ARCADIS

Developing a sustainable e-scooter program

Guidelines to help cities safely accelerate recovery

Many of the world's cities have committed to tackling global warming and improving air quality. Initiatives to reduce car use — the main factor in greenhouse gas emissions — have led to the emergence of soft mobilities, or micromobilities. This includes free-floating, or dockless, e-scooters.

Introduced in 2018, e-scooters have become fixtures in cities across the globe. E-scooter's unprecedented uptake over the past 24 months means they now account for significant modal share.

They are electric, lightweight and immediately accessible, allowing them to respond to new mobility requirements better than cars and public transport. Especially during the pandemic and post-pandemic periods, e-scooters gain more popularity when people are avoiding public transit.

However, the rapid deployment is creating new challenges, such as road safety risks and cluttering of public spaces. Also, while companies point to a potential low-carbon footprint as a promising way to fight climate change, questions are raising around an e-scooter's real environmental impact over its full lifecycle. Arcadis conducted a carbon emission case study for scooters' lifecycle in Paris, which can be found at the end of this paper.

Adding to these considerations, COVID-19 has drastically changed public transport and commuting. During the height of the pandemic, use of public transport fell by as much as 90% on some of the world's most notable transit networks, such as the New York City subway. Months later, use of public transport is still far below average as social distancing and working from home become the new normal. In august 2020, the subway ridership in New York City is still down about 75% compared to 2019.

It is clear that authorities need to acknowledge that the public's faith in public transit will not recover soon, and alternative modes of transit are required to help cities accelerate their recovery. While cities see a pause in crowded commutes, there are opportunities to create frameworks for sustainable, low-carbon micromobility programs. Recommendations for safe and sustainable e-scooter programs are summarized from six angles: usage, carbon footprint, infrastructure, health and safety, data and pricing.

The e-scooter: six themes and recommendations

01. Usage

Self-service e-scooters help pedestrians travel faster and further than ever, and in some spaces, they are replacing walking and public transit. Recommendations to accommodate e-scooter usage include:

- Set aside areas for e-scooters in spaces used by cars, rather than those used by pedestrians. This is a matter of curb management, and, more broadly, the organization of public space.
- Ensure accessibility and equity
  - Prioritize e-scooter deployment in areas that are underserved by public transport
  - Consider booking functions for essential workers
  - Design e-scooter models to respond to new uses that may replace car use:
    - E-scooters for two, such as parent and child
    - Cargo e-scooters
    - E-scooters with seats for older and differently abled riders

02. Health & Safety

Health and safety recommendations include:

- Require proper safety equipment:
  - Mandatory horns or bells
  - A braking system adapted to the speed
  - Equipment that is clearly visible at night
- Create user safety campaigns and training
- Distribute or promote the use of helmets
- Set a speed limit
- Geofence the lanes where the e-scooters are allowed to be used, and block vehicles when they're on prohibited lanes/sidewalks/areas
- Introduce a detection system that blocks e-scooter use if more than one rider tries to board
- Require companies to define protocols for tracking, analyzing and improving their accident rate goals and communicate transparently with the public
- Introduce regular scooter cleaning procedure
- Encourage users to bring and use hand sanitizer

03. Carbon footprint

A city-wide e-scooter program could complement existing or planned public policies designed to help prevent climate change. Recommendations reducing the carbon footprint of e-scooters include:

- Mandate environmental impacts reporting
- Compare the e-scooter's carbon footprint with other modes of transit to identify the major pollution factors
- Facilitate collection, charging and repair using vehicles that pollute as little as possible (electric or even bicycles)
- Enable on-the-spot charging and repairs
- Maximize the use of less-polluting materials (aluminum and batteries)
- Reuse parts from faulty e-scooters
- Make e-scooter companies responsible for the collection of damaged e-scooters
- Set up designated charging zones for e-scooters in cities
- Encourage pickups and drop-offs at a charging point with price incentives

04. Infrastructure

Maximizing e-scooters' potential means weaving it into the current fabric of public spaces, such as cycle path networks, parking areas, traffic conflicts, permitted speeds, etc. Recommendations for using e-scooters in the public space include:

- Introduce a fee for the e-scooter companies for use of the public space.
- Designate areas where e-scooters should be deposited and circulated:
  - Decide upon locations alongside city authorities
  - Include clear signage and wayfinding
  - Ensure charging points can accommodate different e-scooter companies
- Define an upper limit on the number of vehicles in service. This limit may be stepped up gradually, in line with changes to infrastructure.
- Consider the possibility of deploying a special events fleet.

05. Data management

By retrieving and analyzing operating data from e-scooters average distance, main journeys, storage facilities, places with the highest accident rates, etc. is essential to building a safe, efficient and environmentally friendly micromobility framework. Recommendations for e-scooter data management include:

- Establish a strategic vision for data use. Some examples of data use objectives include:
- Measuring the environmental impact
  - Distance covered per e-scooter journey
  - Replacement rate depending on average distance covered per individual vehicle
- Supporting measures designed to improve road safety and optimize traffic management
  - Popular pickup/drop off locations
  - Dangerous intersections or riding scenarios
- Standardize data collection. This is the point when public authorities decide on what type of data that they want to retrieve from companies, how often they will retrieve it, and how the data will be stored. Data from user behavior surveys is qualitative data that should be used to bring meaning to the quantitative data. Most data currently remains with the e-scooter companies, but its use is of public interest.
- The North American Bikeshare Association has developed General Bikeshare Feed Specification (GBFS) that have been adopted worldwide. The three principles guiding this standardization are:
  1. Permanent availability of the system data
  2. Restricted access to historical data (such as data stored on users' itineraries)
  3. Data structured for real-time use for traffic management
- Mobilize qualified human resources and material resources. Do the users have the technical capacity and human resources required to process and store data securely?
- Potential issues with data sharing:
  - The authorities must provide strong incentives and convincing use cases for companies to share their data. This depends on negotiating power, and companies holding large quantities of data will be in strong positions.
  - It is probable that data protection policies will restrict the possibilities for real-time data retrieval (this can vary widely from one part of the world to another). As such, it is recommended to update data on a weekly or monthly basis, or in other aggregated manner.
  - In the event that data can be retrieved in real time, the technical capacity and costs required to process it will be considerably higher.

06. Pricing

Pricing can serve as a lever for mobility management. Recommendations for establishing a pricing model include:

- Ensure a price policy that makes multimodal journeys more attractive
- Introduce dynamic zoning (morning/evening) so pricing is fed by data from e-scooter companies.
- Provide special weekend pricing (e.g. for tourism)
- Create proposals to improve service coverage in areas that are less served by public transit:
- Mandatory e-scooter stations
- Dynamic pricing and zoning
- Offer discounted rides for essential workers and disadvantaged communities

Summary of recommendations for safe and sustainable e-scooter programs

Usage

- Optimize the offering for areas that are less accessible by public transit
- Establish the e-scooter as a means of transit accessible to all
- Prioritize e-scooter deployment in areas with more essential workers
- Carbon Footprint
- Set up fixed charging points
- Set aside compulsory parking areas
- Encourage the use of renewable energies for charging
- Extend the service life of e-scooters
- Pricing
- Offer smart, progressive pricing to encourage users to substitute car trips
- Do not underestimate the resources required for management of public space

Infrastructure

- Analyze the layout of public space: cycle path network, parking areas, traffic conflicts, permitted speed, etc.

Data management

- Establish a strategic vision on data use and circumstances in which it is used
- Standardize data collection
- Set up human and technology resources to manage data

Health and safety

- Establish policy of e-scooter usage in pedestrian areas and geofence e-scooters accordingly
- Identify and redesign accident blackspots
- Restrict speed
- Run awareness-raising campaigns addressing safe behavior, helmets, etc.
- Set up transparent cleaning protocol and encourage users to bring and use hand sanitizer

A global snapshot of e-scooter programs

Around the world, cities are enacting different regulations and programs to address the convergence of e-scooters.

São Paulo, Brazil

In May 2020, São Paulo introduced provisional regulations to allow micro-mobility devices to use public streets. It requires e-scooter companies to cover any damages caused to third parties or public assets, even in cases of force majeure, and to provide the necessary equipment for the safety of users, including helmets.

San Francisco, U.S.

In San Francisco, e-scooter companies must apply for a permit from the San Francisco Municipal Transportation Agency. As is the case in the other cities mentioned, user and pedestrian safety is the key requirement. The Agency requires e-scooter companies to take measures to educate riders and inform them about the ban on use in pedestrian areas. Companies must also introduce deterrents, fines or suspensions for users who break the rules. One innovative aspect of the San Francisco approach is its social and economic fairness requirement. The Agency requires operates to serve low income neighborhoods to guarantee the equitable distribution of e-scooters.

Lyon, France

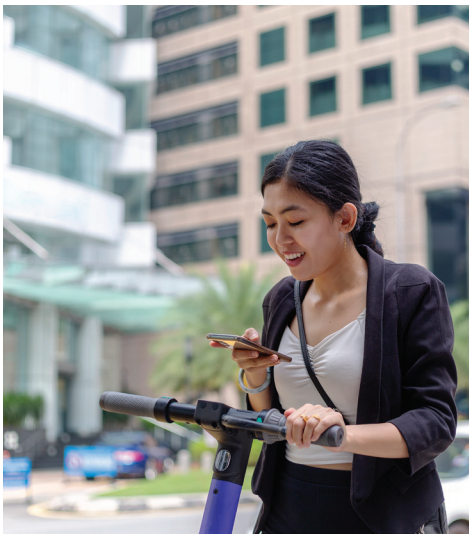
The city of Lyon is considering the retrieval of data on the use of all its infrastructure to better manage flows. In February 2020, the city launched a trial using a data platform that can restrict e-scooter speed, control traffic in certain zones and trigger automatic fines, all in real-time.

London, U.K.

Transport for London (TfL) is working closely with London boroughs on electric scooter trials. New regulations allowing trials of rental e-scooters on UK roads went into effect on July 4, 2020. TfL has revealed plans to run a pilot on a digital management system for mobility but, unlike Lyon, its platform will only include data on micro-mobility solutions, including electric scooters, e-bikes and e-cargo bikes. The specifications include data on the location of vehicles, unique vehicle identifiers, vehicle availability and journey start and end times. In addition, the Future Mobility Strategy of the Department of Transport seeks to identify basic parameters for safe design and operation of new vehicles to consider how traffic regulation and street design may need to evolve.

Abu Dhabi and Dubai, United Arab Emirates

In late 2020 Abu Dhabi and Dubai are planning to lift the blanket ban on e-scooters. However, a gray area remains in terms of regulations. In Dubai, it is forbidden to rent an e-scooter, but permitted to buy one and travel on public streets. Meanwhile, in Abu Dhabi a 12-month trial period began in January 2020, permitting the rental of e-scooters on specific streets. In line with the Emirate strategy for the technology revolution (and also similar to Lyon and London), both cities want to use artificial intelligence technologies to manage traffic flows and maintenance.



Hong Kong, Chinese special administrative region

In Hong Kong, micro-mobility vehicles are a common sight on public streets despite a ban. Since the vehicles are not registered, it is impossible to record offenses. The lawmakers will take inspiration from the Singaporean model to find a solution that works with the dense population and narrow streets of Hong Kong. E-scooter companies are waiting for the study results, due in mid-2020.

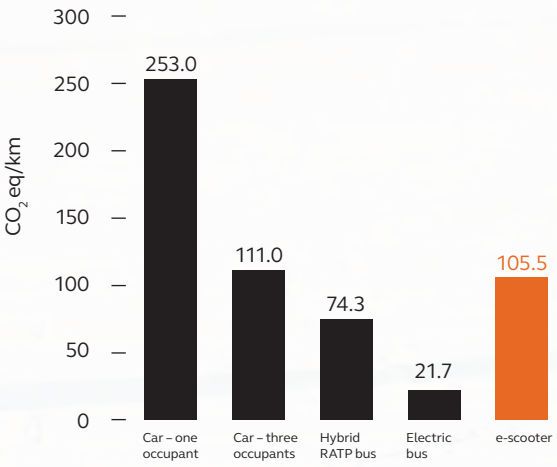
Free floating e-scooter case study:

Paris, France

The use of e-scooters in Paris exploded over a short period of time. Arcadis conducted a study in 2019 to learn more about Paris' e-scooter users, challenges and environmental impacts. Findings include:

- The main users are men in higher socio-professional categories, aged 24 to 30. Users are mainly visitors who do not live in Paris (42% of the total), most of whom are tourists.
- The share of self-service scooters could account for 0.8-2.2% of all journeys within Paris. By comparison, bicycles accounted for around 3% in 2010.
- When compared with other forms of transit, an e-scooter pollutes approximately 2.5 times less than a single person in a car but is responsible for the same carbon emissions as a car carrying three people. With a 30% reduction in its emissions, a journey on an e-scooter could, in terms of CO_2 emissions, be equivalent to one made on a hybrid bus.

Greenhouse gas emissions in g eq/CO_2 /passenger/km for different forms of transport in Paris in November 2019



Key: ADEME values for the four leading means of transport (excluding maintenance and end-of-life, deemed to be negligible per passenger/km for an initial approach)

Value calculated by Arcadis for e-scooters over their total service life

Contact

Yuan Shi
Global Director of New Mobility
yuan.shi@arcadis.com

About Arcadis

Arcadis is the leading global design and consultancy firm for natural and built assets. Applying our deep market sector insights and collective design, consultancy, engineering, project and management services we work in partnership with our clients to deliver exceptional and sustainable outcomes throughout the lifecycle of their natural and built assets. We are a public company with 27,000 people, active in over 70 countries that generate $3.9 billion in revenues.

Arcadis. Improving quality of life

Sources:

1. Agence de l'Environnement et de la Maîtrise de l'energie (ADEME), Base Carbone, 2018.
2. Remix Mobility Brief, Micromobility Policy Survey, Remix, 2018
3. 6 T Bureau de recherche, Usages et usagers des trottinettes électriques en free-floating en France, ADEME, 2019.
4. North American Bikeshare Association official website: https://nabsa.net/opendata/
5. GitHub official website: https://github.com/NABSA/gbfs
6. 2019 policy act on mobilities (Loi d'orientation des mobilitiés), Vie publique
7. Draft law on mobilities, French Ministry for the Ecological and Inclusive Transition, December 26, 2019.
8. Consulted on: https://www.ecologique-solidaire.gouv.fr/loi-mobilites
9. Hollingsworth, Joseph, Brenna Copeland, and Jeremiah X. Johnson. Are e-scooters polluters? The environmental impacts of shared dockless electric scooters. Environmental Research Letters 14.8 (2019): 084031.
10. Gössling, Stefan. Integrating e-scooters in urban transportation: Problems, policies, and the prospect of system change. Transportation Research Part D: Transport and Environment 79 (2020): 102230.
11. Trottinettes électriques : Marseille ne retient que 3 opérateurs sur 5, Lime se retire, Ludovic Moreau, France 3, October 3, 2019.
12. Consulted on: https://france3-regions.francetvinfo.fr/provence-alpes-cote-d-azur/bouches-du-rhone/marseille/marseille-desormais-seules-trottinettes-electriques-3-operateurs-prives-ont-droit-circuler-1691632.html
13. Nantes : les trottinettes électriques en libre-service retirées par la mairie, Christophe Amouriaux; France 3, April 2, 2019.
14. Consulted on: https://france3-regions.francetvinfo.fr/pays-de-la-loire/loire-atlantique/nantes/nantes-trottinettes-electriques-libre-service-retirees-mairie-1648730.html
15. Le Grand Lyon va tenter de réguler les nouvelles mobilités grâce à la data et l'IA, Olivier Cognasse, l'Usine Nouvelle, February 11, 2020.
16. Consulted on: https://www.usinenouvelle.com/article/le-grand-lyon-regule-les-nouvelles-mobilites-avec-blue-systems.N928624
17. Trottinettes en libre-service : Bordeaux Métropole pose ses conditions, MK, France 3, May 24, 2019.
18. Consulted on: https://france3-regions.francetvinfo.fr/nouvelle-aquitaine/gironde/bordeaux/trottinettes-libre-service-bordeaux-metropole-pose-ses-conditions-1674781.html
19. TfL aims to build micromobility data system, UK Authority, February 6, 2020.
20. Consulted on: https://www.ukauthority.com/articles/tfl-aims-to-build-micromobility-data-system/
21. Rogue SF e-scooter company says it's back in business. Not so fast, city officials say. Rachel Swan, San Francisco Chronicle, February 10, 2020.
22. Consulted on: https://www.sfchronicle.com/business/article/Rogue-SF-e-scooter-company-says-it-s-back-in-15044876.php
23. Hundreds more scooters to zip down SF streets, Mallory Moench, San Francisco Chronicle, December 14, 2019.
24. Consulted on: https://www.sfchronicle.com/business/article/Hundreds-more-scooters-to-zip-down-SF-streets-14905922.php#
25. Powered Scooter Share Permit and Pilot Program, San Francisco Municipal Transportation Agency.
26. Consulted on: https://www.sfmta.com/projects/powered-scooter-share-permit-and-pilot-program
27. E-scooter rider bloodied after collision with taxi in Dubai, Anam Rizvi, The National, February 14, 2020.
28. Consulted on: https://www.thenational.ae/uae/transport/e-scooter-rider-bloodied-after-collision-with-taxi-in-dubai-1.979018
29. Abu Dhabi legalises e-scooter rentals to cut congestion, The National, August 12, 2019.
30. Consulted on: https://www.thenational.ae/uae/transport/abu-dhabi-legalises-e-scooter-rentals-to-cut-congestion-1.893186
31. GCC states poised for a smart-mobility revolution, Zawya, February 2, 2020.
32. Consulted on: https://www.zawya.com/mena/en/business/story/GCC_states_poised_for_a_smartmobility_revolution-SNG_166139753/
33. Regulation of e-scooters and electric mobility devices, Sunny Lam, Legislative Council of the Hong Kong Administrative Region of the People's Republic of China, December 30, 2019.
34. Consulted on: https://www.legco.gov.hk/research-publications/english/essentials-1920ise05-regulation-of-e-scooters-and-electric-mobility-devices.htm
35. Brazil: City of São Paulo Enacts Decree Regulating Use of Electric Scooters, Eduardo Soares, Library of Congress, May 23, 2019.
36. Consulted on: https://www.loc.gov/law/foreign-news/article/brazil-city-of-so-paulo-enacts-degree-regulating-use-of-electric-scooters/