IMPROVING THE ROAD SAFETY OF E-SCOOTERS

PIN Flash Report 47

November 2024

European Transport Safety Council

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The PIN programme relies on panellists in the participating countries to provide data and to carry out quality assurance of the figures provided. This forms the basis for the PIN Flash reports and other PIN publications. In addition, all PIN panellists are involved in the review process of the reports to ensure the accuracy and reliability of the findings.

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About the PIN Programme

The ETSC Road Safety Performance Index (PIN) is a policy tool to help national governments and the European Union improve road safety. By comparing performance between countries, it serves to identify and promote best practice in Europe and bring about the kind of political leadership that is needed to create a road transport system that maximises safety.

Launched in June 2006, the index covers all relevant areas of road safety including road user behaviour, infrastructure and vehicles, as well as road safety policymaking more generally. The programme covers 32 countries: the 27 Member States of the European Union, together with Israel, Norway, the Republic of Serbia, Switzerland and the United Kingdom.

National research organisations and independent researchers participate in the programme and ensure that any assessment carried out within the programme is based on scientific evidence.

About The European Transport Safety Council (ETSC)

The European Transport Safety Council is the independent voice for road safety in Europe.

We are a non-profit international organisation, with members from across Europe, dedicated to reducing deaths and injuries in transport. Founded in 1993 in Brussels, we provide an impartial source of expert advice on transport safety matters to the European Commission, the European Parliament, international organisations, and national governments.

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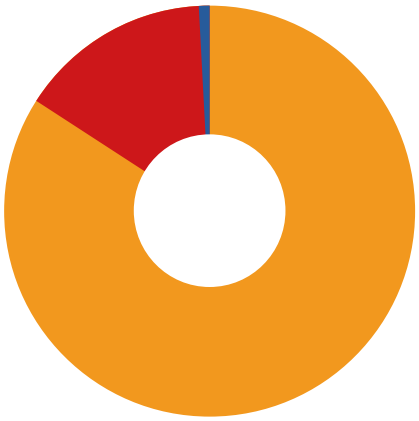
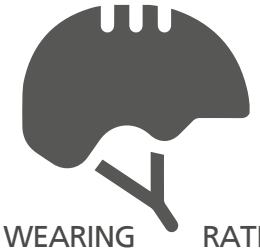


100 Male

18 Female

* 1 Unknown



HELMET WEARING RATES AMONG E-SCOOTER RIDERS **VARIES BETWEEN**

7% - 69%

5,867 SERIOUSLY INJURED IN E-SCOOTER COLLISIONS IN 2022

ETSC'S RECOMMENDATIONS

- Speed limited to 20 km/h
- Helmet required
- Minimum age of 16
- Safe infrastructure
- No alcohol
- 30 km/h speed limit

EXECUTIVE SUMMARY

THE CHALLENGES OF COLLECTING DATA ON E-SCOOTER DEATHS AND SERIOUS INJURIES

Currently, 27 out of the 32 ETSC Road Safety Performance Index (PIN) countries collect data on collisions involving motorised micro-mobility devices (a broader definition of personal light electric vehicles which includes e-scooters, but also rarer vehicles such as self-balancing unicycles). However, it is difficult to obtain a full picture since, in many countries, this vehicle category is not yet or only very recently identifiable in official police-recorded statistics.

Collisions involving micro-mobility devices are likely to be underreported because they often do not involve another motor vehicle. While a victim may go to hospital with injuries, if police are not called to the scene, the crash often goes unreported.

In the 22 PIN countries able to provide data for this report for the years 2021 and 2022, the number of motorised micro-mobility device road deaths increased from 81 road deaths in 2021 to 119 in 2022. However, when analysing the road death data, it is important to also take into account the increase in the use of these devices during this period.

Cross-mobility road risk comparison studies using data from when micro-mobility devices had only relatively recently been introduced, in around 2018 and 2019, should be updated. Micro-mobility road risk assessments using more up-to-date data are needed to see how the situation has evolved and to guide policy.

A SAFE SYSTEM APPROACH FOR E-SCOOTERS

Limiting maximum vehicle speed and acceleration of e-scooters as well as technical specifications covering, for instance, lighting and brakes can improve the safety of the vehicles. Establishing road rules for e-scooter riders such as setting a minimum age limit, mandating wearing a helmet, not allowing tandem riding and specifying where and when not to ride, can also reduce the risk of a collision and the severity of any injuries. Improving infrastructure for all vulnerable road users, including e-scooter riders, could also have a positive impact on the safety of e-scooter riders.

Unified mandatory safety standards for micro-mobility devices do not yet exist at the EU level. In 2024, the European Commission commissioned a study on the need for harmonised technical rules for personal mobility devices (PMDs) across the EU. The study publication is forthcoming.

Speed is an important factor in e-scooter collisions. E-scooter speed can be limited within the vehicle by the manufacturer of the device. Road authorities can decide to impose speed limits for e-scooters as part of their technical specification (e.g. maximum vehicle speed technically possible) or as part of the rules of the road governing e-scooters (this includes imposing lower speed limits on specific roads or areas).

Research tells us that excessive and inappropriate speed can have a direct impact on the severity of e-scooter collisions. Exacerbated by the poor stability of some models, loss of control when navigating road defects or changes in surface level is even more likely at higher speeds. This is significant considering surface defects caused half of all falls in one study of e-scooter casualties. Head injuries are one of the most common e-scooter injuries and higher speeds can result in more severe head injuries.

31 out of the 32 PIN countries restrict the speed for e-scooters. 20 countries restrict the maximum speed to 25 km/h, a further 11 to a maximum speed limit of 20 km/h.

23 PIN countries report regulating e-scooter lighting requirements. Seven mandate lights, front and back, four require riders to have reflectors or wear a reflective vest and 12 mandate both lights and reflectors.

The extent to which (privately owned) e-scooters are tampered with to increase speed and acceleration is not yet known.

Anti-tampering measures and penalties for alterations limit the opportunity to increase the maximum speed and acceleration of (privately owned) e-scooters. However, speed limiting using software control alone is not sufficient to prevent tampering.

E-scooter riders are at risk of falling due to instability of the e-scooter. Wheel size can be a factor in increasing stability and control, but other factors such as suspension, can also affect stability. Testing an e-scooter's overall stability through a range of performance-based tests, could be an appropriate means of setting standards for e-scooter stability, beyond wheel size.

Automated Emergency Braking (AEB) detecting pedestrians and cyclists became mandatory on new car models as of July 2024 in the EU. New models of heavy goods vehicles also have to be fitted with advanced systems capable of detecting pedestrians and cyclists located in close proximity as of July 2022.

However, there is no requirement for these active safety technologies to detect e-scooters and their riders so the extent to which they are able to correctly identify them remains unclear. It is of the utmost importance for e-scooter rider safety that driver assistance systems, automated driving systems and Cooperative Intelligent Transport Systems are capable and tested to correctly identify and react to e-scooters and consider e-scooter safety.

Establishing a clear set of traffic rules for e-scooters can improve safety both for the rider and other road users. For example, setting a minimum age for e-scooter riding, not allowing tandem riding and setting alcohol limits can all improve safety.

Vulnerable road users should not mix with motor vehicle traffic where motor vehicle speeds exceed 30km/h. Roads for motor vehicles with speeds above 30km/h require separate infrastructure for cyclists, pedestrians and e-scooter riders. Separation of bicycles and e-scooters from motor vehicles on the roads with the highest speeds and those with the highest volumes should be a priority for national governments.

MAIN RECOMMENDATIONS TO NATIONAL GOVERNMENTS

Physical characteristics of the e-scooter

- In the absence of mandatory EU regulation on technical standards for e-scooters, countries should adopt into national law, as a minimum, the EN17128 standard and if possible, also incorporate performance-based testing of e-scooters, such as those mandated in Germany's eKFV (Small Electric Vehicles) regulation;
- Set a maximum 20 km/h speed for private e-scooters at the factory. Shared e-scooter providers, while limiting top speed to 20 km/h, should also apply lower speeds, for example in pedestrian zones, using geofencing;
- Anti-tampering mechanisms should be included at the factory. Tampering should be prohibited by law;
- Set a requirement for independent front and rear wheel braking devices for e-scooters and e-scooters should be capable of achieving a deceleration value of at least 3.5 m/s^2;
- Set a requirement for independent front and rear lights on e-scooters. Indicator lights should be considered due to the difficulties of using hand signals;
- Require an audible warning device on all e-scooters.

Rules of the road

- Helmet wearing should be mandatory for all e-scooter riders;
- Riding an e-scooter on pavements should be prohibited and shared e-scooters should be slowed to walking speed, through geo-fencing, in areas with many pedestrians;
- E-scooters should only be ridden by one person at a time;
- E-scooter riders should be at least 16 years old;
- Riding under the influence of alcohol or drugs should be prohibited;
- Use of a mobile phone while riding an e-scooter should be prohibited;
- E-scooter rider training is recommended and consideration should be given to education of all road users in awareness of risks involving e-scooters and other micro-mobility vehicles;
- Enforce against risky micro-mobility riding;
- Enforce e-scooter rider compliance with national rules and regulations.

Improving data collection

- Ensure the e-scooter category is identifiable in official police recorded casualty statistics;
- Consider how to improve the registration of deaths and recording of serious injuries to vulnerable road users, including e-scooter riders, and tackle underreporting. As a matter of priority, analyse data on single e-scooter collisions.

Improving infrastructure for vulnerable road users (VRUs) to improve e-scooter rider safety

- Reduce the speed for motorised vehicles in residential and core urban zones to 30 km/h;
- Develop safer infrastructure in general, but paying special attention to the needs of e-scooter riders;
- Encourage cities to undertake road safety audits of urban infrastructure;
- Encourage cities to apply safe infrastructure design guidelines and renew the guidelines regularly based on the latest research and innovation;
- Enable support for cities in restricting HGV circulation in urban areas at certain peak times when there are high numbers of e-scooter riders and other vulnerable road users, and develop recommended routes for HGVs;
- Give priority to VRUs in road maintenance paying special attention to the quality of surfaces most used by e-scooter riders;
- Implement infrastructure separated from motorised traffic to make walking, cycling and e-scooter riding safer;
- Arrange for e-scooter traffic and motorised traffic to be physically separated where the speed or the traffic flow of the latter is too high.

MAIN RECOMMENDATIONS TO THE EU

Set unified, performance-based safety standards for micro-mobility devices at EU level including:

- A speed limit of 20km/h;
- A maximum acceleration of 2 m/s^2;
- A deceleration capacity of at least 3.5 m/s^2;
- Front and rear lights and indicator lights should be considered;
- Anti-tampering mechanisms;
- An audible warning;
- A series of tests to confirm standards in driving dynamics (such as those set in Germany's eKFV (Small Electric Vehicles) Regulation).

Develop EU guidelines for e-scooter users as a template for national regulations:

- A minimum rider age of 16;
- Mandatory helmet;
- A ban on riding with passengers, on pavements, while using a handheld mobile phone and under the influence of alcohol or drugs.

Vehicle safety regulations:

- Update the EU's General Safety Regulation for cars, vans, trucks and buses to require that the relevant mandatory advanced driver assistance systems (ADAS) (e.g. Automated Emergency Braking Systems (AEBS) and Blind Spot Information Systems (BSIS)) can detect e-scooter riders. Include tests to verify compliance with the requirement.

Improving VRU infrastructure in general:

- Adopt as a matter of urgency the new EU Quality Requirements on VRU Infrastructure Safety, Forgiving and Self-explaining roads as required under the RISM Directive and include integrating the needs of e-scooters;
- Within the context of the Urban Mobility Action Plan, draft guidelines for promoting best practice in traffic calming measures, based upon physical measures and techniques of space-sharing in line with Connected Intelligent Transport Systems developments, to support area-wide urban safety management, in particular when 30 km/h zones are introduced;
- Deliver an EU safe active mobility strategy which sets road safety measures and targets to increase the amount of distance safely travelled by walking and cycling;
- Build upon the European Commission EU communication 'SAVE energy'[1] recommend-ations to local, regional and national authorities to reduce speeds;
- Adopt a fully-fledged European Commission Recommendation to apply safe speed limits in line with the Safe System approach for different road types such as 30 km/h on urban roads in residential areas and other areas used by many vulnerable road users;
- Create an EU fund to support priority measures such as for cities to introduce 30 km/h zones supported by infrastructure measures and traffic law enforcement (particularly in residential areas and where there is a high number of VRUs) and to invest in speed management on high-risk roads which carry large flows of traffic.

[1] https://tinyurl.com/2sx8v3ex

INTRODUCTION

E-scooters are a relatively new form of mobility. They first arrived in Europe in significant numbers around 2018.

The vehicle type was legalised in Belgium, France and Germany in 2019 and privately owned e-scooters are now permitted in most European countries, with the UK and the Netherlands notable exceptions.

The increase in usage has led to an increase in road collisions involving e-scooters. It is important to monitor this development to tackle potential risks to both e-scooter riders and other vulnerable road users such as pedestrians.

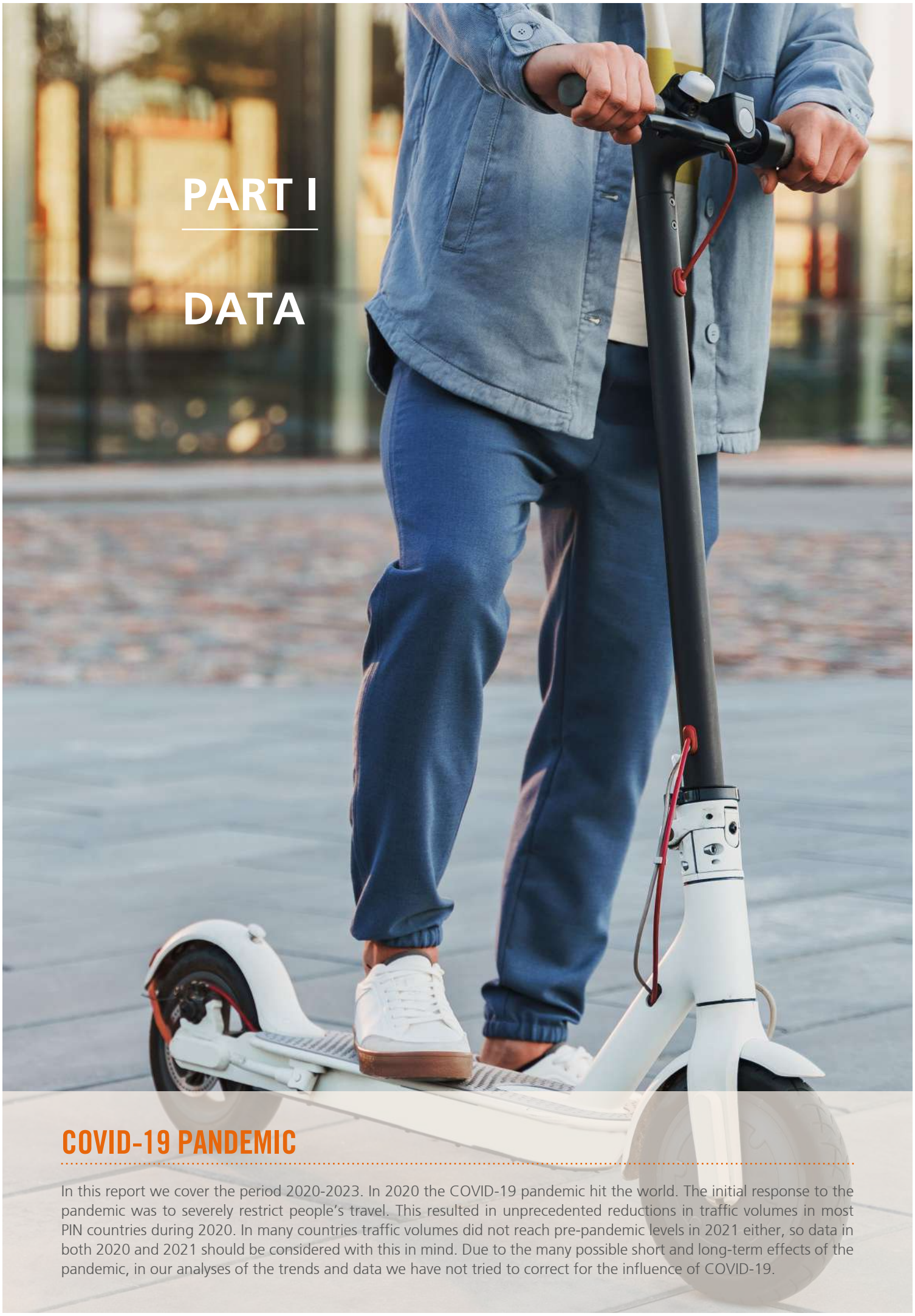
This report is in three parts. In parts I and II we examine the available crash data for deaths and serious injuries involving 'motorised micro-mobility devices' – a category which includes e-scooters but also rarer vehicle types such as self-balancing unicycles and segways. See the 'definition' box below.

In part III we look at countermeasures to reduce the risks to e-scooter users and other road users, looking at technical standards for vehicles, road rules, infrastructure and speed limits in urban areas.

The regulatory landscape for e-scooters within the European Union is characterised by a notable lack of uniformity. National regulations diverge significantly, not only in terms of technical standards but also in how these vehicles are used. Minimum age requirements, maximum speed limits, helmet mandates, and other usage guidelines vary considerably from one country to another.

Consequently this report attempts to share some of the best practices in technical standards and usage requirements from around Europe so national governments can work to improve safety based on evidence from other countries.

We also feature recommendations for the European Union in the hope that work advances urgently on technical standards for e-scooters that can be applied across Europe. We also believe that the EU has an important role to play in promoting common standards for e-scooter users, in areas such as the recommended minimum age, helmet requirements and rules on drink-driving, carrying passengers, and pavement riding. These recommendations can be found throughout the report, and are summarised after the Executive Summary.



PART I

DATA

COVID-19 PANDEMIC

In this report we cover the period 2020-2023. In 2020 the COVID-19 pandemic hit the world. The initial response to the pandemic was to severely restrict people's travel. This resulted in unprecedented reductions in traffic volumes in most PIN countries during 2020. In many countries traffic volumes did not reach pre-pandemic levels in 2021 either, so data in both 2020 and 2021 should be considered with this in mind. Due to the many possible short and long-term effects of the pandemic, in our analyses of the trends and data we have not tried to correct for the influence of COVID-19.

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Data

The data were retrieved from the CARE database when available and completed or corrected by PIN Panellists. The full dataset is available in the Annexes.

DEFINITION

CARE: U-2.22: Motorised micro-mobility device: A motorised, micro-mobility device such as an e-micro-scooter, a segway, a monowheel or a self-balancing unicycle. The device should have at least one wheel, be designed for one person, and have an electric motor that can achieve a maximum speed of up to 25 km/h.

Note:

Data presented in Part I of this report are collected according to the definition above and are therefore referred to as relating to 'motorised micro-mobility devices'. We assume that the vast majority of vehicles within this category are in fact e-scooters. However, this broader definition also includes some other vehicle types, such as self-balancing unicycles. Where the term 'e-scooter' is used elsewhere in the report, it does not relate to the data collected from PIN panelists and the CARE database, but refers specifically to this single category of vehicle.

E-scooters can be privately owned or rented through shared e-scooter schemes. It was not always possible to differentiate in the data between shared and private e-scooters. However, the recommendations do, in some cases, differentiate between the two.

1.1 OVERVIEW OF ROAD DEATHS

This section gives an overview of the available data on road deaths among 'motorised micro-mobility device' users. This broader term is the definition used by the European Commission in their CARE collision database and is how the majority of PIN countries collect data relating to e-scooters. The definition 'motorised micro-mobility device' also includes other vehicles such as monowheels and segways, as well as e-scooters.[2] The definition does not include pedal assist electric bicycles.

Currently, 27 out of the 32 PIN countries collect data on collisions involving motorised micro-mobility devices. However, it is difficult to obtain a full picture since in many countries this vehicle category is not yet or only very recently identifiable in official police-recorded statistics.

Moreover, collisions involving micro-mobility devices are likely to be underreported because they often do not involve another motor vehicle. This has long been an issue with road injuries involving cyclists and pedestrians who are injured without another vehicle being involved. While a victim may present at hospital with injuries, if police are not called to the scene, the crash often goes unreported.[3]

In the 22 PIN countries[4] able to provide data for this report for the years 2021 and 2022, the number of motorised micro-mobility device road deaths increased from 81 road deaths in 2021 to 119 in 2022. In the EU18[5] the number of motorised micro-mobility device road deaths increased from 61 in 2021 to 92 in 2022. However, when analysing the road death data, it is important to also take into account the increase in the use of these devices during this period and

[2] CARE: U-2.22: Motorised micro-mobility device: A motorised, micro-mobility device such as an e-micro-scooter, a segway, a monowheel or a self-balancing unicycle. The device should have at least one wheel, be designed for one person, and have an electric motor that can achieve a maximum speed of up to 25 km/h.

[3] ITF (2023) Safer micromobility https://tinyurl.com/3trtuzch

[4] PIN 22 includes AT, BE, CY, DE, DK, EE, ES, FI, FR, IE, IT, LU, LV, LT, PT, SE, SI, SK, GB, CH, IL and NO. BG, CZ, EL, HR and PL are excluded since data are not available for the whole time series. HU, MT, NL, RO and RS are excluded since no data are available.

[5] EU18: includes AT, BE, CY, DE, DK, EE, ES, FI, FR, IE, IT, LU, LV, LT, PT, SE, SI and SK. BG, CZ, EL, HR and PL are excluded since data are not available for the whole time series. HU, MT, NL and RO are excluded since no data are available.

the possibility that while initially e-scooters were primarily used in urban areas (where speeds tend to be slower), they are now also found on rural roads. In France, for example, a quarter of all motorised micro-mobility device road deaths are outside urban areas. In Italy, collisions involving e-scooters on rural roads increased from 35 in 2021 to 94 in 2022 (+169%) while on urban roads they increased from 2,050 in 2021 to 2,825 in 2022 (+38%).[6]

1.2 ROAD RISK

Calculating the road risk of micro-mobility device users is very difficult because there are little to no data available on the distance travelled or the fleet size, especially for privately-owned devices.

In the few countries collecting data on kilometers ridden, we can observe an increase in recent years. The same can be said for fleet size.

Data on the number of kilometers ridden on shared e-scooters only is available in Italy and Finland. Both countries saw an increase in shared e-scooter use. In Italy the number of kilometers ridden on shared e-scooters increased from 14.4 million in 2020 to 61 million in 2022 and in Finland from 7 million in 2020 to 31 million in 2023. Data available from the shared e-scooter trials in London show that the number of kilometers ridden there also increased with 2.8 million km ridden between 7 June 2021 and 5 June 2022 and 3.6 million km ridden between 6 June 2022 and 4 June 2023.

The shared e-scooter fleet size increased from 12,100 in 2020 to 56,400 in 2023 in Finland and from 35,550 in 2020 to 49,700 in 2022 in Italy.

Studies often compare the road risk of e-scooters (the most popular micro-mobility device) to the road risk of bicycles (both electric and traditional).[7] The Norwegian Public Road Administration (NPRA) compared bicycle and e-scooter injury data in Oslo in 2019 and 2020 with the kilometers travelled for each mode. The risk (i.e. deaths per distance-travelled) for an e-scooter rider to be involved in a collision was 10 times higher than that for a cyclist. The authors concluded that a lack of training (first-time users showed a greater risk of injuries), drink-driving (shared e-scooters being placed close to bars) and misjudging interactions with other road users were the main reasons for the higher risk.[8] The evaluation of the English shared e-scooter trials, undertaken by the Department for Transport, estimated the casualty rate for e-scooters and compared it with those of pedal cycles using national data[9] on rental e-scooters. A provisional rate of 13 casualties[10] per million miles (approximately eight casualties per million km) was estimated for e-scooters based on data from six trials areas, about three times higher than the rate for pedal cycles. Like the study in Norway, the authors of this study also concluded that one of the reasons might be the high proportion of novice riders, although the estimate should be treated with caution as there is some uncertainty around the data.[11]

Cross-mobility road risk comparison studies using data from when micro-mobility devices had only relatively recently been introduced, in around 2018 and 2019, should be updated. Micro-mobility road risk assessments using more up-to-date data are needed to see how the situation has evolved and to guide policy.

[6] ISTAT-ACI statistics on road accidents.
[7] Faerdselsstyrelsen (2020) Evaluation of the pilot schemes for small motorised vehicles, https://tinyurl.com/2bwbs2h4
[8] Norwegian Public Roads Administration (2021) Bicycle and e-scooter injuries in Oslo https://tinyurl.com/3yz3crzf
[9] UK road safety collision data (STATS19) https://tinyurl.com/26zpa5z5
[10] A road casualty is defined in the UK STATS19 as "a person killed or injured in an accident".
[11] UK Department for Transport (2022) National evaluation of e-scooter trials, Findings report https://tinyurl.com/mnnnznmv

1.3 GENDER

There is a significant gender difference among motorised micro-mobility device road deaths. In the 22 PIN countries[12] able to provide data for 2022, 100 male motorised micro-mobility device users died in traffic, compared to 18 females. In the EU18[13] 76 male motorised micro-mobility device users died in traffic in 2022, compared to 15 females. (Table 1)

These proportions are similar to the gender differences seen in moped rider road deaths[14], and slightly higher than the proportions seen in all road deaths.[15] According to some surveys into shared e-scooter use, men are more likely to use these micro-mobility devices than women.[16] [17]

Table 1. Male and female motorised micro-mobility device riders killed between 2020 and 2023

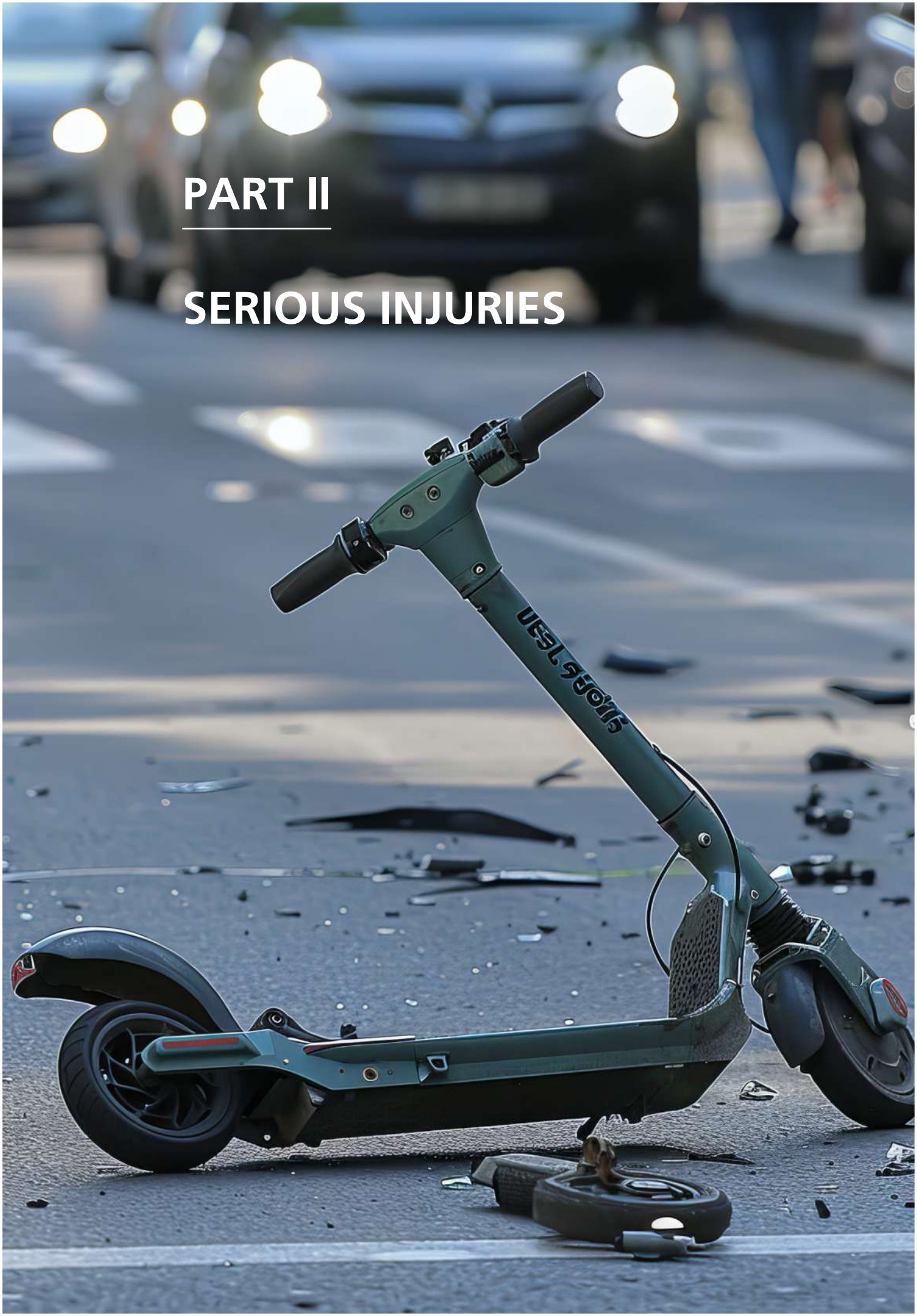
	Male				Female				
	2020	2021	2022	2023		2020	2021	2022	2023
AT	n/a	n/a	n/a	3	AT	n/a	n/a	n/a	0
BE	0	3	4	1	BE	1	0	0	1
BG	n/a	n/a	n/a	2	BG	n/a	n/a	n/a	0
CY	0	0	1	0	CY	0	0	0	0
CZ	n/a	n/a	n/a	5	CZ	n/a	n/a	n/a	0
DE	n/a	5	7	18	DE	n/a	0	3	3
DK	0	0	0	n/a	DK	0	0	0	n/a
EE	0	0	1	0	EE	0	0	0	0
ES	n/a	9	7	7	ES	n/a	0	1	3
FR	6	20	28	37	FR	1	4	7	7
EL	n/a	n/a	0	n/a	EL	n/a	n/a	1	n/a
HR	n/a	n/a	1	1	HR	n/a	n/a	0	0
IE	1	0	1	3	IE	0	0	0	0
IT	n/a	9	15	20	IT	n/a	0	1	1
LV	2	1	1	1	LV	0	0	0	0
LT	0	2	1	1	LT	0	0	0	1
PL	n/a	n/a	2	n/a	PL	n/a	n/a	1	n/a
PT	0	0	0	3	PT	0	0	0	0
SE	0	1	3	4	SE	0	1	0	0
SI	0	0	1	0	SI	0	0	1	0
SK	0	0	3	0	SK	0	0	0	1
GB	1	9	10	n/a	GB	0	1	1	n/a
CH	0	0	3	1	CH	0	0	0	1
IL	3	8	8	3	IL	0	1	0	1
NO	2	1	3	0	NO	0	0	2	0
EU 18	**9**	**50**	**76**	**96**	**EU 18**	**2**	**5**	**15**	**17**
PIN 22	**15**	**68**	**100**	**100**	**PIN 22**	**2**	**7**	**18**	**19**

Source: CARE database and national statistics provided by PIN Panellists in each country

[12] PIN 22 includes BE, CY, DE, DK, EE, EL, ES, FR, HR, IE, IT, LV, LT, PL, PT, SE, SI, SK, GB, CH, IL and NO.
[13] EU 18 includes BE, CY, DE, DK, EE, EL, ES, FR, HR, IE, IT, LV, LT, PL, PT, SE, SI and SK.
[14] ETSC (2023) PIN Flash 44 Reducing Road Deaths Among Powered Two Wheeler Users https://tinyurl.com/4puk8e7k
[15] European Road Safety Observatory (2022) Facts and Figures – Gender https://tinyurl.com/37wjf9de
[16] Wang K., Qian X., Taylor Fitch D., Lee Y., Malik J., Circella G., (2023) What travel modes do shared e-scooters displace? A review of recent research findings https://tinyurl.com/msbkmw7c
[17] CEREMA and ONISR (2023) Enquete nationale trottinettes 2023, https://bit.ly/4036UdC

PART II

SERIOUS INJURIES



02

2.1 SERIOUS INJURY DATA

Collecting data on serious injuries is difficult for any transport mode and motorised micro-mobility devices are no exception.

From the national data that we were able to collect for this report, in the PIN19[18] the number of motorised micro-mobility device users who were seriously injured increased from 4,449 in 2021 to 6,150 in 2022. In the EU15[19] the number of micro-mobility device users who were seriously injured increased from 3,799 in 2021 to 5,377 in 2022.

A study in France showed that e-scooter victims are more likely to have multiple injuries than cyclist victims (64% vs 58%) and have a higher average number of injuries per victim (2.2 vs. 2.0). In terms of body regions affected, differences between both types of user were observed in three areas: the head, the face and the external area. Compared to cyclists, e-scooters victims were more likely to have moderate head injuries (23% vs. 16%) or serious head injuries (2% vs. 1%) and moderate facial injuries (29% vs.22 %).[20]

2.2 UNDERREPORTING SERIOUS INJURIES

The underreporting of serious injuries, particularly in collisions where no other vehicles is involved (93% of e-scooter collisions)[21] and those involving vulnerable road users, should also not be underestimated. Past studies have shown that road deaths and serious injuries among vulnerable road users (pedestrians, cyclists and powered two wheeler riders) are often underreported.[22] There is little reason to believe that the situation will be any different for e-scooter riders. Indeed, a study in the UK showed that official data of e-scooter casualties underreport numbers of e-scooter casualties recorded by hospitals and that only around 25% of those who were most seriously injured were recorded by the police.[23] It is also important to bear in mind that private e-scooter use on the public roads is prohibited in the UK – which may increase the risk of underreporting as users may not wish to tell authorities that they were riding an illegal vehicle.

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Ensure the e-scooter category is identifiable in official police recorded casualty statistics;
- Consider how to improve the registration of deaths and recording of serious injuries to vulnerable road users, including e-scooter riders, and tackle underreporting. As a matter of priority, analyse data on single e-scooter collisions.

[18] PIN19 includes BE, CY, DE, DK, EE, ES, FR, IE, LU, LV, LT, PT, SE, SI, SK, GB, CH, IL and NO.
[19] EU15 includes BE, CY, DE, DK, EE, ES, FR, IE, LU, LV, LT, PT, SE, SI and SK.
[20] Sant publique France (2024) Tardy H., Amoros E., Ndiaye A., Gadegbeku B., Characteristics of accidents involving electric scooters or other personal mobility devices and comparison with accidents involving bicycles. Rh ne register of road traffic accident victims 2015-2019 (in French), https://bit.ly/3U7oN7c
[21] ITF (2023) Safer micromobility https://tinyurl.com/3trtuzch
[22] For more information, see for instance ETSC (2018), An Overview of Road Death Data Collection in the EU, PIN Flash 35, https://etsc.eu/pinflash35/ and PIN Flash 37, https://etsc.eu/pinflash37/
[23] PACTS (2023) Comparing police and hospital e-scooter data sets https://tinyurl.com/5ark2fzy

PART III

COUNTERMEASURES

03

According to the Safe System approach there are many aspects of road safety such as keeping vulnerable road users separate from heavy motor vehicles in traffic, building well maintained and high quality infrastructure, setting appropriate speed limits, tackling drink-driving for all road users, and education and training, that will create a safer environment for all road users, including e-scooter riders. But there are also unique and particular characteristics of current e-scooter design and use that can improve the road safety of these vehicles in particular, both for their riders, and for other road users.

Limiting their maximum vehicle speed and acceleration as well as technical specifications covering, for instance, lighting and brakes can improve the safety of the vehicles. Establishing road rules for e-scooter riders such as setting a minimum age limit, mandating wearing a helmet, not allowing tandem riding and specifying where and when not to ride, can also reduce the risk of a collision and the severity of any injuries. Improving infrastructure for all vulnerable road users, including e-scooter riders, could also have a positive impact on the safety of e-scooter riders. In this section, we will look at how both technical standards and road rules for e-scooter riders could improve safety. We will also examine general road safety good practice for protecting vulnerable road users.

3.1 TECHNICAL STANDARDS FOR E-SCOOTERS / REGULATING E-SCOOTERS

Manufacturers currently self-certify that their e-scooter meets specific standards of product safety before selling them on the EU market. These standards include the General Product Safety Directive (GPS), the Machinery Directive (MD), and the Electromagnetic Compatibility Directive (EMC). The EU Regulation on Batteries is also applicable to e-scooters. The vast majority of manufacturers build according to the EN17128: 2020 type c product standard for personal light electric vehicles. European Standard EN17128 specifies safety requirements, test methods, marking and information relating to personal light electric vehicles. It sets technical requirements for brakes, tyres, lighting and reflectors, acoustic warnings, electrics, the battery and power and weight.

These standards are being taken into law by some governments. For example, from January 2022, Spain's General Directorate for Traffic approved a 'Manual of characteristics of the vehicles of personal mobility'. This subsumed standards from EN 17128:2020 with lighting and electrical requirements as well as minimum 203.2mm (8 inch) wheels and the inclusion of anti-tampering measures.[24]

The durability of an e-scooter is, to some extent, addressed by the EN17128 standard, but these standards are less strict than in the EN15194 standard to which electric bicycles are built to, although it could be argued that the use is similar. Durability can also be verified through testing, as is the case in Germany.[25]

Unified safety standards for micro-mobility devices do not yet exist at the EU level. Regulation (EU) No. 168/2013 (in force since 2016) which introduced a type-approval system for 2-, 3- and 4-wheeled vehicles, excludes self-balancing vehicles and vehicles without a seat from its scope. The European Commission acknowledges that the 'micro-mobility revolution' requires more effort in terms of sharing best practice and providing guidance, especially as these vehicles pose significant safety challenges.[26] In 2024, the European Commission commissioned a study on the need for harmonised technical rules for personal mobility devices (PMDs) across the EU. The study publication is forthcoming.

[24] General Directorate of Traffic, Manual of characteristics of the vehicles of personal mobility, Resolution No. 18, of 21 January 2022, pages 6882 to 6915 (34 pp.) https://tinyurl.com/yw36sxfj
[25] https://tinyurl.com/293fyvb6
[26] Questions and Answers: European Urban Mobility Framework, europa.eu, 14 December 2021 https://tinyurl.com/4apk6wsm

GERMANY
NATIONAL REGULATION OF E-SCOOTERS

In the absence of a regulation for micro-mobility devices at the EU level, Germany introduced its own legislation in 2019 – the eKFV (Regulation on small electric vehicles).[27] With the introduction of the eKFV, e-scooters are considered as a new category of motor vehicle and must meet certain standards (including passing a number of tests and requirements for driving dynamics) before being permitted to ride on German roads. To ride on public roads, e-scooters in Germany should meet the following requirements:

- The design speed should be 6 km/h to max. 20 km/h;
- The power should be limited to 500 W (1400 W for self-balancing vehicles);
- Vehicles must meet minimum road safety requirements (braking/deceleration, lighting, acoustic warning, driving dynamics, electrical safety and protection against manipulation);
- A general operating permit or individual operating permit must have been granted for the vehicle itself and a valid insurance sticker should be applied by the vehicle's owner;
- The maximum vehicle mass, without rider, should be no more than 55 kg.

As this report went to press, Germany's eKFV Regulation was being revised. The intention is to introduce mandatory indicators for e-scooters from April 1, 2025.

Campaign poster by the German Minister of digital affairs and traffic highlighting the rules for riding an e-scooter on German roads listing required age, speed, location and conditions for use[29]

[27] https://tinyurl.com/293fyvb6
[28] https://bit.ly/4eWm6xn

Speed

Speed is an important factor in e-scooter collisions. E-scooter speed can be limited within the vehicle by the manufacturer of the device. Road authorities can decide to impose speed limits for e-scooters as part of their technical specification (maximum vehicle speed technically possible) or as part of the rules of the road governing e-scooters (this includes imposing lower speed limits on specific roads or areas). However, speed enforcement for e-scooters that is reliant on police resources is difficult to implement.

When it comes to shared e-scooters, authorities can require both that shared e-scooter providers limit the maximum speed of the vehicle, as well as deploy geofencing technology in their fleets so that the speed of shared e-scooters is automatically reduced in certain areas (see geofencing box below).

Research tells us that excessive and inappropriate speed can have a direct impact on the severity of e-scooter collisions.[29] Exacerbated by the poor stability of some models, loss of control when navigating road defects or changes in surface level is even more likely at higher speeds. This is significant considering surface defects caused half of all falls in one study of e-scooter casualties.[30] Head injuries are one of the most common e-scooter injuries and higher speeds can result in more severe head injuries.[31] A study carried out in Austria found that reducing the speed of e-scooters from 25 km/h to 15 km/h in collisions between e-scooters and pedestrians could decrease the risk of head injuries to the pedestrians by almost half.[32]

31 out of the 32 PIN countries restrict the speed for e-scooters. 20 countries restrict the maximum speed to 25 km/h, a further 11 to a maximum speed limit of 20 km/h. In some countries a limit of 6 km/h is set in pedestrian zones or on pavements (where allowed) (Table 2).

[29] Posirisuk P., Baker C., Ghajari M., (2022) Computational prediction of head-ground impact kinematics in e-scooter falls https://tinyurl.com/k53m2cp2
[30] Coelho Leal A, Feito P, Corominas L, S nchez-Soler J, P rez-Prieto D, Mart nez-Diaz S, Alier A, Monllau J, Electric Scooter-Related Injuries: A New Epidemic in Orthopaedics https://tinyurl.com/pbjd8enx
[31] Posirisuk P., Baker C., Ghajari M., (2022) Computational prediction of head-ground impact kinematics in e-scooter falls https://tinyurl.com/k53m2cp2
[32] https://tinyurl.com/3fupvc23

Table 2. Maximum permitted speed limit of e-scooters

Maximum speed allowed	
20 km/h	**25 km/h**
Cyprus 10km/h in pedestrian areas	**Austria**
Denmark	**Belgium**
Germany	**Bulgaria**
Ireland	**Croatia**
Italy 6km/h in pedestrian areas	**Czechia**
Lithuania 7km/h when overtaking pedestrians on pavements	**Estonia**
Malta	**Finland**
Norway 6km/h when overtaking pedestrians on pavements	**France** 6 km/h in pedestrian areas or pavements when riding there is authorised by local authorities
Poland Limit applies on cycle paths. E-scooters not allowed on roads with a speed limit higher than 30 km/h; if higher speed and no cycle path/road then on pavements with speed of a pedestrian	**Greece** Second category up to 6 km/h[1]
Sweden	**Israel**
Switzerland	**Luxembourg**
	Latvia Plans to introduce lower speed limits in specified zones for shared e-scooters
	Netherlands only vehicles type-approved as a 'special moped' are allowed
	Portugal The speed limit is inherent to the vehicle classification and not a limit imposed to the driver, so if a vehicle, that could be categorised as an electric scooter, has a potential baseline speed above 25Km/h it can no longer be classified as an electric scooter for the purpose of defining its legal traffic regime.
	Romania
	Serbia
	Slovenia
	Slovakia
	Spain Prohibited on sections of road running through town, interurban roads, urban highway and motorway, urban tunnels and pavements
	United Kingdom only applies to shared e-scooters

[1]Vehicles whose maximum designed speed does not exceed 6 km/h. These vehicles circulate as 'pedestrians'.
Source: PIN Panellists

Geofencing

Geofencing is a technology whereby global positioning technology automatically reduces the speed of a vehicle (or stops it entirely) as it enters a specific area. Many shared e-scooter providers have this technology installed on their devices to denote a boundary for the e-scooter's range (i.e. the e-scooter stops working once you cross the boundary/leave the city).

Some local authorities require the use of geofencing to reduce the speed of shared e-scooters in certain areas or at certain times of the day. Reducing the speed of e-scooters via geofencing is currently only possible among shared e-scooters. As geofencing technology is already installed on shared e-scooters speed reductions in certain areas can therefore be applied to a whole fleet of vehicles. Speed reductions via geofencing in certain areas can also form part of the operating licence granted by a municipality to a shared e-scooter provider.

In Vienna, the speed of shared e-scooters is reduced automatically when entering pedestrian zones, residential streets or 'shared spaces'. Restricted zones have been set up around specific places such as hospitals or market areas. It is technically impossible to ride shared e-scooters or park them in these zones.[33]

Seville and Madrid (Spain) both have areas where geofencing is used on shared e-scooters (Voi and Bird) to slow vehicles down. The focus is on areas where e-scooters and pedestrians can't be separated adequately. The e-scooter automatically slows to the speed of a jog when it enters the area, reducing the risk of a collision.[34]

Geofencing is used across the trial e-scooter rental schemes in England. It not only partially reduces the speed of an e-scooter in some areas, but can also be used to cut all power in some pedestrian areas and parks. Each local authority sets its own rules but all must comply with the Government's 15.5 mph (about 21 km/h) maximum speed limit.[35]

Across cities in France, geofencing is used by Dott (a shared e-scooter provider) to either stop their e-scooters or reduce their speed to 8km/h in certain areas of the city, for example where there are high numbers of pedestrians.[36]

ESTONIA
REDUCING SHARED E-SCOOTER SPEEDS ON FRIDAY AND SATURDAY NIGHTS REDUCED COLLISIONS

Bolt, an e-scooter rental company, partnered with local authorities to reduce the maximum speed of their e-scooters in Tallinn, Estonia, from 25 km/h to 17 km/h on Friday and Saturday nights. The goal of the initiative was to implement a highly-targeted speed limit specifically aimed at the key collision risk factors identified by the local police: speed, intoxication, and low visibility. According to the Estonian Transport Administration, this targeted approach led to a 20% reduction in e-scooter collisions.[37]

[33] Stadt Wien (2024) E-scooters in traffic https://tinyurl.com/yjwdwk3v
[34] Fundacion MAPFRE (2022) E-scooters: good practices and latest collision data https://tinyurl.com/446dfzwa
[35] DfT (2022) National evaluation of e-scooter trials https://tinyurl.com/mnnnznmv
[36] DOTT (2023) France Safety Report, https://tinyurl.com/yfne4edj
[37] Bolt's annual rentals safety report 2023 https://tinyurl.com/4a7d7at5

HELSINKI AND TAMPERE RESTRICTED SPEED AND NIGHTTIME USE OF SHARED E-SCOOTERS AND SAW A REDUCTION IN INJURIES

In September 2021, Helsinki introduced a number of restrictions on shared e-scooters including reducing the daytime speed to 20 km/h (down from 25 km/h), reducing the night-time speed to 15 km/h and banning their use entirely between the hours of midnight and 5am. A study comparing shared e-scooter injuries before and after the restrictions, found that there were 19 e-scooter injuries for every 100,000 rides before the restrictions and 9 per 100,000 rides during the restricted period.[38]

In Tampere, the speed of shared e-scooters was reduced to 15 km/h between the night hours of midnight and 06:00, however a study based on data from the University Hospital there, found that it had no impact on e-scooter injuries, indicating that nighttime speed reductions alone are not sufficient to reduce nighttime e-scooter injuries.[39]

Power

A limit on the maximum motor power of an e-scooter is used in many countries as a means of controlling, to some extent, an e-scooter's speed and acceleration.

19 of the 32 PIN countries have set a maximum power for e-scooters within their national regulations. In Czechia, Israel, Luxembourg, Portugal, Sweden and Slovakia, the maximum power allowed is 250W. In Estonia, Finland, Latvia, Lithuania and Spain however, the maximum power allowed is 1000W. Other countries have settled on 400W (IE), 500W (DE, IT, CH, UK) or 600W (AT, HR, RS) in their regulations (Table 3).

Discussions continue on whether setting a power limit for e-scooters is the most effective safety control of acceleration and speed. The weight of the vehicle and its rider as well as the topography of the area also affect the achievable speed and acceleration. An alternative could be to limit the acceleration of e-scooters. Standard EN17128 proposes a maximum acceleration of 2m/s^2 which could be used as an alternative to a power limit.

Table 3. Maximum permitted power for e-scooters

Maximum power allowed				
250W	**400W**	**500W**	**600W**	**1000W**
Czechia	Ireland	Germany	Austria	Estonia
Israel		Italy	Croatia	Finland
Luxembourg		Switzerland	Serbia	Latvia
Portugal		United Kingdom[(1)]		Lithuania
Sweden				Spain
Slovakia				

[(1)]UK – trials
Source: PIN Panellists

[38] Oskari Pakarinen, Arja Kobylin, Veli-Pekka Harjola, Maaret Castr n, Henri Vasara (2023) Restrictions on top speed and nighttime usage substantially decrease the incidence of electric scooter injuries https://tinyurl.com/4c4jsnjm
[39] Liukkonen, R., Aarnikko H.,Stenman P., et al (2023) Association of Nighttime Speed Limits and Electric Scooter–Related Injuries https://tinyurl.com/38x8xtwb

Lighting

E-scooters are small vehicles that can travel and manoeuvre quickly in traffic. Front and rear lights increase the visibility of the rider in all conditions. This is particularly important as vehicle detection systems in e.g. new passenger cars fail to reliably recognise e-scooter riders, especially at speeds over 10 km/h.[40]

23 PIN countries report regulating e-scooter lighting requirements. Seven mandate lights, front and back, four require riders to have reflectors or wear a reflective vest and 12 mandate both lights and reflectors (Table 4).

Table 4. E-scooter lighting requirements in PIN countries where e-scooters are permitted

	Lighting
AT	Mandatory white light at the front and red light at the rear (in the dark or in poor visibility). Mandatory reflectors or reflective foils: white on the front, red on the back and yellow on the sides.
BE	Mandatory white reflector at the front and red reflector at the rear, side markings consisting of either a white reflective strip on each side of the footrests, or a white reflective strip in the form of a continuous circle on each side of the tyre of the front and rear wheels, or a combination of the two. During night time mandatory fixed or flashing non-dazzling light at the front and rear. At the front, the light must be white or yellow, red at the rear. The red rear light must be visible at night in clear conditions at a minimum distance of 100 metres.
BG	Mandatory running lights (during night time).
CH	Mandatory white front light and red rear light. Must be on day and night.
CY	Mandatory white or yellow light in the front and red light in the rear. Mandatory wearing of retroreflective materials at night.
DE	Type-approved yellow retro-reflective devices.
DK	Lights front and rear. Must be on day and night.
EE	White light at the front and red light at the rear.
ES	Mandatory white light at the front and red light at the rear. Mandatory white reflector at the front and red reflector at the rear and side reflectors.
FI	Lights and reflectors required as for bicycles.
FR	Mandatory white or yellow light at the front and red light at the rear (in the dark or in poor visibility, or all the time on rural roads where riding is allowed). Mandatory reflectors on front and sides. Reflective vest is mandatory during low visibility conditions (by night or by day) or all the time on rural roads where riding is allowed.
HR	Reflective vest during night and low visibility conditions.
IE	Must be fitted with front and rear lights.
IT	White/yellow front light and red rear light at night and in case of poor visibility. Mandatory red rear reflectors. Reflective clothing at night.[(1)]
IL	Helmet with a reflector mandatory.
LT	White light at the front and a red light at the rear, with orange reflectors on both sides. A brightly coloured vest with reflective elements must be worn when driving on the carriageway, or a white light in front and a red light in the rear. When driving in the dark or in poor visibility, a white light in front and a red light in the rear and a brightly coloured vest with reflective elements must be worn.
LV	White front light, red rear light. Must be on day and night.
PL	Mandatorily equipped with at least one white or yellow light in the front, and at least one red light at the rear and one red reflector of other than triangle shape, and at least one white or yellow reflector on each side; the lights or reflectors of the e-scooter when illuminated by light of another vehicle should be visible from a distance of at least 150 m.
PT	From dusk till dawn it is mandatory to use white light at the front and red light at the rear.
SE	If you ride in the dark, the electric scooter must have front and rear lights and be equipped with reflectors.
SI	Reflectors and reflective foils (white to the front, red to the back and yellow or orange side reflectors on both sides); at night and in poor visibility: white front light, red rear light.
SK	While riding in reduced visibility the e-scooter must be equipped with front and rear lights and reflectors. At the rear, the lights and reflectors should both be red and white at the front.
RS	Mandatory reflective vest when moving on the roadway. Must wear reflective vest or be otherwise illuminated on the bicycle and bicycle-pedestrian path in conditions of reduced visibility and at night.

Source: PIN Panellists

(1) IT – From 30 September 2022, e-scooters sold in Italy must be equipped with indicators and brake lights linked to the front and back wheel; from 1 January 2024, this obligation was extended to all e-scooters (including those already in circulation).

[40] Holmes A and di Cugno D, Reviewed by: Grover C, Young A and Brookes D, Assessing e-scooter risk to motor insurers, Thatcham Report July 2021 and Austrian Road Safety Board (2021) Reliability of AEB to protect vulnerable road users (in German) https://tinyurl.com/5n6uzr6x

Tampering

The extent to which (privately owned) e-scooters are tampered with to increase speed and acceleration is not yet known. Apps and social media tutorials can easily be found on the internet to facilitate e-scooter tampering. Some shops and garages also assist e-scooter riders to by-pass the speed limitations of their vehicle.[41]

Limits on the vehicle speed of e-scooters are there to improve safety. A means to restrict those limits being tampered with can be implemented by the use of anti-tampering measures.

Anti-tampering measures and penalties for alterations, limit the opportunity to increase the maximum speed and acceleration of (privately owned) e-scooters. However, speed limiting using software control alone is not sufficient to prevent tampering.

On-road enforcement is made easier when there is a clear violation of regulations. For example, an e-scooter travelling faster than the construction-controlled speed would indicate the e-scooter had been tampered with and justify intervention from the authorities.

SPAIN
VALENCIA POLICE DEPLOY NEW DEVICE TO TEST SPEED AND POWER OF E-SCOOTERS

Faced with a large increase in the number of e-scooter collisions on their territory, the police in Valencia, Spain, have introduced a new device to carry out spot checks of the maximum speed and power of an e-scooter. Rather like the roller-test benches used to check the maximum speed of small mopeds, the device is portable and is used at the side of the road. E-scooters found to be in violation of the maximum speed or power are immobilised and the owners fined €500.[42]

E-scooter stability

E-scooter riders are at risk of falling due to instability. Wheel size can be a factor in increasing stability and control in e-scooters[43] but other factors, such as suspension, can also affect an e-scooter's stability. Testing an e-scooter's overall stability through a range of performance-based tests, could be an appropriate means of setting standards for e-scooter stability, beyond wheel size.

Braking and deceleration

More than one independent means of braking increases the effectiveness of stopping as well as stability when stopping. Electric braking (releasing the throttle) must be supplemented by a mechanically operated brake (drum or disc brakes) in case of electrical failure.

E-scooters have been found to be unstable when decelerating.[44] As the e-scooter brakes, the rider needs to decrease speed as well, which can only happen because the e-scooter carries a braking force upon the rider, through the steering bar. The braking force, however, is applied at the wheels and not at the steering bar, causing the rider to easily topple over the front wheel when the front wheel brake blocks the front wheel. Heavy braking is therefore not possible.

Speed control can be further improved with a motor brake for regulating downhill speed automatically. This has already been incorporated into some shared e-scooters.

Setting a minimum deceleration capacity such as the 3.5 m/s^2 found in Germany's eKFV Regulation and testing e-scooters braking capabilities through performance-based braking tests would ensure safer braking of e-scooters.

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41 https://tinyurl.com/2td2tda4
42 https://tinyurl.com/yayz6urs
43 Posirisuk P., Baker C., Ghajari M., (2022) Computational prediction of head-ground impact kinematics in e-scooter falls https://tinyurl.com/k53m2cp2
44 Paudel, M., & Yap, F F., (2021) Front steering design guidelines formulation for e-scooters considering the influence of sitting and standing riders on self- stability and safety performance. https://tinyurl.com/ppba5wmp

Audible warning

The ability of an e-scooter rider to make their presence known increases awareness for other road users. In many PIN countries bicycles are required to be fitted with a bell for the same reason. As e-scooters are electrically powered, a buzzer could be integrated into the e-scooter's construction.

13 PIN countries, Belgium, Switzerland, Cyprus, Germany, Estonia, Spain, Finland, France, Ireland, Italy, Lithuania, Sweden and Slovakia report that they regulate on the need for e-scooters to have an audible warning (Table 5).

Table 5. Audible warning requirements for e-scooters

	Audible warning
BE	E-scooters must be fitted with a horn that can be heard from a distance of 20 m
CH	E-scooters must have a signal bell
CY	E-scooters must have a signal bell
DE	E-scooter must be equipped with device enabling an audible warning signal to be given
EE	E-scooters must have a signal bell
ES	E-scooters must have a signal bell
FI	E-scooters must have a signal bell
FR	E-scooters must be fitted with a horn that can be heard from a distance of 50 m
IE	E-scooters must have a signal bell
IT	E-scooters must have a signal bell
LT	E-scooters must have a signal bell
SE	E-scooters must have a signal bell
SK	A scooter with an auxiliary motor intended for operation in road traffic must be equipped with at least one brake and a device enabling an audible warning signal to be given

Source: PIN Panellists

SPAIN INTRODUCES E-SCOOTER CERTIFICATION

From 22 January 2024 all e-scooters marketed in Spain must have a 'circulation certificate' detailing the vehicle's technical characteristics, as well as certification by an authorised body demonstrating that they comply with the requirements set out in the e-scooter 'Characteristics Manual'.[45] E-scooters sold before this date may continue to circulate without a certificate until 22 January 2027.[46]

SERBIA INTRODUCES E-SCOOTER REGISTRATION STICKERS

Serbia introduced a registration requirement for private e-scooters in March 2024. E-scooter owners must register their vehicle with the Road Traffic Safety Agency. The vehicle is checked to ensure it complies with the criteria and, if it does, a registration sticker is placed on the vehicle. The registration sticker clearly shows the characteristics of the vehicle. Since 15 June 2024, only vehicles with a registration sticker are permitted to circulate in traffic.

3.2 EU VEHICLE SAFETY LEGISLATION

New vehicle technologies able to detect pedestrians and cyclists, thereby mitigating or preventing collisions have become mandatory on new models of vehicles in recent years. Automated Emergency Braking (AEB) detecting pedestrians and cyclists became mandatory on new car models as of July 2024. New models of heavy goods vehicles also have to be fitted with advanced systems capable of detecting pedestrians and cyclists located in close proximity as of July 2022.

However, as these active safety technologies are not required to detect e-scooters in particular, the extent to which they are able to identify e-scooter riders correctly remains unclear. It is of the utmost importance for e-scooter rider safety that driver assistance systems, automated driving systems and Cooperative Intelligent Transport Systems are capable and tested to correctly identify and react to e-scooters and consider e-scooter safety.

The passive safety of cars will also be improved by extending the crash test zone to include the windscreen between the A-pillars for better pedestrian, cyclist, and e-scooter protection.

[45] General Directorate of Traffic, Manual of characteristics of the vehicles of personal mobility, Resolution No. 18, of 21 January 2022, pages 6882 to 6915 (34 pp.) https://tinyurl.com/yw36sxfj
[46] Fundacion MAPFRE (2023) Analysis of the collisions involving personal mobility vehicles https://tinyurl.com/8mtcwr3w

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- In the absence of mandatory EU regulations on technical standards for e-scooters, countries should adopt into national law, as a minimum, the EN17128 standard and if possible, also incorporate performance-based testing of e-scooters, such as those mandated in the German regulation (eKFV);
- Set a maximum 20 km/h speed for private e-scooters at the factory. Shared e-scooter providers, while limiting top speed to 20 km/h, should also apply lower speeds, for example in pedestrian zones, using geofencing;
- Anti-tampering mechanisms should be included at the factory. Tampering should be prohibited by law;
- Set a requirement for independent front- and rear-wheel braking devices for e-scooters and e-scooters should be capable of achieving a deceleration value of at least 3.5 m/s^2;
- Set a requirement for independent front and rear lights on e-scooters. Indicator lights should be considered due to the difficulties of using hand signals;
- Require an audible warning device on all e-scooters;
- Enforce e-scooter rider compliance with national rules and regulations.

RECOMMENDATIONS TO THE EU

Set unified, performance-based safety standards for micro-mobility devices at EU level including:

- A speed limit of 20 km/h;
- A maximum acceleration of 2 m/s^2;
- A deceleration capacity of at least 3.5 m/s^2;
- Front and rear lights and indicator lights should be considered;
- Anti-tampering mechanisms;
- An audible warning;
- A series of tests to confirm standards in driving dynamics (such as those set in Germany's eKFV (Small Electric Vehicles) Regulation);
- Update the EU's General Safety Regulation for cars, vans, trucks and buses to require that the relevant mandatory Advanced Driver Assistance Systems (ADAS) (e.g. Automated Emergency Braking Systems (AEBS) and Blind Spot Information Systems (BSIS)) can detect e-scooter riders, and include tests to verify compliance.

3.3 ROAD RULES FOR E-SCOOTER RIDERS

Establishing a clear set of traffic rules for e-scooters can improve safety both for the rider and other road users. For example, setting a minimum age for e-scooter riding, not allowing tandem riding and setting alcohol limits can all improve safety. The EU has provided some guidance to local authorities for safe use of micromobility devices in urban areas.[47]

Helmets

Head injuries are common in e-scooter collisions. International studies show that up to a third of all injuries sustained by e-scooter riders during collisions are head injuries[48] and a clear relationship has been found between not wearing a helmet while riding an e-scooter and traumatic brain injury.[49] Wearing a helmet while riding an e-scooter can reduce the risk of head injuries by up to 44%.[50] Helmets specific to e-scooter riding do not yet exist so a bicycle helmet is considered an appropriate helmet to wear. This is the case in Denmark where wearing a bicycle helmet that complies with the EN 1078 standard is obligatory when riding an e-scooter.

More research is needed to develop helmet testing methods that specifically address impacts sustained by e-scooter riders in collisions. Simulations of e-scooter falls show that the angles of e-scooter riders' heads at impact differed to bicycle falls. 56% of the impacts were to the forehead and skull, however 44% of the impacts were to the face indicating that while open-face helmets such as bicycle helmets can protect e-scooter riders from brain injury, they would not protect against facial ones.[51]

In 20 PIN countries it is mandatory for some, or all, e-scooter riders to wear a helmet. (Table 6)

[47] Topic Guide Safe Use of Micromobility devices in urban areas https://tinyurl.com/2c4wse59
[48] VIAS Institute (2021) E-scooters and road safety (in Dutch or French) https://tinyurl.com/mvek4cap
[49] Revista Emergencias (2023) SCIENTIFIC LETTERS : Electric scooter accidents and injuries https://tinyurl.com/3sxs89sk
[50] Study conducted within the research project SURF (Smart Urban Road Safety - Traffic Safety of new Vulnerable Road Users) https://tinyurl.com/3fupvc23
[51] Posirisuk, P., Baker, C., and Ghajari, M., (2022) 'Computational prediction of head-ground impact kinematics in e-scooter falls' Accident Analysis and Prevention

Table 6.
Is it mandatory to wear a helmet when riding an e-scooter?

E-scooter helmet mandatory	E-scooter helmet not mandatory
Austria under 12	**Belgium**
Bulgaria under 18	**Germany**
Cyprus	**Finland** not mandatory but strongly recommended
Croatia	**Ireland** not mandatory but strongly recommended
Czechia under 18	**Luxembourg**
Denmark	**Malta**
Estonia under 16	**Netherlands**
France on roads outside urban areas	**Poland**
Greece	**Portugal**
Italy under 18	**United Kingdom**
Latvia under 18	**Switzerland**
Lithuania under 18 and for everyone on the carriageway	
Romania	
Spain regulated at local level	
Sweden under 15	
Slovakia under 15	
Slovenia under 18	
Israel	
Norway under 15	
Serbia	

Source: PIN Panellists

Helmet wearing rates for e-scooter riders vary across the PIN countries able to provide data. In Denmark 69% of e-scooter riders wear a helmet while in Austria and Latvia fewer than 10% do (Table 7).

Table 7. Helmet wearing rates among e-scooter riders

Proportion of e-scooter riders wearing a helmet	
DK	69%
ES[1]	49%
SI[2]	33%
IE[3]	27%
CZ	21%
EE	13%
HU	11%
AT[4]	9%
LV[5]	7%
DE	3%[6]-5%[7]

[1]ES – in observational studies. Users in urban areas in 2023.
[2]SI – in case of severe injuries
[3]IE – observational studies in 2021
[4]AT – observational studies in urban areas in 2023
[5]LV – 2021
[6]German-In-Depth-Accident Study database (GIDAS)
[7]Hospital census
Source: PIN Panellists

SPAIN
E-SCOOTER WITH BUILT-IN HELMET STORAGE – FREE PATENT

CESVIMAP, the research and development department of MAPFRE, a Spanish insurer, has patented a design for a helmet storage unit for e-scooters which also serves as a bumper, reducing the risk of injury in the case of a collision with a pedestrian.[52] In tests performed with the unit, the g-force exerted on the head of the child pedestrian dummy was 85% lower when the helmet storage unit was attached than when it was not. This could mean the difference between serious and slight injuries.

[52] MAPFRE Foundation (2023) Safety on two wheels: the CESVIMAP prototype that reduces damage in collisions with e-scooters https://tinyurl.com/5cur2an7

DENMARK
HELMET REQUIREMENT HAS INCREASED THE USE OF HELMET, ESPECIALLY FOR PRIVATE E-SCOOTERS

In Denmark it is legally required to wear a bicycle helmet on an e-scooter. Since the introduction of the requirement at the beginning of 2022, helmet wearing amongst e-scooter riders in Denmark has increased from 28% in 2020 to 69% in 2022. The helmet-wearing rate among e-scooter riders is higher than for cyclists, who are not required to wear a helmet. However, the proportion of riders of rental e-scooters wearing a helmet is only around 14%. Technical solutions to this are being sought by some rental companies. In the city of Odense, for example, some shared e-scooters[53] come with a helmet attached.[54]

Passengers

E-scooters are designed to be ridden by one person and, on average, for a maximum carrying capacity of 100 kg.

Evidence indicates that between 2% to 5% of all observed trips involve two riders on a single e-scooter. When surveyed, 32% of e-scooter riders in 22 countries admitted to tandem riding.[55] Tandem riding contributes to 17% of all e-scooter related casualties[56], indicating that tandem riding is much more dangerous that riding on an e-scooter alone. This is likely due to decreased stability and decreased braking efficiency.

In all PIN countries (with the exception of Cyprus) passengers are not permitted on e-scooters. In Cyprus passengers are only permitted when the device is manufactured with a dedicated seat for a passenger. These passengers should also be at least 12 years old and wear a legally prescribed helmet.

Minimum age

As road users, young people tend to display risky behaviours and have a diminished appreciation of the hazards that they face.[57] The risks associated with young road users stem from inexperience, immaturity and lifestyle linked to their age and gender.[58] Setting a minimum age for riding an e-scooter can mitigate against some of these risks, prevent collisions and save lives.

Most PIN countries have set a minimum age for riding an e-scooter. Only Czechia, Estonia, Finland, Hungary, Portugal and Sweden do not.

The most common minimum age set by PIN countries is 14 years but it varies from 10 years in Luxembourg and Poland to 16 years in Belgium, Ireland, Israel, Lithuania, the Netherlands and the UK (Table 8).

In 14 countries (LU, PL, AT, NO, BG, HR, CY, DE, RO, SI, RS, ES, CH, EL) the age for riding an e-scooter is lower than for riding a moped. In nine countries (FR, IE, IT, LV, DK, SK, BE, NL, UK) the age for riding an e-scooter is the same as for riding a moped.

[53] https://tinyurl.com/ym6v9p2y
[54] TRAFIK & VEJE (2023) Big effect of helmet requirements on e-scooters – but the use of helmets on rental e-scooters lags behind https://tinyurl.com/am3xen2m
[55] Delavary, M., Lyon, C., Vanlaar, W.G.M., Robertson, R.D., Nikolaou, D., Yannis, G. (2024). E-Scooter Riders. ESRA3 Thematic report Nr. 6. ESRA project (E-Survey of Road users' Attitudes). (2024-R-23-EN). Traffic Injury Research Foundation. https://tinyurl.com/fmujrxye
[56] ITF (2023) Safer micromobility https://tinyurl.com/3trtuzch
[57] Twisk, D., Stelling, A., (2014), Young people's risky behaviour requires integral approach, SWOV, p4. https://goo.gl/Y1GjNF
[58] European Commission (2018), Novice Drivers https://bit.ly/3qT3Xt8

Table 8. Legal minimum age for riding an e-scooter

Minimum age to ride an e-scooter					
10	**12**	**14**	**15**	**16**	**none**
Luxembourg	Austria[1]	Bulgaria[2]	Denmark[3]	Belgium	Czechia[4]
Poland[5]	Norway	Croatia	Greece[6]	Ireland	Estonia
		Cyprus	Slovakia[7]	Israel	Finland
		France		Lithuania[8]	Hungary
		Germany		Netherlands	Portugal
		Italy		United Kingdom[9]	Sweden
		Latvia			
		Romania			
		Slovenia[10]			
		Serbia			
		Spain[11]			
		Switzerland[12]			

[1]AT - from nine years old with voluntary bicycle exam
[2]BG - on cycle paths, 16 years old on roads
[3]DK - if younger than 15 years old must be accompanied by an adult (on a separate e-scooter or different mode of transport)
[4]CZ - unclear
[5]PL - between 10 and 18 years old it is required to hold a cycling license (or AM, A1, B1 or T license) to ride an e-scooter on public roads; children younger than 10 can only drive e-scooters accompanied by parents and only in residential areas
[6]EL - for e-scooters with a design speed up to 25 km/h, 12 years old for e-scooters with design speed up to 6 km/h
[7]SK - e-scooters may only be ridden by a person over the age of 15 on the road, with exception of cycle paths, dirt tracks, forest roads and residential areas
[8]LT - at least 14 years of age only after training and a certificate
[9]UK - it only applies to rental e-scooters. Some local authorities have set the limit to 18 years.
[10]SI - 12 years old with voluntary bicycle exam
[11]ES - between 14 and 16 years old set at city level
[12]CH - with moped licence (14 and 15 years), otherwise 16 years old
Source: PIN Panellists

Riding under the influence of alcohol or drugs

Riding an e-scooter under the influence of alcohol carries with it an increased risk of being involved in a collision.[59] In a survey of e-scooter riders in 22 European countries, 21% admitted to riding an e-scooter after potentially consuming too much alcohol.[60] Various studies have shown that alcohol is a risk factor in up to 40% of e-scooter deaths.[61] A study conducted in Oslo found that 40% of individuals injured in e-scooter collisions were alcohol-impaired. Another study in Bern, Switzerland, reported alcohol consumption in 43.5% of e-scooter collisions, with an average blood alcohol concentration of 1.4 g/l. In France, 36.7% of e-scooter riders admitted to hospital trauma centres had blood alcohol levels exceeding the legal limit of 0.5 g/l. A further study found that alcohol-impaired e-scooter patients arrived at the hospital emergency department more often at night and via ambulance, and they required hospital admission more frequently than sober patients.[62]

24 of the 32 PIN countries reported having a legal alcohol limit for riding an e-scooter. Most countries with a limit have chosen the same limit as for driving other vehicles (Table 9). Two countries (Austria and Slovakia) went for a more relaxed limit compared to other vehicles. In Austria the alcohol limit for e-scooter riders is the same limit as the limit that applies to cyclists.

There is no alcohol limit for riding an e-scooter in Sweden, however the Swedish Transport Agency [2023b] writes: "It is not permitted to drive an electric scooter if you are too tired, sick or affected by alcohol or other substances in order to be able to ride safely".[63]

[59] VTI (2023) Electric scooters : A review of international literature and an analysis of Swedish accident data https://tinyurl.com/3t7ctpvp
[60] Delavary, M., Lyon, C., Vanlaar, W.G.M., Robertson, R.D., Nikolaou, D., Yannis, G. (2024). E-Scooter Riders. ESRA3 Thematic report Nr. 6. ESRA project (E-Survey of Road users' Attitudes). (2024-R-23-EN). Traffic Injury Research Foundation. https://tinyurl.com/fmujrxye
[61] ITF (2023) Safer micromobility https://tinyurl.com/3trtuzch
[62] VTI (2023) Electric scooters : A review of international literature and an analysis of Swedish accident data https://tinyurl.com/3t7ctpvp
[63] Ibid

Table 9. Legal alcohol limit for riding an e-scooter

Alcohol limit for e-scooter riders				
0.0 g/l	**0.2 g/l**	**0.5 g/l**	**0.8 g/l**	**No limit**
Czechia	Norway	Belgium	Austria	Finland
Lithuania	Serbia	Bulgaria	United Kingdom	Sweden[5]
	Poland	Croatia		
		Cyprus		
		Germany[1]		
		Denmark		
		France		
		Greece		
		Israel[2]		
		Italy		
		Luxembourg		
		Latvia		
		Portugal		
		Slovakia[3]		
		Slovenia		
		Spain[4]		
		Switzerland		

[1]DE - 0.0 g/l for riders under 21 years old
[2]IL - 0.1 g/l for novice and drivers aged below 24
[3]SK - 0.24 mg/l of exhaled air, 0.5 g/l of body weight
[4]ES - 0.0 g/l for riders under 18 years old
[5]SE - it is not permitted to ride an e-scooter if you are too tired, ill or under the influence of alcohol or other substances to ride safely
Source: PIN Panellists

17 PIN countries are able to provide details of the numbers of e-scooter deaths that can be attributed to drunk-riding. The numbers killed are small but the proportions attributed to alcohol are high. For instance, all those killed on an e-scooter in Croatia in 2022 were drunk-riding. Two thirds of the e-scooter riders killed in Switzerland in 2022 were under the influence of alcohol and half of all e-scooter riders killed in Slovenia were riding while drunk. (Table 10).

Table 10. Total number of e-scooter users killed who were under the influence of alcohol

	2019	2020	2021	2022	2023
BE	0	0	0	0	n/a
BG	n/a	n/a	n/a	n/a	0
CY	0	0	0	0	0
CZ	n/a	n/a	n/a	n/a	1
DE	0	0	1	0	1
DK	0	0	0	0	0
EE	0	0	0	0	0
ES	n/a	0	1	2	0
FR	4	0	7	7	11
HR	n/a	n/a	n/a	1	0
LV	n/a	n/a	0	0	0
LT	0	0	1	0	0
PT	n/a	n/a	n/a	n/a	0
SI	0	0	0	1	0
SK		0	0	0	0
GB	n/a	0	2	n/a	n/a
CH	1	0	0	2	0

Source: PIN Panellists

NORWAY
OSLO BANS E-SCOOTERS AT NIGHT TO COMBAT DRUNK-RIDING

A study of e-scooter collisions in Oslo, based on data from the emergency care unit of Oslo University Hospital, found that the risks associated with riding an e-scooter at night were higher than during the day. Researchers found that 41% of collisions (344 out of 837) occurred between 22:00 and 06:00. In addition, the collision risk for e-scooters was calculated at 273 injuries per million person-km at night (between 10 p.m. and 6 a.m.) while the equivalent during the day was calculated at 81 injuries per million person-km. Rider behaviour, and in particular the use of alcohol or drugs, played a role in these higher nighttime collisions numbers. The study found that during the night, almost 80% of e-scooter collisions were related to the use of alcohol or drugs, while during the day, only 13% were.[64]

The city of Oslo decided to ban shared e-scooters at night between 11 p.m. and 5 a.m. in 2021 in an effort to reduce collisions and drunk-riding. Thanks to this measure and a number of other measures also introduced (eg. the introduction of a blood alcohol concentration limit of 0.2g/l, mandatory insurance and a dramatic reduction in the number of shared e-scooters) the number of injuries reduced from 1,878 in 2021 to 556 in 2023.[65]

GERMANY
AWARENESS CAMPAIGN - ROLL WITHOUT RISK!

E-scooters have been allowed on German streets since 2019. Since then, the number of collisions involving e-scooter riders has risen steadily: around 8,300 people were seriously injured on an e-scooter in 2023 in Germany, an increase of 12% compared to the previous year. 20 people died in a collision involving e-scooters in 2023 - twice as many as in the previous year.

The German Road Safety Council (DVR), with the support of the Federal Ministry for Digital and Transport (BMDV) and the German Social Accident Insurance (DGUV), has been running an awareness campaign, 'Roll without risk!' aimed at young people. 40% of injured e-scooter riders are under the age of 25.

The campaign focuses on the main causes of collisions such as driving under the influence of alcohol, using pavements and riding in tandem. Parking e-scooters without hindering others is another topic.

DVR has been working with shared e-scooter providers to hang campaign signs and stickers on their shared e-scooter fleets. Campaign materials are in two languages as tourists in large cities also often use shared e-scooters.

More information: www.dvr.de/e-scooter

Source: DVR/Tina Merkau (2024)

Source: DVR/BMDV/DGUV (2024)

[64] NPRA (2021) Bicycle and e-scooter injuries in Oslo https://tinyurl.com/3yz3crzf
[65] Oslo City Council (2021) New rules for e-scooters in Oslo https://tinyurl.com/mu79f3r8

Insurance

Personal liability insurance and vehicle occupant insurance can protect road users either in the case of property loss or to compensate for long-term care needs in the event of a serious injury. Insurance tools can also increase a road user's personal responsibility, leading them to drive or ride more carefully.[66]

Only 10 PIN countries require e-scooter riders to have some form of insurance (Table 11). In some PIN countries, while insurance is not necessary for private e-scooter riders, providers of shared e-scooters are obliged to have insurance. Requiring e-scooters to carry an insurance sticker, as is the case in Germany, can help with the enforcement of this rule where it applies.

Table 11. Is insurance mandatory for e-scooter riders?

Insurance mandatory	Insurance not mandatory
Czechia	Austria
Denmark	Belgium
Finland	Bulgaria
France	Croatia
Germany	Cyprus
Malta	Estonia
Netherlands	Greece
Norway(1)	Hungary
Slovakia	Ireland
United Kingdom(2)	Israel
	Italy(3)
	Latvia
	Lithuania
	Luxembourg
	Poland
	Portugal
	Romania
	Serbia
	Slovenia
	Spain(4)
	Sweden
	Switzerland

(1)NO – liability insurance from January 2023
(2)UK – trial operators require insurance
(3)IT – required for sharing providers
(4)ES – required by some cities and for sharing providers as part of their civil liability
Source: PIN Panellists

66 Global Road Safety Partnership (2017) Insuring safer roads https://tinyurl.com/msevpcny

Rider training

An e-scooter rider should be competent to use the e-scooter and understand the rules governing other road vehicles. There is evidence[67] that a high percentage of collisions occur the first time a rider uses an e-scooter.

ETSC recommends that pedestrians and cyclists should receive at least a minimum level of road safety education and awareness of the risks imposed by the current traffic system through training and education. This level of education and awareness should be extended to e-scooter riders.

UK
GUIDANCE FOR LOCAL AUTHORITIES AND RENTAL OPERATORS

The UK government issued guidance for local authorities and rental operators.[68] Users are not required to complete a mandatory training course, but the government guidance recommends e-scooter providers offer training courses to users. To achieve this, the motor vehicles (driving licences) regulations 1999[69] has been amended. Local authorities should include provision of training in their agreements with operators.

SPAIN
E-SCOOTER SAFETY COURSE FOR YOUNG PEOPLE

A rise in the number of deaths related to the use of e-scooters in Spain led to the development of an education programme aimed at young people.

Fundaci n Educatrafic, a non-profit organisation run by education and road safety professionals in Zaragoza, set up a training programme providing practical support to young people from the age of 16 using electric scooters, skateboards and other personal mobility vehicles.

The training programme takes place in a specialist driving centre and is divided into an awareness discussion about the use of personal vehicles and a practical element designed to simulate an open road. The initiative aims to make the training fun, giving attendees access to a circuit where they can practice different manoeuvres in safety, while still following the rules of the road. Practical tests include riding at low speeds to improve control; emergency braking; negotiating cones; and making various turns. They also perform alcohol simulation tests as a pedestrian to illustrate the dangers of being close to a road. [70]

[67] Norwegian Public Road Administration (2021) Bicycle and e-scooter injuries in Oslo https://tinyurl.com/3yz3crzf
[68] 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
[69] https://www.legislation.gov.uk/uksi/1999/2864/contents/made
[70] European road safety partnership (2021) Spanish initiative aims to reduce scooter accidents https://tinyurl.com/yhh87yst

3.4 INFRASTRUCTURE FOR VULNERABLE ROAD USERS

Road infrastructure should take into account the needs of the communities it serves.

According to the Safe System approach, vulnerable road users should not mix with motor vehicle traffic where motor vehicle speeds exceed 30km/h.[71] Roads for motor vehicles with speeds above 30km/h require separate infrastructure for cyclists, pedestrians and e-scooter riders. Separation of bicycles and e-scooters from motor vehicles on the roads with the highest speeds and those with the highest volumes should be a priority for national governments.

Pavements are also not safe places for e-scooters to ride due to the increased risk of collision with a pedestrian and due to the often poor quality of pavement surfaces (cracks, uneven joints). And, yet, e-scooters continue to be ridden on pavements. For instance, in Austria, in 2023, 13% of all e-scooter collisions occurred on the pavement. Of the e-scooter collisions that occurred in Sweden in 2023, 6.5% occurred on the pavement despite the practice being banned on 1 September 2022. In 2021, before the ban, 8% of collisions occurred on the pavement. A study carried out by the University of Graz, Austria,[72] suggests that e-scooters should be banned from pavements and footpaths, as collisions with pedestrians often result in serious injuries.

The presence of e-scooters on pavements can also make pedestrians feel unsafe. If pedestrians feel unsafe they will not walk.[73] Research from 13 studies from different countries shows that, on average with all the studies taken together, 6% of those injured in e-scooter collisions were not to the driver of the e-scooter themselves (although the average in individual studies ranged from 1.6-13.8%). The majority of these 6% were pedestrians and they were often elderly, already a fragile and vulnerable group of road users. Of the pedestrians and cyclists injured in collisions with e-scooters, large proportions tripped over or rode on parked e-scooters or e-scooters lying on the ground. In one American study, half of all pedestrians who were injured through contact with e-scooters were injured when they tried to clear a strewn e-scooter from the road.[74] Statistics from the UK in 2021 show that of the reported casualties in collisions involving e-scooters, 15% were pedestrians. Overall, some 23% were not e-scooter riders themselves.[75] (Note: a study in the UK showed that official data of e-scooter casualties underreport numbers of e-scooter casualties recorded by hospitals and that just over a quarter of those most seriously injured were recorded by the police.)[76]

Due to the inherent instability of e-scooters, the quality of the surfaces that e-scooters ride on is an important factor in their safety. Navigating defects or changes in surface level can cause an e-scooter rider to lose control.[77] A study in Norway found that 14.8% of injured e-scooter riders had fallen into or collided with a kerb, while 11.5% were attributed to holes in the road surface. 9.8% of injured e-scooter riders had fallen into or collided with tram rails. Meanwhile, 4.5% of injuries were due to collisions with cars.[78] A review of e-scooter collisions in Sweden between January 2019 and November 2023 found that in a number of the collision reports there is a mention of kerbstones stopping the e-scooter and causing the rider to fall. Speed bumps and cobblestones are also described as having contributed to the collisions as are slippery conditions (including from leaves), bumps, unevenness or a cable over the road.[79]

Cycle lanes separated from car traffic are the safest locations to ride e-scooters and bicycles and are associated with a lower injury risk.[80]

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[71] European Commission (2022) Road Safety Thematic Report – Safe System Approach https://tinyurl.com/2f7t26ch
[72] Study conducted within the research project SURF (Smart Urban Road Safety - Traffic Safety of new Vulnerable Road Users) https://tinyurl.com/3fupvc23
[73] ITF (2023) Safer micromobility https://tinyurl.com/3trtuzch
[74] Høye, A. K., Milch V., (2023) Road safety effects of micromobility - E-scooters https://tinyurl.com/2tu8w8zu
[75] Department for Transport (UK) (2022) Reported road casualties Great Britain: e-Scooter factsheet 2021 https://tinyurl.com/5xr9ff7u
[76] PACTS (2023) Comparing police and hospital e-scooter data sets https://tinyurl.com/5ark2fzy
[77] Posirisuk P., Baker C., Ghajari M., (2022) Computational prediction of head-ground impact kinematics in e-scooter falls https://tinyurl.com/k53m2cp2
[78] NPRA (2021) Bicycle and e-scooter injuries in Oslo https://tinyurl.com/3yz3crzf
[79] VTI (2023) Electric scooters : A review of international literature and an analysis of Swedish accident data https://tinyurl.com/3t7ctpvp
[80] ITF (2023) Safer micromobility https://tinyurl.com/3trtuzch

Most PIN countries do not allow e-scooters to ride on pavements. Countries that do, tend to limit it to certain exceptions such as at lower speeds or for younger riders (Table 12).

Table 12. Are e-scooters permitted to ride on pavements?

E-scooters allowed on pavements	E-scooters not allowed on pavements
Bulgaria[1]	Austria[11]
Croatia[2]	Belgium
Czechia[3]	Cyprus
Estonia	Denmark
Greece[4]	Finland
Latvia[5]	France[12]
Malta[6]	Germany[13]
Norway[7]	Israel
Poland[8]	Italy
Portugal[9]	Lithuania
Slovakia[10]	Luxembourg[14]
	Romania
	Serbia[15]
	Slovenia
	Spain
	Sweden
	Switzerland[16]
	United Kingdom

[1]BG - riding on the right if no cycle lane
[2]HR - only in cases when there is no bicycle path or lane, they can move on areas intended for pedestrians and calm traffic zone, provided that they take into account the safety of other road users
[3]CZ - up to 10 years old
[4]EL - up to 6 km/h
[5]LV - if no cycle lane, paths, road
[6]MT - up to 10 km/h
[7]NO - up to 6 km/h and not being an obstacle for pedestrians
[8]PL - if the road speed limit is >30 km/h and there is no cycling path/road. In such cases the speed of the e-scooter on the pavement should be that of a pedestrian, and the rider should give the right of way to pedestrians. The rider should ride on a 30 km/h (or less) road if there is no bicycle path/road.
[9]PT - children up to 10 years old
[10]SK - on the right side of the pavement, pedestrian path or pedestrian crossing, only if it does not endanger or restrict pedestrians, while not exceeding walking speed
[11]AT - local authorities can make exceptions
[12]FR - when permitted, up to 6 km/h
[13]DE - local authorities can make exceptions, that must be indicated with a sign
[14]LU - from the age of 10 you have the right and from the age of 13 it is mandatory to ride in places provided for bicycles, otherwise traffic lanes
[15]RS - e-scooters must be ridden on a cycle path, pedestrian-cycle path or cycle lane. If these are not present, e-scooters can ride on a road with a maximum speed limit of 30 km/h. Only people over the age of 18 are permitted to ride an e-scooter on a road with a maximum speed limit of 50 km/h.
[16]CH - except in areas where bicycles are permitted to ride on the pavement

SPAIN
A CAMPAIGN TO PROTECT PEDESTRIANS

E-scooters are not permitted to ride on the pavement in Spain. In practice, however, not all e-scooter riders respect these rules and it is common to see e-scooters riding on pavements.

To make the rules clear and with the aim of reducing collisions on pavements and in pedestrian areas, the Directorate-General for Traffic has launched a campaign supported by a number of national organisations representing pedestrians, people with disabilities and the elderly.

The campaign seeks to reinforce the idea that respecting the rules is essential if all road users are to be able to coexist in cities. Using the slogan 'No pasa' (do not pass), the campaign makes it clear that bicycles and e-scooters 'do not pass' on the pavement. The campaign can be seen on buses and on urban media in Madrid, Seville, Valencia, Zaragoza and Malaga, and also includes radio adverts and pieces for digital media and social networks nationwide.

Running alongside the campaign there will also be an enforcement campaign carried out by police forces who will be checking for personal mobility vehicles and bicycles riding on the pavements. Riding an e-scooter or bicycle on the pavement carries a fine of 200€.[81]

3.5 REDUCING SPEED IN URBAN AREAS

Most e-scooter journeys take place in urban areas on roads with mixed-traffic.[82] [83]

To facilitate the sharing of road space among pedestrians, cyclists, e-scooter riders and motorised vehicles, efforts need to be made to reduce motorised vehicle speed in residential and core urban zones.[84] At low speeds, drivers have more time to react to the unexpected and avoid collisions. Injuries at lower speeds are also less severe. In the event of a collision at lower speeds, the severity of any injury is reduced and survival rates for a vulnerable road user are increased.

Different traffic calming measures designed to reduce vehicle speeds are suited to different functions of roads depending on the road hierarchy. Traffic calming should also discourage motorised traffic, except for traffic that needs access to that specific area.[85] Enforcement on roads limited to 30km/h has a contribution to make where engineering measures by themselves are insufficient to incentivise drivers to travel at safe speeds.

[81] https://www.dgt.es/comunicacion/campanas/hagamos-acera/
[82] VIAS Institute (2021) E-scooters and road safety (in Dutch or French) https://tinyurl.com/mvek4cap
[83] NPRA (2021) Bicycle and e-scooter injuries in Oslo https://tinyurl.com/3yz3crzf
[84] OECD (2013), Cycling, Health and Safety, http://goo.gl/qPHEf4
[85] ETSC (2015), 30 km/h limits gaining rapid acceptance across Europe, https://bit.ly/2D3IhII

ANNEXES

ISO Codes

Country	ISO Code
Austria	AT
Belgium	BE
Bulgaria	BG
Switzerland	CH
Cyprus	CY
Czechia	CZ
Germany	DE
Denmark	DK
Estonia	EE
Greece	EL
Spain	ES
Finland	FI
France	FR
Great Britain	GB
Croatia	HR
Hungary	HU
Ireland	IE
Israel	IL
Italy	IT
Lithuania	LT
Luxembourg	LU
Latvia	LV
Malta	MT
The Netherlands	NL
Norway	NO
Poland	PL
Portugal	PT
Romania	RO
Serbia	RS
Sweden	SE
Slovenia	SI
Slovakia	SK
The United Kingdom	UK

Table 1. Total number of motorised micro-mobility device road deaths over the period 2020-2023

	2019	2020	2021	2022	2023	Note: Shared, privately owned or both. If privately owened, how do you get to calculate the figure?
AT	n/a	n/a	2	4	3	Both (e-Scooters only)
BE	1	1	4	4	2	Both
BG	n/a	n/a	n/a	n/a	2	No statistics are available for previous years
CY	1	0	0	1	0	Both
CZ	n/a	n/a	n/a	n/a	5	Contains only e-scooters, data from Police database
DE	n/a	n/a	5	10	21	
DK	1	0	0	0	n/a	Both
EE	0	0	0	1	0	
ES	n/a	n/a	9	8	10	
FI	0	1	2	2	2	Both. This information is from OTI's database on in-depth investigated accidents. Ownership type is collected as a part of in-depth investigation. This information is not yet available from official statistics.
FR	10	7	24	35	44	Both
EL	n/a	n/a	n/a	1	n/a	Both. Statistics only from 2022 on
HR	n/a	n/a	n/a	1	1	n/a
HU	n/a	n/a	n/a	n/a	n/a	
IE	0	1	0	1	3	
IT	n/a	n/a	9	16	21	Both
LU	n/a	0	0	0	n/a	Statistics only from 2020 on
LV	1	2	1	1	0	
LT	0	2	1	0	2	Both (e-Scooters only)
MT	n/a	n/a	n/a	n/a	n/a	
NL	n/a	n/a	n/a	n/a	n/a	
PL	n/a	n/a	n/a	3	n/a	
PT	0	0	0	0	3*	PT note: Data is provided by the police forces and do not include a breakdown by type of property; includes passengers.
RO	n/a	n/a	n/a	n/a	n/a	
SE	1	0	4	4	n/a	Both shared and private e-scooters. Source Strada
SI	0	0	0	2	0	
SK	0	0	0	3	1	
UK	n/a	n/a	n/a	n/a	n/a	
GB	n/a	1	10	11	6	Both trial schemes and private, all data based on police recording. 2023 not yet available
CH	2	0	0	3	2	Both
IL	3	3	9	8	4	Shared and privately owned
NO	n/a	2	1	5	0	Provisional data for 2023, data for 2023 is complete in june.
RS	n/a	n/a	n/a	n/a	n/a	

EU 18	**15**	**14**	**61**	**92**	**112**
PIN 22	**20**	**20**	**81**	**119**	**124**

Source: CARE database and national statistics provided by PIN Panellists in each country

Table 2. Million km ridden by motorised micro-mobility device riders over the period 2020-2023 (or last three years available)

	2020	2021	2022	2023	Note: please specify the methodology to collect the data
FI	7	20	30	31	Rental e-scooters. Average journey 1,8 km. Source: https://tieto.traficom.fi/fi/tilastot/yhteiskayttoisten-sahkopotkulautapalveluiden-tarjonta-kysynta-ja-markkinatilanne
IT	14.4	41.2	61	n/a	Only shared electric scooters are considered Source: ACI processing of Sharing Mobility Observatory Data n.7 https://osservatoriosharingmobility.it/documenti-osm/

Source: national statistics provided by PIN Panellists in each country
Data were not available for the other PIN countries

Table 3. Motorised micro-mobility device fleet size over the period 2020-2023 (or last three years available)

	2020	2021	2022	2023	Note: please specify the methodology to collect the data
AT	n/a	210000	n/a	n/a	Estimation based on one-off KFV exposure survey (questionnaire)
FI	12,100	34,100	55,200	56,400	Rental e-scooters. https://tieto.traficom.fi/fi/tilastot/yhteiskayttoisten-sahkopotkulautapalveluiden-tarjonta-kysynta-ja-markkinatilanne
IT	35,550	45,900	49,700	n/a	Only shared electric scooters are considered Source: ACI processing of Sharing Mobility Observatory Data n.7 https://osservatoriosharingmobility.it/documenti-osm/

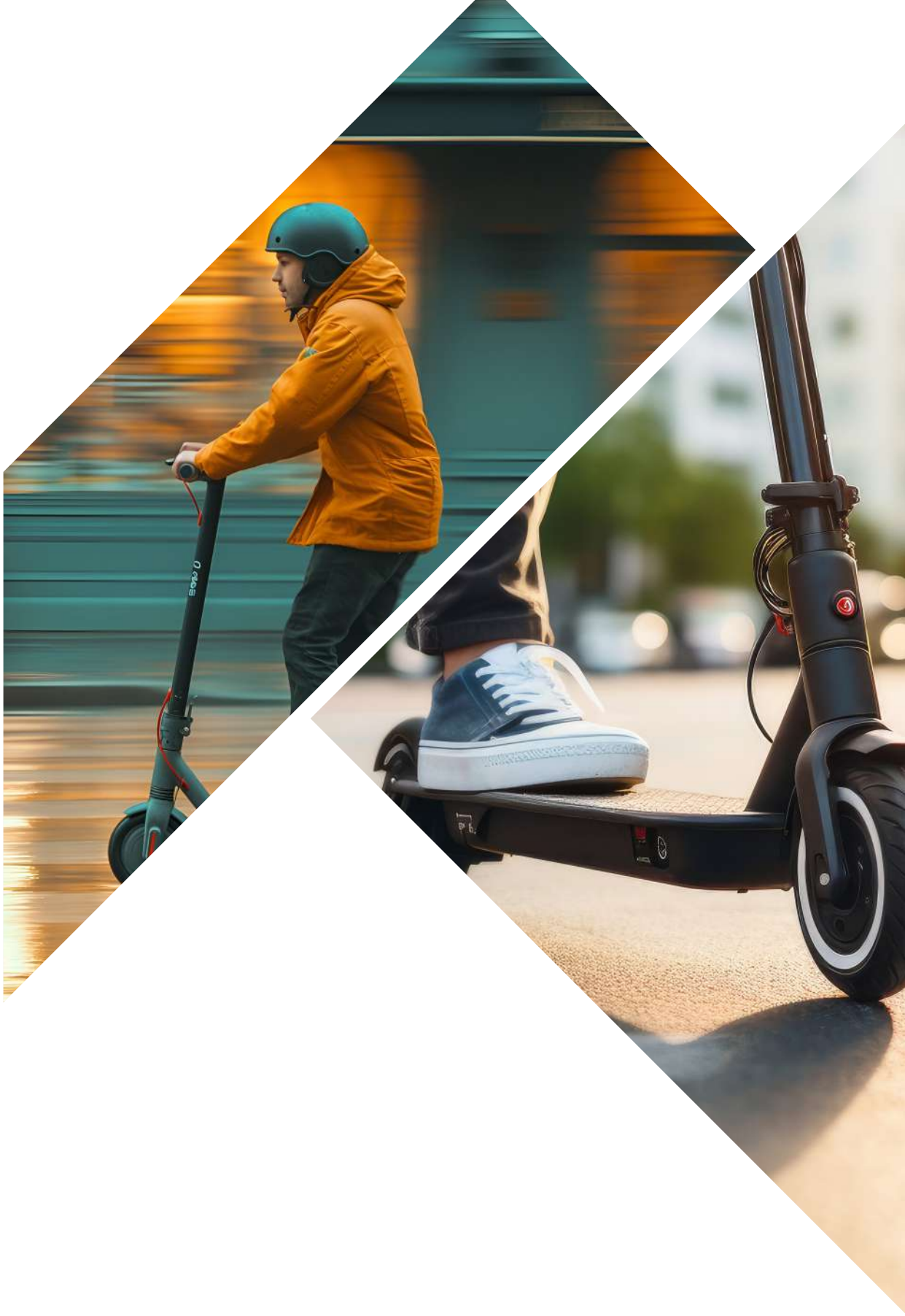
Source: national statistics provided by PIN Panellists in each country
Data were not available for the other PIN countries

Table 4. Total number of motorised micro-mobility device serious injured over the period 2020-2023

	2019	2020	2021	2022	2023
AT	n/a	n/a	n/a	n/a	283
BE	8	26	56	97	n/a
BG	n/a	n/a	n/a	n/a	37
CY	3	1	3	4	1
CZ	n/a	n/a	n/a	n/a	22
DE	n/a	n/a	787	1,099	1,084
DK	8	15	18	19	n/a
EE	n/a	n/a	28	60	53
ES	n/a	n/a	172	312	341
FI	n/a	n/a	n/a	n/a	n/a
FR	158	211	413	604	671
EL	n/a	n/a	n/a	n/a	n/a
HR	n/a	n/a	n/a	18	58
HU	n/a	n/a	n/a	n/a	n/a
IE	3	17	24	33	35
IT	n/a	n/a	n/a	n/a	n/a
LU	n/a	0	4	6	n/a
LV	n/a	1	13	25	15
LT	1	3	10	6	12
MT	n/a	n/a	n/a	n/a	n/a
NL	n/a	n/a	n/a	n/a	n/a
PL	n/a	n/a	n/a	164	n/a
PT	3	2	8	15	19
RO	n/a	n/a	n/a	n/a	n/a
SE	616	717	2,238	3,052	n/a
SI	1	3	16	30	29
SK	1	1	9	15	12
UK	n/a	n/a	n/a	n/a	n/a
GB	n/a	106	329	356	n/a
CH	14	55	89	114	121
IL	136	142	218	283	339
NO	0	4	14	20	13
RS	n/a	n/a	n/a	n/a	n/a

EU 15	**802**	**997**	**3,799**	**5,377**	**2,272**
PIN 19	**952**	**1,304**	**4,449**	**6,150**	**2,745**

Source: CARE database and national statistics provided by PIN Panellists in each country



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