Shared e-scooters

A review of uses, health and environmental impacts, and policy implications of a new micro-mobility service

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1. Contexte

Nov. 2019 > conception de l'article (pendant stage de recherche au LVMT, dirigé par Anne Aguiléra)

Août 2021 > publication de l'article (co-écrit avec Anne Aguilera) sur *Sustainability*

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Review

Shared E-Scooters: A Review of Uses, Health and Environmental Impacts, and Policy Implications of a New Micro-Mobility Service

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Abstract: Shared e-scooters refer to a micro-mobility service that enables the short rentals of e-scooters. The rapid growth of e-scooter sharing has sparked a heated discussion about its role in the urban mobility sector. This article presents a systematic review of the current knowledge on its uses and users, health and environmental impacts, and policy issues. The analysis is based on academic literature, identified with Google Scholar by using keywords and publication years from 2017, and relevant gray literature. Firstly, we highlight that the profiles of e-scooter renters seem to highly match the characteristics of other micro-mobility services users. Secondly, e-scooters are often associated with a high perception of risk from the public and an increasing occurrence of related road accidents. Thirdly, even if promoted as a green mobility option, the true environmental impact of shared e-scooters has only started to be investigated. Early studies point out negative impacts around their production, usage, and maintenance. Fourthly, the integration of shared e-scooters into the existing transport systems requires policy changes, both at the local and national level, including traffic regulations, safety rules, and physical infrastructure. Finally, this paper reveals the ambiguity of the term "e-scooter" and stresses the need for more research, as the future of cities is tied to the development of low-car lifestyles.

Keywords: shared e-scooters; micro-mobility services; users and uses; health impacts; environmental impacts; public policy

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1. Introduction

Standing electric scooters (henceforth e-scooters) are electrically powered vehicles with a handlebar, deck, and wheels. They are light (less than 35 kg), travel at a relatively low speed (about 25 km/h), and usually carry only one person (the driver). While e-scooters have been around for years, the possibility of rental is quite recent. Since the launch of the first shared e-scooter schemes in late 2017, e-scooters have become an increasingly popular means of transport for urban residents across the globe [1,2]. In late 2019, shared e-scooter services were available in almost three hundred cities [3].

E-scooters are part of the broad family of the new mobility services supported by information and communication technologies [4]. More precisely, they belong to the micro-mobility modes [5]. According to the International Transport Forum [6], the word "micro" can refer both to the vehicle type (light, with a small footprint) and to the distance travelled (usually short). The term "micro-mobility" encompasses a range of personal, light, low-speed vehicles [7]. Some, such as electric bikes, e-scooters, and hoverboards, are propelled by an electric motor, while others, e.g., conventional bicycles, skates, skateboards, and standing scooters, are solely powered by human energy. Micro-vehicles are often described as new sustainable travel modes with low economic and environmental impacts [8]. Notably, they can contribute to reducing travel time on congested roads, speed up short distance trips, and do not require any driving license.

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1. Contexte

Quelques concepts clés

- Trottinettes électriques (*e-scooter* en anglais)
- Services de micromobilité partagée

Source: M, 2020

1. Contexte

Quelques date clés

- 2017 > lancement du premier service à Santa Monica, dans les États-Unis
- 2018 > diffusion surtout dans les États-Unis et en Europe
- 2020 > service disponible dans 390 villes dans toit le monde (sauf l'Afrique)

Source: NUMO, 2022

2. Objectif

This article presents the current state of knowledge and discusses future research avenues on shared electric scooters (e-scooters) in terms of user and usage characteristics, health impacts, environmental sustainability, and policy issues. In this article, we aimed to provide a ***broad — yet initial — overview about the impacts and role of shared e-scooter services***

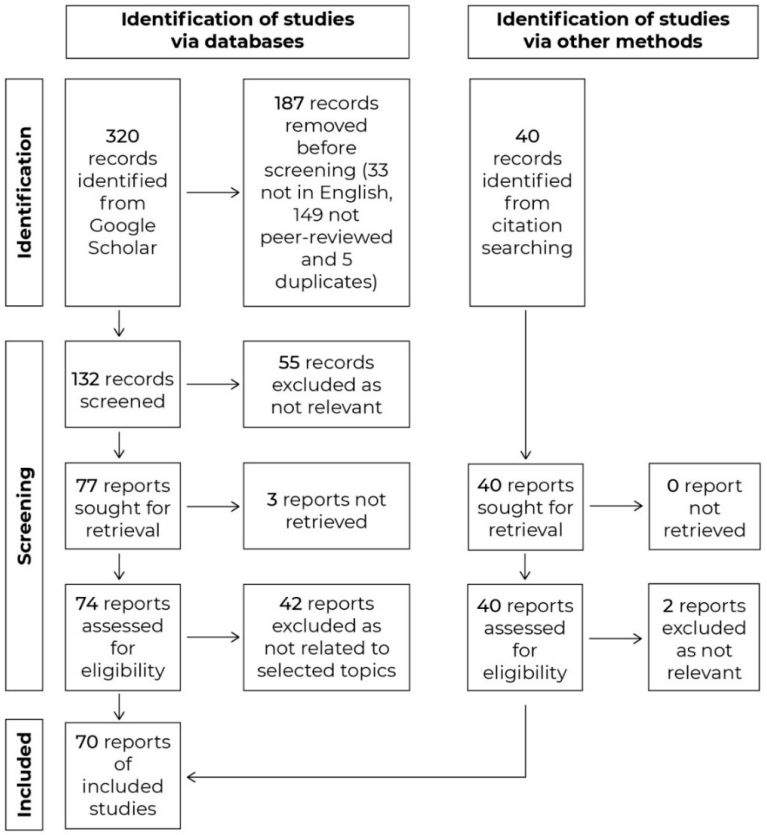
(Bozzi & Aguilera, 2021)

3. Méthodologie

- moteur de recherche : Google Scholar
- mots clés : e-scooter, micro-mobility, shared
- année de publication : jan. 2017 – oct. 2020
- langue: anglais

> corpus final de 70 références :

- 47 sources revues par les pairs
- et 23 sources non revues



Source: Bozzi & Aguilera, 2021

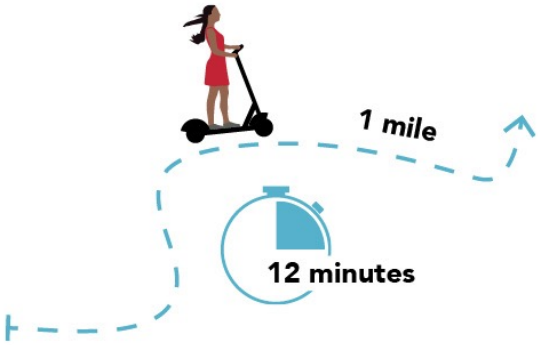
4. Résultats

Topic	Source Type	North America	Europe	Oceania	Asia	Global
Uses and users	Peer-reviewed	Bai and Jiao, 2020; Caspi et al., 2020; James et al., 2019; Mathew et al., 2019; McKenzie, 2019a, 2020, 2019b; Noland, 2019; Sanders et al., 2020; Zou et al., 2020	Hardt and Bogenberger, 2019; Laa and Leth, 2020; Ruhrort, 2020	Curl and Fitt, 2020; Fitt and Curl, 2020	Zhu et al., 2020	Davies et al., 2020
	Not peer-reviewed	Chang et al., 2019; Clewlow, 2018; Espinoza et al., 2019; Hall, 2017; Lee et al., 2019; NACTO, 2019, 2020	6t-bureau de recherche, 2019; Berge, 2019; Civity Management Consultants, 2019; Giles, 2020			NUMO, 2020; Lime, 2018; Tillemann and Feasley, 2018
Health impacts	Peer-reviewed	Allem and Majmundar, 2019; Alwani et al., 2020; Badeau et al., 2019; Bloom et al., 2020; Glenn et al., 2020; James et al., 2019; Kobayashi et al., 2019; Sikka et al., 2019; Trivedi et al., 2019		Fitt and Curl, 2020; Haworth and Schramm, 2019; Mayhew et al., 2019; Mitchell et al., 2019		Neven et al., 2020; Santacreu et al., 2020
	Not peer-reviewed					
Environmental impacts	Peer-reviewed	Hollingsworth et al., 2019	de Bortoli and Christoforou, 2020; Martínez-Navarro et al., 2020; Moreau et al., 2020			
	Not peer-reviewed		Berge, 2019			Rose and Schellong, 2020
Policy issues	Peer-reviewed	Bartling, 2019; Brown et al., 2020; Button et al., 2020; Hollingsworth et al., 2019; James et al., 2019; Janssen et al., 2020; Noussan et al., 2020; Riggs and Kawashima, 2020; Zou et al., 2020	de Bortoli and Christoforou, 2020; Florek-Klęsk, 2019; Lipovsky, 2020	Haworth and Schramm, 2019; Lo et al., 2020	Zhu et al., 2020	Gössling, 2020; Li et al., 2020; Santacreu et al., 2020; Shaheen et al., 2017; Shaheen et al., 2020; Shaheen and Cohen, 2019 Tice, 2019; Turoń and Czech, 2020
	Not peer-reviewed	NACTO, 2020; Transportation for America, 2018				Laker, 2019; Reed, 2019; Schellong et al., 2019

Source: Bozzi & Aguilera, 2021

4.A Utilisation et utilisateurs

- principalement utilisés pour des trajets très courts, surtout l'après-midi et le week-end
- la répartition spatiale et les objectifs des trajets en scooter électrique: des variables du contexte local



- caractéristiques convergentes: âge, sexe, éducation…
- en particulier, visiteurs

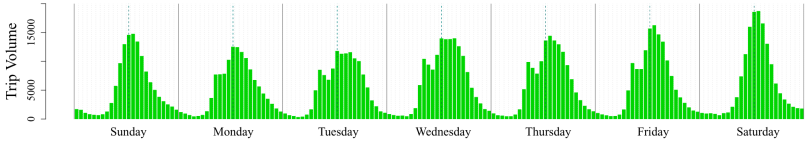
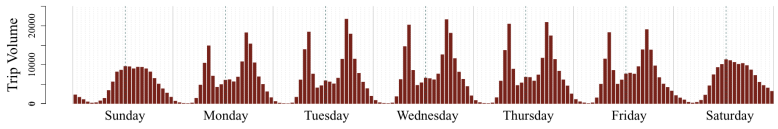


Fig. 4. Scooter-share trip start times aggregated to hours of the week. Solid lines at midnight and dashed blue lines at 12 noon. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)



(a) *Member* Capital Bikeshare trip start time

Source: McKenzie, 2019

4.B Impacts sur la santé

Accidents

- forte augmentation des blessés suite à l'introduction des trottinettes partagés (mais lié à l'augmentation des utilisateurs de trottinettes électriques)
- équipements de protection rarement portés
- conducteurs de trottinettes : les plus à risque

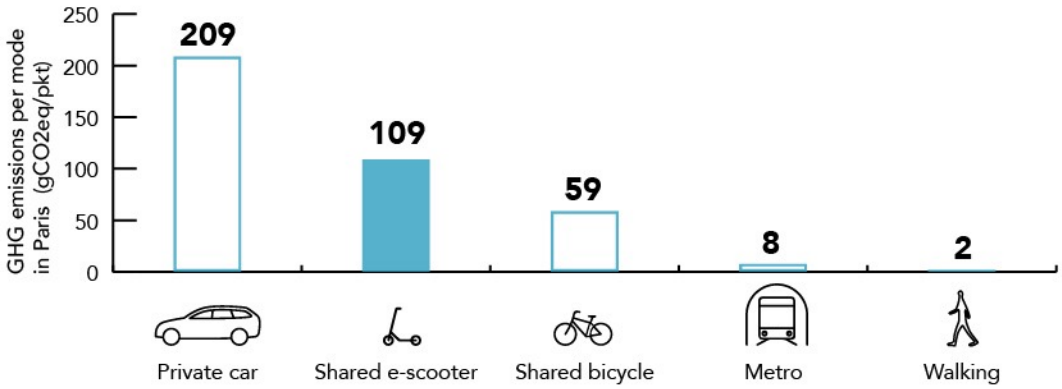
Sécurité perçue

- les blessures graves et les décès causés par les trottinettes: extrêmement rares mais largement rapportés par les médias
- sentiment d'insécurité et période d'adaptation à un nouveau véhicule

Activité physique

- mode de transport « sans effort »

4.C Impacts sur l'environnement



Realisation : A. Bozzi, 2021
Source: de Bortoli & Christoforou, 2020

4.C Impacts sur l'environnement

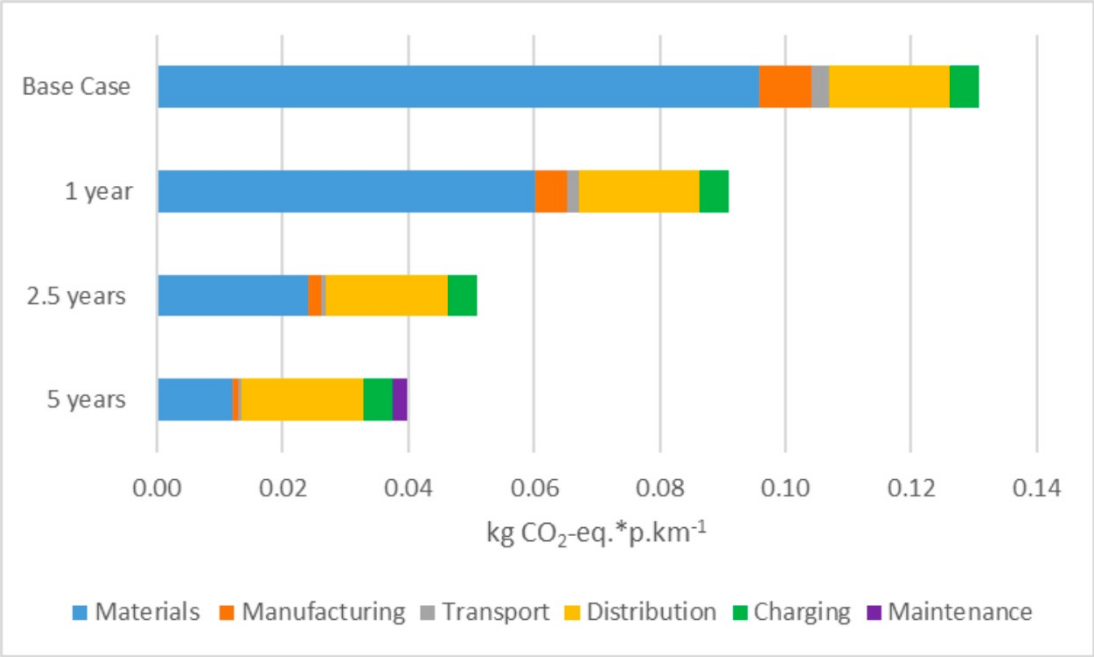


Figure 5. Evolution of the contribution of the life cycle phases for the different prolonged lifetime scenarios on the global warming impact category.

Source: Moreau et al., 2020

4.D – Enjeux politiques

Cadre juridique

- défis à l'échelle nationale et locale (ex. nouvelles régles sur la classification des e-scooters et où ils peuvent être utilisés)

Sécurité

- question de équilibre véhicules, usagers et infrastructures

Partage des données et confidentialité

- données collecté par les entreprises
- souvent pas partagé avec les autorités locales (sauf quand il est requis)

Infrastructure spatiale

- où garer et conduire les trottinettes en libre-service?

4.D – Enjeux politiques

Où les garer?

- problème: mal garés (risques pour la sécurité)
- quelques propositions: réglementations générales / spécifiques, sensibilisation des utilisateurs

Où les conduire?

- confusion : pistes cyclables, routes, trottoirs ?
- réponse des chercheurs : pistes cyclables (et pas trottoirs)

5. Conclusions

Principales conclusions

- utilisé principalement par les jeunes hommes, en particulier dans les villes nord-américaines et européennes
- accidents de la route (relativement) élevés
- impacts environnementaux peu connus mais plutôt négatifs
- nécessite des changements de politique
- l'ambiguïté du terme *e-scooter* en anglais

5. Conclusions

Lacunes de la recherche

- investiguer utilisations et des utilisateurs dans différents contextes socio-économiques (par exemple, genre, ethnicité, usages dans zones suburbains)
- explorer comment les impacts sur la santé et l'environnement varient en fonction des conditions locales
- explorer dans quelles conditions l'utilisation de scooters électriques partagés favorise un transfert modal vers des modes de transport plus actifs et contribue à une diminution de l'utilisation et de la propriété de la voiture

Phénomène temporaire ou durable? et après covid ?

Merci!

Question?

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Sources

Bozzi, A. D., & Aguilera, A. (2021). Shared E-Scooters: A Review of Uses, Health and Environmental Impacts, and Policy Implications of a New Micro-Mobility Service. *Sustainability*, *13*(16), 8676. https://doi.org/10.3390/su13168676

McKenzie, G. (2019). Spatiotemporal comparative analysis of scooter-share and bike-share usage patterns in Washington, D.C. *Journal of Transport Geography*, *78*, 19–28. https://doi.org/10.1016/j.jtrangeo.2019.05.007

Moreau, H., de Jamblinne de Meux, L., Zeller, V., D'Ans, P., Ruwet, C., & 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*, *12*(5), 1803. https://doi.org/10.3390/su12051803