transport and the operations that movement assists. E-scooters are a new mode in London's transport system which have the potential to contribute greatly to the city, albeit mis-education and a lack of information disseminated to key stakeholders such as those at local boroughs and transport authorities may cause mistrust and a lack of confidence. It is vital that a conversation regarding the integration of these new modes is had and continues throughout the e-scooter trials. Stakeholders are able to learn from each other and make improvements to a system which could significantly benefit the local areas and the people within them. Macharis and Kin[45] highlight that gaining stakeholder perspectives on projects is crucial to buy-in and subsequent scheme success. All stakeholders, particularly e-scooter operators, local borough councils, highway engineers and public realm designers etc should play their part in allowing e-scooters to truly make a positive difference to the city. This is highly important at a time when pandemic-related disruption shows little sign of easing.

Being one of the few major cities in Europe to have yet introduced e-scooters, London has a unique opportunity to learn from Paris and other European cities. Within the Parisian case study, shared e-scooters were found to offer two key opportunities: they contribute towards intermodal trips and also provide an alternative option to public transport. 6t estimates that

45 Macharis, C. and Kin, B. (2017) "The 4 A's of sustainable city distribution: Innovative solutions and challenges ahead," International Journal of Sustainable Transportation.

the e-scooter mode share was between 0.8% to 1.9% in Paris by the end of 2019. Based on the growth of cycle share schemes, this is expected to increase significantly. In London, a third opportunity is sought – to replace private car trips. Where these benefits shall be realised will be dependent on the local context, as detailed in Section 5. In particular, the location of parking is key to ensure these benefits can be realised. Cooperation between stakeholders will significantly enhance the benefits these e-scooter schemes can deliver.

A recent UK based study (Packard, 2020[46]) identified that stakeholders (extending from decision-makers to transport planners, engineers and prospective users) are generally in favour of e-scooters. When asked to rank favoured policy packages, most stakeholders chose policies that might lead them towards a future scenario of 'Self-care' – a future scenario within which e-scooters aid individual travel within a society that continues to maintain an aspect of social distancing. Perhaps reflective of the ongoing impact of the pandemic, in the 'new-normal' individuals have settled into their new habits, with fewer numbers returning to public transport. This indicates that the importance of self-protection is likely to remain, particularly in the near future whilst the impacts of the pandemic are still prevalent.

Needless to say, the above merely aims to get the conversation between stakeholders started, to ensure that the favoured future for transport in London's boroughs remains achievable with the help of e-scooters.

6.2 Integration with public realm and existing infrastructure

Conversations regarding the location of e-scooter parking areas took place following some time of frustration in Paris, both within City Hall and amongst operators. A parking strategy was developed which incorporated the use of existing car parking spaces near pedestrian crossings. As discussed in Section 4, this strategy has proved to be successful.

The irresponsible parking of e-scooters within public realm and on footways is a major cause for concern amongst stakeholders, from local authorities through to disability groups. It is of upmost importance that e-scooter parking areas are integrated within the existing urban realm where possible. Social distancing requirements in place during the COVID-19 pandemic have highlighted the constrained nature of the existing footways and areas of public realm with many footway in London less than 2m in width. Whilst not only is this width insufficient for social distancing requirements, this highlights that additional space would also be required for e-scooter parking to ensure that these constrained footways remain fully

46 Packard, G (2020) "The changing use of e-scooters in London: Stakeholder perspectives and future scenario pathways", unpublished

useable by pedestrians. A solution therefore is required and one that perhaps can take inspiration from Paris.

PARKLETS

Paris's solution to on-street e-scooter parking through the use of existing car parking spaces offers further advantages which will allow additional benefits to be captured in London. By removing existing car parking, car-use itself is in effect disincentivised by removing convenient car parking opportunities. Through urban design, London has the potential to go one step further and providing new spaces that are enjoyable and useable by all, not just retained for parking purposes.

It has become clear that street design has a strong effect on the local economy, air quality, transport and local environment. Perhaps more so, street design has a strong impact on those that use it, their health and wellbeing and has the ability to influence movement and how people travel. Views of our streets are changing, they are now places to be in and to spend time in, rather than to travel through. E-scooter parking must respond to this view. A recent initiative to increase the number of 'parklet' projects throughout London was launched by the Cross River Partnership[47]. Parklets are a temporary pavement extension which sit in existing parking bays and are also endorsed by London Living Streets. There is therefore an opportunity to deliver e-scooter parking areas through this method, similar to Paris but with a greater emphasis on also creating areas for people to sit, take shelter and enjoy. This both delivers areas away from existing footways for e-scooters to be parked, as well as delivering new useable and enjoyable spaces for the public to use.

In line with London's Healthy Streets approach to urban planning (discussed further below), parklets offer great benefits to local communities, including providing streets with new focal points and and additional spaces for all to use, rather than just car owners. An attractive, looked after and signposted parklet with incorporated e-scooter parking will further encourage respectful parking. An example of a London parklet with cycle parking incorporated into the design is shown below.

[47] https://crossriverpartnership.org/wp-content/uploads/2020/07/Creating-Parklets-for-Community-and-Business-Resillience.pdf

Figure 20: Example of a parklet (meritstemdesign.co.uk/parklets)

Whilst parklets offer a number of additional benefits, it is emphasised that some parking areas may require a larger number of e-scooter parking spaces. The density of parking areas and the number of e-scooters that can be parked is crucial to allow an efficient service across different areas of London. These parking areas and parklets may take varying forms to provide different levels of parking. In high demand areas, parking spaces can be reclaimed to provide e-scooter parking only, whilst in smaller community driven areas, parklets with incorporated e-scooter parking can offer benefits for non e-scooter users also. A balance must be sought and should be driven by conversations between the operator, local borough and community members.

DISINCENTIVES AND 'TIDYING UP'

As well as providing space for e-scooters to be parked, users will also need to be discouraged from discarding used e-scooters in the middle of footways or where they might cause an obstruction. This is required not only to retain the 'look and feel' of the surrounding environment, but also to ensure the footways do not become unusable to vulnerable users such as wheelchair users or pedestrians with blindness or vision impairments.. London Vision states "…*They (e-scooters) represent a very real hazard on our streets and endanger blind and partially sighted pedestrians. Furthermore, the lack of real rules and provision has the potential to threaten the safety of both the rider and pedestrians using London's roads and pathways.*" (London Vision, 2020[48]).

[48] https://www.londonvision.org/blog/e-scooters-london-visions-response

Operators in Milton Keynes have responded to this concern by employing a team with one aim: to correct badly parked scooters. This ensure issues can be identified quickly and rectified whilst also showing residents and other riders what considerate parking looks like. This initiative is similar to that in Marseille, though it is expected that this was due to a lack of dedicated parking areas.

SEGREGATED CYCLE ROUTES

The aforementioned UK based e-scooter study (Packard, 2020) indicated that stakeholders viewed the most important policy package to get to the desired future was infrastructure. London has an existing network of cycle tracks, cycle lanes and cycle paths with spending on the provision of these routes increasing year on year. It was announced in February 2020 that across the UK, £1billion is expected to be spent on building 250 miles of new, high quality segregated cycle routes and safe junctions in towns and cities. This investment in infrastructure is unsurprising given the plethora of research surrounding the impact cycling infrastructure has on cycle as a mode share. One is likely to assume that infrastructure that segregates e-scooters from general traffic increases safety and encourages use, similar to the effects of cycling infrastructure (Aldred et al., 2017[49]). In Paris, a pro-active policy to develop cycling lanes has likely contributed to the success of the e-scooter services.

The wider impacts are also clear. Farla et al (2016)[50] indicates that investment in cycling infrastructure benefits the economy and enhances the attractiveness of areas for people to live and work in, also reducing congestion. It also boosts social inclusion by providing better access to public services and cutting travel costs.

In 6t's Spring 2019 Parisian e-scooter study, 82% of e-scooter users indicated they wanted to ride on a bicycle lane/track (6t-bureau de recherche, 2019[51]). It is reasonable therefore to promote e-scooter parking locations near existing cycling infrastructure. Elsewhere, e-scooter parking areas should also be located near roads which would be deemed to be suitable to use an e-scooter on. This is to ensure that unconfident riders do not resort to illegally riding on footways.

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[49] Aldred, R., Elliott, B., Woodcock, J. and Goodman, A. (2017) "Cycling provision separated from motor traffic: a systematic review exploring whether stated preferences vary by gender and age," Transport Reviews.

[50] Farla, K., Simmonds, P., Rosemberg, C. and Rentel, M. (2016) Evaluating the economic and social impacts of cycling infrastructure: considerations for an evaluation framework. Brighton. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/509391/evaluating-economic-social-impacts-cycling-infrastructure-evaluation-framework.pdf.

[51] 6t-bureau de recherche (2019) Uses and Users of Free-Floating Electric Scooters in France. Paris. Available at: https://6-t.co/en/free-floating-escooters-france/.

6.3 Integration with local policy

Politically, the debate sits between sustainability and safety. It is widely understood that steps need to be taken to drastically lower transport-related carbon emissions, particularly in a large city such as London. The Mayor's Transport Strategy (2018) sets out the aim to have 80% of trips in London made by sustainable transport by 2041. Additionally, the 'Vision Zero for London' policy aims to eliminate all deaths and serious injuries from road collisions on London's streets also by 2041.

It is important to remember that new technologies such as e-scooters need to be socially accepted, and further constructed by society themselves (Geels and Verhees, 2011[52]). Hence, they need to be embedded within existing societal norms and public perceptions need to be understood. This is key to framing policies which will assist successful e-scooter integration into London's transport mix. In London, the pandemic has been a catalyst for an increase in cycling as a mode which allows social distancing. The e-scooter also has the potential to facilitate the increase of individual travel modes. Additionally, the provision of appropriate e-scooter parking areas can also deliver new pockets of public space for all to benefit from, such as parklets with outdoor seating.

PUBLIC PERCEPTION

Studies show that in cities with legalised e-scooter use, the public has met their arrival with both enthusiasm and scepticism as authorities struggle to cope with unforeseen outcomes. London however sits in a strong position, having a restrained approach to legalising e-scooters and therefore buying time to learn from other countries. Gössling (2020)[53] undertook media analysis in 10 cities to assess public concerns prior to and after the implementation of e-scooter schemes. Results suggest that cities (Paris included) largely adopted a trial and error approach to seeking appropriate legislation with policies introduced including maximum speeds, mandatory use of bicycle infrastructure, dedicated parking and limiting the number of operators. Concluding that where negative public opinion can be averted, e-scooters stand a chance to become a disruptive niche innovation. If introduced in a way which incorporates lessons learnt, as well as taking into account stakeholder viewpoints, e-scooters have the potential to contribute significantly to the transport mix in London.

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[52] Geels, F. and Verhees, B. (2011) "Cultural legitimacy and framing struggles in innovation journeys: A cultural-performative perspective and a case study of Dutch nuclear energy (1945-1986)," Technological Forecasting and Social Change.

[53] Gössling, S. (2020) "Integrating e-scooters in urban transportation: Problems, policies, and the prospect of system change," Transportation Research Part D: Transport and Environment.

SUSTAINABILITY AND HEALTHY STREETS

A wide variety of studies are beginning to emerge relating to the sustainability of e-scooters with some research concluding that parking practices are key to ensuring that e-scooters retain an element of 'green'. Moreau et al (2020)[54] discusses the green benefits of dockless scooters and private scooters, concluding that private scooters are more sustainable given they do not rely on vehicles to collect and charge the vehicles. E-scooter operators have set out ways to combat this, through developing swappable batteries though thought should be given to the amount of space required to provide the infrastructure for these swappable batteries. Furthermore, the ideal locations for battery stations should also be studied to ensure riders have easy access to battery facilities so 'flat' e-scooters are not discarded across footways.

How e-scooter parking should respond to the requirements of London's Healthy Streets aspirations should also be considered. The approach adopted by TfL aims to improve air quality, reduce congestion and help make London's diverse communities greener, healthier and more attractive places to live, work, play and do business. Highlighting that where walking, cycling and public transport use levels have risen, traffic levels have remained the same. The city is therefore suffering the impacts of congestion. The Healthy Streets initiative strives to make best use of the space we have on our streets, to enable local people to make full use of the space they live near and where our surrounding spaces are more appealing to cyclists and pedestrians. This is the best way to reduce car use.

As a new mode within London's transport mix, e-scooters have the potential to contribute towards the Healthy Street principles by also encouraging the reduction of car use. Through the development of parking areas for e-scooters, there is additional opportunity to enhance street space. The Healthy Streets indicators relevant to e-scooters and how/where they are parked are discussed in the below table.

[54] Moreau, H., de Jamblinne de Meux, L., Zeller, V., D'Ans, P., Ruwet, C. and Achten, W. M. J. (2020) "Dockless E-Scooter: A Green Solution for Mobility? Comparative Case Study between Dockless E-Scooters, Displaced Transport, and Personal E-Scooters," *Sustainability*. MDPI AG, 12(5), p. 1803

Figure16: Healthy Streets Indicators. Source: TfL, Lucy Saunders

Healthy Streets Indicator	How e-scooter parking can respond
People choose to walk, cycle and use public transport	E-scooter parking can complement intermodal travel if located close to transport hubs, including train stations and tube stations E-scooter parking should not detract from cycle parking infrastructure or remove it altogether
People feel safe	Parking areas should not intrude into busy pedestrianised areas to not encourage riding on the pavement. They should be located nearby and clearly signposted
Places to stop and rest	Through the development of parklets, well designed parking areas can become areas for riders and pedestrians alike, to enjoy and to spend time nearby, perhaps through seating and planting
Shade and shelter	Parking areas may also provide a covered area for pedestrians and riders to shelter temporarily. Larger parking hubs in busy areas may provide additional facilities such as a drinks kiosk
Things to see and do	Parking areas through the provision of parklets can provide additional public realm and areas for sculptures, planting and seating to be located

SAFETY

E-scooter safety has generated several studies. The International Transport Forum (ITF) examined micromobility safety, concluding that a trip by car or motorcycle in dense urban areas is more likely to result in a fatality than by an e-scooter. Though the risk of hospital admissions may be higher on e-scooters, the lack of studies on this topic is noted (ITF, 2020)[55]. Understanding the risk to pedestrians is difficult given the likelihood of unreported incidents.

The Mayor's Transport Strategy sets out the goal to eliminate all serious injuries and deaths from London's road network by 2041. This goal, known as Vision Zero, will be realised through systematic action as set out within the Vision Zero Action Plan. Following media reports of e-scooter related deaths, including one in Battersea in 2019, it is no wonder authorities are conscious as to the potential safety risks.

E-scooter parking has the ability to contribute to this effort to make London's roads safer. Through the possible removal of on-street car parking spaces to provide parking hubs, not only is car driving disincentivised, but pedestrian visibility of the road is greatly improved, particularly near pedestrian crossings. Furthermore, the provision of planting, benches and perhaps even public art provides the feeling of 'place'. Through street design, driving behaviour can be influenced.

6.4 COVID 19

The COVID-19 pandemic has uprooted business as usual trends, many of which can be viewed as negative including private-vehicle use for short journeys. This unprecedented event has generated an opportunity to take control of these trends before they return. E-scooters, perhaps provide an answer to combatting the use of cars for short trips. Whilst cycling provides the answer for most, e-scooters offers another convenient solution.

Further to this, the reallocation of space has become one of the pandemic's most tangible effects on the built environment. The value of street space has increased significantly and in London, where local authorities continue to combat the negative impacts of motor vehicles, cars are bearing the brunt of it. The health crisis has allowed city stakeholders to stop and pause, assess the existing mobility landscape and revaluate. On-street car parking spaces have provided ideal spaces to claim back for the pedestrian. The long-term impact of these changes are yet to be seen, however the rapidly deployed TfL Streetspace schemes were received well, with calls to make many of the wider footways and cycle lanes more permanent.

[55] ITF (2020) Safe Micromobility: Corporate Partnership Board Report.

Whilst space for motor vehicles has been reduced, there is a great potential for many of those journeys to be replaced by e-scooters. Furthermore, the reclaim of space from the street for e-scooter parking further enhances the benefits of these new modes. Cooperation between stakeholders in order to ensure these schemes offer the most effective solutions for the people of London is however of upmost importance.

7. RECOMMENDATIONS

To conclude this report, a number of recommendations have been devised relating to the key themes surrounding the topic of parking which were discussed in Section 2.

7.1 End users' concerns

CONVENIENCE & DOOR-TO-DOOR MOBILITY

It must always be remembered when planning parking areas, that e-scooters will be used because they are fast and convenient. This asset is particularly key to support modal shift from private cars to e-scooters. In Paris, a 2-minute walking time to/from an e-scooter was deemed to be acceptable. A comparable figure should be used as a baseline for developing the London e-scooter parking strategy.

VEHICLE AVAILABILITY

For shared e-scooter services to contribute to modal change and social distancing, they need to fit smoothly into end-users' daily lives. Vehicle availability will be key for users to develop a reflex-use of these services. A dense network of vehicle parking areas, where use of these modes is expected to be / is the highest, is the only way to ensure this.

7.2 Local authorities' concerns

URBAN DESIGN AND INFRASTRUCTURE

E-scooter operators in London have an opportunity to learn from Paris, to provide a dense network of successful parking locations within the constraints of limited space. As in Paris, on-street car parking should be used to reclaim street space for e-scooter parking areas. In London, operators have the opportunity to go the extra mile, by incorporating additional urban design into these spaces. Whilst some parking areas will provide parking only, parking areas in and around areas with high pedestrian footfall can offer additional quality space for the pedestrians (benches, green spaces, etc.). In London, this can be implemented through Parklets which also adhere to the Healthy Streets principles. Operators and local authorities may thus develop, together, a two-tier system including plain parking areas, reclaimed from cars, to high quality parklets that fit into the pre-existing urban design strategy.

The example of France also shows that the local authority should look to invest in local infrastructure which might be beneficial to e-scooter users as well as pedestrians. Their local knowledge is key to identify the most suitable locations, and their direct involvement has, in many French cities, allowed to curtail the clutter that was observed in the initial stages of

service deployment. They should not rely on private operators to completely transform their streets.

CLUTTER AND CONFLICT WITH USERS

Developing an efficient parking infrastructure will take time, and this infrastructure will not necessarily be completed at the time the experiment is launched. In this experimental period, operators should look to ensure that e-scooters are parked correctly, through providing a 'taskforce' of workers that rectify badly parked e-scooters. It is expected that this will be required perhaps only at the beginning of the trial period, as a way to educate users. In Paris, the use of designated parking areas was successful in reducing the number of poorly parked e-scooters, and no parking taskforce has been necessary.

REGULATION

Local authorities are launching e-scooter trials to explore the benefits they might bring to their mobility ecosystem; similarly, e-scooter firms rely on the local authority to develop the proper parking strategy and to operate their service. These two stakeholders have a similar goal of efficiency, but different constraints. It is thus important that continual discussions take place between the operator and local authority. Operators should be able to table possible new regulations which assist the operation of e-scooters. Similarly, the local authority should make the operator aware of any regulatory changes, be that Traffic Regulation Orders or similar.

INTERMODALITY AND MODAL CHANGE

Shared e-scooter services may have three kinds of impact on the mobility ecosystem. First, they may contribute to enhancing intermodal practices, and support access and egress trips to public transport. This effect has materialised in Paris and can be expected to be even stronger in London: Paris displays the densest public transport network in the world, with a metro station every 600 meters[56]. In London, stations are further scattered – the closest two stations being 300 meters apart, and the furthest two stations being 6.5 kilometres apart[57] - making access and egress trip a key challenge. This implies paying specific attention to parking around station areas to limit pressure on public space. Second, shared e-scooter services may also capture certain public transport trips, as was observed in Paris. While this may appear contrary to a sustainable mobility strategy, it is worth underlining that in both Paris and London, public transport is very much at capacity. Moreover, in light of the current COVID-19 outbreak, non-car-based alternatives to public transport become attractive. Third, while this was not the case in Paris, shared e-scooters service may contribute to capturing car-based trips in London. Indeed, car-based mobility is much more important in Greater London

[56] Les Echos, 2020, A Paris le metro le plus dense du monde. https://www.lesechos.fr/weekend/voyages/a-paris-le-metro-le-plus-dense-du-monde-1213980
[57] TfL, 2019, Tubes trivia and facts https://madeby.tfl.gov.uk/2019/07/29/tube-trivia-and-facts/

than it is in the City of Paris, as only 10% of trips taken by Paris residents rely on a private car whilst 19% of trips in Inner London and 45% of trips in Outer London were completed by car. To cater for the latter two possible effects, it is important to supply parking that allows for a variety of trip origin and destinations.

7.3 Operators' concerns

VEHICLE CHARGING & FLEET MANAGEMENT

Ultimately, operators should take responsibility for their end-users. The unlocking app should educate the rider about safety. Operators may also consider providing incentives for users to park the vehicle correctly, as well as to leave the e-scooters where they are needed and parking is available.

Where possible, cargo bikes should be used to aid the distribution of charged e-scooters, particularly where the network of parking networks is dense.

EFFICIENCY

Open discussions about vehicle density and fleet size should be had to ensure that the local authorities are aware of the operating impacts of the measures they may take. Those measures that limit vehicle availability (fleet caps, sparse network of dedicated parking areas) will directly threaten e-scooter services operators and limit the asset they may provide to both end-users and local authorities.