

PROJECT REPORT MIS046

Update on current practice and safety implications of e-scooters

J Hitchings, J Weekley, G Beard

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Executive Summary

In 2019, TRL conducted a study for the Road Safety Authority (RSA) in Ireland which investigated current practice and safety implications of electric personal mobility devices (Hitchings, Weekley & Beard, 2019). This category covered devices including e-scooters, Segways, hoverboards, u-wheels, powered mini scooters, and powered unicycles. At the time of that work, Ireland classed these devices as ‘mechanically propelled vehicles’ and they were consequently required to have registration, motor tax, insurance, and a driving licence when used on a public road. Given that these devices fail to meet the criteria for vehicle registration, they were therefore not permitted for use on public roads in Ireland.

However, the Irish Government has recently been carrying out activities aimed at updating the regulations surrounding e-scooters. As such, the RSA has commissioned TRL to complete an update to the 2019 report. The purpose of the update is to understand what has changed in the two years since the previous work and to identify information which is still applicable to the current situation.

A two-step approach was taken to accomplish this:

- 1) A focused review of international evidence was completed to understand recent e-scooter collision data and therefore e-scooter safety.
- 2) A review of current international e-scooter regulations was undertaken to identify where legislation has changed over the past two years within the case study countries investigated within the 2019 report, and to identify practices being undertaken or considered within other countries.

The evidence review concluded that there is still a lack of good quality data for e-scooter injuries and collisions. As such, it is imperative that road safety agencies and other key stakeholders enable robust data collection wherever possible. Despite the lack of data, evidence does suggest that increasing helmet use would have a positive impact on reducing the number and severity of injuries associated with e-scooter riders. Furthermore, the limited evidence also suggests that prohibiting e-scooter use whilst under the influence of alcohol may reduce the number and severity of injuries. Ultimately however, one of the most important take-aways from the evidence review is there still exists a lack of robust research in this area. Given the increasing uptake of e-scooters around the world, now is the time for further research to be undertaken to fill this void.

Regarding the case study investigation, of the 11 countries covered within the 2019 report (excluding Ireland), only three were found to have had made significant changes or additions to their regulations. These countries were Belgium, France, and Spain. Other countries, such as Germany, showed no change as they had already introduced new legislation at the time of the 2019 report. Fifteen additional countries were investigated where information was found to be readily available on the legislation of e-scooters. The findings from this case study investigation were collated in a typology spreadsheet which is available from the authors of this report. It is worth noting that official legislation (i.e. from government sources) was difficult to obtain, and as such the case study investigation was often reliant on secondary sources (e.g. news websites).

1 Introduction

In 2019, TRL conducted a study for the Road Safety Authority (RSA) in Ireland which investigated current practice and safety implications of electric personal mobility devices (Hitchings, Weekley & Beard, 2019).

The RSA has commissioned TRL to update this study to understand what information has now changed or is new, and information that is still applicable to the current situation. This update is focussed on two areas: 1) undertaking a focused evidence review to understand what relevant new road collision data has emerged in the last two years, and 2) providing an update of the previous ‘Case Study Investigation’ to identify information on the legislative context and current practice in 11 case study countries (excluding Ireland). In addition to the case study countries covered in the previous report, we have reviewed information for additional case study countries where information on e-scooter regulations and policy was readily available.

For this report, we focused only on e-scooters; all other types of personal electric mobility devices were out of scope for this study. For the evidence review, we have however used alternative terminology where the research being reviewed makes a distinction; similarly for the case study investigation, how these vehicles are categorised varies depending on country and legislation discussed may apply more widely – the most appropriate for accuracy has been used in each case.

2 Review of recent collision data

2.1 Introduction

In the previous study, we carried out a comprehensive review of the published literature looking at the safety risk of e-scooters and other types of powered transporter. To understand the impact of e-scooters on safety, data on collisions and injuries are critical; however, unlike for many other vehicle types, there do not yet exist many years of data that can be analysed in depth. Without accurate data on collisions, injuries, and usage, little can be concluded about the risk factors which impact e-scooter collision likelihood and outcomes, and therefore what actions can be taken to mitigate the risk.

One conclusion from the previous study was:

There are limited data available regarding the potential impact on serious injuries; anecdotal evidence suggests that scooter-related injuries increase with increased scooter use but that these are generally minor and a result of users falling off rather than interactions with other road users.

The aim of this section is to provide a focused review of recent collision data which has emerged since the original report to provide an update of this work. Within the scope of this project, it was not possible to conduct a systematic or in-depth literature review, however instead we focussed the search on identifying any key pieces of research that include collision or injury data which have been published in the intervening period.

2.2 Key studies

There are two studies that have been conducted since the previous review, and that we will focus on in this section; the 'Safe Micromobility' report by the International Transport Forum (ITF, 2020), and a Road Safety Research Report conducted by FERSI (FERSI, 2020).

The study for the ITF carried out a review of e-scooter safety and other electrically powered personal mobility devices, pedal cycles, and electrically assisted cycles in an urban context. This included a literature review, desk research and input from a workshop attended by 40 participants from 15 countries in October 2019.

The study investigated the data available in terms of fatalities and injuries. One key finding was that there are very little data on e-scooter-related fatalities. Police data on collisions, which are used for information on motor-vehicle related fatalities, do not yet include specific data on e-scooters in most countries. Therefore, the analysis was carried out on 38 media reports of fatalities up to the end of October 2019.

From these limited data, three conclusions were drawn:

- pedestrian fatalities (due to e-scooter collisions) are rare and similar to pedestrian fatalities associated with cycle collisions,
- most fatal e-scooter collisions (over 80%) involve a motor vehicle,
- fatality risk is similar for trips by cycle and trips by e-scooter

For injury data, the report found eight published studies citing collision data; most of these used data obtained using keyword searches on data collected by emergency departments (mostly in the USA) and as such had relatively low sample sizes and little consistency between the datasets.

The authors acknowledged that it is difficult to draw conclusions on injury risk based on such a limited number of studies, however some key points made were:

- serious e-scooter collisions often involve motor vehicles,
- pedestrian injuries are rare or under-reported,
- helmet use is rare,
- male riders suffer most injuries,
- road surface conditions can be a factor in incidents.

A key conclusion from this study therefore was that there is a critical need for comprehensive, accurate and harmonised data collection for e-scooter incidents. The report recommended that all countries should update police and hospital data collection to identify e-scooters as a separate category. It was also recommended that this includes information on vehicle ownership/use type (i.e. private or rental). It is also important for governments to collect trip data for these vehicles to establish exposure and associated risk. Without this, comparison of raw collision counts and injury/fatality outcomes between e-scooters and other modes of transport are relatively meaningless and could lead to misleading conclusions about the relative risks between modes. The information collected must also be consistent across different countries in order to enable comparison – as such a minimum set of information should be defined and international guidelines produced for harmonised data collection.

The FERSI Road Safety Research Report (FERSI, 2020) carried out a survey of 18 participating EU countries looking at number of questions related to e-scooters. In eleven of the countries participating in the survey, e-scooters are currently not identifiable in the collision data that are collected. In seven countries – Austria, Belgium, Denmark, Germany, France, Spain and Switzerland – specific e-scooter collision data are available, although in most cases this is a recent addition made in 2020. Three sets of collision data are quoted in the report:

- 1,200 e-scooter riders hospitalised in Austria in 2019,
- 104 traffic collisions involving e-scooters (with 109 injuries) in Cologne, Germany between mid-June and mid-November 2019, and
- 291 e-scooter collisions in Berlin, Germany in the latter half of 2019.

The survey results also mentioned some work done in Norway to calculate an e-scooter collision rate based on emergency room treatments; this calculated the rate as approximately 89 collisions per million vehicle-km travelled for e-scooters (compared with 8 for bicycles). However, it was noted that collision risk generally reduces with experience and generally current users of e-scooters are lacking in experience.

The survey also showed that most countries who participated have not collected self-reported data (for example surveys of riders) around e-scooter incidents; only four countries – Austria, Finland, Belgium and Norway – have done so. The survey data in Austria found that most conflicts occurred between e-scooter riders and vulnerable road users such as pedestrians or cyclists. Conversely though, a pilot study in Norway found that 86% of reported collisions were ‘single vehicle’ (involving only the e-scooter).

To supplement the information contained in these two studies, we conducted a focused evidence review to understand what new road collision data has emerged in the last two years with respect to understanding e-scooter safety. The results from this review are provided in the following section.

2.3 High-level review

A short list of search terms was generated to run the literature search; these were based on those used in the previous study but substantially reduced to reflect the focus on injury or collision data for electric scooters only. These search terms were applied in ScienceDirect as Boolean search expressions. We also applied a date filter of 2019 onwards to identify research carried out since the previous study.

Table 1: Search terms for literature review

1 st Level		2 nd Level
e-scooter* OR electric scooter* OR scooter*	AND	safe* OR injur* OR collision* OR accident* OR risk*

This search produced 55 results. Of these, 29 were identified as irrelevant based on the title and abstract. The remaining pieces of literature were reviewed further and 6 more were deemed irrelevant to the objectives of this study. The remaining 20 pieces of literature are discussed in the following sections. The majority are individual studies of hospital data which are discussed in section 2.3.1; other research of interest is discussed in sections 2.3.2 and 2.3.3.

2.3.1 Individual injury data studies

Most of the relevant papers reviewed are studies that use keyword searches on hospital records to identify injuries that are e-scooter related. As such there are several caveats that must be considered when assessing these data.

- Keywords used when recording incidents are inconsistent, particularly in a hospital setting. Differences in individuals' skill and understanding can result in very different keywords being recorded for similar incidents.
- The source of the sample varied a lot between studies – mostly they were from emergency departments or trauma centres, but also some were looking at very specific hospital departments or injury types e.g. records of referrals to particular consultancies and surgery services.
- The studies were also focused on different objectives – for example, some were focused on quantifying the cost of e-scooter injuries to the health care system – and therefore the data presented were not consistent between studies.
- As well as the objectives of each study being different, the data collected by different hospitals is not consistent. Even where similar datapoints are collected – for example type of injury, severity of injury – the categorisation is not consistent; injury severity needs to be measured using an agreed standard.
- As the data are from hospital records, there is no indication of the exposure – i.e. how much e-scooters are used in the area and therefore what the injury rate is.

As in the ITF report (ITF, 2020), most of the studies were found to be in the USA and of small sample size.

However, despite the limitations and the difficulty of drawing definitive conclusions, there are some findings that are broadly consistent across all the studies identified:

- Head and face injuries tend to dominate in e-scooter incidents, followed by injuries to the upper extremities
- Low helmet use by e-scooter riders is both prevalent and a factor in injury severity
- Alcohol use when riding e-scooters appears to be a factor in incident risk
- Most injuries recorded seem to be caused by 'falling off' incidents rather than collisions between e-scooter riders and other road users
- The percentage of patients requiring hospital admission, surgery and/or intensive care varies a lot between the studies as would be expected given the different data sources and study intentions. In most studies, very serious injuries are not uncommon.

Details on each of these studies are shown in Table 2.

Table 2: Summary of individual injury data studies

Location	Size of sample / duration of study	Injury type and severity	Injury location or cause	Helmet use	Alcohol
DC, USA (Cicchino <i>et al.</i> , 2021)	105 people presenting to an urban emergency department over one year	Greater injury severity on road which may reflect higher travel speeds	58% on sidewalk 23% on road		
California, USA (Bloom <i>et al.</i> , 2021)	248 people presenting to an urban hospital network over 10 months		50% caused by loss of balance 6% caused by (disproportionately elderly) pedestrians tripping over discarded stationary scooters	3% recorded as wearing helmets at the time of injury	
Singapore (Ang <i>et al.</i> , 2021)	43 people admitted as inpatients to Department of Orthopaedic Surgery over 15 months Study looking at inpatient costs. The median cost and median duration of admission was comparable to accidents from other modes of transport			More than 80% not wearing protective gear	

Location	Size of sample / duration of study	Injury type and severity	Injury location or cause	Helmet use	Alcohol
Texas, USA (Allen <i>et al.</i> , 2019)	124 people presenting to a city emergency department over three months	56.1% upper extremity injuries 45.5% head and face injuries 34.2% lower extremity injuries 28.5% were admitted to the hospital 21.1% required surgical intervention. 1.6% were admitted to the intensive care unit	84.7% falling from scooter 9.7% had collided with a motor vehicle	1.6% recorded as wearing a helmet at the time of injury	
DC, USA (Douglass <i>et al.</i> , 2020)	235 people presenting to an urban emergency department over two years	36.2% upper extremity injuries 52.3% abrasions 39.1% fractures 9.4% of patients required hospital admission	82% falling from scooter	1.7% recorded as wearing a helmet at the time of injury	
California, USA (Lavoie-Gagne <i>et al.</i> , 2021)	442 people presenting to a Level 1 trauma centre over two years	51% orthopaedic injuries 31% facial injuries 13% cranial injuries 4.5% chest/abdominal injuries 40.7% required hospital		2.5% recorded as wearing a helmet at the time of injury	Substance use while riding e-scooters identified as modifiable risk factor for hospital admission

Location	Size of sample / duration of study	Injury type and severity	Injury location or cause	Helmet use	Alcohol
		admission 3% required intensive care			
Texas, USA (Trivedi <i>et al.</i> , 2019)	90 people presenting to an emergency department in the first seven months after introduction of e-scooters scheme to Dallas	58% craniofacial injuries (58% considered severe, 42% considered minor)		No rider recorded as wearing a helmet	Alcohol use had been involved in 18% of all scooter-related trauma admissions
DC, USA (Schlaff <i>et al.</i> , 2019)	13 patients requiring neurosurgical consultation over a 15 months scooter pilot programme in DC	Looking at severe injuries only, including one death. Included skull fracture, central cord syndrome, and vertebral compression fracture			
California, USA (Dhillon <i>et al.</i> , 2020)	87 patients requiring trauma surgeon care in nine trauma centres over one year	The head and face were most commonly injured, followed by the extremities 20.7% required intensive care 17.2% requiring surgical intervention 1.1% died		71.3% not wearing helmet	

Location	Size of sample / duration of study	Injury type and severity	Injury location or cause	Helmet use	Alcohol
London, UK (Barker <i>et al.</i> , 2020)	Four people presenting with significant injuries over four weeks following lockdown at King's College Hospital, London (claim to be first published UK data)	Observed facial lacerations, mandibular and midface fractures, avulsed teeth, and cervical spine injury		One rider recorded as wearing a helmet	Three of the patients had consumed alcohol prior to riding the electric scooter
Utah, USA (Badeau <i>et al.</i> , 2019)	Eight people presenting to an urban emergency department in a six months period before introduction of an e-scooter share programme; 50 presenting in a six months period afterwards (same time of year)	8% major head injury 36% major musculoskeletal injury 12% minor head injury 34% minor musculoskeletal injury 40% superficial soft tissue injury 16% required hospital admission 14% required operative procedures		No rider recorded as wearing a helmet at the time of the injury	16% reported alcohol intoxication at time of injury
Christchurch, New Zealand (Smit <i>et al.</i> , 2020)	30 patients referred to oral and maxillofacial surgical service at Christchurch hospital over 18 months	77% required operative procedures			67% reported having consumed alcohol before the e-scooter accident

Location	Size of sample / duration of study	Injury type and severity	Injury location or cause	Helmet use	Alcohol
Indiana, USA (Mukhtar <i>et al.</i> , 2021)	192 patients requiring imaging exams in an emergency department over 15 months	72.9% had injuries identified, most commonly soft tissue and musculoskeletal			
Auckland, New Zealand (Bekhit <i>et al.</i> , 2020)	770 people presenting to healthcare providers in the Auckland region over eight months Study looking at costs to healthcare. The estimated injury rate was 60 per 100,000 trips and hospital presentation rate was 20 per 100,000 trips.	68.1% treated in the community by primary care physicians 31.9% treated in hospitals (30.5% of these requiring admission and inpatient care)			26.8% of injuries were thought to be associated with alcohol use
Texas, USA (Rix <i>et al.</i> , 2021)	160 people presenting to an emergency department over three months. Study used the data to calculate a vehicle-miles-travelled (VMT)-based injury rate for electric rental scooters which was approximately 175 to 200 times higher than state-wide or county specific injury rates for motor vehicle travel.				

There are several of these studies that are interesting to note, over and above the data presented. Badeau et al. (2019) present a before-and-after study – analysing the emergency department records for a period of six months before the introduction of a e-scooter rental sharing scheme in Salt Lake City, Utah and then a second six month period after the introduction of the scheme. Both six-month periods were June to November. This does not constitute a robust comparison as additional things will have changed between the time periods; however, it is interesting to note the large increase in injuries from eight patients in the first period to 50 patients in the second.

Two of the studies listed in the table looked at the injury rate for e-scooters – that is they included some measure of trip data for e-scooters. Bekhit et al. (2020) calculated that the injury rate was 60 per 100,000 trips and hospital presentation rate was 20 per 100,000 trips. Rix et al. (2021) calculated that the injury rate for e-scooters was 175 to 200 times higher than that for motor vehicles. However, neither were able to make allowance for the effect of rider experience.

Finally, Ang et al. (2021) compared the cost and duration of hospital admission for e-scooter injuries and found that it was comparable with other modes of transport such as motorcycles and bicycles.

2.3.2 Wider injury data studies

Three papers identified in the literature review were related to wider injury data studies which have interrogated the National Electronic Injury Surveillance System (NEISS). The primary aim of this system is to collect data on consumer product-related injuries from the emergency departments of approximately 100 emergency departments across the USA and extrapolate to provide national estimates.

Crowe and Elkbuli (2021, in press) argue strongly for legislation around helmet use and cites two studies based on data from NEISS. These found that, between 2014 and 2018, the number of age-adjusted hospital admissions due to e-scooter-related trauma increased by 365% over that time and in the following year, 2019, the incidence of e-scooter injuries nearly doubled (Farley, Aizpuru, Wilson, Daly, Xerogeanes, Gottschalk, & Wagner, 2020; Namiri, Lui, Tangney, Allen, Cohen, & Breyer, 2020). They also found that the head appeared to be the most common site of injury and 50% of these were traumatic brain injuries.

In our review, two further studies using NEISS data were identified.

Bresler, Hanba, Svider, Carron, Hsueh, & Paskhover (2019) looked at craniofacial (head and face) injuries specifically and found that, between 2008 and 2017, 990 injuries secondary to motorised scooters were recorded. The method used was to search the NEISS database for injuries categorised under “Scooters/skateboards, powered” and filter for those involving the craniofacial region. Of these, 36.1% were closed head injuries, 20.5% were lacerations and 5.2% were facial fractures. Where helmet use was recorded, 66% of the patients were not wearing a helmet at the time of injury. The authors estimated that the annual incidence of e-scooter-related craniofacial injuries (defined as above) tripled over the ten-year period investigated.

Aizpuru, Farley, Rojas, Crawford, Moore & Wagner (2019) looked at all motorised scooter-related injuries from 2013 to 2017. Again, the database was searched for injuries in the

category “Scooters/skateboards, powered” with an additional filtering to remove injuries associated with hoverboards/skateboards or miscoded injuries (although this removed only a small number). They found 820 injuries to be included in the study; of these, head injuries were most common at 27.6%, with 25.9% of injuries being fractures or dislocation. There were no deaths recorded. Based on the rate of incidence and population data, the authors estimated that there would have been 32,400 motorised scooter injuries nationwide during this period.

2.3.3 *Alternative data sources*

As discussed above, the majority of studies that have been carried out have used data obtained from medical records. However, similar to the method used in the ITF study (ITF, 2020), one study identified in our review (Yang, Ma, Wang, Cai, Xie, & Yang, 2020) used a data mining method to obtain information from news reports on e-scooter related crashes. Between 2017 and 2019, this method identified 169 e-scooter-involved crashes in the USA and, based on these data, concluded the following:

- Children and the elderly are more likely to be severely injured
- Female riders are more likely to be involved in falling-off incidents; male riders are more likely to be involved in fatal collisions

It is important to note, however, that the methodology does not allow for exposure considerations, and as such robust conclusions on e-scooter injury risk cannot be inferred, as discussed earlier. Quantitative analyses carried out supported the growing demand for further discussion on helmet use, alcohol, or substance use while riding, vulnerable riders, and the need for more data.

2.4 **Conclusions**

From this high-level review of recent literature focusing on injury data, we draw the following conclusions.

1. There is still a lack of good quality data for e-scooter injuries and collisions. Most of the published literature uses data extracted using keyword searches in individual hospital records. While this provides an interesting indication, there are many limitations to using such a data source. In particular, there is no consideration of exposure – without knowing how many people are using e-scooters, there is no context in which to place the injury or collision data. It is worth noting that, in theory, e-scooter operator data should be able to provide information on exposure for rental e-scooters as they will usually collect data on trip counts and trip length, and will sometimes use these data to promote ‘safety successes’ such as ‘1 million safe miles travelled’. In this report we have not included a discussion of these data as the focus is on peer-reviewed literature rather than commercial media reports. However, it would be useful in the future to combine this kind of usage data with incident data to obtain a clearer picture of risk. There will be an opportunity for this following the results of the UK trials that are currently underway.
2. As in the previous study, a key finding is therefore that all stakeholders need to enable data collection where possible and this should be a priority for road safety agencies. Data

collection processes and procedures for road safety need to be updated as soon as possible to include e-scooters and other personal mobility devices. There needs to be a category for e-scooters to be able to identify them separately from mobility scooters, mopeds, electric bicycles, powered skateboards or other forms of powered personal mobility device. Currently, most countries do not separately identify e-scooters in accident data, but it is increasingly being implemented. Longer-term, governments and public authorities need to collect trip data for e-scooters and a shared standard for data collection should be established to ensure consistent data between police, hospitals, public health, and authorities both nationally and internationally.

3. Despite the lack of data, there is some evidence that suggests increasing helmet use amongst e-scooter riders will make a difference to the number and severity of injuries. The studies reviewed show high incidence of head injuries and very low helmet use, suggesting that many could have been preventable. Depending on the political context, enforcing helmet use may be difficult; if enforcement is not possible, or in the interim, encouraging and / or incentivising helmet use should be considered.
4. The studies reviewed above also suggest that restrictions on alcohol use while riding may reduce the number and severity of injuries. Although there are very limited data on the impact of alcohol on e-scooters this is one area where we can apply the lessons from other road users even in the absence of direct evidence for e-scooters. It is reasonable to state that operating e-scooters under the influence of drugs or alcohol should be prohibited and enforced.
5. Where the cause of the incident is discussed, the studies suggest that single vehicle incidents – i.e. falling off – dominate over collisions with other motor vehicles. Use of e-scooters is still sufficiently novel to most people that this is probably to be expected due to lack of experience. It will also vary significantly depending on where the riding of e-scooters is permitted. It is worth noting that there is very little literature or data that looks at the impact of e-scooters on pedestrian injuries; this needs to be included in future data collection.

3 Update on case study investigation: review of current international regulations

3.1 Introduction

In the previous review, a case study investigation was conducted to identify and summarise the existing legislative context and current practice in 12 countries, including Ireland. These countries were selected as they were found to have personal light electric vehicles (PLEVs) in frequent operation and had developed legislation or policy on their use. The other 11 countries that were subject to the case study investigation were:

- Belgium
- France
- Germany
- Netherlands
- Spain
- Switzerland
- United Kingdom
- Israel
- US
- Australia
- New Zealand

This investigation highlighted the lack of consistency in how PLEVs are defined, categorised, and regulated, as well as the uncertainty over the pace at which changes in this area are being implemented. The results of this investigation ultimately demonstrated the difficulty which policy makers and regulators face when considering these vehicles.

The current investigation intends to provide an update on the current legislative practices that these 11 countries are now demonstrating to inform the current developments in Ireland. Focus is given to where changes have been made over the past two years since the original case study investigation was conducted. Furthermore, additional case study countries have also been investigated where information on e-scooter regulations and policy was readily available.

3.2 Method

The FERSI (2020) report provided a useful starting point for relevant information on the current context of e-scooter legislation in EU countries. This report was reviewed, and relevant information drawn out before an extensive series of web searches was conducted using Google to identify additional sources of relevant information. Web searches focused on identifying sources published since the original report was completed in June of 2019. For the original case study countries, information was compared with that detailed in the 2019 report.

Section 3.3 presents a series of short summaries on each of the investigated countries. These summaries provide information on current legislation, and any policy or guidance on safety (e.g. minimum age or licence requirements, limitations of operation on specific roads, use of helmets). Information was scarce on 'common sense' laws such as using e-scooters in a careful and considerate manner that does not put others at risk, and prohibiting riding while under the influence of drugs or alcohol. We believe that most countries would be able to

penalise such behaviours through existing legislation (not specific to e-scooters) but due to the lack of official information, details on ‘common sense’ laws are not included in these summaries. For the original case study countries, short tables are also provided for countries where changes have occurred, which compare the 2019 report details with the current context.

Where possible, information was sought from official sources (e.g. government websites). However, there were not many sources identified of these types. As such, much information has been drawn from news articles. This continues to highlight that there is a lack of direct regulation and legislation available – a point which was noted in the 2019 report.

In addition to the summaries provided in the following section, a separate spreadsheet was created to collate key legislative and regulatory details for the investigated countries and sources for the information collated. This organises countries alphabetically, highlighting which countries enforce which rules, and is available from the study authors.

3.3 Results

3.3.1 Original case study countries with changes since 2019

The following subsections provide short summaries for three of the original case study countries from the 2019 report. These three countries (Belgium, France, Spain) are those which were found to have had significant changes in how they categorise and regulate e-scooters.

Section 3.3.2 discusses the other eight of the original case study countries, which have not shown any significant changes in their e-scooter legislation since the 2019 report.

3.3.1.1 Belgium

2019 context	Current context	Notable changes
<p>PLEVS with a max speed of 18km/h permitted on cycle paths, and on pavements at speed less than or equal to walking pace.</p> <p>Devices faster than 18km/h classed as and subject to requirements of a motor vehicle.</p>	<p>PLEVs have a specific vehicle category, ‘personal transportation devices’, with two sub-categories – motorised and non-motorised.</p> <p>Motorised devices have a speed limit of 25km/h, and are expected to use cycle facilities, though permitted on pavements if they do not travel faster than pedestrians.</p> <p>There is no age restriction, no requirement to wear protective gear, and no restriction on maximum power.</p>	<ul style="list-style-type: none"> Introduced specific vehicle category for PLEVs. Increased max speed limit from 18km/h to 25km/h.

At the time of the 2019 report, Belgium categorised e-scooters as a ‘motorised propulsion device’, a motor vehicle with one or more wheels with a maximum design speed of 18km/h. When these devices travelled at walking speed, they were considered a pedestrian, and when travelling faster than walking speed they were considered a cyclist. As such, users of PLEVs were expected to meet the requirements of pedestrians or cyclists as necessary. Ultimately, this meant the devices were permitted on cycle paths, or pavements when travelling no faster than walking speed.

The FERSI (2020) report states that Belgium now has a specific vehicle category for PLEVs called ‘personal transportation devices’ which has two sub-categories: motorised and non-motorised. These devices can be no wider than 1m and motorised devices are restricted to 25km/h, though there is no restriction on their maximum power output. E-scooters fall under the motorised sub-category. They are limited to use on cycle facilities, or pavements if they do not travel faster than pedestrians. They are not permitted for use on roads. In addition, there is no age restriction on their use, and there is no requirement to have insurance, registration plate, or to wear protective gear while riding.

It is also worth noting that Brussels has already introduced specific e-scooter parking zones, and since September 2019 users can be fined for parking e-scooters in no-park zones (FERSI, 2020).

An article posted on the Electric Vehicles Research web page in June 2020 notes these points, but also states that e-scooters that are fitted with a saddle fall under a different vehicle category¹. Vehicles fitted with at least one seat are subject to specific type-approval, and under the Belgian traffic code an e-scooter fitted with a seat would be classified as a moped. It would therefore be subject to vehicle registration, requiring a licence plate, vehicle insurance, and a driving licence. An age restriction of 16 years would also apply, with a requirement to wear an appropriate helmet while riding.

3.3.1.2 France

2019 context	Current context	Notable changes
<p>PLEVs prohibited in public spaces (roads and pavements), though permitted on private roads.</p> <p>No requirement to wear protective gear, or to have insurance.</p>	<p>PLEVs have specific vehicle category, ‘motorised personal transport’.</p> <p>Max speed limit of 25km/h, or 8km/h in pedestrian zones, and are expected to use cycle facilities, though if not available then expected to use roads (providing speed limit is not >50km/h).</p>	<ul style="list-style-type: none"> Introduced specific vehicle category for PLEVs. Now permitted in public spaces, with guidance on where they can be used. Introduced max speed limit of 25km/h, and 8km/h in pedestrianised zones.

¹ <https://www.electricvehiclesresearch.com/articles/20908/non-type-approved-e-scooters-with-saddle-are-illegal>

	<p>Minimum age restriction of 12 years old.</p> <p>Legal liability insurance is required.</p> <p>Riders between 12-18 years old required to wear a helmet and must be accompanied by an adult (on a separate vehicle as sharing is not permitted).</p>	<ul style="list-style-type: none"> • Introduced age restriction to use devices. • Introduced requirement to have insurance to use a device. • Introduced requirement for riders aged between 12-18 years old to wear a helmet and be accompanied by an adult.
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France has demonstrated significant changes to the regulation of e-scooters and other PLEVs. Previously these devices were largely illegal, only being permitted on private roads. The 2019 report notes that despite their illegal status, e-scooters and similar devices were still frequently seen in French cities with little enforcement.

Since then, France has introduced a specific vehicle category for these devices called ‘motorised personal transport’ (FERSI, 2020). They are now no longer restricted to only private roads and can be used in public spaces. Specifically, they are expected to use cycle facilities, though where these are not available, they are permitted to use road lanes providing the speed limit is not greater than 50km/h. These devices are also now subject to a 25km/h maximum speed limit, or 8km/h when in pedestrian zones. There is no requirement to display a registration plate; however, legal liability insurance is now required to use these devices.

The FERSI (2020) report states that there is now an age restriction of 12 years old to use the device, and riders between the ages of 12 and 18 are required to wear a helmet while riding and must be accompanied by an adult. The adult would be required to operate a separate device, as sharing is not permitted. These details are also noted in an article published by the The Straits Times in 2019², which states this legislation came into place on the 26th of October that year. This article also notes that Paris authorities have specific guidance banning the parking of e-scooters on footpaths, with other local authorities implementing mandatory e-scooter parking zones (FERSI, 2020). National authorities are working on parking regulations for e-bikes and e-scooters which are to be implemented in 2026 (FERSI, 2020).

While the FERSI (2020) report and the article published by The Straits Times agree on details, an article published on Eltis (The Urban Mobility Observatory) in August 2020 states some different details³. It states that the minimum age restriction is 8 years old, and that only

² <https://www.straitstimes.com/world/europe/e-scooters-legalised-in-france-but-banned-on-footpaths#:~:text=PARIS%20%E2%80%A2%20France%20on%20Friday,footpaths%2C%20highways%20and%20rural%20roads.&text=They%20may%20normally%20only%20be,be%20aged%2012%20or%20over>

³ <https://www.eltis.org/resources/case-studies/overview-policy-relating-e-scooters-european-countries>

children younger than 12 are required to wear a helmet. Furthermore, this source states that the maximum speed limit on roads is 20km/h, as opposed to 25km/h. Without any official source to cite, it is difficult to identify which of these rules reflect those which are currently applied in France. However, given that the article published by Eltis is the only identified source to note an age restriction of 8 years old and a maximum speed limit of 20km/h, as well as the FERSI (2020) report drawing on information from FERSI members and other experts within the field, it is likely that the initial details described here are more reflective of the current context. This point does demonstrate the difficulties that are encountered when trying to identify clear guidance on the rules which apply to e-scooters.

3.3.1.3 Spain

2019 context	Current context	Notable changes
<p>E-scooters banned in many locations.</p> <p>Plan to introduce new measures banning e-scooter use on pavements, and a 25km/h max speed limit.</p> <p>Some local authorities introduced their own rules, e.g. Madrid permitted e-scooters to use cycle facilities but banned them from roads with a speed limit of >30km/h.</p>	<p>PLEVs have specific vehicle category of ‘personal mobility vehicles or devices’.</p> <p>Max speed limit of 25km/h, and expected to use cycle facilities, though if not available then expected to use roads (though national regulation states they are not permitted on rural roads).</p> <p>Max power restriction of 250W.</p> <p>Local authorities enforce their own rules.</p>	<ul style="list-style-type: none"> • Introduced specific vehicle category for PLEVs. • Introduced more detailed guidance on where their use is permitted. • Introduced max speed limit of 25km/h. • Introduced max power restriction of 250W.

The 2019 report noted that, due to an influx of e-scooter use in Spanish cities in the summer of 2018, steps had been taken by local authorities to ban their use. Announcements were made later that year to introduce a ban on their use on pavements and implementing a 25km/h speed limit.

Information provided by the FERSI (2020) report states that on the 25th March 2020, Spain introduced a new vehicle category for e-scooters and other PLEVs called ‘personal mobility vehicles or devices’. This categorisation included the rules that had been announced at the time of the 2019 report. Further to these points, there is now also a 250W restriction on the maximum power output of e-scooters. These devices are banned from use on pavements and are only permitted on cycle facilities, though where these are not available, they are permitted on roads. However, national regulation does not permit their use on rural roads.

Evidence was also found of different local authorities enforcing their own rules. For example, Stewarts Law provides a summary of legislation in Barcelona⁴. This includes a minimum age

⁴ <https://www.stewartslaw.com/news/e-scooter-uk-legalisation-and-regulation/>

restriction of 16 years old to operate an e-scooter, and a requirement to wear a helmet if you weigh between 25 and 50kg. On the other hand, Madrid has a minimum age restriction of 15 years old, and all users are required to wear a regulatory helmet⁵. One source noted that a law which enforces helmet-wearing is expected to be introduced in the future⁶.

Guidance on whether e-scooters require insurance in Spain is unclear. The FERSI (2020) report states that insurance is not required, while Eltis reports that the national traffic authority does require devices to be insured⁷, and Stewarts Law states that insurance is only recommended. It is possible that insurance requirements differ between local authorities and the information from these sources are all accurate but reflective of different locations. However, no clarity could be found on this point during this case study investigation. This once again provides an example of the difficulty users can have in trying to find clear guidance on using e-scooters.

3.3.2 Countries with no changes since the 2019 report

Of the original case study countries included in the 2019 report, eight of them have shown no significant changes in their legislation of e-scooters. These countries are Germany, Netherlands, Switzerland, UK, Israel, US, Australia, and New Zealand. These are discussed in turn in the following subsections.

3.3.2.1 Germany

At the time of the 2019 report, details on the ‘Light Electric Vehicle Bill’ which was about to be introduced in Germany were readily available. These details were summarised within the 2019 report and are also covered in the FERSI (2020) report. This legislation includes the following rules:

- Maximum speed limit of 20km/h
- Maximum power output of 500W
- Age restriction of 14 years old
- Requirement to have legal liability insurance
- Requirement to have and display a registration plate
- Requirement to use cycle facilities, though if these are not available then expected to use roads. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-scooters are permitted were not identified for Germany during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.

⁵ <https://www.emesa-m30.com/electric-scooter-regulations-in-madrid-are-they-permitted/>

⁶ <https://www.thinkspain.com/news-spain/32617/new-rules-for-electric-scooters-on-spain-s-roads>

⁷ <https://www.eltis.org/resources/case-studies/overview-policy-relating-e-scooters-european-countries>

This law came into force on June 14th, 2019, and no changes to this were identified from the current investigation. Some sources were identified which demonstrated this legislation coming into place, including an article published on Electrive⁸ and another on the Library of Congress⁹, both published in June of 2019.

3.3.2.2 *Netherlands*

No significant changes were found for e-scooter legislation in The Netherlands when compared with the summary provided in the 2019 report. That is that e-scooters are not permitted on public roads unless they are given special type-approval as a ‘special moped’ from the national type-approval authority¹⁰. ‘Special mopeds’ are then subject to their own set of rules and regulations, which includes an age restriction of 16 years old and a requirement to have insurance.

The FERSI (2020) report states that The Netherlands are currently developing a renewed legal framework that will organise the admittance of PLEVs, though it is worth noting that e-scooters and other PLEVs are reportedly hardly ever seen in the country. A post on Micro’s website¹¹ raises concerns about the initiative that is being undertaken in The Netherlands, suggesting that it may be an unnecessarily long-term process which results in an outcome that does not coincide with regulations in place within other European countries.

3.3.2.3 *Switzerland*

The legislation that was outlined in the 2019 report for Switzerland remains the same. The FERSI (2020) report summarises this legislation effectively, with two other identified sources (HSE¹² and Helvetia¹³) supporting the points detailed therein. In short, e-scooters are categorised as light mopeds, with some rules and requirements differing depending on the maximum speed of the device (20km/h or 30km/h). E-scooters can be used from 16 years old,

⁸ <https://www.electrive.com/2019/06/19/germany-kick-scooters-now-legal-and-set-to-multiply/#:~:text=Kick%2Dscooters%20and%20similar%20LEVs,Electric%20Vehicles%20in%20Road%20Traffic%E2%80%9D.&text=Electric%20pedal%20scooters%20may%20only,cycle%20paths%20or%20cycle%20lanes>

⁹ <https://www.loc.gov/law/foreign-news/article/germany-regulation-to-allow-use-of-e-scooters-on-public-roads-enacted/#:~:text=Top%20Recent%20Articles-,Germany%3A%20Regulation%20to%20Allow%20Use%20of%20E%2Dscooters%20on%20Public,electric%20vehicles%20on%20public%20roads.&text=Previously%2C%20the%20Use%20of%20e%2Dscooters%20was%20prohibited%20in%20Germany.>

¹⁰ <https://www.eltis.org/discover/news/e-scooter-regulations-germany-and-france>

¹¹ <https://www.micro-step.nl/en/electric/regulations-electric-scooters/#:~:text=The%20E%2Dscooter%20with%20electric,maximum%20power%20as%20E%2Dbikes.>

¹² <https://healthyandsafe.biz/e-scooters/#:~:text=In%20Switzerland%2C%20electric%20scooters%20and,use%20cycling%20lanes%20where%20Present.&text=To%20be%20allowed%20to%20ride,comply%20with%20the%20ASTRA%20regulations.>

¹³ <https://www.helvetia.com/ch/web/en/about-us/blog-and-news/stories/on-the-move/your-own-e-scooter.html>

or from 14 years old if the user holds a moped licence. The following rules apply for devices with a maximum speed of 20km/h:

- Maximum speed limit of 20km/h, or 6km/h in pedestrianised zones where devices are permitted
- Maximum power restriction of 500W
- Prohibited from use on pavements and required to operate on cycle facilities, though where these are unavailable, they are required to use the road. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-scooters are permitted were not identified for Switzerland during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.

In addition, it is not required that registration plates are displayed, legal liability insurance is not required, and there is no requirement for riders to wear protective gear (though a helmet is recommended).

3.3.2.4 UK

In the UK, private e-scooters and other ‘powered transporters’ remain illegal, with their use only being permitted on private land with permission from the landowner. However, ongoing trials of shared e-scooters within the UK began in August 2020 after the Department for Transport accelerated their plans due to the COVID-19 pandemic. For these trials to take place, changes were implemented to secondary legislation that regulates rental e-scooters in a similar manner to that of electrically assisted pedal cycles (EAPCs)¹⁴. This decision was based on e-scooters having a similar road presence to EAPCs and other bicycles, being similarly sized with similar visibility. These regulations include:

- Maximum speed limit of 25km/h
- Maximum power restriction of 500W
- Riders require a valid driving licence
- Trial e-scooters must be covered by a motor vehicle insurance policy, provided by rental operators
- Permitted to use the same facilities as bicycles and EAPCs, meaning they are allowed on roads (except motorways) and in cycle lanes and tracks, where possible.
- In addition, helmet-wearing is not mandatory while operating an e-scooter but is encouraged.

¹⁴ <https://www.gov.uk/government/publications/e-scooter-trials-guidance-for-local-areas-and-rental-operators/e-scooter-trials-guidance-for-local-areas-and-rental-operators>

Following these trials, it is likely that laws will be amended to treat e-scooters more like EAPCs, as these are not currently treated like ‘motor vehicles’ under current law¹⁵, official announcements on future regulations are not expected until after trials have finished in 2022.

3.3.2.5 *Israel*

Information on Israel proved difficult to find during the web search. No evidence could be found which demonstrated any significant changes to the details originally covered in the 2019 report. This included an age restriction of 16 years old, a requirement to hold a driver’s licence, and a requirement to wear a helmet while riding. It is therefore assumed that these rules still apply, and no changes or additions have been made to the current context of e-scooter legislation within Israel.

3.3.2.6 *US*

As was noted in the 2019 report, e-scooter laws vary across the different states, and local authorities within states can apply specific rules to their own municipalities. This remains the case, as there is still no legislation which applies to the US as a whole. Given the different road traffic environments and needs across the US, it is unlikely that there will be any nationwide e-scooter legislation soon.

During this investigation, an article published on the Unagi Scooters webpage was found detailing e-scooter laws for all 50 states (as well as a small selection of other countries)¹⁶. Where available, information is summarised per state on where e-scooters are permitted (e.g. sidewalks, cycle facilities, or roads), maximum speed limits, age restrictions, whether protective gear is required while riding, and whether a vehicle licence and registration is required. It also highlights states which do not have readily-available information on e-scooter legislation, which includes Alaska, Wyoming, and West Virginia. This source (link provided in footnote) also includes a state-level map diagram with key, which details all this information. It is worth noting that no date is provided on when this article was published. However, based on dates that are referred to therein it is assumed to have been published in early 2019, which means that the provided information may now be outdated.

Somewhat similar to the Unagi Scooters article, the Share-Use Mobility Center has produced a ‘Micromobility Policy Atlas’¹⁷. This provides information on e-scooter policies on several areas of regulation and management from around the world, including specific states within the US. Separate pages for the different locations can be selected for details on specific operating rules, including (but not limited to) maximum speed limits, age restrictions and information on where their use is permitted. Though this source does provide a greater level of detail than that provided within the Unagi Scooters article, the ‘Micromobility Policy Atlas’ does not (yet) cover information on all US states.

¹⁵ <https://www.gov.uk/government/publications/e-scooter-trials-guidance-for-local-areas-and-rental-operators/e-scooter-trials-guidance-for-local-areas-and-rental-operators#background>

¹⁶ <https://unagiscooters.com/articles/the-comprehensive-guide-to-electric-scooter-laws/>

¹⁷ <https://learn.sharedusemobilitycenter.org/atlas/?modes=scooter>

3.3.2.7 Australia

Like the US, due to the absence of nationwide legislation, Australia continues to have different e-scooter laws between states¹⁸. State-specific rules were covered in brief within the 2019 report, and more recent evidence continues to show that these are still applicable.

In Queensland, e-scooters are categorised as Personal Mobility Devices (PMDs) and are permitted on paths or roads with a speed limit of 50km/h or lower¹⁹. They are also subject to a 25km/h maximum speed limit, an age restriction of 16 years old (or 12 with adult supervision), and a helmet requirement. Similar rules apply in the state of Victoria, though a stricter 10km/h maximum speed limit is enforced, as well as a maximum power output of 200W²⁰. South Australia instead enforces a 15km/h limit²¹.

Northern Territory classes e-scooters with a power output greater than 200W as a motorised vehicle under the NT Motor Vehicles Act²². As such, they require vehicle registration and must be ridden by licensed riders. However, as these devices are not manufactured to comply with registration requirements and established national safety standards, they are unable to be granted vehicle registration. They are therefore not permitted for use on public roads and are in essence illegal (this is similar to the current legislation in the UK). Lastly, in New South Wales, e-scooters are still currently illegal, only being permitted on private property²³. The NSW government also recently abandoned plans to conduct an e-scooter trial in Sydney²⁴.

3.3.2.8 New Zealand

In New Zealand, e-scooters are categorised as a “low-powered vehicle”, providing that the wheels do not exceed 355mm in diameter and the maximum power output is no greater than 300W²⁵. They are permitted on footpaths and on the road, though are prohibited from using designated cycle lanes within the road as these are strictly reserved for cyclists. Devices which

¹⁸ <https://www.budgetdirect.com.au/blog/australias-electric-scooter-laws-by-state.html#:~:text=Electric%20scooter%20laws%20in%20Australia,be%20used%20on%20private%20property>

¹⁹ <https://www.qld.gov.au/transport/safety/rules/wheeled-devices/personal-mobility-devices>

²⁰ <https://www.vicroads.vic.gov.au/safety-and-road-rules/road-rules/a-to-z-of-road-rules/scooters-and-wheeled-recreational-devices>

²¹ <https://learn.sharedusemobilitycenter.org/atlas/shared-mobility-devices-model-permit-and-operational-conditions/>

²² https://nt.gov.au/_data/assets/pdf_file/0006/374352/v56-motorised-foot-scooters-and-power-assisted-cycles.pdf

²³ <https://www.lexology.com/library/detail.aspx?g=d5ad741f-2236-4ac4-bb02-1c0ec7692c36>

²⁴ <https://www.smh.com.au/national/nsw/nsw-abandons-electric-scooter-trial-because-minister-not-in-the-mood-20210304-p577oa.html#:~:text=Electric%20scooters%20are%20illegal%20on,but%20sales%20continue%20to%20grow.&text=Its%20final%2073%2Dpage%20report,streets%20up%20to%2025km%2Fh>

²⁵ <https://www.nzta.govt.nz/vehicles/vehicle-types/low-powered-vehicles/#:~:text=E%2Dscooters%20can%20be%20used,the%20sole%20use%20of%20cyclists>

have a power output of greater than 300W are not permitted on the road. These details have not changed since the 2019 report.

It is worth noting that New Zealand was considering implementing a 10km/h speed limit for e-scooters during 2019²⁶. However, no evidence was found on this having been implemented. Given that this is not shown in the government guidance (see footnote 24), it is likely that plans to reduce the speed limit have been abandoned.

3.3.3 *Additional countries*

During the current case study investigation, information relating to additional countries beyond the original case study countries was found. This began with the FERSI (2020) report, which covered information relating to several EU countries. Throughout the web search, relevant information was also found through sources that provided information on multiple countries beyond that of those being searched for. The following subsections provide short summaries for 15 additional countries where information on the current context of e-scooter legislation was found to be readily available. Sections 3.3.3.1 to 3.3.3.12 cover additional European countries that were covered in the FERSI (2020) report. Sections 3.3.3.13 to 3.3.3.15 cover countries which were not covered in the FERSI (2020) report, but were found to have information available on them.

3.3.3.1 *Austria*

Austria has a specific vehicle category for small vehicles which are intended for use off roads. Within that category is a group for “small and mini scooters with electric motors” which covers e-scooters. Since June of 2019, this group is subject to similar rules to those that apply for bicycles²⁷. According to the FERSI (2020) report, the rules which apply to e-scooters are:

- Maximum speed limit of 25km/h
- Maximum power restriction of 600W
- Prohibited from use on pavements and required to operate on cycle facilities, though where these are unavailable, they are required to use the road. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-scooters are permitted were not identified for Austria during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.
- Riders required to have a bike licence (a bicycle exam can be taken from around age 9)

²⁶ <https://www.rnz.co.nz/news/national/406106/e-scooter-speed-limit-of-10km-h-being-considered-say-lobby-groups>

²⁷ <https://etsc.eu/austrian-warnings-over-e-scooter-safety/#:~:text=In%20Austria%2C%20e%2Dscooters%20are,available%2C%20or%20on%20the%20road.>

- Riders younger than 12 required to wear a helmet.

It has also been reported that riders in Austria who are 12 years old or younger are required to be accompanied by another person of 16 years or older²⁸. However, the Library of Congress has stated that adult supervision is only required for riders younger than 12 that do not hold a bike licence²⁹. This would imply that a bike licence is only required to operate an e-scooter from 13 years old. This point would require further clarification, likely from an official Austrian governmental source, to understand what rules actually apply here.

Additionally, there is no requirement for an e-scooter to display a registration plate, nor is there a requirement for the user to hold legal liability insurance.

3.3.3.2 Czech Republic

Within the Czech Republic, e-scooters fall under the same category as e-bikes. As such, FERSI (2020) states they are subject to the following rules:

- Maximum speed limit of 25km/h (any faster and the device would be considered a moped)
- Maximum power restriction of 250W (though a separate source states that the power restriction is 1000W³⁰)
- Prohibited from use on sidewalks and required to operate on cycle facilities, though where these are unavailable, they are required to use the road. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-scooters are permitted were not identified for the Czech Republic during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.
- Helmets required for riders younger than 18 years old.

The restriction that e-scooters cannot be operated on sidewalks is seemingly quite strict, with bicycles also being banned unless the sidewalk also acts as a designated cycle path³¹. Legal liability insurance and registration are also not required for e-scooters in the Czech Republic.

3.3.3.3 Denmark

Denmark categorises e-scooters the same as bicycles. FERSI (2020) states that the following rules apply:

²⁸ <https://edriveplanet.com/guides/electric-scooter-and-skateboard-laws-in-europe-all-countries/>

²⁹ <https://www.loc.gov/law/foreign-news/article/austria-ban-on-riding-e-scooters-on-sidewalks-enacted/>

³⁰ <https://edriveplanet.com/guides/electric-scooter-and-skateboard-laws-in-europe-all-countries/>

³¹ <https://news.expats.cz/weekly-czech-news/transport-ministry-electric-scooters-cant-be-driven-on-sidewalks-under-any-circumstances/>

- Maximum speed limit of 20km/h
- Required to operate on cycle facilities, though where these are unavailable, they are required to use the road. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-scooters are permitted were not identified for Denmark during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.
- Age restriction of 15 years old for independent riding, though can be used from a younger age with adult supervision or when in playground areas.

The legal requirement for e-scooters to use cycle facilities has been in place since the 1st of January, 2019³². There is no requirement to wear protective gear, though it is recommended. In addition, like most other counties, devices are not required to display a registration plate, and legal liability insurance is not required for privately owned e-scooters. However, in the case of rental e-scooters, the rental firm is responsible for providing insurance.

3.3.3.4 Finland

In Finland, e-scooters are categorised on their maximum possible speed through electrical assistance. If the device has a maximum speed of 15km/h (i.e. the electrical assistance automatically turns off at 15km/h), then it is considered a pedestrian. If the device can travel at speeds up to 25km/h using the electrical assistance, it is instead considered a bicycle. Devices which can travel at speeds faster than 25km/h are treated like a moped and are subject to specific requirements – namely they are required to be registered and display a registration plate and hold vehicle insurance. The FERSI (2020) report outlines the following rules for e-scooters in Finland:

- Maximum speed limit of 25km/h (this still applies to devices which have the capability to travel faster than this speed³³)
- Maximum power restriction of 1000W
- Devices with a maximum speed of 15km/h are required to operate on pavements; while devices which can travel at faster speeds must use bicycle facilities
- Helmet-wearing is required on devices categorised as a bicycle.

It is worth noting that service suppliers in Helsinki have set their own restrictions, limiting e-scooters to a speed of 20km/h rather than 25km/h³⁴. It is therefore important that service

³² <https://www.loc.gov/law/foreign-news/article/denmark-copenhagen-limits-number-of-electric-scooters-on-its-streets/>

³³ <https://edriveplanet.com/guides/electric-scooter-and-skateboard-laws-in-europe-all-countries/>

³⁴ <https://www.liikenneturva.fi/en/road-safety/electronic-mobility-devices#:~:text=The%20electric%20scooters%20that%20are,more%20than%2025%20km%2Fh.&text=Electric%20scooters%20must%20not%20be,that%20are%20meant%20for%20pedestrians>

providers are clear about the rules that they enforce and how they differ from government legislation to minimise the risk of creating confusion among users.

3.3.3.5 *Greece*

According to the FERSI (2020) report, Greece does not yet permit e-scooters in public space. Despite this, they are reportedly still seen regularly across the country with a growing popularity among citizens. Problems have been reported with their use (e.g. being left dumped on streets and sidewalks, rather than correctly parked), which has created a push to establish an appropriate legal framework to manage e-scooter operation within Greece. This new framework intends to address the use, safety, and regulation of e-scooters and other PLEVs³⁵.

According to details provided on an edriveplanet article³⁶ (which was last updated in May 2020), e-scooters are supposedly legal, with an age restriction of 18 years old, a maximum speed limit of 25km/h, and no restriction on where they may be used. However, with no reliable source to back up these points, it is difficult to know whether these details are true – especially when considering that other evidence (see footnote 37) would suggest that a regulatory framework is still being developed.

3.3.3.6 *Hungary*

Hungary does not yet have any categorisation for e-scooters (FERSI, 2020). Consequently, there are no clear rules or regulations on their operation within the country, with no guidance on a maximum speed limit, maximum power output, or age restriction.

However, an e-scooter pilot program began in Budapest in May of 2019³⁷. This program, undertaken by Cities-4-People³⁸, seeks to understand the impact of e-scooters in Budapest and ultimately encourage the uptake of these devices. Given the scope of the program, it is likely this work will also help lay the groundwork for establishing regulatory guidance within the country. E-scooters usage as part of this program is limited to bicycle facilities and is restricted to users 18 years or older³⁹.

3.3.3.7 *Italy*

E-scooters are of the same category as bicycles in Italy. The rules which apply to them are:

- Maximum speed limit of 20km/h on mixed pedestrian and cycle paths, and 6km/h in pedestrian areas

³⁵ <https://news.gtp.gr/2020/02/03/greek-transport-ministry-preparing-city-scooter-regulations/>

³⁶ <https://edriveplanet.com/guides/electric-scooter-and-skateboard-laws-in-europe-all-countries/>

³⁷ <https://www.li.me/second-street/lime-eu-cities4people-first-electric-scooters-budapest>

³⁸ <https://cities4people.eu/about/>

³⁹ <https://edriveplanet.com/guides/electric-scooter-and-skateboard-laws-in-europe-all-countries/>

- Maximum power restriction of 500W
- Age restriction of 18 years old
- Required to operate on cycle facilities or road lanes within 30km/h zones, are permitted in pedestrian zones providing they travel at the lower speed limit, and are prohibited from travelling on motorways or roads with a speed limit of 50km/h or greater.

These details were provided in the FERSI (2020) report. However, other sources have noted different and additional rules. For instance, it has been reported that the maximum speed limit for e-scooters is 25km/h on roads, the age restriction is 14 years old, and users under the age of 18 are required to wear a helmet⁴⁰. These details were also reported by Eltis⁴¹ and an Italian news site⁴². This presents some disparity in the available information and would require further clarification. It is possible that the different rules outlined here are applied within different local authorities, as – according to a post on edriveplanet⁴³ – the Italian national government gave individual authorities the power to decide on local rules.

3.3.3.8 Norway

Norway defines e-scooters as ‘small electric-powered vehicles’ and, like Italy, treats them very similar to bicycles. The FERSI (2020) report outlines the rules for e-scooters as follows:

- Maximum speed limit of 20km/h
- Permitted to use all parts of the road but expected to only use the pavement when their presence would not present a risk to pedestrians. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-scooters are permitted were not identified for Norway during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.

There is no minimum age restriction, nor a restriction on the maximum power of a device. Furthermore, there is no requirement for the rider to wear protective gear, hold legal liability insurance, or for the device to display a registration plate. Helmet-wearing is encouraged, however⁴⁴.

⁴⁰ <https://www.mondaq.com/italy/rail-road-cycling/1009680/electric-scooters-the-law#:~:text=An%20electric%20scooter%20must%20comply,carry%20other%20passengers%20or%20objects%3B&text=an%20Electric%20scooter%3B-,You%20do%20not%20need%20to%20have,to%20use%20an%20Electric%20scooter.>

⁴¹ <https://www.eltis.org/resources/case-studies/overview-policy-relating-e-scooters-european-countries>

⁴² <https://www.thelocal.it/20200609/heres-what-you-need-to-know-about-italys-new-electric-scooter-craze/>

⁴³ <https://edriveplanet.com/guides/electric-scooter-and-skateboard-laws-in-europe-all-countries/>

⁴⁴ <https://www.lifeinnorway.net/norway-looks-at-tougher-regulations-for-electric-scooter-rentals/#:~:text=It%20might%20not%20seem%20like,and%20also%20on%20the%20road>

The FERSI (2020) report also notes that different cities in Norway apply specific rules for shared e-scooter services. Typically, these rules will be to limit the number of e-scooters a single service is permitted to have in a given location.

3.3.3.9 Poland

Regulations in Poland are very similar to those in Norway, with e-scooters also being categorised as bicycles. Similarly, there is no age restriction to use an e-scooter, nor a restriction on the maximum power of a device. Neither is there a requirement to wear a helmet, hold insurance, or display a registration plate on the device. The rules in place are:

- Maximum speed limit of 25km/h
- Requirement to operate on bicycle facilities, though if these are unavailable, they should use roads. If the speed limit of a road is greater than 30km/h, then e-scooters are permitted on the pavement, providing they travel at around walking pace (up to around 8km/h).

These details are all taken from the FERSI (2020) report. However, more stricter regulations have been under discussion. This includes reducing the maximum speed limit to 20km/h⁴⁵ and requiring young riders aged between 10 and 18 years to have a driver's licence or bicycle card (a requirement for cycling without a guardian in Poland)⁴⁶.

3.3.3.10 Portugal

Portugal categorises e-scooters the same as light mopeds. The FERSI (2020) report states that maximum speed limit guidance is not clear, while a Portuguese news website stated near the end of 2020 that they are limited to 25km/h⁴⁷. This might suggest that the 25km/h speed limit is applied only within a local municipality⁴⁸, or possibly that an announcement was made on speed restrictions after the FERSI (2020) report was published in September of that year. Either way, clarification is required on this point. The FERSI (2020) report does outline the following rules for e-scooter use in Portugal:

- Minimum age restriction of 16 years old
- Helmet-wearing is required
- Prohibited from use on sidewalks and required to operate on bicycle facilities, though if these are unavailable, they are to use the road. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-

⁴⁵ <https://www.polishnews.co.uk/electric-scooters-restrictions-proposed-changes-to-the-regulations-of-the-ministry-of-justice/>

⁴⁶ <https://notesfrompoland.com/2021/02/03/polish-government-to-introduce-electric-scooters-rules-amid-safety-concerns/>

⁴⁷ <https://www.portugalresident.com/electric-scooters/>

⁴⁸ <https://edriveplanet.com/guides/electric-scooter-and-skateboard-laws-in-europe-all-countries/>

scooters are permitted were not identified for Portugal during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.

In addition, there is no requirement for the user to have insurance, or for the device to display a registration plate.

3.3.3.11 Serbia

Serbia does not yet have a legal framework that permits the use of e-scooters in public places (FERSI, 2020). They are however seen regularly within the country, which has generated a push for a new traffic safety law to be implemented that appropriately manages these devices within the Serbian traffic environment. This new law was reported to have been drafted by the end of 2020, and it is suggested to have a proposed speed limit of 10km/h in cycle lanes and 6km/h on sidewalks⁴⁹.

3.3.3.12 Sweden

E-scooters in Sweden are split into three categories depending on the maximum power and speed capability of the device. These categories are bicycle, Class I moped and Class II moped and are detailed below as follows:

Category	Maximum speed capability	Maximum power output
Bicycle	20km/h	250W
Class I Moped	25km/h	1000W
Class II Moped	45km/h	4000W

Those that are classed as mopeds are unlikely to receive the necessary type approval to allow their use in public environments⁵⁰. On the other hand, those that are considered as bicycles are expected to follow the same rules which apply to bicycles. The FERSI (2020) report outlines these as follows:

- Maximum speed limit of 20km/h
- Maximum power restriction of 250W
- Helmet-wearing required for users younger than 15 years old
- Required to use bicycle facilities, though if these are unavailable they are to use the road, and are also permitted on pavements providing they do not travel faster than pedestrians. Other countries and regions (e.g. France, Italy, Queensland – Australia) have specified that use of e-scooters is restricted to roads of 50km/h or less. However, specific details on the types of roads where e-scooters are permitted were not

⁴⁹ <https://www.serbianmonitor.com/en/use-of-electric-scooters-still-not-legally-regulated/>

⁵⁰ <https://www.transportstyrelsen.se/elsparkcykel>

identified for Sweden during this case study investigation. Some regional variation is likely, and it is possible that the specifics of which roads are permitted for e-scooter use are determined by local authorities.

There is no requirement for the device to display a registration plate or for the user to have insurance, and some local authorities may enforce parking regulations and restrictions.

3.3.3.13 *Canada*

E-scooters are legal and unrestricted when used on private property. However, like the US and Australia, official regulations for their use in public differs by jurisdiction⁵¹. As of June 2020, e-scooters are subject to the following rules in Ottawa⁵²:

- Maximum speed limit of 24km/h
- Maximum power restriction of 500W
- Only permitted for use in bicycle facilities or designated sidewalks
- Minimum age restriction of 16 years old
- Users younger than 18 years old are required to wear a helmet.

An article published in 2020 on the 'eridehero' webpage provides brief descriptions of regulations within other Canadian provinces where information is available⁵³. Ontario has a 32km/h maximum speed restriction, a minimum age restriction of 16 years, and a requirement to wear a helmet. Toronto penalises riders older than 14 years who ride on sidewalks. In Quebec, e-scooters have been made available through a pilot program which enforces its own stricter rules, including a minimum age restriction of 18 years and the requirement to carry a certificate received from completing a training course issued through the pilot program. Meanwhile, following a failed pilot program in 2019, the city of Montreal has made shared e-scooter services illegal – though privately owned devices are still permitted.

3.3.3.14 *Japan*

E-scooters are typically categorised as mopeds within Japan⁵⁴. Across all countries discussed within this case study, Japan is one of the few places that requires devices to display a registration plate. They are only permitted for use on roads and riders are required to hold a motorcycle licence and motor insurance. Some discussion also appears to have begun to ease

⁵¹ <https://currusmotors.com/electric-scooter-in-canada/#:~:text=According%20to%20Canada%27s%20Motor%20Vehicle,sidewalks%20and%20bike%2Fbicycle%20paths.>

⁵² <https://ottawa.ca/en/living-ottawa/laws-licences-and-permits/laws/law-z/e-scooters-law-no-2020-174#e-scooters-law-no-2020-174>

⁵³ <https://eridehero.com/blog/electric-scooter-e-bike-laws-canada/>

⁵⁴ <https://www.stewartslaw.com/news/e-scooter-uk-legalisation-and-regulation/>

these restrictions, to encourage the uptake of these devices, given their beneficial effect on reducing traffic and emissions⁵⁵.

3.3.3.15 South Korea

A revision to South Korean law was put in place on the 10th of December 2020, which recategorized e-scooters as bicycles where previously they were considered as motorbikes⁵⁶. This change in legislation permits their use on bicycle facilities, lowers the minimum age restriction to 13 years old, and removes the need for the user to hold a motorcycle licence and wear protective gear, while their use on sidewalks is still prohibited. These regulations have been opposed by many in the country who believe they are not strict enough and present a risk to safety. Consequently, revisions have already been proposed to the legislation that re-introduce harsher rules – largely to penalise individuals who illegally modify their e-scooter or ride without wearing a helmet.

3.4 Conclusions

The case study investigation has highlighted countries that have made recent changes in the way that e-scooters are regulated, as well as the specific changes that have been made since the previous report was completed in 2019. These changes have typically involved recategorizing e-scooters (as well as other PLEVs) so that they are generally treated more like bicycles within the road environment, while introducing specific restrictions on maximum speed and power which these devices may operate at. This case study investigation has also allowed us to expand on the original case study countries that were covered in the 2019 report by exploring information on additional countries where information was found to be readily available. The details of the various regulations which are applied in the investigated countries have been collated within a separate spreadsheet.

Evidently some of the most common regulations include a 25km/h maximum speed restriction and require devices to operate on cycle facilities or the road where these are unavailable. Many countries continue to prohibit their use on pavements, though some countries permit this providing they do not travel faster than the pedestrians that they share the space with. Further to these points, other regulations observed within some of the investigated countries included prohibiting e-scooters from carrying more than one user, allowing their operation only on lower speed roads, and recommending wearing a helmet while operating an e-scooter. Minimum age and maximum power restrictions have also been identified in some countries. However, it is important to highlight that there is little consistency in these regulations, with minimum age restrictions ranging from 12 (e.g. France) to 18 years old (e.g. Italy), and maximum power restrictions ranging from 250W (e.g. Spain) to 1000W (e.g. Finland). Some countries also enforce mandatory helmet wearing (e.g.

⁵⁵ <https://learningenglish.voanews.com/a/usain-bolt-brings-his-e-scooters-to-japan/5173967.html#:~:text=Under%20current%20Japanese%20laws%2C%20electric,must%20have%20a%20motorcycle%20license.&text=E%2Dscooter%20sharing%20has%20become,they%20have%20also%20created%20problems>

⁵⁶ https://www.koreatimes.co.kr/www/nation/2020/11/119_299420.html

Portugal), sometimes only for specific age groups (e.g. Sweden), while others only recommend their use (e.g. UK). Meanwhile, some other investigated countries appeared to demonstrate no formal regulations on these factors (e.g. Belgium).

This lack of consistency in how different governing bodies choose to regulate e-scooters is arguably the most crucial finding from this case study investigation. Though this investigation has provided some insight into what rules are seemingly more common around the world, this does not necessarily mean that these represent best practice. There is a significant lack of research demonstrating those rules that are most effective at improving safety and reducing risk. The existing regulations would appear to largely be based on a general feeling of what is considered appropriate. This therefore presents a crucial need for further research to explore the appropriateness of any proposed and current guidelines to establish what exactly can be considered as best practice.

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In 2019, TRL conducted a study for the Road Safety Authority (RSA) in Ireland which investigated current practice and safety implications of electric personal mobility devices. The RSA commissioned TRL to complete an update to this work with the purpose of understanding what has changed in the two years since the previous work and identifying information which is still applicable to the current situation. A focused review of international e-scooter collision data was conducted alongside a case study investigation. The review sought to understand aspects surrounding e-scooter safety, while the case study investigation aimed to provide an update on the current context of legislation within the case study countries covered within the 2019 report, as well as any additional countries where information was found to be readily available.

From the limited data that was available, the evidence review concluded that encouraging or requiring helmet use while riding an e-scooter and prohibiting e-scooter use while under the influence of alcohol may help reduce the number and severity of injuries associated with e-scooter use. Furthermore, efforts are needed to gather robust data in this area. The case study investigation provided summaries on the current context of e-scooter legislation with 26 different countries. The details of these were collated within a typology spreadsheet, which is available with this report from the authors.

Other titles from this subject area

- MIS047** Update on current practice and safety implications of e-scooters, Hitchings J, 2021
- MIS6** Review of current practice and safety implications of electric personal mobility devices, Hitchings J, Weekley J & Beard G, 2019

TRL

Crowthorne House, Nine Mile Ride,
Wokingham, Berkshire, RG40 3GA,
United Kingdom

T: +44 (0) 1344 773131

F: +44 (0) 1344 770356

E: enquiries@trl.co.uk

W: www.trl.co.uk

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