



27/11/2020 | POSITION PAPER

MICROMOBILITY

THE INCLUSION OF PERSONAL LIGHT ELECTRIC VEHICLES IN ROAD TRAFFIC





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THE CHALLENGE AND PURPOSE

- 1.1 To provide the expertise that will facilitate the safe adoption and consistent deployment of Personal Light Electric Vehicles (PLEV) within road traffic. This will be achieved by looking at the status of these vehicles across Europe and by considering the current periodical technical inspections (PTI) rules to provide a recommendation for a harmonized approval framework in the EU.

THE CURRENT STATUS

- 2.1 A PLEV is a small, light, electrically powered motor vehicle, normally with the following characteristics: lightweight, compact design, without seats, designed to be driven in a standing position, and with or without a self-balancing capability.¹
- 2.2 The current type-approval regulation ([EU 168/2013](#)) for category L vehicles has been in force since 2016. This regulation excludes PLEV such as pedelecs (EAPC) limited to 250 W and 25 km/h, self-balancing vehicles, or other seatless vehicles from its scope.
- 2.3 PLEV are currently regulated in the EU as a personal consumer product and not as a road-going vehicle. As such, their design and build as well as their specific characteristics are not assessed or regulated according to road-going standards.
- 2.4 All PLEV manufacturers have only the minimum legal obligation to comply with the General Product Safety Directive ([GPSD 2001/95/EC](#)); [Directive 2006/42/EC](#) on Machinery and [Directive 2014/30/EU](#) on electromagnetic compatibility. These directives are not specific to road vehicles; the assumption is that they are covered elsewhere, but that they do include minimum health and safety requirements.
- 2.5 Although PLEV operation is like bicycles, they are legally classified as motor vehicles because of their motorized drive. Consequently, some EU Member States made these vehicles subject to compulsory registration.
- 2.6 The pragmatic result is that each Member State defines whether these vehicles are exempted from type-approval and/or banned from public roads. That is a disruptive and inconsistent status which leads to:
 - a lack of trust by society,
 - consumer confusion,
 - product capability variation (e.g. design requirements),

¹ See more information in annex 1: SAE standard J 3194



- variable quality and reduced product reliability,
 - potential incorrect/unsafe use.
- 2.7 PLEV volumes are growing rapidly across Europe, both in terms of personal use and rental, features and design capability.
- 2.8 The focus on clean air, the focus on last-mile journeys and the move away from mass transit solutions seen during COVID-19 are adding to the impetus and raising consumer awareness.
- 2.9 The Transport Research Laboratory (TRL) in the UK recently launched a study to identify the minimum safety requirements for safe use of personal mobility devices on public roads², and [how those safety requirements should be regulated](#) on behalf of the European Commission.

THE AIR QUALITY, INTERMODAL TRANSPORT, BLENDED ECOSYSTEM OPPORTUNITY

- 3.1 PLEVs are used either for short distances, e.g. directly from point to point, or part of longer inter-modal journeys e.g. to provide the last-mile solution for car or public transport journeys. Particularly, where the needs of commuters are not met by a public transport capability (e.g. transfer from suburban to urban areas).
- 3.2 **BY DESIGN:**
- They are predominantly designed for single rider use, ensuring the maximum design weight is comparable to cyclists.
 - PLEVs are small and of lightweight and compact design. This allows one person to carry them and enables better intermodal transport by bridging gaps between other transport systems and complementing a mobility ecosystem.
 - These properties mean that users can carry their PLEV with them, which is why they have benefits in terms of intermodal transport connection and covering short distances.
 - Their quick fold capability allows easy storage and minimizes the demand for storage and transport space.
 - Their electric based, automated power trains contain a small number of components. Their electrification reduces local traffic noise and exhaust emissions contributing to environmental improvements, coupled with ease of use for the rider.

² See more information in annex 8 TRL Study Information Sheet



- However, some compact designs, the lack of suspension in some cases, the small wheel diameter and the lack of load capacity or goods carrying capabilities by design, raise questions around handling and stability.
- The variation in designs leads to a variety of components that would require an independent assessment and calls into question the road safety risk caused by a lack of user familiarity.

KEY OBSERVATIONS ON THE CITA QUESTIONNAIRE

- 4.1 According to the latest CITA questionnaire³ on micromobility, which covers replies from 22 CITA members from across Europe and beyond, the following can be observed:
- There are different legal standards concerning the requirements for users, the technical specifications of the vehicles and the rules of behaviour in road traffic.
 - There was broad agreement on the components that should be included in a PTI requirement.
 - Only 27% of members agreed with insurance plate fitment.
 - Over 90% agreed with mandating helmet use.
 - 70% allowed carriage on public transport.
 - There was a broad agreement to include design speed, deceleration and driving dynamics (handling) to form part of the PTI assessment.
- 4.2 For a more detailed analysis, see Annex 5, and for the full survey results, see Annex 6.

³ See Annex 5 and 6




CITA'S RECOMMENDATIONS ON MICROMOBILITY

- 5.1 CITA recommends a complete motorized vehicle approval and PTI inspection regime which includes all inspection areas set out in Directive 2014/45/EU as amended.
- 5.2 **That** collaboration with all relevant stakeholders is the set-up: CITA is engaged in defining the technical standards of vehicle approval, the procedures for periodic testing and inspection and the right equipment required for testing of these vehicles.
- 5.3 **That** a collaborative focus group (involving industry, academia and government) is set up to deliver harmonized requirements.
- 5.4 **That** PLEVs are quickly anchored as a separate vehicle category within EU type-approval legislation to achieve harmonization.
- 5.5 **That** a regulation contains provisions for Technical Services to conduct PLEV technical assessments leading to a harmonized approval. And that authorized Testing Centers will be responsible for inspection of these vehicles so that they will perform safely within road traffic over the whole lifecycle.
- 5.6 **That** the rules of use should be harmonized throughout Europe and include considerations for the:
- Conditions of carriage on local public transport
 - Limitation of the areas of safe application and use
 - Speed limits depending on the area of use (pedestrian zone) and design capability
 - Helmet wearing obligation
 - Insurance and display
 - Modifications
 - Continuous approval
- 5.7 **That** normative specifications on the security of the installed software concerning unauthorized access and manipulation are to be created.
- 5.8 **That** European wide uniform requirements for the operators of rental systems for the protection of personal data are out of scope but are defined under the General Data Protection Regulation.
- 5.9 **That** uniform rules for handling the rental process are recommended so that customers have simple and uniform access to the vehicles and that payment and return can be made smoothly.



1. ANNEX 1 SAE J3194™: TAXONOMY & CLASSIFICATION OF POWERED MICROMOBILITY VEHICLES



SAE J3194™ TAXONOMY & CLASSIFICATION OF POWERED MICROMOBILITY VEHICLES

POWERED MICROMOBILITY VEHICLE







A wheeled vehicle that must:

- Be fully or partially powered
- Have a curb weight ≤ 500 lb (227 kg)
- Have a top speed ≤ 30 mph (48 km/h)

Scope of J3194™

- Only includes vehicles that are primarily designed for human transport and to be used on paved roadways and paths
- Excludes solely human-powered vehicles

TYPES OF POWERED MICROMOBILITY VEHICLES¹

	Powered Bicycle	Powered Standing Scooter	Powered Seated Scooter	Powered Self-Balancing Board	Powered Non-Self-Balancing Board	Powered Skates
						
Center column	Y	Y	Y	Possible	N	N
Seat	Y	N	Y	N	N	N
Operable pedals	Y	N	N	N	N	N
Floorboard / foot pegs	Possible	Y	Y	Y	Y	Y
Self-balancing ²	N	N	N	Y	N	Possible

¹All vehicles typically designed for one person, except for those specifically designed to accommodate additional passengers(s)
²Self-balancing refers to dynamic stabilization achieved via a combination of sensors and gyroscopes contained in/on the vehicle

CLASSIFICATION SYSTEM

The classification system consists of the micromobility vehicle type with descriptors of curb weight, vehicle width, top speed and power source.

Name	Code	Description
Curb weight		
Ultra lightweight	WT1	Curb weight ≤ 50 lb (23 kg)
Lightweight	WT2	50 lb (23 kg) < curb weight ≤ 100 lb (45 kg)
Midweight	WT3	100 lb (45 kg) < curb weight ≤ 200 lb (91 kg)
Midweight Plus	WT4	200 lb (91 kg) < curb weight ≤ 500 lb (227 kg)
Vehicle width		
Standard-width	WD1	Vehicle width ≤ 3 ft (0.9 m)
Wide	WD2	3 ft (0.9 m) < vehicle width ≤ 4 ft (1.2 m)
Extra-Wide	WD3	4 ft (1.2 m) < vehicle width ≤ 5 ft (1.5 m)
Top speed		
Ultra low-speed	SP1	Top speed ≤ 8 mph (13 km/h)
Low-speed	SP2	8 mph (13 km/h) < top speed ≤ 20 mph (32 km/h)
Medium-speed	SP3	20 mph (32 km/h) < top speed ≤ 30 mph (48 km/h)
Power source		
Electric	E	Powered by an electric motor
Combustion	C	Powered by an internal combustion engine

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 Source: SAE International from SAE J3194™ Standard - TAXONOMY & CLASSIFICATION OF POWERED MICROMOBILITY VEHICLES. https://www.sae.org/standards/content/J3194_201911/

SAE J3194™ TAXONOMY & CLASSIFICATION OF POWERED MICROMOBILITY VEHICLES

GUIDANCE ON TERMINOLOGY USE

The following naming convention may be used to develop either word- or code-based terms using classifiers and vehicle types.



- Curb weight: 40 lb
- Width: 2 ft
- Top speed: 18 mph
- Propulsion: electric

"Ultra lightweight, standard-width, low-speed, electric standing scooter"
 "WT1/WD1/SP2/E standing scooter"



- Curb weight: 190 lb
- Width: 2 ft
- Top speed: 30 mph
- Propulsion: electric

"Midweight, standard-width, medium-speed, electric seated scooter"
 "WT3/WD1/SP3/E seated scooter"

PHASIS

This SAE technical report J3194 provides a taxonomy and classification of powered micromobility vehicles. These vehicles may be privately owned or be available via shared- or rental-fleet operations. The report was issued in November 2019. It does not provide specifications or otherwise imposes minimum safety design requirements for powered micromobility vehicles.



2. ANNEX 2 CURRENT REQUIREMENTS ON PTW

Currently, there are only DVSA (UK) inspection processes and rules for motorcycle, scooter, moped and motorcycle combination (class 1 and 2 vehicles) MOT tests available which are linked [here](#).

The following table shows an overview of existing requirements in European states (selection with no claim to completeness).

Country	Classifications	Speed limit	Rated Engine power	Max weight (kg)	Age	Insurance requirements
Sweden	Classified as bike	20 km/h	<250W	No limit	Helmet <15 years	No
Norway	Classified as bike	20 km/h	No limit	No limit	No limit	No
Finland	Classified as bike	25 km/h	No limit	No limit	Helmet <15 years	No
Denmark	Classified as e-scooter	20 km/h	No limit	25	15	Yes
UK	motor vehicle	25 km/h	<550W	55	16 (provisional drivers license)	Yes
Germany	E-scooter	20 km/h	500W	55	14	Insurance + plate
Austria	E-scooter	25 km/h	600W		16	No requirement
Switzerland	E-scooter	20 km/h	500W	200	14	No requirement
France	PMD	20 km/h	No max power of the engine in France, only a speed limit (25 km/h)		14	Need to have insurance coverage for Third party liability and personal damages
Italy	Mezzi di micromobilita personale (monopattini)	20 km/h	500 W max		14	Need to have insurance coverage for Third party liability and personal damages
Spain	VMP	6 min - 20 or 25 km/h max		Between 25 and 50 - TBC	Between 25 and 50 - TBC	Yes

Source: Voi Technology AB (2020)

3. ANNEX 3 EXISTING INTERNATIONAL STANDARDS AND LEGAL APPROACHES FOR TESTING

The draft standard ([DIN EN 17128](#)) "Non-type-approved light motorized vehicles for the transport of persons and goods and related equipment - Personal light electric vehicles (PLEV) - Safety requirements and test methods" was developed as a technical standard regulating the product safety or operational stability of PLEV.

By unifying requirements, a sufficient safety level is to be achieved to minimize injuries and hazards to users and other road users. The draft standard was prepared by the responsible European working committee "[CEN/TC 354/WG 4 - Light electric vehicles and self-balancing vehicles](#)".



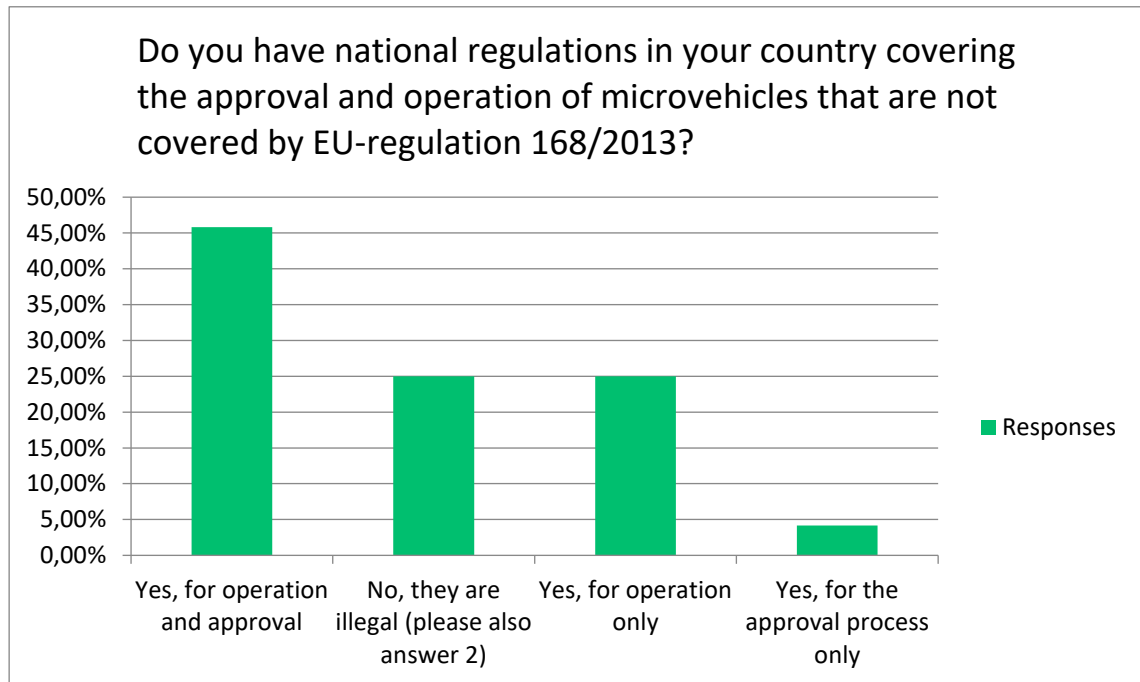
4. ANNEX 4 SUGGESTED REQUIREMENTS FOR SAFE OPERATION OF PLEVS BY CITA

- 1 Safe participation in road traffic is only possible if the vehicles are put into operation according to the technical requirements.
- 2 Minimum performance requirements should be specified and tested independently during a future vehicle approval and PTI testing procedures. These could be expressed in terms of outcome (e.g. average deceleration), under specific speed, load, and gradient conditions.
Future work on approval and testing procedures should include the appropriate test equipment used. We propose that defined requirements should be produced by the European Commission, acknowledging national regulations already in force and developed via the regularized development approaches of European regulation.
- 3 A regulation should contain provisions for PLEV on conducting various test sections by Technical Services for the approval and then inspected by bodies for PTI and the corresponding requirements to ensure that tests are successfully performed.
- 4 Specific rules of conduct are required for travelling through traffic areas to ensure the safety of all road users. This contains provisions for PLEV on conducting various test sections and the corresponding requirements to ensure that tests are successfully performed. The test methods CITA members proposed in the questionnaire include determining maximum design speed, testing the deceleration devices, various driving dynamic tests (indentation, ramps, unilateral drop, curbstone) and deactivating power transmission.
- 5 PLEV, e.g., must comply with the tests according to the testing requirements and requirements for driving dynamics. Minimum requirements for PLEV driving dynamics should be tested to ensure they can participate safely in a blended road traffic ecosystem within the specified operational design domain specified. The provisions are necessary to provide consumer confidence and enforcement transparency on the road safety capabilities of these vehicles.

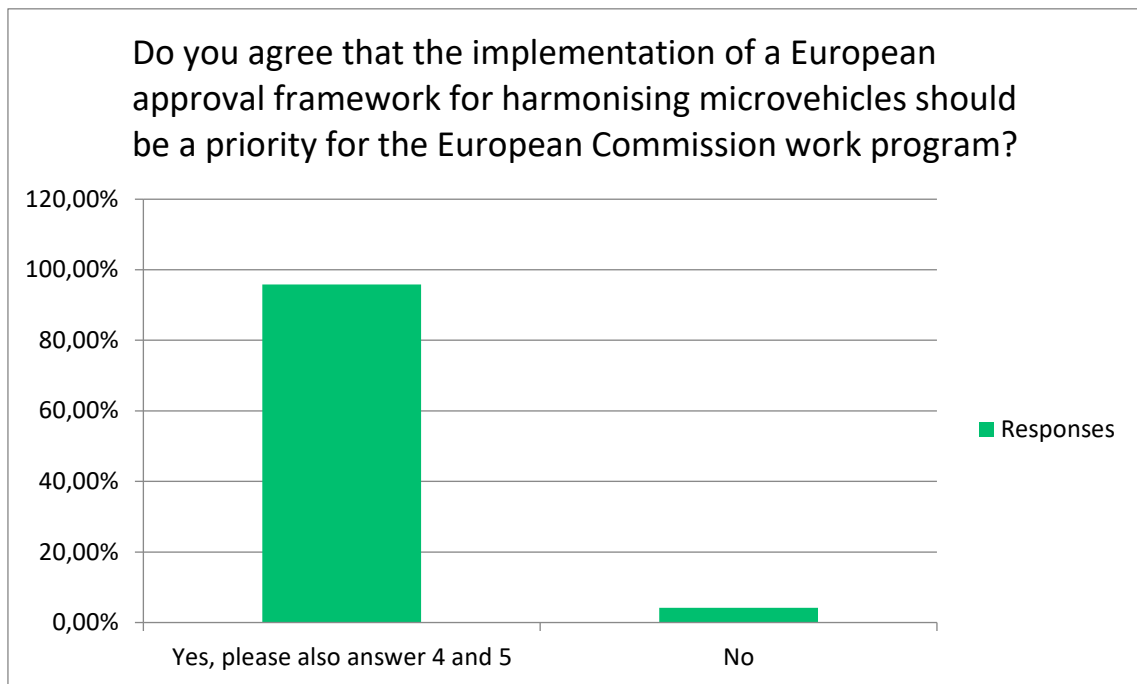


5. ANNEX 5 CITA SURVEY – DETAILED OBSERVATIONS

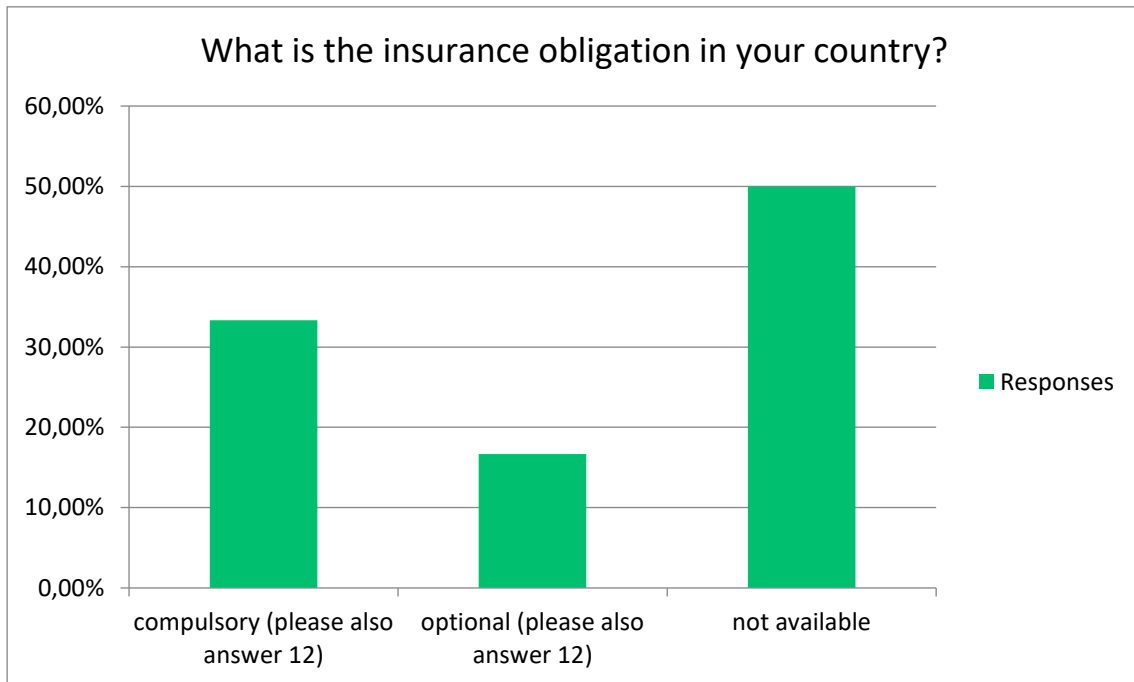
1. The CITA questionnaire on micromobility compiles replies from 22 CITA members from across Europe and beyond, between December 2019 and February 2020. There are very different legal standards in the EU Member States concerning user requirements, technical specifications of vehicles and rules of behaviour in road traffic. In some countries, the use is even illegal (e.g. Lithuania, Croatia).



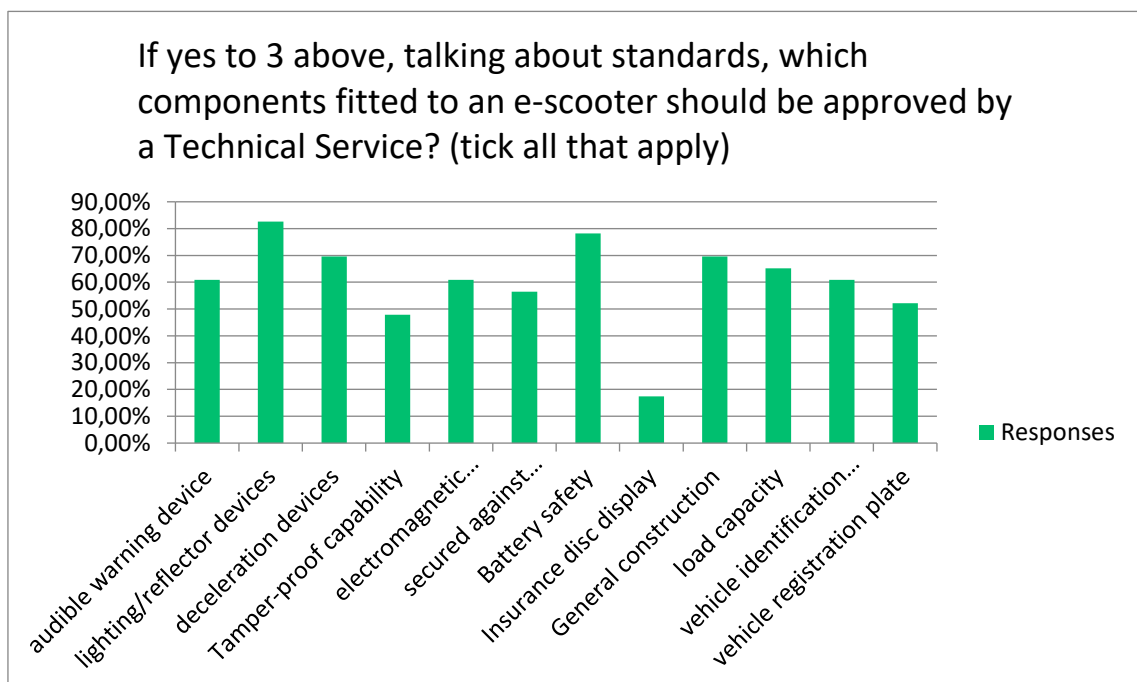
2. Since the type-approval regulation for motorcycles (EU), 168/2013 excludes PLEVs and the approval of such vehicles has to be regulated at a national level, many different regulations, permitted use cases and operating models for PLEVs coexist in the EU, which do not necessarily align the requirements. This increases the expense of designing, marketing and approving the same products across the EU. Regulation offers an opportunity for standardization and scalable build, which in turn reduces costs.



3. CITA members agree that a European approval framework for PLEV should be a priority in the EU Commission's work programme.
4. Future regulation should acknowledge the high demand among citizens for these vehicles. It should lay down the general requirements concerning vehicle design, build and approval, connected technologies, permitted use, insurance and driving licenses so that safe usage on public roads of these vehicles within the EU will be harmonized in future. It should close the gaps created by Regulation (EU) No 168/2013, which specifically excludes vehicles without seats.
5. A regulation should contain provisions for Technical Services to successfully perform specified, repeatable technical assessments to demonstrate compliance with minimum safety criteria. For example, in Germany, the manufacturer must apply to obtain a national type approval called "General Operating License" (ABE) for series-produced vehicles. A Technical Service certifies that the requirements according to the national Road Traffic Licensing regulation (StVZO) are met by the manufacturer (§ 20 StVZO). An individual vehicle approval according to § 21 StVZO can also be certified for individual vehicles by the "Technical Service" or similar national organizations ("Technical Test Centre").



6. Besides the approval process, the specific terms and references of **vehicle insurance** for PLEV vary with legal regulations in each region. Spain, Malaysia, Singapore, Qatar and Germany do have an insurance obligation for using PLEV in their country. In Germany, every PLEV approved according to the national regulation must be subject to compulsory insurance and have a valid insurance plate. A PLEV only receives an insurance plate number if it has an operating license (type or individual vehicle approval).

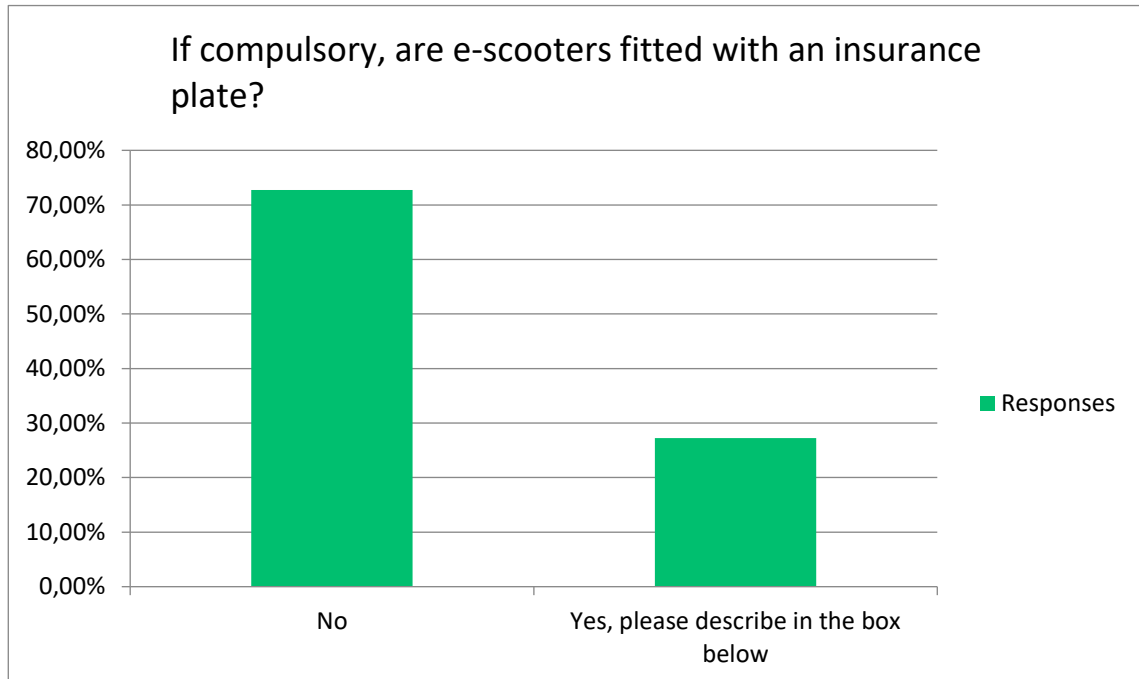




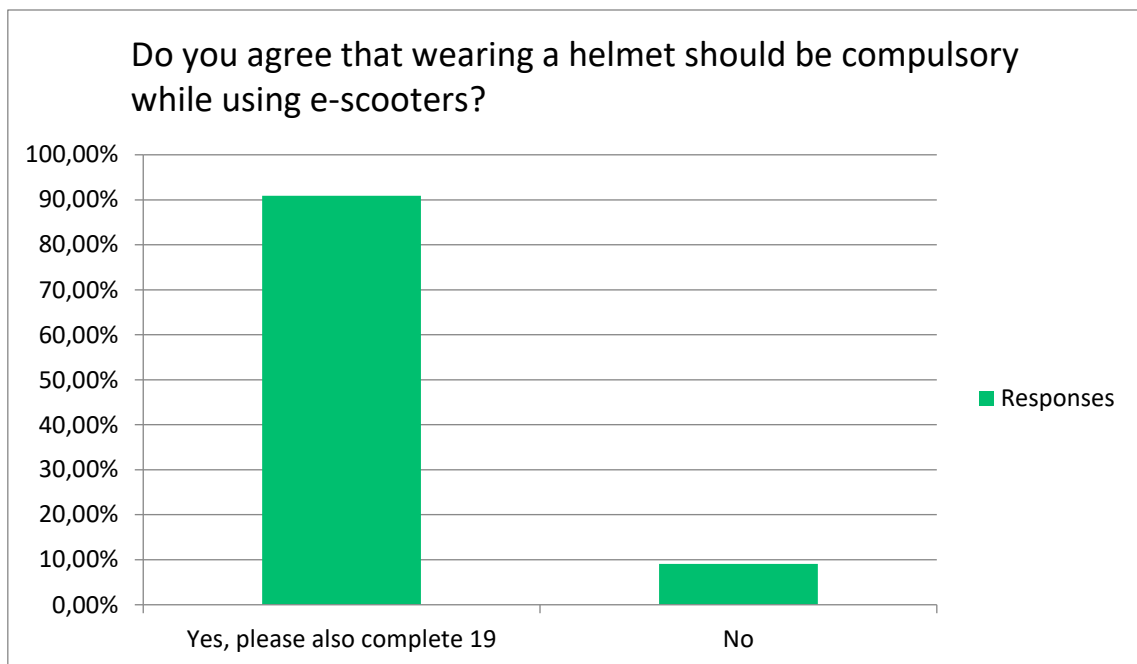
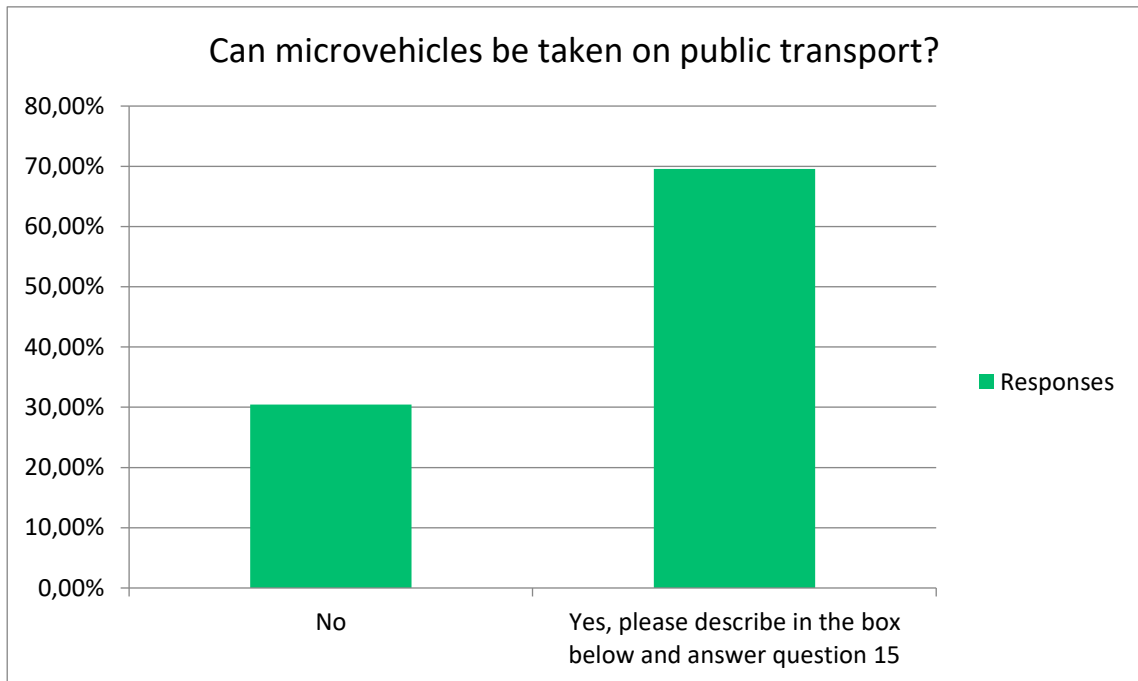
7. Light powered vehicles are excluded from **periodic technical inspections (PTI)** in Europe. Directive 2014/45/EU set minimum emissions and safety standards for vehicles that are currently in operation. It applies only for vehicles with a minimum design speed of 45 km/h. Since one of the primary goals of roadworthiness tests is to ensure road safety, it is not logical that certain categories of vehicles are inspected periodically, while others are excluded from this obligation. There is an increased risk in a blended mobility sector if vehicles cannot always demonstrate a minimum road safety standard. As CITA already concluded in its 2019 study, mandatory inspections of two-, three-wheelers and light trailers would have a positive cost-benefit impact.
8. A PLEV must be equipped with deceleration devices such as two independent brakes so that if one fails, the other can still bring the vehicle to a standstill.
9. As vehicles are to be allowed access to local roads, the requirements regarding headlights, rear lamps, reflectors and side reflectors as per cycling equipment are advisable.
10. Due to the driving characteristics of scooters, it is also highly recommended to include the obligation for direction indicators in European regulation. Unlike bicycles, it is not possible to simply indicate a turn by hand.
11. As PLEV are practically silent, they must be equipped with at least one audible warning device as on mopeds and bicycles.
12. Requirements regarding electromagnetic compatibility should be laid down because mutual interference between electrical devices must be included in any mobility ecosystem. UN/ECE Regulation No 10 is appropriate as a minimum requirement because it already applies to vehicles in road traffic (EMC test documentation must be attached).
13. Standard DIN EN 15194-2018-11 (4.2.17 Anti-tampering measure) is the minimum standard for protection against tampering to prevent unauthorized access or changes to the vehicle. It should be applied. Consideration should be given to limiting the area of operational design of these vehicles, e.g. urban parks, cycle lanes and/or specific roads.
14. Engine power control for PLEV must be designed to ensure hands-on capability i.e. autonomously cut out within one second after the driver lets go. The purpose of this requirement is to prevent inadvertent power activation without driver input and/or continued power after a dismount.
15. Standard DIN EN 15194-2018-11 (4.2.3 Batteries) is the minimum standard for ensuring battery safety to guarantee safe use on the public roads and transportation on public transport.



For this purpose, the battery shall be approved at the system level under UN Regulation 38.3. The regulations of ISO 13063 and UN R 136 help to assess the approval regulations DIN EN 15194:2017 Chapter 4.2.



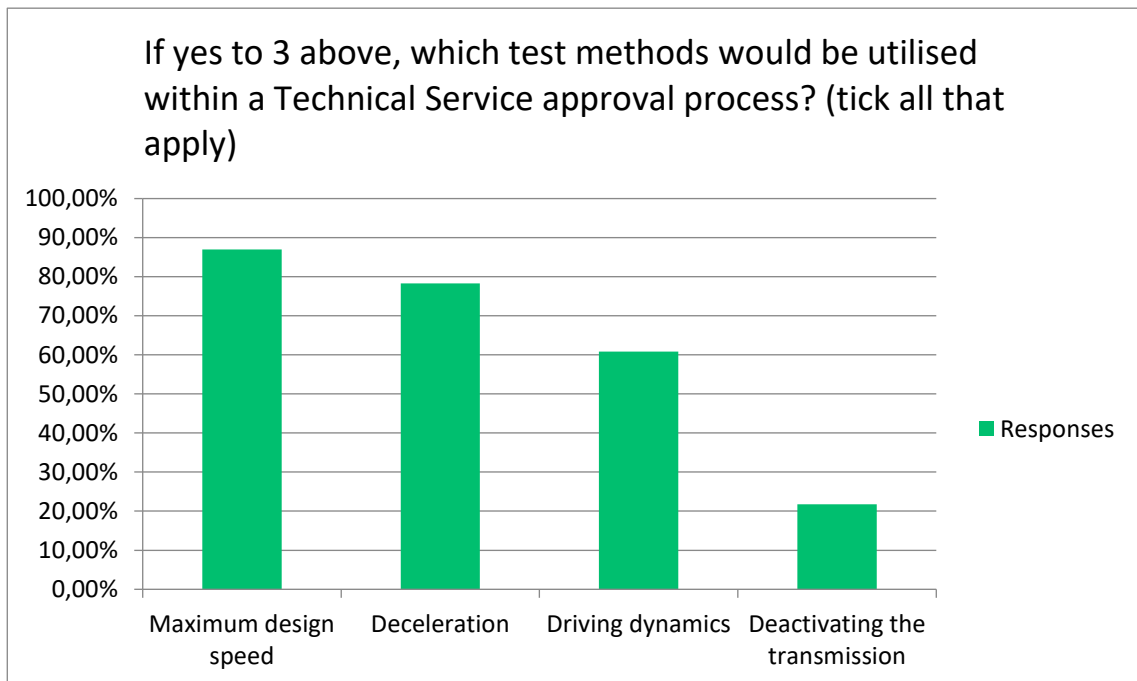
16. According to the German ordinance, PLEV is motor vehicles with a maximum design speed of no less than 6 km/h and must therefore have **insurance cover**. However, CITA members would not agree that a PLEV might only be operated on public roads with a valid insurance disc. If an insurance disc becomes mandatory, it will comply with specific design requirements to prevent the risk of injury to drivers or other road users.
17. Considering the usual speed ranges, the use in public traffic areas and especially the increased motor demands on handling, we recommend the introduction of a **helmet obligation** for PLEV. Helmets shall be approved under EN 1078.



18. PLEVs are often designed and used for bridging the first/last mile and as linking vehicles in intermodal transport. These vehicles must be allowed to be carried on public transport. Again, there is variation across the EU Member States.



19. The standard and a future European regulation must not contradict each other but complement each other.
20. Concerning the mechanical load capacity of the electrical components, the draft standard DIN EN 17128 provides for two different test methods. On the one hand, a hammer test (spring hammer) is carried out under EN 60068-2-75, and on the other hand, dismountable electrical components are subjected to a drop test under EN 22248 from a height of 0.9 m.
21. The two standards (DIN EN 17128 for PLEV and DIN EN 15194:2018-11 for Pedelec 25 (EPAC)) both contain the same above-mentioned test procedures regarding the mechanical strength of the batteries. The short-circuit test is also identical. The latter test for protection against mechanical stress corresponds approximately to the test described in UN R 136 Annex 8c, item 2.2. for battery systems for vehicles of Class L.



6. ANNEX 6 CITA SURVEY – FULL RESULTS

[See PDF document annex 6 CITA survey full results](#)

7. ANNEX 7 DVSA E-SCOOTER HIRE FLEET GAP ANALYSIS SAMPLE

[See PDF Document ANNEX 7 DVSA E-scooter Hire Fleet Gap Analysis](#)



8. ANNEX 8 OTHER RECOMMENDED ARTICLES/ FURTHER READING COVERING MICROMOBILITY

Electric Scooter Injuries and Hospital Admissions in the United States, 2014-2018

<https://jamanetwork.com/journals/jamasurgery/article-abstract/2758159>

ROSPA Road Safety Factsheet Electric Scooters (E-Scooters)

<https://www.rosipa.com/rospaweb/media/Documents/Road%20Safety/road-safety-factsheet-e-scooters.pdf>

The International Transport Forum [Safe Micromobility](#)

https://www.itf-oecd.org/sites/default/files/docs/safe-micromobility_1.pdf

Fleet Europe E-scooters are 'unsafe' says influential safety organisation

<https://www.fleeteurope.com/en/maas/europe/features/e-scooters-are-unsafe-says-influential-safety-organisation?a=JMA06&t%5B0%5D=e-scooter&t%5B1%5D=Safety&t%5B2%5D=ITF&t%5B3%5D=Bird&t%5B4%5D=Lime&curl=1>

Injury from electric scooters in Copenhagen: a retrospective cohort study

<https://bmjopen.bmj.com/content/bmjopen/9/12/e033988.full.pdf>

European Transport Safety Council E-Scooters

<https://etsc.eu/tag/e-scooters/>

TRL Review of current practice and safety implications of electric personal mobility devices

<https://assets.gov.ie/26565/104b462a29fe421284339210e86ebc73.pdf>

TRL Study Information Sheet on Privacy Notice for Personal Mobility Device Study

<https://trl.co.uk/temporary-landing-pages/privacy-notice-for-personal-mobility-device-study>

European Commission Conference Micro-mobility: the next big thing?

<https://ec.europa.eu/transport/sites/transport/files/2019-10-14-micro-mobility-background-note.pdf>

BBC News Electric scooters: Europe battles with regulations as vehicles take off

<https://www.bbc.co.uk/news/world-europe-49248614>

Euronews Deaths put e-scooters in the spotlight

<https://www.euronews.com/2019/06/17/as-deaths-put-e-scooters-in-the-spotlight-what-are-european-countries-doing-to-keep-citize>

UK Parliament E-scooters: pavement nuisance or transport innovation?

<https://committees.parliament.uk/committee/153/transport-committee/news/119723/legalise-escooters-says-transport-committee/>



9. ANNEX 9 AUTHORS AND CONTACT DETAILS

CITA, the International Motor Vehicle Inspection Committee, is the worldwide not-for-profit association of governmental agencies and authorised private companies active on vehicle compliance.

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