CARRS-Q RESPONSE TO

NTC CONSULTATION REGULATION IMPACT STATEMENT:

BARRIERS TO THE SAFE USE OF PERSONAL MOBILITY DEVICES

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The Centre for Accident Research & Road Safety – Queensland is a joint venture initiative of the Motor Accident Insurance Commission and Queensland University of Technology

Introduction

This submission has been prepared in response to the National Transport Commission (NTC) Consultation Regulation Impact Statement on *Barriers to the safe use of personal mobility devices*. As a leading and internationally recognised research institution in road safety, the vision of Centre for Accident Research and Road Safety - Queensland (CARRS-Q) is for a safer world in which injury-related harm is uncommon and unacceptable. CARRS-Q was established in 1996 as a joint initiative of Queensland University of Technology (QUT) and the Motor Accident Insurance Commission (MAIC).

CARRS-Q builds new scientific understanding that enables regulatory authorities, policy makers, educators and communities to frame strategic choices about applied future actions. Clear proactive input to relevant national research priorities is a key element of the research strategy, which has been assisted by staff membership of all major road safety policy groups including at the state and federal level.

One of the Centre's core research themes is Vulnerable Road User Safety which has traditionally encompassed pedestrian, bicycle and motorcycle safety. CARRS-Q is now one of the most active organisations in Australia in relation to research into the safety of e-scooter use. Our involvement includes:

- In February 2019 Professor Narelle Haworth helped prepare a successful Problem Statement to the US Behavioral Traffic Safety Cooperative Research Program for a study entitled "Behavioral Issues Associated with E-Scooter Riding and Safety Risk Management". These proposals are very competitive and USD490,000 has been allocated for organisations to bid for this project which is scheduled to begin in January 2020.
- In February 2019, we undertook an observational study of e-scooter and bicycle use in the Brisbane CBD (copy of report in The Medical Journal of Australia in Appendix 1). Shared e-scooters were found to be much more common than private e-scooters and helmet wearing rates were much lower for shared than private e-scooters.
- In October 2019, the observational study was repeated, with an extension to code separately the e-scooters from the (now) two companies operating in Brisbane. The results of this study are not yet available.
- An international review of the safety of e-micromobility including comparisons between e-scooters (and other new forms) and electric bicycles. The review is not publicly available but its findings have informed this submission.
- In November 2019, CARRS-Q hosted the International Cycling Safety Conference which included a keynote presentation on new forms of micromobility, as well as a session focussing on e-scooter safety.

It should be noted that the focus of the CARRS-Q response is the safety of the users of personal mobility devices and other people with whom they interact. We note that the impact assessment criteria used by the NTC included access and amenity, broader economic costs and benefits, and compliance and enforcement. Our comments relate to those criteria only to the extent to which they may influence safety outcomes.

General issues and comments

Considering both private and shared PMDs

Unlike other devices or vehicles for transport and recreation, the major use of PMDs was initially as part of shared schemes. Thus, most of the limited data available about PMDs and their safety and usage relate to these shared schemes, rather than private use. Many pundits are predicting that private use will grow, and potentially overtake shared schemes. Therefore it is important that any regulatory approach cater to both forms of use, and not be clouded by current knowledge that is biased toward shared models.

There is a need to consider the potential differences between private and shared personal mobility devices. These relate to:

- The greater range of regulatory controls that might be possible for shared PMDs (e.g. geofencing)
- The degree of ruggedness required of the manufacture to ensure that safety standards continue to be met
- Possible differences in skills and motivations of users
- Ability to enforce compliance and apply penalties for noncompliance

Defining PMD user as a pedestrian

One of the contributors to our current lack of knowledge regarding the safety of PMDs relates to the lack of comprehensive crash and injury data. Defining a person on a PMD as a pedestrian in the ARRs (as suggested for Options 2 and 3 in Table 7 of the NTC document) may have the consequence that they will continue to be classified as pedestrians in the police crash records. This would have two negative consequences:

1. It will be difficult to assess the number of PMD users injured, and indeed any changes that might occur as a result of the NTC work
2. Injuries resulting from collisions between PMDs and pedestrians would not be included in the road crash data and so would be unable to be monitored

It is unclear whether Options 4 and 5 would result in PMDs being classified as bicycles in police crash reporting.

Potential future scenarios related to PMDs

New devices are emerging and existing devices are continually evolving. The international evidence suggests that the shared e-mobility market will be dominated by dockless e-scooters, because of their considerable economic advantages over dockless e-bikes.

E-mobility may be incorporated into Mobility as a Service (MaaS). The recent moves toward shared mobility companies spreading across vehicle types supports the potential for this to occur (e.g. Uber buying a large e-scooter company).

If significant growth in e-mobility occurs, particularly as a transport mode and not mainly recreation, then there will be a need to examine the future capacity of facilities and what types of uses should be prioritised. This may involve considering whether growth in e-mobility will require dedicated e-scooter lanes, or shared e-mobility lanes, or whether there will be a need to widen bike paths or shared paths to provide sufficient capacity. Some discussion is occurring regarding the potential for road space allocation to consider kinetic energy and dimensions of vehicles/devices rather than being prescriptive regarding the specific users of particular allocated areas.

Question 1: Are the requirements in the proposed regulatory framework appropriate? Are there any requirements that should be removed, included or modified?

Our comments here relate to the proposed regulatory framework as outlined in Table 2 of the NTC document. We note that this is primarily a definition of what should be classed as a PMD. While a definition is important, the consequences of the definition relate also to how it interacts with other regulations and policies at state and local government levels (and requirements of operators of shared schemes, in the case of shared PMDs). The proposed regulatory framework effectively provides a first screening.

Given that there are likely to be compliance and enforcement challenges associated with PMDs, there should be a focus on maximising the extent to which undesired outcomes are prevented by the regulatory framework, rather than assuming that compliance and enforcement will be effective. For example, the maximum speed attainable as spelt out in the proposed regulatory framework should not exceed the maximum speed allowable under the speed options.

Our main feedback regarding the proposed regulatory framework relates to inconsistency with the taxonomy of powered micromobility devices recently published by the Society of Automotive Engineers.

SAE J3194™ Taxonomy and classification of powered micromobility devices

Consistency with international standards is a relevant consideration in deciding on appropriate regulatory frameworks because of these standards will influence what is manufactured and thus available for importation to Australia. The above standard https://www.sae.org/binaries/content/assets/cm/content/topics/micromobility/sae-j3194-summary---2019-11.pdf) defines a "powered micromobility vehicle" as a wheeled vehicle that must:

- Be fully or partially powered
- Have a kerb weight not exceeding 227kg
- Have a top speed not exceeding 48 km/h

Interestingly, this standard appears to cover a range of vehicles that are otherwise defined as electric bicycles, and potentially mopeds in Australia, as well as what NTC is considering as PMDs.

Within the standard, there is a classification system that comprises characteristics such as kerb weight, vehicle width, top speed and power source. Under this classification system, vehicles under the NTC proposed regulatory framework would include:

> *Ultra lightweight or Lightweight or Midweight, Standard-width, Ultra low-speed or Low-speed, Electric vehicles*

Thus this classification system allows a finer regulatory approach, which could be of value in relation to decisions about where (and by whom) vehicles could be operated. For example, it might be appropriate to allow only Ultra-low speed vehicles to be operated in pedestrian areas or, conversely, to prohibit their use on particular types of roads.

Issues directly related to the proposed framework

In addition to international consistency, there are several other issues regarding the proposed regulatory framework that should be raised.

We note that the proposed regulatory framework differs somewhat from the Queensland road rules in that the proposed framework does not allow a PMD 700mm in length by 1250mm in width by 1350mm in height. We understand that NTC has taken this approach so that PMD dimensions were suitable for footpath use and could allow them to be carried on public transport. We would support the NTC approach, but on the grounds that a wide device could pose dangers to riders of bicycles and other PMDs when the wide device is being overtaken on a bicycle path or a road.

We are generally supportive of the approach taken to maximise the flexibility of the proposed regulatory framework to future-proof it against unanticipated new devices. However, the potential for a device to be developed to “max out” the allowed dimensions and characteristics and be unsuitable for use on the allowed areas is of some concern.

The proposed regulatory framework does not define “an effective stopping system controlled by using brakes, gears or motor control” and how (and by whom) this would be measured. This should be clarified.

Unlike the current Australian bicycle definitions, there is no requirement for a PMD to have lighting or an auditory warning device in the proposed regulatory framework. In the Option implementation “Using PMD at night”, lights and reflectors are required but this should also be included in the proposed regulatory framework to avoid there being devices allowed for which fitting of lighting or auditory warning devices is not possible.

Question 2: Is 60kg a suitable maximum weight for a PMD? If not, what is a more suitable weight and what other factors should be considered?

It is understood that the rationale for a maximum weight of 60kg for PMDs is to allow the inclusion of Segway-type devices, however the potential safety consequences should be considered.

In a collision or fall, the transfer of kinetic energy is a major determinant of the severity of injury. For a collision with another moving object, the acceleration (and injury potential) for a road user is influenced strongly by the relative kinetic energy of the other party.

The NTC Consultation Regulatory Impact Statement includes two tables that show the kinetic energies for PMDs and motorised mobility devices, Tables 6 and 8. It should be noted that the kinetic energy values in the first two rows of these tables are incorrect because they appear to have neglected the mass of the person in their calculations. The correct values are included in the table below.

Table 1 below extends on Tables 6 and 8 in the NTC document to show the kinetic energy values for persons walking, running, riding a standard bicycle and riding an e-bike.

The kinetic energy of a 60 kg PMD travelling at 25 km/h is 43 times that of a person walking and 3 times that of the same PMD travelling at 15 km/h. At 25 km/h a 60 kg PMD has 50% more kinetic energy than a 15 kg PMD. While mass contributes to kinetic energy, speed is more important because it is the square of speed that is included in the formula (as noted in Appendix D of the NTC document).

One option for consideration is whether PMDs are divided into lighter and heavier classes, with different requirements for the two classes. For example, heavier PMDs could require some user requirements (e.g. holding a car driver licence or having a higher minimum age), or having lower maximum speeds or limitations on the environments in which they are used.

Table 1. Kinetic energy values for a range of devices and their users.

	Person (kg)	Device* (max kg)	Total mass (kg)	Speed (max km/h)	KE(J)
MMD	80	110	190	10	733
PMD	80	60	140	10	540
PMD	80	60	140	15	1,215
PMD	80	60	140	25	3,376
PMD	80	15	95	25	2,291
Walker	80	-	80	5	77
Runner	80	-	80	10	309
Bicycle	80	15	95	25	2,291
e-bike	80	25	105	25	2,532

* Note that the total mass does not include any cargo carried.

Another safety consideration is that if PMDs are to be allowed access to public transport, then 60kg PMDs may be difficult to restrain effectively and so may pose a danger to other public transport users.

Question 3: Should children under the age of 16 years old continue to be permitted to use a motorised scooter incapable of travelling more than 10km/h on level ground on roads and paths? Or should they be able to use any device that complies with the proposed PMD framework?

There is little specific research information available to assess the likely safety implications of this question, although some of the bicycle safety literature is relevant. We do know that while drivers have been shown to be at fault in the majority of motor vehicle-bicycle collisions for adult riders, the opposite is true for children. Many of these collisions occur when the child who has been riding on the footpath rides out from a driveway.

In Australia, children are allowed to ride electric bicycles in the same way as adults. However, in the United Kingdom, there is a minimum age of 14 years for riding electric bikes (pedelecs).

It would seem that whether children under the age of 16 years old should be able to use any device that complies with the proposed PMD framework depends on what that framework includes – the lower the allowed maximum speed and the less exposure to roads, the more suitable will the framework be to younger riders. We would be concerned if children aged under 16 were allowed to ride under combinations such as Option 5, Speed Approach 3 or Option 4, Speed Approach 3.

Question 4: Do you agree with the criteria selected to assess the options? Are there any key impacts not covered by these criteria?

There seems to be little or no consideration of effects on PMDs on physical activity and population health. This would ideally be an additional criterion or it could be included in the Broader Economic Costs and Benefits.

The potential for PMDs to provide a last-mile transport solution has been promoted. The data provided by operators of shared e-scooter schemes show that PMD trips are mostly about 1km in length, supporting this role. However, survey data suggests that e-scootering is often substituting for walking and cycling, or generating new recreational trips, rather than reducing car travel[1]. Our Brisbane data shows relatively higher use of shared e-scooters during off-peak periods, suggesting recreational rather than commuting use[2].

In terms of motor vehicle use, we are not aware of any studies that compare any savings in motor vehicle use from shared PMD schemes with the use of motor vehicles to take the PMDs away for charging and then reposition them. However, a study of docked bicycle schemes[3] showed that the extent of this use of motor vehicles was significant, and outweighed the reduction motor vehicle use in some cities such as London.

Similarly, we are not aware of any research that measures the impacts on physical activity (and thus health) or substituting PMD use for walking and cycling for short trips.

From a broader policy perspective: Should we make the same safety allowances for devices that have little or no health benefit as we do for the bicycle which has proven health benefits?

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[1] Christchurch City Council. (2019). Draft Micro-mobility Discussion Paper. Tabled at Council on 28 February 2019. https://ccc.govt.nz/assets/Documents/Consents-and-Licences/business-licences-and-consents/public-spaces/Council-E-scooter-Permit-Recommendations-28-February-2019.pdf
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[2] Haworth, N.L. & Schramm, A. (2019). Illegal and risky riding of electric scooters in Brisbane. *Medical Journal of Australia*. See Appendix 1.

[3] Fishman, E., Washington, S. & Haworth, N. (2014). Bike share's impact on car use: Evidence from United States, Great Britain and Australia. *Transportation Research Part D: Transport and Environment, 31*, 13-20.

Question 5: When considering the safety risk assessment, access and amenity impacts, broader economic impacts, as well as compliance and enforcement impacts; has the impact analysis sufficiently considered all relevant variables and available evidence? What other factors could be included in the analysis?

Often the assessments are being made based on little empirical evidence, as noted in Section E.3.1 in relation to safety.

Safety risk assessment

In Appendix B, the implementation of Options 2 and 3, we would suggest that helmet requirements for PMDs should apply for the same locations as currently do for bicycles. In most jurisdictions (except Northern Territory), bicycle helmets are required to be worn at all times when riding, including on non-road-related areas. It would be an unfortunate outcome if PMD riders on bicycle paths through parks etc. were not also required to wear bicycle helmets.

Question 6: What do you believe is the most appropriate road infrastructure for PMDs to access: footpaths, separated paths, bicycle paths and/or roads?

Question 7: What is an appropriate and safe maximum speed that PMDs should be permitted to travel across the various infrastructure: (a) pedestrian areas, (b) bicycle areas, and (c) roads?

The CARRS-Q international safety review of e-micromobility concluded that the appropriateness of infrastructure and speed are inextricably linked. This should not have been surprising given that it is a fundamental tenet of the Vision Zero road safety philosophy.

The challenge is to identify operating environments that provide sufficient separation from higher-speed motor vehicles while minimising risks to bicycle riders and slower-speed pedestrians. It would seem appropriate to prohibit the operation of PMDs in locations where riding of bicycles is prohibited.

Where e-scooters are allowed to be used should really depend on the maximum speeds at which the e-scooters can (or allowed to) travel and the speeds of motorised vehicles and bicycles in those locations. In general, safe operation of e-scooters on footpaths requires low maximum speeds. Safer operation on low-speed, low traffic volume roads requires higher maximum speeds of e-scooters. Based on the fundamental safety principles of kinetic energy transfer and separation, Table 2 is an attempt to indicate the relative degree of risk of e-mobility operations under different situations.

The table assumes operation by adults and helmet wearing. It does not apply to footpaths or shared paths where many of the pedestrians are elderly. A potential modification in that situation is to increase the risk level to the next category. All use on roads with speed limits of greater than 50 km/h was considered high risk and so is not included in the diagram. The definition of local roads is quite important. It needs to be clear to users that it is not all roads with a speed limit of 50 km/h or less because some of these roads are heavily trafficked, multi-lane roads in cities.

The table concludes that low risk operation of e-micromobility devices is possible under the following conditions:

- Riding up to 10 km/h on footpaths with few pedestrians
- Riding up to 5 km/h on footpaths with many pedestrians
- Riding up to 25 km/h on shared paths
- Riding at 25 km/h (but not 10-12 km/h or less) on bike paths or protected bike lanes, or in bike lanes on roads with speed limits of 30 and 40 km/h
- Riding at 25 km/h (but not 10-12 km/h or less) in bike lanes on roads with speed limits of 50 km/h or lower

Table 2 Risk matrix for e-micromobility devices as a function of maximum riding speed and operating environment. P=risk to pedestrian, R=risk to rider, P+R=risk to both pedestrians and riders

Operating environment	Maximum riding speed			
	5 km/h	10-12 km/h	25 km/h	>25 km/h
Footpath with few pedestrians			P	P+R
Footpath with many pedestrians		P	P	P+R
Shared path				P+R
Bike path/protected bike lane	R	R		R
Bike lane on road 30-40 km/h	R	R		R
Road 30-40 km/h	R	R	R	R
Bike lane low volume Road 50 km/h	R	R		R
Road Low volume 50 km/h	R	R	R	R
Bike lane High volume Road 50 km/h	R	R		R
Road High volume 50 km/h	R	R	R	R

The equivalent of Option 3, Speed Approach 1 is indicated by the cells outlined in bold.

Question 8: Do you agree with the overall assessment that Option 3, Speed Approach 1 is the option that best balances mobility and safety? If not, which option and speed approach do you prefer?

The situations equivalent to Option 3, Speed Approach 1 are outlined in bold in Table 2. It can be seen that most of the situations which it includes were assessed as low risk (green). The exceptions were footpaths with many pedestrians, where there was considered to be a medium risk to pedestrians, and roads of 30-40 km/h without bike lanes and low volume roads of 50 km/h speed limit. Both of the latter were assessed as medium risk to the PMD riders.

It is also possible to compare the other combinations of Options and Speed Approach with the risk matrix. This identifies certain combinations as containing situations assessed as high risk (e.g. footpath travel at 25 km/h).

The equivalent of Option 3, Speed Approach 2 is indicated by the cells outlined in bold. Option 3, Speed Approach 2 might be dangerous to PMD users because of lower speed in vicinity to higher speed motor vehicles. It also might cause danger to bicycle riders who could be forced closer to traffic in overtaking slower PMDs.

There is a need to clarify "impractical to travel on the adjacent area" in Option 2. Does this apply if the footpath is grass only with no concrete path? This would happen quite often in both suburbs and rural areas. The "less than 50m" would be a problem here.

Research letter

Illegal and risky riding of electric scooters in Brisbane

Narelle L Haworth, Amy Schramm

There are worrying reports of escalating numbers of emergency department presentations by riders and pedestrians with injuries caused by electric scooters (e-scooters).[1–3] In Brisbane, injuries involving shared e-scooters were monitored for about 2 months in early 2019; of the 109 patients for whom data were available, 12 had minor head injuries, three major head injuries, 23 upper limb fractures, and seven lower limb fractures. Not wearing helmets, travelling at more than 30 km/h, and alcohol consumption were identified as significant factors in e-scooter accidents.[3]

Dockless e-scooter sharing schemes emerged in the United States in 2017, and by January 2019 at least 11 e-scooter companies were operating in more than 100 cities and 26 states across the US.[4] One of the largest companies, Lime, received a permit to operate in the Brisbane City Council area from November 2018 until mid-2019. The permit allows riding on roads only to cross them or to avoid obstructions on footpaths. Queensland road rules for rideables (including e-scooters) regulate their maximum dimensions, speed (maximum 25 km/h), and weight.[5] Riders must be at least 12 years old (and supervised by an adult if under 16) and wear a bicycle helmet, and riding on higher speed and wider roads is forbidden. More than 500 000 e-scooter trips were undertaken during the first three months of the trial.[6]

Between Monday 18 and Thursday 21 February 2019, we observed 785 e-scooters (including 698 commercial shared e-scooters, 90%), as well as 2960 bicycles (269 shared, 9%) at six locations in central Brisbane during the periods 7–11 am and 4–6 pm. Most riders (618, 89%) were adults and 528 (76%) were boys or men; the proportion of riders under 18 years of age was greater than for share bicycles (11% *v* 2%). Almost half the shared e-scooters (312, 45%) were ridden illegally (rider not wearing a helmet, riding on the road, or doubling a passenger), as were ten private e-scooters (9%); correct helmet use was less common than for share bicycle riders (81%). Not wearing a properly fastened helmet (no helmet or helmet not properly fastened) was the most frequent risky behaviour, and was again more common among shared than private e-scooter riders (275 shared e-scooter riders [39%], four private e-scooter riders [5%]) (Box).

Characteristics of scooter and bicycle riders during peak morning and evening traffic periods at six sites in Brisbane, 18–21 February 2019

	E-Scooters		Bicycles	
Characteristic	Shared	Private	Shared	Private
Total number	698	87	269	2691
Sex				
Males	528 (75.6%)	66 (76%)	192 (71.4%)	2254 (83.8%)
Females	170 (24.4%)	21 (24%)	77 (29%)	437 (16.2%)
Age group				
Child (under 13 years)	7 (1%)	1 (1%)	0	1 (< 0.1%)
Adolescent (13–17 years)	68 (9.8%)	2 (2%)	4 (2%)	21 (0.8%)
Adult	618 (89.2%)	83 (96%)	263 (98.5%)	2658 (99.2%)
Where ridden				
Footpath	648 (93.1%)	83 (95%)	147 (54.6%)	696 (25.8%)
Road	48 (6.9%)	4 (5%)	122 (45.4%)	1997 (74.2%)
Time				
7–9 am	127 (11.0%)	24 (2.1%)	61 (5.3%)	941 (81.6%)
9–11 am	200 (38.0%)	7 (1%)	60 (11.4%)	260 (49.3%)
2–4 pm	276 (39.7%)	12 (1.7%)	52 (7.5%)	353 (51.0%)
4–6 pm	102 (7.4%)	44 (3.2%)	96 (6.9%)	1152 (82.5%)
Helmet use				
Helmet correctly worn	428 (60.9%)	83 (95%)	218 (81.0%)	2642 (98.4%)
No helmet	252 (35.8%)	4 (5%)	46 (17%)	35 (1.3%)
Worn, but not fastened	23 (3.3%)	0	5 (2%)	9 (0.3%)
Passenger "doubling"	14 (2.0%)	0	0	0

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Research letter

It is unclear whether the current rules for of e-scooters are appropriate for reducing the safety risks for riders and pedestrians. For pedestrian safety, 10 km/h advisory speed signs are sometimes installed on bicycle paths shared with pedestrians, and this could also be a safe maximum footpath speed for e-scooters. Whereas the Queensland rules restrict e-scooters to footpaths (except in specific circumstances), footpath riding is banned in Portland (Oregon)[2] and in California.[4] The Queensland 25 km/h speed limit would be more appropriate were e-scooters ridden on roads rather than on footpaths; however, riders in Portland do not comply with the requirement to ride on the road if they think it unsafe.[2]

While helmets were provided with most Lime e-scooters when the scheme commenced, it was reported in the press that many had no helmets in January and February 2019.[7] The low helmet-wearing rate among shared e-scooter riders indicates the need to ensure that helmets remain available and that police enforce helmet rules. Further, whether bicycle helmet standards are adequate for e-scooters should be examined.

Competing interests: No relevant disclosures. ■

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