Learning from the Literature: Insights for Regulating E-scooters in New South Wales, Australia

Presented by

Dr Yuting Zhang, Research Fellow

Institute of Transport and Logistics Studies

THE UNIVERSITY OF SYDNEY

Photo from Yuting (Sydney)

Challenges in regulating micromobility vehicles

Photo from weibo.com

Background

Dilemma of e-scooters:

- Escalating safety concerns (e.g., collisions, parking predicaments, and inadequate infrastructure)
- Potential to cut car travel and emissions, leading toward more environmentally sustainable outcomes

Shared e-scooter scheme as a way to assess the feasibility of the vehicles prior to enacting official legalisation.

Research aim:

To provide an evidence review of shared e-scooters and to investigate how existing evidence may inform long-term policies on shared e-scooters in jurisdictions that are in a conflicting position with e-scooters, including NSW.

*The work reported in this research is funded by Transport for New South Wales. The findings reported are those of the authors and are not the position of TfNSW; but approval to present these findings is appreciated.

Authors: Dr Yuting Zhang, Professor John Nelson, Professor Corinne Mulley

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Motivations For the study - NSW Context

- **Shared (rental) e-scooters**

E-scooters' popularity took off worldwide.
Brisbane started Australia's first shared e-scooter trial.

The first time shared e-scooters became legal in NSW.

2018
Interests expressed by private operators, local councils, and individuals to state government

2019
TfNSW built an Electric Scooter Advisory (ESA) Working Group to develop advice for a potential e-scooter trial in NSW

April 2022
Rob Stoke (the Minister for Active Transport, Cities, Infrastructure) announced a shared e-scooter trial scheme to launch

July 2022
A trial of e-scooter shared schemes was announced. TfNSW issued an invitation to councils to participate.

Pre-trials conducted in Western Sydney Parklands and The Australian Botanic Gardens at Mount Annan

December 2022
Lake Macquarie commenced the trial as the first council.

Now
More councils to join the trial

- **Private e-scooters**

Private e-scooters can be purchased

Private e-scooters are only legal on privately owned land

E-scooter regulations in Australian states and territories (as of September 2023)

State/Territory	New South Wales	Tasmania	Victoria	Queensland	Western Australia	South Australia	Northern Territory	Australian Capital Territory
Private e-scooters	×	√	√	√	√	×	×	√
Shared e-scooters	√ (trial)	√	√	√	√	√ (trial)	√ (trial)	√
Year of first shared e-scooter trial	2022	2021	2019	2018	2018	2019	2020	2020
Max speed (kph)	20	25	20	25	25	15	15	25
Minimum age (y/o)	16	16	16	12 (with supervision) 16 (without supervision)	16	18	18	12
To carry on public transport	×	Depends on the public transport driver/manager	×	Depends on the public transport driver/manager	×	×	×	Depends on the public transport driver/manager
Blood Alcohol Concentration (BAC) (grams)	0.05	0	0	0.05	0.05	0.05	0.05	0
Riding e-scooters in public	×	√	√	√	√	×	×	√
Riding e-scooters on private property	√	√	√	√	√	√	√	√
Helmet	Required							
Bell, horn, and lights	Required							
Driver's license	Not required							
Insurance	Not required							
Mobile phone usage	Not allowed							
Carrying passengers	Not allowed							

* × indicates an illegal status. √ indicates a legal status.

Source: Based on e-scooter regulations in Australian states and territories.

Rapid review of evidence

Three themes relevant to jurisdictions considering e-scooter implementation and motivated by the NSW context:

1. **Safety;**
2. **Where shared e-scooters fit into the modal landscape, i.e., whether journeys shift to e-scooters from walking/cycling, public transport, or private cars;**
3. **What are the social and environmental impacts on sustainability.**

- Worldwide, English, OECD countries, 2012-2023
- Both academic (Scopus & Web of Science) and grey literature (news pieces, blogs and reports)
- Look at shared e-scooters within the broader micromobility context in relation to private e-scooters, mopeds, and bikes/e-bikes.
- Not a systematic literature review - snowball method

Photo from Yuting (E-scooters at Victoria Dock, Hobart, Tasmania)

Definitions

What is an e-scooter (either seated or standing)?

The term refers to one type of powered micromobility vehicle with a centre column and floorboard, but without operable pedals and self-balancing (SAE International, 2019).

Belong to 'micromobility'

Lightweight, personal vehicles and include both e-bicycles and e-scooters (Cook, Stevenson, Aldred, Kendall, & Cohen, 2022).

Belong to "Powered Two-Wheelers (PTWs)'

Vehicles that utilise batteries and an electric powered drivetrain (Hardt & Bogenberger, 2018).

≠ 'Mopeds'

E-scooters and mopeds are different in engine size (the key differential index), speed, cost, portability and weight.

= 'Active Transport'??

In NSW, Yes - Power-assisted micromobility (including e-scooters) belongs to active transport (Transport for New South Wales, 2022)

In UK, No - E-scooter is not an active travel mode (UK Department for Transport, 2022)

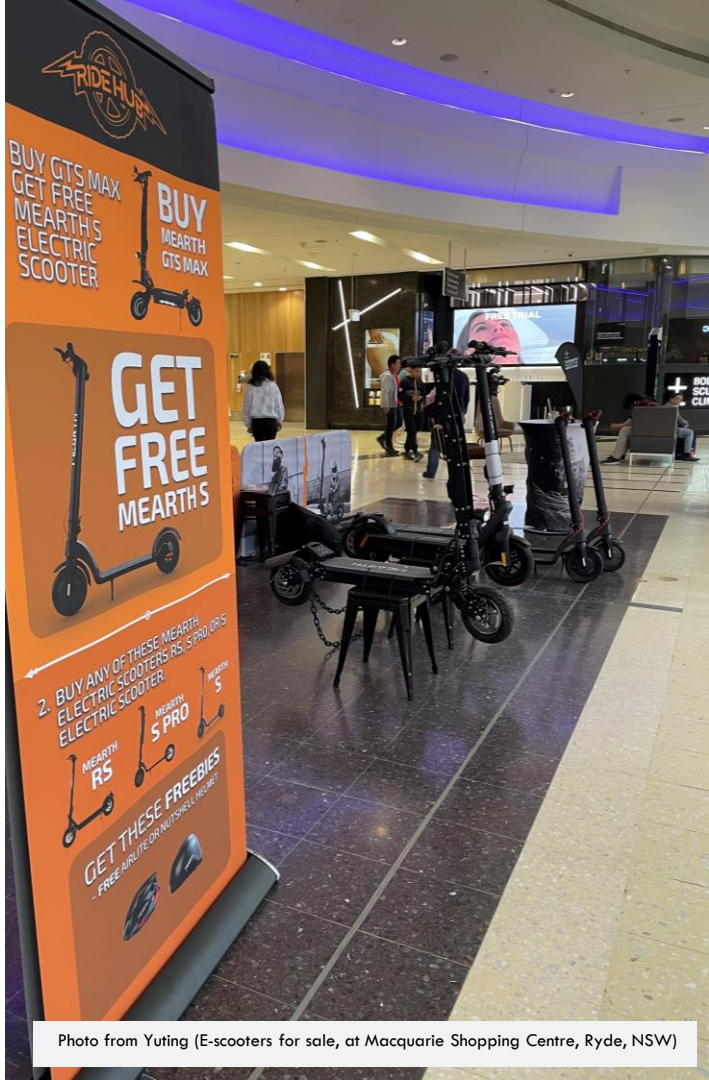

Photo from Yuting (E-scooters for sale, at Macquarie Shopping Centre, Ryde, NSW)

Safety

- Transport regulators' primary regulation goal on e-scooters
- Understudied in literature by comparison to cycling - lack of available data for research

1.E-scooter rider behaviour	Safety of the vehicle
Features of infrastructure	Effective regulation

Photo from online (https://www.bordermail.com.au/story/7733552/border-city-puts-its-hand-up-to-have-electric-scooter-test-phase/)

Safety - E-scooter rider behaviour

Helmet

- E-scooter users are at a high risk of head injuries
- Helmet is critical for head protection of e-scooter users

Speed

- Affected by rider's control and vehicle design
- Generally, a decreased riding speed is associated with an increased safety level
- The maximum speed limit is commonly 20–25 kph

Alcohol

- Most common type of drug influence
- Regulations should consider an alcohol unit limit that is safe for e-scooter riding
- Focus on certain populations – young, frequent users

Interactions with other road users

- Lack of dedicated infrastructure increased the possibility of congestions and therefore collisions with other road users
- Focus on safety-critical nodes, such as intersections

Shared schemes Vs private e-scooters

- Shared e-scooter users tend to perform more risky behaviours than private e-scooter users
- Dockless e-scooters parking controversy

Safety - Safety of the vehicle

Vehicle design

- E-scooters share some similarities with bicycles but have quite different parameters
- Literature focus on the effects of the braking system and wheel design

Batteries

- Battery explosions related to materials (lithium-ion) – may cause fire in situations of overcharging and overheating
- Potential for other more-sustainable materials to replace lithium-ion batteries, such as aluminum-ion and hydrogen
- Product standards are important. Importing clause are relevant.

Features of safe micromobility paths

Safety feature	Scholarly literature
Dedicated infrastructure	(Austin Public Health, 2019)
Curbed by concrete or vegetation	(Fonseca-Cabrera, Llopis-Castelló, Pérez-Zuriaga, Alonso-Troyano, & García, 2021)
One way instead of two ways	(Thomas & DeRobertis, 2013)
Separated away from parked or moving motorized traffic	(Fonseca-Cabrera et al., 2021)
Adopt pavement materials with great skid resistance but less vibrations, such as concrete, asphalt, and rough painted tile pavements	(López-Molina, Llopis-Castelló, Pérez-Zuriaga, Alonso-Troyano, & García, 2023; Q. Ma et al., 2021)
Softer (soil, for example, is safer than concrete)	(Chontos, Grindle, Untaroiu, Doerzaph, & Untaroiu, 2022)
Highlighted with colours (commonly red, green and blue) to improve attraction, legibility and intuitiveness of riders and others, which is especially helpful at intersections and junctions	(Autelitano & Giuliani, 2021)
Clear legislation and information	(Useche et al., 2022)

Safety - Effective regulation

Legislation

- The absence of uniform regulations around e-scooters is widely acknowledged as a major obstacle of safe use
- Statutory recognition and definition of emerging types of micromobility devices should serve as a base of road rules and possible risk analysis to increase safety

Licencing and messaging

- Safety education and skills training - many safety issues are related to inexperience, lack of protective gear, and poor riding skills
- Advantages and disadvantages of micromobility vehicle licensing
- Persuasive messaging can play a positive role

Data and decision-making process

- Road safety has been traditionally evaluated based on motor vehicle data, but the popularity of micromobility requires new data sets with often tech-driven collection and interpretation methods
- E-scooter-related collision data generally comes from police and emergency departments. Many others unnoticed and uncounted.

Demographic considerations

- Consider the demographic difference of micromobility riders, as a base to adjust the intensity, frequency, and timing of regulation enforcement
- Age, gender, ethnicities, neighbourhoods, and household compositions

Safety – Recommendations

Category	Optimum	Level of government
Legislation/ regulatory framework	Address an explicit definition, categorisation and product standard of micromobility vehicles	Commonwealth, state
	Clearly outline responsibilities and obligations of riders of micromobility vehicles and other road users	Commonwealth, state
	Align with existing and future road infrastructure facilities	State, local
	Be supported by sufficient enforcement efforts	State, local
	Share consistency in shared schemes and the use of private E-scooters	State, local
	Acknowledge the holistic and interdependent nature of infrastructure treatments and other interventions to achieve a comprehensive and effective approach to safety	Commonwealth, state, local
Licensing and messaging	Mandatory safety education and skills training (probably via rider licensing). Also, school education programs and persuasive messaging on micromobility safety.	Commonwealth, state
Data and decision-making process	Rely on new ways of data collection and analysis methods enabled by technological developments. In addition to rider data from police and emergency departments, data directly from the vehicle and data from non-riders should also be considered.	Commonwealth, state, local
Demographic considerations	Promote an approach to safety management that is user-based, location-based, and time-based. Specifically consider demographic characteristics of riders - locations with high safety risks (e.g., road intersections, sidewalks, low socio-economic neighbourhoods, and areas with a high population of children); time periods with high safety risks (night and days with bad weather).	State, local

Modal benefits

Mode substitution

- Valuable experiences from bike-sharing to e-scooter sharing
- In larger and denser cities - bike-sharing tended to be more of a substitute to public transport; in small to medium size and less denser cities - bike sharing tended to be more complementary as a first/last mile integration
- Evidence show e-scooter trips tend to replace bus trips in some cities and countries.

Mode integration

- Last mile transport is encouraged by dedicated infrastructure such as lanes for micromobility vehicles and traffic calming paths to connect public transport stations with their surroundings.
- Literature point to dedicated parking spots adjacent to major public transport stations.
- Take account of the user characteristics

Recommendations:

1. Repositioning e-scooters to areas with limited bus service can better promote synergistic relationship between the two systems.
2. Encouraging first and last mile combination with public transport, with user characteristics in consideration.

Environmental and social sustainability

Social sustainability

- Greater sustainability is generally associated with the aim of encouraging active transport for short trips and public transport for longer trips and as such is associated with more walkable neighbourhoods, smart growth, transit-oriented development and new urbanism
- Separately from the impact on global emissions, the use of e-scooters has an impact on the users which has a societal impact
- There is some evidence that e-scooters are being used to make journeys that would not otherwise be made

Environmental sustainability

- Whether e-scooters are likely to improve the level of greenhouse emissions associated with mobility is linked also to their usage and the degree to which e-scooter trips replace trips using vehicles with higher emissions.
- The charging of e-scooter batteries requires energy, largely derived from fossil fuel, which has an impact on their sustainability and on their overall life cycle assessment.
- Studies on the relationship between the use of e-scooters and emissions do not always consider the emissions involved in the production and ending of life of e-scooters.

Recommendations:

1. Social sustainability benefits strongly correlated to the mode replaced by e-scooter trip. Parking is a particular problem with dockless e-scooters.
2. The environmental impact depends on the mode replaced. Lifetime assessment of carbon impact is not good at taking account of battery production, end of life recycling and the impact of relocation strategies.

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Questions?

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