

The Impact of Regulations on the Usage of e-Scooter Sharing Systems in New Zealand Cities

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ABSTRACT

E-scooter sharing systems (SSS) are a new form of shared micromobility which has quickly gained traction in New Zealand since it was introduced in late 2018, while local governments across the country are introducing regulations that both embrace the technology and protect rider safety. This research paper seeks to initiate a conversation the level of regulations and its impact on ridership, a topic which is not well-researched in New Zealand nor abroad. Current implementations of SSS regulations overseas are presented while acknowledging the ever-changing nature of this innovative mobility mode by including examples of ongoing debates and developments in this area. Lessons are drawn from research into similar bicycle and moped sharing systems. Key regulations and users' demographic data are synthesized to form a framework for analysis.

A nation-wide survey permitted collection of data across a range of demographics and a few SSS companies were approached for a business perspective. The results show that regulations governing user behaviour have a strong negative effect on SSS usage, particularly with respect to frequent users and younger casual users, the two higher-revenue user groups. However, non-users view mandatory safety helmets positively when they are provided with the vehicle, and may broaden the customer base even if overall ridership is reduced. E-scooters being distributed in a way that is convenient and reliable has a strong positive effect on SSS usage, while discount pricing for targeted groups finds support by most people. Local governments may be able to use these two factors to target demographics experiencing transport disadvantage, though the SSS operators may be less enthusiastic about regulation in these areas.

BACKGROUND

Regulations in Overseas Cities

Cities around the world have faced the challenge of regulating a fast-growing industry and rapidly changing transport landscape. Guidelines for micromobility regulations for local governments were published in late 2018 ([IMLA 2018](#)). Nonetheless, the differentiating factors between cities, particularly with respect to population density,

2018). Similar incidents have been reported with SSS in various cities and though it appears to polarize public opinion, it is unclear what effect this has on e-scooter usage.

Studies in China have shown that station-based BSS are preferred over free-floating BSS for regular trips (such as commuting to work) and that free-floating BSS do not replace regular car usage (Li et al. 2019; Sun 2018). Additionally, with station-based BSS, variation in station sizes reduce usage while station density increases usage (Médard de Chardon et al. 2017). This suggests that reliability is a key component of making BSS a viable alternative for commuting, which may explain why station-based BSS tend to target affluent areas even though docking stations in disadvantaged communities can produce substantial accessibility improvements (Qian and Niemeier 2019). It is likely that these conclusions can be applied to the usage of SSS as a regular commuting mode, by applying geofenced parking locations for SSS in order to imitate docking stations.

This may, however, decrease usage among recreational or i 708.045n in recreh5

Regulations in New Zealand

In New Zealand, the speed and location of vehicles are governed by the NZ Transport Agency (NZTA), while local government controls local transport planning (such as creation of cycleways) and issues business permits. The road code states that e-scooters are not permitted to be ridden in cycle lanes, but they are permitted on the footpath, on the road, and on separated cycleways. On the footpath, they must be operated careful and considerate manner and "at a speed that does not put other footpath users at risk". There are no regulations with respect to a speed limit nor to the use of safety helmets (NZ Transport Agency 2019). Additionally, local governments have introduced various regulations as detailed in Table 2.

Table 2. Regulation of shared e-scooter services in New Zealand

City	Fleet Size	Regulations
Auckland	1,875 (May 2019)	Slow speed zones, redistribution requirements. Maintenance targets. Code of Practice, trial permits required. (Auckland Council 2019a; Auckland Council 2019b)
Hutt City	600 (Apr 2019)	Working bells, redistribution requirements. Operations, parking, safety and maintenance targets. Trading permit required. (Hutt City Council 2019)
Wellington	800 (Mar 2019)	Will be available sometime in June. Code of Practice likely to be implemented - regulations currently in discussion. (Wellington City Council 2019; Newstalk ZB 2019)
Christchurch	1,600 (May 2019)	No specific regulations. Trading permit required. (Christchurch City Council 2019a; Christchurch City Council 2019b)
Dunedin	300 (Jan 2019)	No specific regulations, but classified as vehicles. Memorandum of Understanding - no permit. (Dunedin City Council 2019; Block 2019)
New Plymouth	50 (Feb 2019)	15kph maximum speed, removed from public places by midnight. Incident reporting. Memorandum of Understanding - no permit. (Persico 2019)

The distribution of legislative power in New Zealand may be different to that of other countries, which may impact the nature of local government regulation. There is also little consistency between city councils. For example, the Dunedin City Council website states that SSS operators do not require a permit as they are classed as vehicles on the footpath (i.e. falls under NZTA road rules), while other councils treat them as a business trading in public places and impose operating conditions on the permit.

METHODOLOGY

The relationship between e-scooter regulations and SSS ridership is currently not well-understood. From the previous section, it seems that the primary reasons for introducing regulations tend to be safeguarding public health and public space (particularly foot-paths). Regulations specifically for the purpose of increasing ridership for social or environmental outcomes appear to be a secondary concern.

This study intends to clarify this relationship such that the balance between safety / space and SSS usage can begin to be quantified. To do so, a survey on the public opinion of e-scooter regulation was conducted and selected SSS companies were contacted with some questions.

Survey

The survey was created on the website SurveyHero using a free account. The questions were proposed (see below) and were given ethics approval by the Department of Geography at the University of Canterbury. The survey would use opt-in sampling, meaning that consent would be freely given. It was distributed online using a link posted on a number of Facebook groups which either expressed a particular interest in e-scooters, or were geographically based in one of the major cities which has (or will have in the near future) access to SSS, as well as some of the location-based subreddits. The nature of the sampling method meant that responses would most likely be received from those who were passionate about e-scooters, micromobility, or transportation modes in general, and young people who use social media platforms.

The questions posed could be grouped as follows:

1. Demographics

- ^ Which New Zealand e-scooter city do you live in?
- ^ What suburb do you live in?
- ^ How old are you?
- ^ What is your gender?
- ^ How often do you use an e-scooter sharing service?
- ^ Which of these travel modes do you use to commute to and from work, study, or other daily activities?

2. How regulations would affect usage of e-scooters

- ^ If safety helmets were mandatory, how would this affect your use of e-scooters?
- ^ If safety helmets were mandatory and provided, how would this affect your use of e-scooters?
- ^ If a speed limit of 15 kph was imposed and enforced on e-scooters, how would this affect your use of e-scooters?
- ^ If e-scooters were not permitted to be ridden on footpaths, how would this affect your use of e-scooters?

^ If e-scooters had to park in restricted locations (one or two locations per street),
how would this affect your use of e-scooters?
^

We were just wanting to know a couple of opinions you have on regulation in regards to:

1. The redistribution of E-scooters around the city after they are charged to encourage usage in areas that don't have as much use as places like the city centre, and do you think it would be beneficial to increase usage in these areas?
2. A discounting scheme for either students or low income users.
3. Enforcing regulations around wearing helmets, reducing the speed, and the use on footpaths."

The purpose of these questions were to identify differences in opinions between companies and the public, which may highlight the areas of tension between regulators and operators. The expectation is that SSS companies would be against increased regulation, though they may be inclined to offer discount schemes for low income brackets, something which is currently occurring overseas ([Lime 2019](#)).

Table 3. Companies Operating in New Zealand in May 2019

Company	Company Headquarters	NZ Cities of Operation	NZ National Fleet Size
Lime	San Francisco	Auckland, Hutt City, Christchurch, Dunedin	2850
Flamingo	Wellington	Auckland, Wellington, Christchurch	1225

RESULTS

Survey

230 people responded to the survey. The results of the survey are presented in Table 4 and use the following clustering groups based on concepts from a segmentation study by [Degele et al. \(2018\)](#):

67%75%	Frequent Users	Casual Users (Older)	Casual Users (Younger)	Non-Users
Ban on Riding on Footpaths				
(would ride less)	83%	50%	60%	48%
(would ride more)	0%	8%	1%	9%
Speci ed Parking Locations				
(would ride less)	75%	50%	57%	24%
(would ride more)	0%	0%	1%	9%
Better Distribution near you each day				
(would ride less)	16%	0%	0%	6%
(would ride more)	67%	67%	68%	45%
Mandatory Helmets vs Speed Limit				
(prefer helmet)	42%	33%	54%	31%
(prefer limit)	50%	50%	37%	30%
(both)	0% *	17%	8%	39%
* Note that 8% of Frequent Users opted not to provide a response to this question.				
Ban on Riding on Footpaths vs Speed Limit				
(prefer ban)	42%	25%	40%	43%
(prefer limit)	58%	75%	60%	57%
Opinion of Discount Scheme				
(in support)	75%	42%	86%	70%
Providing More Trip Data (average score w/ range 0 to 100)				
	49	48	65	61

The following gures provide a visual representation of the results from all respondents where the answers were given on a scale. Figure 1 s28 rg 0.28 1 0.)

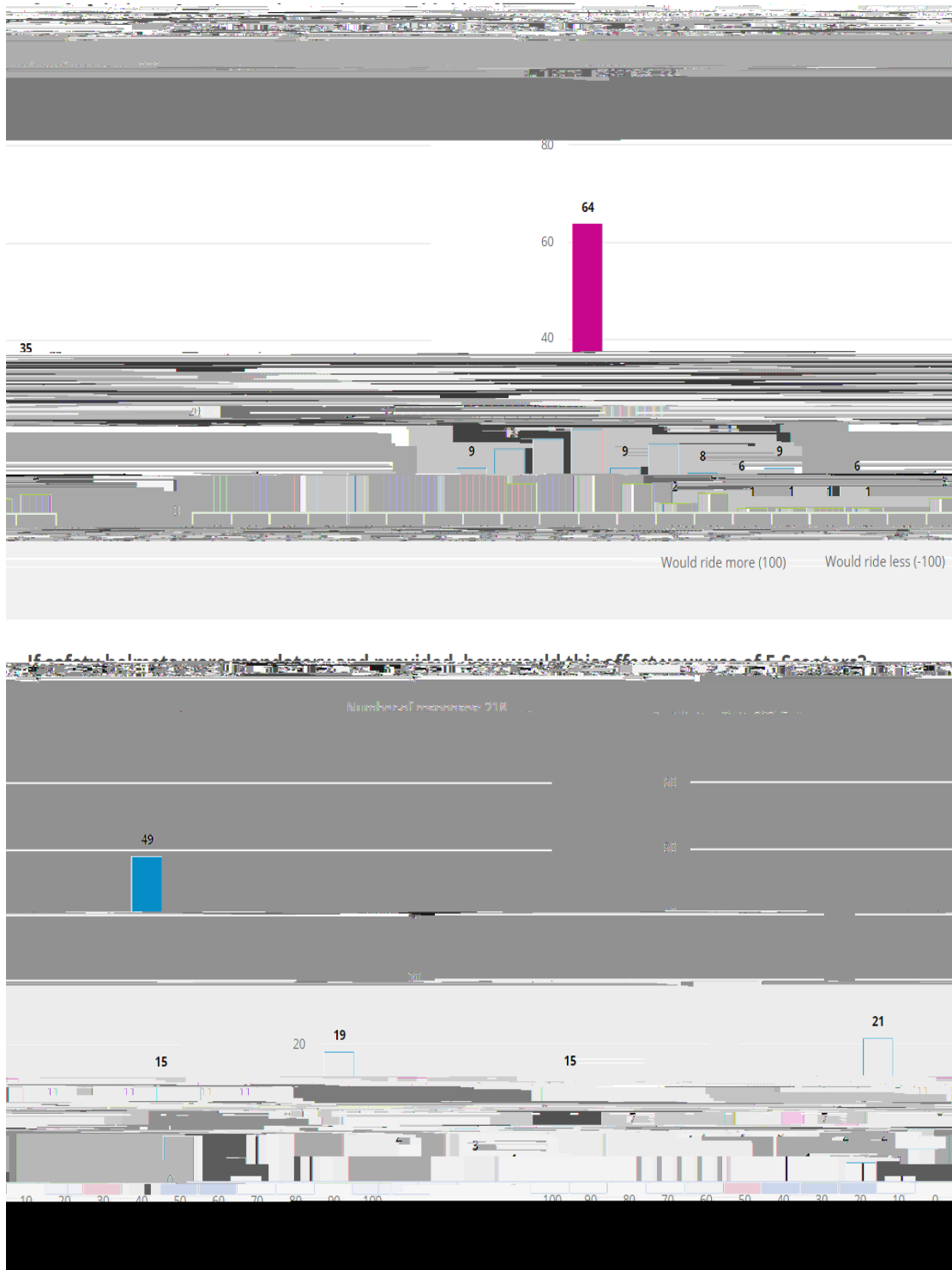


Fig. 1. Histogram of responses to questions regarding mandatory safety helmets.

negatively. Interestingly, the split among Younger Casual Users are much more even, and many of Non-Users' responses suggest that they are willing to try out SSS if helmets were made available.

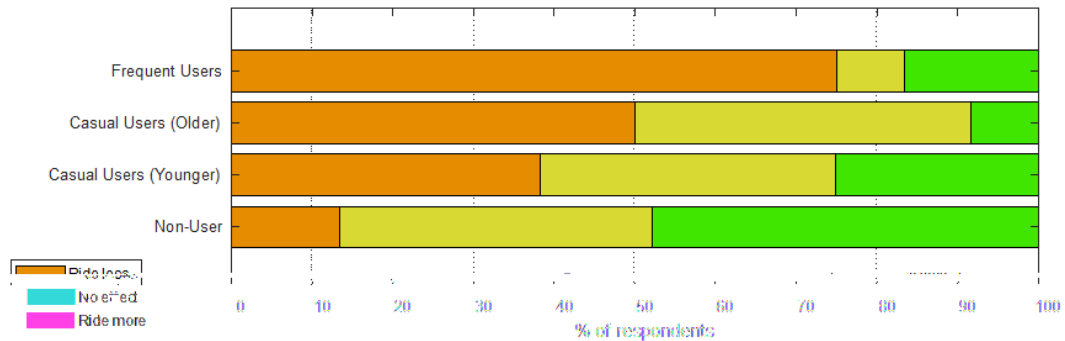


Fig. 3. Effect of helmet regulation on different user groups.

The survey questions setting different regulations against each other produced results that corroborate our initial observations. A choice of a footpath-riding ban versus a speed limit clearly favours the latter, as seen in Figure 4. Notably, among Older Casual Users there is a very strong preference for a speed limit to be imposed over a footpath-riding ban. This may be due to the feeling of relative safety of riding on footpaths instead of next to cars, less reliance on speed (e.g. use for recreational rather than transit), and less thrill-seeking behaviour (more common among the younger population), compared to other groups where top speeds may be more of a concern.

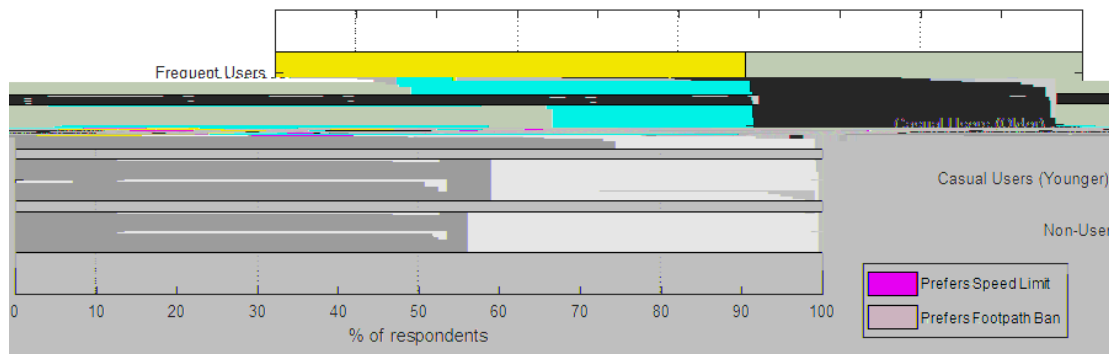


Fig. 4. Choice of speed limit or footpath-riding ban.

The comparison between speed and helmets shown in Figure 5 is a bit more divisive and offers some insight in how the clusters use SSS. Frequent Users are seen to prefer speed limits over helmets, suggesting that top speeds are not as important as the convenience of not carrying a helmet for their daily commute (and also of note is the 8% who were not willing to select any option). In contrast, Younger Casual Users prefer helmets, suggesting that speed is more important to them. This could also be indicative of a cultural shift whereby younger people have grown up around mandatory bicycle

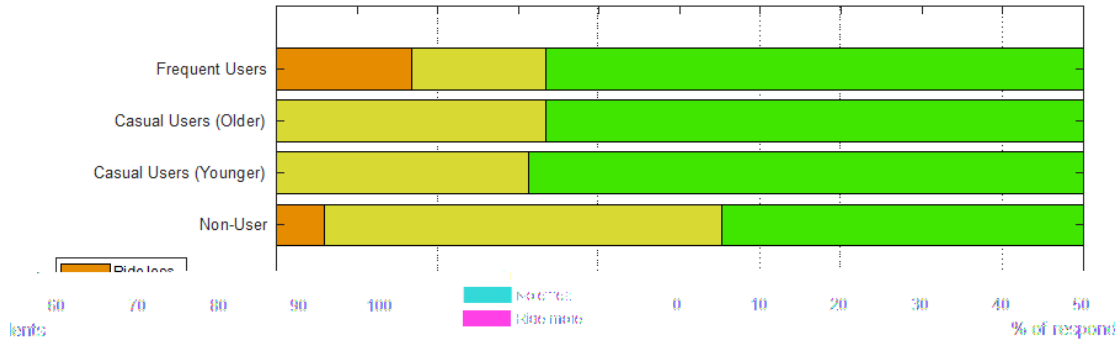


Fig. 6. Effect of better e-scooter distribution on different user groups.

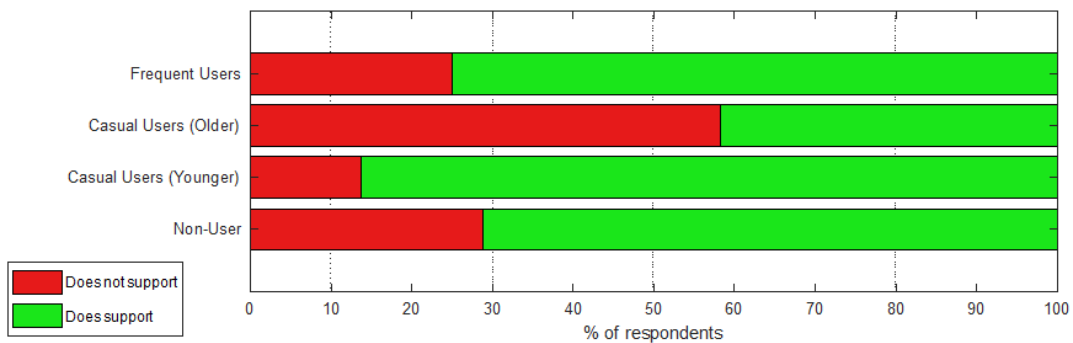


Fig. 7. Support of discount scheme by different user groups.

A 'better' distribution and an income-based discount scheme would likely be welcomed by all groups. The difficulty lies in the fact that an equitable distribution of vehicles desired by local governments may not be equivalent to current business practice. Areas where alternative transport modes are needed (transport disadvantaged) are perhaps areas with mostly Non-Users, which are would fall outside operators' preference for demand-driven levels of service.

So why regulate at all? From survey comments (see Appendix I), it would appear that Non-Users have strong opinions against certain aspects of SSS: footpath riding (the key issue for other groups) and a general lack of safety regulations. They are likely to be underrepresented in this study and are likely to be a large proportion of the general population, and at some point in the future there may be political pressure to implement some sort of regulatory framework. In this instance, survey data suggests that if any regulation had to be imposed, then operator-provided mandatory helmets may be the most widely accepted by the general public.

The concern of SSS companies about regulation requiring equitable distribution is understandable, as over-provision of vehicles in low-demand areas will clearly lead to under-utilisation. Nonetheless, governments should consider the potential for social and

transport equity outcomes that innovative micromobility modes may provide and invest accordingly. Partly because the uniqueness of SSS may open up previously unobtainable goals, but also because the positive aspects of SSS are unlikely to be realised without government intervention. Without benefits to the public and the community, SSS may become just a way for corporations to increase urban penetration and privatisation of public space (Médard de Chardon 2019).

Along with income-bracket discounts, it may be worthwhile also considering transfer discounts as a way to encourage SSS use, particularly in areas experiencing transport disadvantage (Li et al. 2019). E-scooters are great for first- and last-mile considerations, and while they may not be an optimal choice for a single-mode journey in transport-disadvantaged areas, they may be more attractive in a multi-mode journey in conjunction with public transport hubs. Together with a more even distribution across underserved areas, there is a lot of potential for environmental benefits to be realised.

There are some non-regulatory options. Both companies indicated their preference for education and awareness campaigns, though neither explicitly spoke out against safety regulations. Finally, the best determinant of BSS success is infrastructure spending and the same is likely to be true for SSS (Médard de Chardon et al. 2017; Médard de Chardon 2019).

Limitations of Study

One of the main drawbacks of a study on SSS has been the lack of published data to reference and compare these results to. The assumption that BSS and moped sharing systems have enough similarity to SSS in terms of public experience, public opinion, and customer segmentation, was useful but it must be acknowledged that this assumption has not been tested or proven.

Regulation of SSS has been acknowledged as a future problem for city councils and local governments, but there is no systematic approach and thus the scope of this study was limited to commonly-accepted regulations. It is possible for a more innovative regulatory framework to exist which is not covered in this paper.

The survey was conducted using opt-in sampling, meaning that the respondents of the survey may not accurately represent the population. It is likely that Non-Users as a group are underrepresented in this survey (i.e. the idealist majority who tend not to respond to surveys). Also, using a headcount for overall numbers means that Frequent Users are underrepresented in terms of revenue impact. An attempt has been made to separate these clusters based on responses but more work needs to be done in this area.

It is notable that the survey and company responses capture current opinions, while SSS are still new and may have some teething problems. Opinions may change over time as the general public becomes more familiar with the technology.

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SFMTA (2019). Powered Scooter Share Permit and Pilot Program. <https://www.sfmta.com/projects/powered-scooter-share-permit-and-pilot-program>

Singapore Legal Advice (2019). Guide to E-Scooter/Personal Mobility Device (PMD) Laws in Singapore. <<https://singaporelegaladvice.com/law-articles/e-scooter-laws-singapore>>.

Sun, Y. (2018). Sharing and Riding: How the Dockless Bike Sharing Scheme in China Shapes the City. *Urban Science* 2(3), 68.

Thornton, R. (2019). Higher fees for bikes and scooters raise questions of equity at UTC. <<https://www.austinmonitor.com/stories/2019/03/higher-fees-for-bikes-and-scooters-raise-questions-of-equity-at-utc/>>

Trivedi, T. K., Liu, C., Antonio, A. L. M., Wheaton, N., Kreger, V., Yap, A., Schriger, D., and Elmore, J. G. (2019). Injuries Associated With Standing Electric Scooter Use. *JAMA Network Open* 2(1), e187381.

Wellington City Council (2019). News - Two e-scooter companies selected for Wellington trial. <<https://wellington.govt.nz/your-council/news/2019/03/451073e-rctedsearScty-or>>

er, (2019). Cali(f)40(or)-20(ia.)-178(Mae)30y. of Micromo-r . <<https://www.cityofsanfrancisco.gov/press-releases/Pages/pr031903.aspx>>

APPENDIX I. COMMENTS SUBMITTED BY SURVEY RESPONDENTS

Regulation	Cluster	City	Comment
General	Frequent User	Auckland	E-scooters need minimal regulation and councils and public agencies should enable more routes amenable to e-Scooters. Cities that don't cater to e-scooters will become backwaters.
General	Frequent User	Auckland	E-scooter regulations are ludicrous when cars kill 400 people a year.
General	Frequent User	Auckland	As someone who is disabled, these help me in my day to day life, as there's no guaranteed car parking in the city (and expensive) and buses don't get close enough to where you want to go most times.
General	Non-User	Wellington	Personally, I'd probably be too embarrassed and old to be seen riding one in public, but I would love to see regulations hugely favouring riders - the more e-scooters out there, the better!
General	Non-User	Christchurch	I don't currently use them, but I would still like to see more safety regulations implemented. I would be more likely to use them if the companies paid fairer rates and there were stricter regulations surrounding safe usage. I currently boycott them due to concerns about lack of regulation and enforcement.
Helmet	Casual User (Younger)	Christchurch	100% helmets should be mandatory and provided.
Helmet, Speed Limit	Casual User (Younger)	Auckland	I would agree to slow down the speed of e-scooters on busy sections is the right thing to do but having mandatory helmets would be cumbersome to the user.
Helmet, Speed Limit	Casual User (Younger)	Wellington	Definitely think a lower speed limit and supplied helmet is the way to go.
Speed Limit	Casual User (Younger)	Auckland	Reducing the speeds would make them much less attractive and I would barely ever use them.
Speed Limit, Where to Ride	Casual User (Older)	Wellington	They should be allowed in cycle lanes. Special speed limit should only apply on footpath.
Helmet, Where to Ride	Casual User (Younger)	Auckland	Wearing a helmet should be mandatory like on bicycles, and they should be allowed on the footpaths. They would be too dangerous on roads.
Where to Ride	Casual User (Younger)	Auckland	I think they're dangerous on the footpaths and should only be used in bike lanes or roads.
Where to Ride	Casual User (Younger)	Christchurch	They shouldn't be on the roads. It's hard enough watching for cyclists whilst driving.

Where to Ride	Non-User	Auckland	I will never use them, but they need to get off the footpaths entirely, have stronger restrictions keeping children off of them, and increase in tickets given out to dangerous riders
Where to Ride	Non-User	Wellington	Walkers have right of way over e-scooters on footpaths.
Where to Ride	Non-User	Christchurch	Pedestrians in particular would benefit from scooters not being allowed on footpaths.
Personal Data	Casual User (Younger)	Auckland	I would be okay with giving personal details in order to get discounts for using e-scooters if the e-scooter services were publicly owned.
Upkeep	Non-User	Auckland	More penalties for malfunctioning and unsafe scooters.
Infrastructure	Non-User	Auckland	If councils and the government invested more in building

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APPENDIX II. WRITTEN RESPONSES FROM LIME AND FLAMINGO

Lime:

1. While I agree that widespread supply is good for everyone - in short, I don't think regulation is the best way to achieve this. I believe it should be economically driven through