Littering the City or Freedom of Mobility? The Case of Electric Scooters

Zane Datava, Tomas Skjølsvold, and Marius Korsnes

Introduction

Over the last years, urban mobility across the globe has been heavily impacted and transformed by the rapid influx of free-floating electric scooter (e-scooter) services (Christoforou et al. 2021). These services combine 'advances in mobile apps, routing, and GPS technology' (Ruhrort 2020, p. 6), with access to dockless scooters for anyone willing to install an app. The sudden arrival and rapid rise of these services have been hailed as ushering in a new era of sustainable urban micro-mobility where the role of privately owned cars and vehicles might diminish (e.g.

Z. Datava (✉) · T. Skjølsvold · M. Korsnes
NTNU, Trondheim, Norway
e-mail: zane.datava@ntnu.no

T. Skjølsvold
e-mail: tomas.skjolsvold@ntnu.no

M. Korsnes
e-mail: marius.korsnes@ntnu.no

Edge et al. 2020), but they are also contested, based on concerns for their role in increasing the demand for minerals and metals in battery production (Hollingsworth et al. 2019), conflicts with pedestrians and conflicts over the use of space (James et al. 2019), as well as their broader role in urban developments (Hosseinzadeh et al. 2021).

In this chapter, we explore the co-production of e-scooters, infrastructures, users and non-users, with an interest in the e-scooter's impacts on urban space and generation of waste. Through this, we explore what is lost and gained as e-scooters enter as a sustainability-oriented 'innovation', and what this technology adds to existing modes of mobility and mobility infrastructures. To understand better how this novel mode of mobility is enacted and experienced in the cityscape, and potentially ends up generating more waste, we focus on e-scooter users, e-scooter opponents and e-scooter distributors. This approach generates new knowledge about how a broad range of actors understand and enact this new form of mobility, as for instance called for by van Waes et al. (2020).

Through addressing these topics, we intervene in ongoing debates about the proliferation of electric scooters in urban environments. These debates tend to highlight how the e-scooters become obstacles for pedestrians, cyclists or those who have impaired sight or hearing. E-scooters are also contested due to their roles in accidents. An active global resistance against e-scooters exists. In Norway, this is organised through the Facebook group *La oss ta fortauene tilbake!* (Let's take back the sidewalks!). The group consists of more than 16,000 users, who argue that riding e-scooters on sidewalks should be banned, that parking should be publicly regulated and that speed limits should be enforced. Reacting to increasing numbers of e-scooter accidents (Tu.no 2019), various activist initiatives have emerged also in Trondheim, e.g. through the organisation of teams that remove e-scooters from sidewalks (Flatås and Ersfjord 2020). Technology developers are also addressing such issues, e.g. by developing apps that stop e-scooter users from ending a trip before the scooter is safely positioned in a safe, specially designated place (Sundby and Isachsen Sandøy 2021). The remainder of this chapter is organised as follows: the sources of our data are described in the upcoming part 'data and methods', the e-scooter placement in the context of the twin transition is described in the following part 'The twin transition

of the electric scooter'. Further, in 'Theoretical perspectives: The co-production of socio-technical change and spatial justice', social justice aspects connected to bringing in a new technology are explored. 'Digital urban mobility: access to the paths and freedom of movement as an embodied practice' looks at the e-scooter use from 'inside' and analyses its users' experiences. The concluding part, 'Matter out of place: The digitised urban landscape in flow', shows how an e-scooter might become a hindrance and cause congestion instead of easing it.

Data and Methods

This chapter combines interviews, ethnography, photography and social media analysis to explore electric scooter use, attitudes towards it and co-existence in the urban surroundings. The material includes 20 interviews with electric scooter users (14), electric scooter opponents (4) and distributors (2). The age range of respondents was 23–68 years, and the length of interviews varied from 30 min to 2 hours. Participants were chosen by using the snowball sampling method. This method allowed us to grow a pool of diverse participants, as well as to access participants who were hard to access, or 'hidden'. In many cases, such participants are hidden because they belong to vulnerable groups, but in our case, they were hidden due to speed: e–scooter users were often difficult to stop while cruising at 20–25 km/h. Interviewees were located in Trondheim, Oslo and other Norwegian cities. Due to COVID-19 restrictions, interviews were partly conducted digitally. The interview material was primarily analysed using narrative analysis and supplemented with the results from coding. Interviews were supplemented with participant observation and ethnographic observations on electric scooter use and displacement. Around 100 hours of direct observations were done, underpinning the analysis in this chapter alongside interviews.

Oslo had most e-scooters per inhabitant among European cities in 2021: 191 e-scooters per 10,000 inhabitants,[1] and as such is a very useful example for our study. Three research trips to Oslo were made during the

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[1] https://fluctuo.com, accessed on 31 March 2021.

research project. Participants were also interviewed on the street, about 10 short interviews were conducted by taking contact with e-scooter users while they were about to start or end their trips. A collection of more than 100 pictures was assembled in Trondheim, Oslo and Bergen from September 2020 to August 2021 and analysed regarding the use of space, parking and assemblages with other urban elements.

Further, we analysed the content of the Facebook group 'La oss ta fortauene tilbake!' to understand current attitudes and perceived problems around electric scooters. This group continuously provided updated visual ethnographic material about e-scooters use from urban sites across Norway.

The Twin Transition of the Electric Scooter

There is a growing body of scholarly literature on the implementation of e-scooters, which suggests that this technology can be related to a broad set of social and environmental issues. Examples focusing on social aspects deal with contestation and conflict over access to urban space, e.g. between e-scooters, pedestrians and users of other mobility devices (James et al. 2019). Gössling (2020) analysed media articles from 10 different cities across the world, focusing on e-scooter implementation, regulations, as well as local problems and solutions, concluding that e-scooters can both help solve urban mobility issues, (congestion, pollution), and contribute to urban mobility problems (inappropriate parking, littering, safety). The environmental aspects of e-scooters have been studied through lifecycle assessments (LCA), which have illustrated that their greatest environmental impact lies in the production process (Hollingsworth et al. 2019), as well as their short lifespan which causes pollution compared to the transport options they replace (Moreau et al. 2020).

Such discussions indicate that through observing the implementation and increased use of e-scooters, we might observe a socio-technical transition, where a diverse set of elements changes over time and across scales. Geels and Schot (2010) note the systemic traits of such transitions,

foregrounding how they entail simultaneous shifts in technologies, practices, regulations and culture. In the case of e-scooters, the most obvious expression of such a transition would be the visible expression in changed ways of doing urban mobility. These changes, however, rest upon broader socio-technical changes, including all the digital innovations that over the last years have given rise to what Van Dijck et al. (2018) dubbed the platform society.

Scholars have noted that while shared mobility services both for cars and bicycles are not novel phenomena, they remained small niches until the use of mobile and digital technologies escalated in the late 2000s (Ruhrort 2020). Increased connectivity associated with these developments and new modes of communication between users and service providers have opened windows for innovation on behalf of new types of actors (Wang and Wells 2020; Ruhrort 2020), leading some scholars to conclude that the logic of digitalisation is one of the key drivers pushing the roll out of shared mobility in general and shared bike- and scooter services in particular (Sareen et al. 2021). Hence, our account in this chapter is fuelled by an interest in observing how an object such as the electric scooter transforms urban space and mobility, but also by a curiosity about the nested layers of infrastructure, including digital ones, that enable such shifts.

E-scooters also represent a new site for the proliferation of batteries as an enabler of energy and mobility services, a trend that is expected to grow as mobility and energy transitions unfold together with digitalisation (Magnusson et al. 2020). Such combinations of technologies, infrastructures and practices have environmental, climatic and social consequences. What these consequences are, however, is not determined by the technology as such, but by the concrete ways that these technologies are used, placed and discarded. It is therefore central to probe the contemporary use and contestation of e-scooters to understand which roles they might play in the future.

Theoretical Perspectives: The Co-production of Socio-Technical Change and Spatial Justice

Innovation as Co-produced

Our theoretical approach is inspired by socio-technical and co-productionist perspectives on innovation and urban environments. Such perspectives reject linear understandings where technologies move from invention to implementation, and take on an understanding of change as co-produced by technology, users, practices, infrastructure, policies, etc. This includes a focus on changed interaction and experiences of urban life (e.g. Graham and Marvin 2002). As part of this, one recognises that urban environments are constantly being reconfigured according to different, sometimes conflicting, interests. This suggests that studying how new technologies such as e-scooters are currently used, is essential also to understand future innovation trajectories (see e.g. Schot and Kanger 2016 or Berker et al. 2005 for discussions about the role of users in innovation).

This is reflected in the work of Akrich et al. (2002), stating that innovation processes tend to be multi-layered, non-linear and unpredictable despite of careful planning. As they point out, '[i]nnovation by definition is created by instability' (Akrich et al. 2002, p. 195), and their examples show that innovation both needs the instability in order co-produce a market, and at the same time, instability makes the implementation of the innovation vulnerable. Even well-designed innovations with a clearly defined customer and market may surprise the innovators, as the customers may use the innovation in a totally different way or abandon it entirely. In this understanding, innovation takes place in the meeting of social environment and the new technology (Akrich et al. 2002).

To us, these perspectives suggest looking at e-scooter innovation through a variety of actors and discourses, including existing infrastructure and its extensions, politics and regulations, activist groups and their impact, and of course, the production and use of electric scooters, including shipping, batteries, charging, maintenance, as well as potential for recycling. Electric scooter users and their usage patterns are an important factor, and businesses distributing and running electric scooter

companies need to be taken into consideration as well. In short, a wide array of actors interact and co-produce the potentials and pitfalls of new electric micro-mobility technologies.

Spatial Justice Perspectives

Beyond a co-productionist perspective, our analysis takes cue from work that links ideas of justice and spatiality (as also addressed by Sareen in this book). An often-ignored question relates to who can and cannot use a particular space. There have been ongoing debates of the right to the city, which often are referred to in relation to the 1970s discussions on the 'production of space', which French sociologist Henri Lefebvre saw as a civic right (Lefebvre 1991). We can continue to question who has the right to make space, for whom the space is made, and to explore the kinds of relations that are produced in the process of changes, such as implementation of new mobility devices. As pointed out by Soja (2010, p. 5), 'the spatiality of (in)justice […] affects society and social life just as much as social processes shape the spatiality or specific geography of (in) justice'. Unjust geographies are actively produced and reproduced, as spatiality of justice is an integral and formative component of justice itself, a vital part of how justice and injustice are socially constructed and evolve over time (Soja 2010).

A related discussion is found in the work of Trogal (2017), who has illustrated the ways in which care is connected to space. Her argument is based on the idea that a spatial concept itself implies care—as care was the reason to produce space and spatial relations. Her idea focuses on the practices of collective care and its influence on various spatial concepts, such as commons. Commons are co-used spaces, neither private nor public. Ownership of those spaces is made and reproduced through use, and this ownership can be material or immaterial.

We draw on these perspectives on spatial justice, commons and care to take a closer look at the questions of rights and access to space and place in relation to e-scooters. If e-scooters are placed where someone normally would walk undisturbed, are they 'taking' that space where something else existed?

Spatial Justice Aspects of E-scooter Innovation and Use

Across the sites we studied, multiple informants pointed out that many are excluded from the use of the new micro-mobility devices. Excluded groups include less-able-bodied and older others, families and those living outside e-scooter coverage zones. The digitised nature of this form of urban mobility has a variety of implications for our analysis. The trips are booked and paid for by digital applications on smart phones, and e-scooter companies have access to information on trips taken, their routes and parking modes. The majority of our informants found this unproblematic: 'I have all the apps available, as I don't know which e-scooter I will find when I would need it', and 'I don't mind that companies have access to my movement patterns, I think that they need it mostly to know where the e-scooters are parked'. An informant in her 30s who works as teacher mentioned that 'Towards the end of the season I tried the other brands as well. I tried, Voi, and Bolt. I think I've tried all that are available'.

'It is of course surveillance; the company can see who is using which e-scooter at what time and where they are. But I would not be concerned about that, because we already have so many apps and we have given consent for so much, you don't even know where you have clicked to consent to something', an idea expressed by a researcher in her late 20s was repeated also by other informants.

Even though some of the participants had their favourite company or a subscription to use one of them monthly, the majority of e-scooter users used scooters by any brand that was available. The applications, even though there would be several to download if one wanted to have freedom to choose whatever e-scooter was available, was generally quite easy to use, according to our informants. There were other technical issues, such as the drainage of phone battery because of the app use. One of the informants said: 'I used to have a different phone, and its battery died very quickly while being logged on to the app, so that calling was a problem at some point'.

Nevertheless, there is a potential controversy between the promised lightweight mobility and digitised mode of mobility and its materiality.

For every e-scooter brand, there is a different app to be downloaded and data is being gathered during every trip. Simultaneously, streets become a visible parallel illustration of what is happening on the digitised side. Therefore, the focus on material politics and spatial justice can bring a useful addition to an understanding of digitisation, as it indicates and demonstrates the connections between the digitised and the material forms of the same phenomena.

The evanescence and unpredictability of e-scooters, as they are always left in different spots, appear and disappear, has turned out to be one of the major challenges for infrastructures in public spaces. Yet, their immediate availability is one of their main characteristics and attractions for their users: 'I agree that they (e-scooters) should be parked in a more responsible way, but I actually like that they are available everywhere'.

One of the informants, who was against the e-scooters and had never used one, said: 'I like the idea of something being publicly available for everyone to share' but doubted the way it had been done regarding the flexibility of parking and the lack of regulation: 'they have to have some sort of fixed electronic data and they have to be within an area in the radius of some place so it's out of the way'. He expressed annoyance towards the way e-scooters were a hindrance in public areas in the city and had himself had an accident while running in the darkness of the evening and bumping into one which was left on the path.

There was a strong media reaction after one of the first summer days in Oslo left the popular area Aker Brygge densely covered with e-scooters, as their drivers were leaving them behind to head to the urban beach nearby. There is a visible side effect connected to promises of these lightweight micro-mobility devices. Namely, they may become a hindrance, something that is thrown aside and is in the way and is piling up in urban space. One of our interlocutors said:

> Have you been to Oslo lately? I was there for just a couple of days, and it was shocking that the e-scooters were everywhere - just thrown in piles and often in the middle of the sidewalks. I also noticed a few dangerous situations, one e-scooter driver just drove in front of the bus.

Space and care also overlap in the case of protests towards electric scooters, as exemplified by people from the group *La oss ta fortauene tilbake!* who express their continuous discontentment and anger caused by misplaced electric scooters.

The definition of acts of care by Joan Tronto 'includes everything that we do to maintain, continue and repair "our world", so that we can live in it as well as possible. That world includes our bodies, ourselves, and our environment, all of which we seek to interweave in a complex, life-sustaining web' (Tronto 1993, p. 103). In the case of the implementation of the electric scooters, care is often non-existing in the most visible way in relation to space. One of the reasons is that e-scooters are shared and don't belong to their users:

> I like that I don't need to worry about an e-scooter as I would need to worry about my bike. I don't need to lock it or to charge it. If one is not working, I just take another one
>   said one of the informants, a young woman from Trondheim, who would often use an e-scooter to go to work and training.

Our material also shows attempts to cross the line between shared and private. An interviewee from one of the providers working for the e-scooter company mentioned that it wasn't uncommon to hear beeping sounds from the e-scooters inside people's yards and houses when looking for e-scooters to charge, which indicated that people had attempted to 'privatise' e-scooters by locking them in to make sure the vehicle would not be taken by someone else. Ironically, though, this could lead to the e-scooter battery not being recharged, which would soon make the e-scooter of little use to its user.

Digital Urban Mobility: Access to the Paths and Freedom of Movement as an Embodied Practice

One of the electric scooter companies, Voi, which is based in Sweden, promotes their electric scooters as being made for everyone, they advertise on their website that: 'Voi lets you move freely around urban environments in a safe and easy way' and is 'reducing air and noise pollution, and breaking traffic gridlock across Europe'.[2] Freedom of movement was often mentioned as important for informants: 'Especially during the Covid-19 pandemic lockdowns I felt that it was a rather responsible choice to use the e-scooters. It allows me to choose my own paths and get there faster. I don't need to rely on bus schedules either'. Meanwhile, several informants expressed their doubts about the e-scooter sustainability: 'Well, I do not know exactly, but I think, at least in Norway, they might at least be more sustainable, because electricity comes from hydropower here'.

One informant interviewed in November 2020 mentioned that she thought that the e-scooter is a nice cheap invention, which greatly reduces the time she would use to go from her place uphill to visit her friend. 'It would take 20 minutes by foot, and it only takes four minutes by electric scooter.' There is no bus connection between these two places. Additionally, it was mentioned that it is cheap to rent an electric scooter, as it costs approximately 20 Norwegian kroner for a short trip.

Our data also shows that some people are left out from the use of electric scooters, as, even though the scooters are available to all, not everyone is able to use them. On the one hand, one of the interviewed participants mentioned that her main reason to use them is that she, who is in her early 40s, has a chronic illness, which makes walking difficult and painful, if she needs to walk for more than an hour. For her, electric scooters provide a very convenient way to move around and not lose her mobility. She uses the e-scooters for work meetings and for social gatherings. On the other hand, another participant was excluded from

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[2] Webpages https://www.voiscooters.com and https://www.voiscooters.com/voi-technology/, accessed 27 April 2022.

using electric scooters, as he, because of a slight disability, was unable to use his right hand—and the speed of the scooter is regulated with the handle on the right side. In sum, e-scooter experiences vary. Our informants expressed both empowerment: 'This is my superpower! I can go much faster!', or 'I like the freedom it gives to me, as I am not dependent on bus schedules', as well as a sense of slight shame: 'I don't feel especially good when driving, because I know how e-scooters are seen by other people—that they are in the way, that they are disturbing others'.

Even though electric scooters are advertised as a more convenient mobility alternative for moving around in urban environments and a greener choice of transportation, the most visible change has been seen in the urban landscape, and consequent public reactions against what becomes a 'littering' of the landscape. For example, in October 2020, the police were called on to a suspected case of drowning in Nidelva in Trondheim. At the scene, the police discovered that the reported incident was caused by an electric scooter thrown into the river. In contrast to the touted promises of electric scooters, the technology has rather become central in discussions of the challenges they produce. Even those who use them on an everyday basis and are otherwise satisfied with the mobility and freedom possibilities that e-scooters can give, express that there should be clearer rules and designated parking, which would prevent people from parking wherever they please. Some of the interviewees were concerned that they would suffer consequences because 'others' aren't using e-scooters responsibly. They expressed their concern regarding responsible parking and driving, which would lessen both the accidents and public opinion about the e-scooters. One of our informants, a 25-year-old student from Oslo, said that: 'I think that the teenagers are worst, they use e-scooters for fun and don't care much for the rest of the people and the environment. I, myself, always try to park so that is as tucked away as possible'.

In sum, many of our informants would use e-scooters both because they are practical to use to get around town, and because they are more fun to use. A young researcher working on the outskirts of Trondheim was not able to take the e-scooter all the way up to her job, because the area was not in the zone covered by the e-scooter network. As she started to occasionally use them in her free time, she said that 'my main reason

was, yeah, it was that it's fun to use, I think'. All informants, in addition, mentioned that it was practical and convenient to use them: 'when I need to travel to a place, for example, connecting to a bus, I usually prefer to take electric scooters because it's a lot faster', said one of the informants, a 23-year-old student.

Another aspect to consider are protests towards e-scooters and the cases where they get moved or destroyed, as an answer to their taking up common space, or causing annoyance. Freedom of parking and a lack of clear regulation causes trouble on the streets, as they might be piled up in the middle of paths and roads and cause irritation because of this disruption, or, even worse, accidents.

As shown in this section, mobility and the energy sustaining it have material forms, which in the case of e-scooters have become central in academic and political discussions. Instead of praising e-scooter speed and mobility possibilities, their hindrances are more visible and debated (e.g. James et al. 2019).

Matter Out of Place: The Digitised Urban Landscape in Flow

The e-scooter, a technology argued to be more sustainable and convenient, becomes something which is mostly talked about as an encumbrance, or an obstacle—something that bothers urban inhabitants. In our material, we see that even those that use e-scooters on an everyday basis are bothered by the lack of regulations and lack of order. In all our interviews with e-scooter users, some aspects of annoyance was expressed. Informants were not satisfied with how other e-scooter users drive and park them. Those who misbehaved were 'others', younger and less responsible people who need to have stricter regulations and rules, both from the companies and from municipalities. Other e-scooter users were causing trouble on the streets, throwing e-scooters when finishing their ride, and littering the space for everyone. Despite claims of being a last mile mobility device, a combination of lack of clear regulation and consequent chaotic parking is one of the reasons that e-scooters litter the streets instead of easing urban congestion. Notably, an informant said

that 'if they would change the regulation, then maybe they [e-scooters] would disappear', thus indicating that the ease of parking is an essential aspect of e-scooter use.

But how has this futuristic technology managed to produce waste so early during the implementation phase? Are they garbage because they are in our way and can potentially harm us? Or are there other explanations?

Space gets attention and gets noticed when it's occupied, and objects get noticed when they are in the way for someone or something. According to Mary Douglas, the lack of context determines if a thing becomes 'matter out of place' and turns into waste (Douglas 1984, p. 40). Similarly, items found in the wrong place, i.e. not in their proper, designated place, can in some cases be considered garbage (among other characteristics) because of their location (Thompson 1979). The status of an item changes depending on where it is located, and how it is embedded into the everyday fabric consisting of materiality, habits, routines and meanings. One of the possible ways of looking at garbage is to view it as social pollution, which influences and becomes part of people that live next to and encounter it (Drackner 2005). In this sense, waste can be seen as a collective sub-consciousness of culture, forced out of mind and daily life, although it is right in front of our eyes every day (Eriksen 2011).

The ideal situation regarding waste would be that everything would be re-used—as embedded components in a circle of life. As shown through the examples of this chapter, e-scooter use replaces walking through conveniently available digitised solutions, and simultaneously creates more waste in urban spaces through generating demand for a previously undesired product. Similar to the challenges associated with coworking spaces in the chapter by Ortar and Flipo (in this book), pointing to the lacking awareness of the ecological costs of digitisation by those companies that suggest the technology, it is difficult to imagine the e-scooter revolution as a more sustainable mobility alternative for the future. Although e-scooters theoretically fulfil the idea of digitised and lightweight transition towards decarbonised mobility, they, as shown, have a direct impact on infrastructural congestion, as well as causing conflicts regarding spatial justice, which compromises their claims. The

Exhibition Fig. 8   Technical drawings of a bulk electric bus order for Bergen on display (*Source* Rune Egenes and Norwegian Petroleum Museum [used with permission])

users of e-scooter technology rarely posed any concerns about it and mainly praised its practical benefits—such as the possibility to locate the devices and follow up if they need to be charged. Nevertheless, while enabling individual freedom of movement in the selection of mobility devices and trajectories, they form new, and highly material constellations in the urban space which hinders other users of the urban space and disables and blocks their trajectories. Exhibition Fig. 8 follows this chapter.

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