DISCREPANCIES BETWEEN REGULATION OF E-SCOOTERS ACROSS THE EU

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Abstract
The commercial use of e-scooters began between 2017 and 2018 in North America, where large-scale e-scooter sharing systems began to take hold. Due to their speed and convenience, the expansion of these systems quickly spread to major European cities as well. During the COVID-19 pandemic, sales of e-scooters also increased for individual purposes, as individuals were looking for an alternative to public transit. As a result, e-scooters have rapidly integrated into urban micromobility across the European Union and worldwide. The use of e-scooters by different age groups and for various purposes indicates widespread adoption. Even so, there is currently no binding framework at the EU level regulating their use in traffic. Most e-scooters do not fall under the scope of Regulation (EU) No 168/2013 on vehicle type-approval but are treated as products for sale on the internal market because their characteristics, especially power and speed, are lower than the Directive presumes for powered two wheelers like mopeds. Therefore, key aspects of traffic regulation, including age restrictions, the use of protective equipment, speed limits, insurance, and registration, depend on the individual EU Member State. This article presents a comparative analysis of specific areas of traffic legislation in all 27 EU member states. The analysis covers the areas of legislation stated above: age restrictions, the use of protective equipment, speed limits, insurance, and registration. Each specific area of legislation was categorized and classified at the national level. This breakdown allows us to see where legislation is harmonized across countries and where more significant discrepancies exist. The findings highlight discrepancies in regulations, with none of the areas of legislation under consideration exhibiting uniform rules across the entire EU. This fragmentation of legislation has consequences for road safety, cross-border mobility, and micromobility policy in urban environments. With the introduction of harmonized legislative framework for the use of e-scooters across the EU, the current consequences could be mitigated.

Keywords: *e-scooter, urban micromobility, EU traffic regulation, road safety, legislative fragmentation*
JEL classification: R41, R48, K32

INTRODUCTION

Urban transport has assumed new dimensions across the globe since late 2017, following the introduction of the first shared mobility systems for e-scooters (Bozzi & Aguilera, 2021). Single-user vehicles characterised by low speeds, light weight, and agility have thereby become an integral component of micromobility (Guyader et al., 2021). As Abduljabbar et al. (2021) observe, such vehicles enable flexible, cost-effective, and sustainable modes of travel, particularly for short distances or for covering the first and last mile in combination with other transport modalities (Guyader et al., 2021). According to Bozzi and Aguilera (2021)the marked increase in their use and accessibility has been driven primarily by digital platforms, underpinned by rapid advances in communication technologies and the accelerated flow of information. The number of trips undertaken within shared mobility schemes rose by 5% between 2023 and 2024, reaching 640 million, despite an overall reduction in the number of vehicles deployed in such systems (*European Shared Mobility*, 2025).

Nevertheless the proliferation of shared e-scooter platforms and the substantial number of privately owned devices, the legislative landscape differs considerably among the 27 EU Member States. E-scooters are technically configured and designed to achieve a speed of 25 km/h. Devices falling within this compliant category are generally treated as light vehicles or bicycle equivalents, whereas those exceeding the prescribed speed or weight thresholds are reclassified into motor-vehicle categories such as mopeds, thereby triggering more stringent regulatory obligations. Within the EU, e-scooters are nevertheless marketed under the classification of products, a circumstance that carries significant implications for user safety, cross-border mobility, operator compliance, and the coherence of urban mobility policy. Riders travelling internationally, or those using shared fleet services that operate across borders, may be subject to entirely different legal obligations depending on the jurisdiction. Operators of micromobility services must likewise navigate a complex patchwork of national requirements, while policymakers are left without a common reference framework. The present paper addresses this gap in the comparative academic literature by providing a systematic analysis of e-scooter regulation across all 27 EU Member States. The analysis draws on original research conducted within the eSCURB project. It examines four principal regulatory dimensions — minimum age, helmet requirements, insurance and registration obligations, and speed limits — and identifies patterns of convergence and divergence across national legal systems.

1. EU LEGAL FRAMEWORK FOR E-SCOOTERS

The fragmentation and discrepancies observable within the EU stem from the inherent limitations of existing legal frameworks, and in particular from the classification of e-scooters as products rather than as vehicles. The principal EU type-approval framework, Regulation (EU) No. 168/2013, applies to two- and three-wheeled motor vehicles and quadricycles designated as category L vehicles, which encompass mopeds and motorcycles. E-scooters, designed primarily for micromobility and operated in a standing position without a seat, do not qualify as category L vehicles and consequently fall outside both the type-approval framework and the scope of vehicle classification under traffic legislation. At the EU level, e-scooters are instead treated as consumer products subject to specific regulatory requirements. Regulation (EU) 2023/988 on general product safety establishes the fundamental criteria for preventing hazardous products from entering the market, while the technical specifications underpinning CE marking — which signifies European product conformity, though is not obligatory — are set out in the EN 17128 standard on light personal electric vehicles.

Supplementary legislation governs batteries (Regulation (EU) 2023/1542), hazardous materials (Directive 2011/65/EU – RoHS), and waste management (Directive 2012/19/EU – WEEE). Strategic documents such as the European Green Deal and the Strategy for Sustainable and Smart Mobility further outline policy directions promoting the integration of micromobility into urban transport; these instruments, however, serve solely as guidance, carry no legally binding force, and do not establish standardised traffic rules. The classification of e-scooters as products rather than vehicles thus constitutes the decisive distinction shaping their regulation across Member States. While the EU sets the criteria for their placement on the market, rules governing their use in traffic — including the minimum riding age, helmet requirements, insurance and registration obligations, and speed restrictions examined in this paper — remain a matter of national jurisdiction and policy orientation, and form the basis of the legislative fragmentation observable among individual Member States.

2. METHODOLOGY

This paper's comparative analysis is based on a systematic review of national laws, regulatory guidance documents, and official sources for all 27 EU member states. This was done as part of the eSCURB project's analysis of legislation and regulation. Data was collected between 2024 and beginning of 2026. For each EU member state, the primary national traffic law governing the legal classification of e-scooters was examined, encompassing regulations on minimum age, helmet use, insurance, registration, and speed limits applicable to e-scooters. The sources used include online databases of national laws, official publications from governments and transportation authorities, and regulatory documents that have been put together. Where two differing data points were identified for a given area of inquiry, official government sources were treated as authoritative.

The analysis focuses on compliant e-scooters, defined as devices that fall within the standard legal e-scooter envelope in each country, typically capped at a maximum design speed of 25 km/h and within applicable power and weight limits. Devices that exceed these thresholds and are reclassified as motor vehicles, such as mopeds, fall outside the scope of this analysis.

The collected data are presented across four distinct categories: minimum age requirements, helmet use, insurance and registration criteria, and speed restrictions. Within each category, the data were further reorganised according to the requirements of a clear yet sufficiently detailed presentation of the findings, with the aim of facilitating cross-country comparison. The categorisation reflects recurring regulatory patterns rather than an exhaustive classification of all national legislative nuances. These subsections give an in-depth overview of the regulations mentioned for each EU country.

3. COMPARATIVE ANALYSIS

Key issues in e-scooter regulation include age, the use of helmets and other personal protective equipment, licensing and registration criteria, speed restrictions, and technical specifications for e-scooters. The subchapters provide a detailed overview of the regulations specified for each EU nation.

3.1. MINIMUM AGE REQUIREMENTS

Due to vehicle categorisation, a notable regulatory difference at minimum required age at which young people are permitted to ride e-scooters is among EU member states. The legislation of all EU member states has been grouped into four main categories, these being no minimum age requirement, strict and moderate, and a graduated system. Each country also has its own specific rules in its legislation, which are listed in the notes, and all the data collected for each country are presented in Table 1.

The first category includes countries that have no legally defined minimum age for riding e-scooters, representing 18.5% of EU member states, including the Czech Republic, Hungary, Portugal, Spain, and Sweden. In this category Spain is an exception, where individual municipalities determine the age limits, which are typically between 15 and 16 years of age, as there is no national legislation setting an age limit. The second category includes countries with a strict statutory minimum age of 16 or above, namely Belgium, Bulgaria, Ireland, and the Netherlands. Belgium is particularly notable as a model of regulatory clarity, with a single unambiguous threshold that minimises interpretation errors. The third category, which encompasses a moderately strict minimum age requirement of 14 or 15 years, includes Croatia, Cyprus, Denmark, Finland, France, Germany, Italy, and Romania. Most countries fall into the category of mandatory age above 14, representing 22.2% of EU member states. The fourth and final category includes countries with legally established graduated systems, in which age interacts with licensing, training, or supervision requirements, representing 37% of EU member states. These countries are Austria, Estonia, Greece, Latvia, Lithuania, Luxembourg, Malta, Poland, Slovakia, and Slovenia.

Table 1: Minimum age requirements for e-scooter riders across EU Member States

Country	Min. Age	Category	Notes
Austria	12	Tiered	Under 12 with adult/bicycle permit
Belgium	16	Strict 16+	Uniform national rule
Bulgaria	16	Strict 16+	Uniform national rule
Croatia	14	Moderate 14+	National traffic law
Cyprus	14	Moderate 14+	National traffic law
Czech Republic	None	No minimum	Under 10 treated as pedestrians
Denmark	15	Moderate 15+	National rule
Estonia	16	Tiered	8–15 need supervision; full rights at 16
Finland	15	Moderate 15+	National rule
France	14	Moderate 14+	National rule
Germany	14	Moderate 14+	National rule
Greece	15	Tiered	12+ for ≤6 km/h devices; 15+ for standard
Hungary	None	No minimum	Legal gap identified
Ireland	16	Strict 16+	National rule
Italy	14	Moderate 14+	National rule
Latvia	14	Tiered	14–17 require bicycle/driving licence
Lithuania	16	Tiered	14–15 with training certificate
Luxembourg	10	Tiered	Under 10 on sidewalks; 13+ cycle infra
Malta	16	Tiered	Mandatory theory test + AM licence
Netherlands	16	Strict 16+	For RDW-approved scooters only
Poland	10	Tiered	10–17 need bicycle card; 18+ free
Portugal	None	No minimum	Sidewalk exception for ≤10 years
Romania	14	Moderate 14+	Road traffic law
Slovakia	10	Tiered	Under 10 sidewalks only
Slovenia	14	Tiered	12–14 with bicycle licence
Spain	None	No minimum	Municipalities often set 15–16
Sweden	None	No minimum	For bicycle-equivalent scooters

3.2. HELMET REQUIREMENTS

Legislation regarding helmet usage obligations pertains to regulations that directly affect the physical safety of the rider in the event of a collision.

As well here, inconsistent requirements are observed across individual EU member states. Table 2 presents the statutory provisions for each EU country, which have been consolidated into four main categories, these being helmets not required, helmets required below a certain age, helmets required for all riders, and other. The legal requirement of individual country is listed in the notes. The first category, comprising the largest segment at 37%, includes Belgium, Finland, France, Germany, Ireland, Luxembourg, Malta, the Netherlands, Poland, and Portugal, where helmet use is not legally required for e-scooter riders of any age. In certain countries, helmet use is recommended or strongly advised, yet it is not legally mandated. Slovakia is the only exception in this category, as non-mandatory usage pertains solely to adult riders, with age-specific regulations established for minors. The second and most extensive category encompasses countries that legally impose restrictions on helmet usage for e-scooter riders up to a designated age. In the Czech Republic, Lithuania, and Slovenia, helmet use is mandatory until the age of 18; Latvia mandates it until 17; Estonia and Romania until 16; Sweden until 15; and Austria requires it only until 12. In specific nations, this regulation pertains solely to travel on carriageways. Bulgaria, Croatia, Cyprus, Denmark, Greece, and Italy mandate helmet use for all riders, constituting a universal regulation that accounts for merely 22% of EU member states. There are two significant exceptions: first, Hungary, for which no data on helmet regulations for e-scooter riders is available; and second, Spain, where helmet usage decisions, similar to age restrictions, are determined by individual municipalities.

Table 2: Helmet requirements for e-scooter riders across EU Member States

Country	Helmet Requirement	Notes
Austria	Mandatory under 12	Age-specific
Belgium	Not mandatory	Recommended only
Bulgaria	Mandatory for all	Universal rule
Croatia	Mandatory for all	Universal rule
Cyprus	Mandatory for all	Universal rule
Czech Republic	Mandatory under 18	Age-specific
Denmark	Mandatory for all	Universal rule
Estonia	Mandatory under 16	Age-specific
Finland	Not mandatory	Recommended only
France	Not mandatory	Local mandates possible
Germany	Not mandatory	No national rule
Greece	Mandatory for all	Universal rule
Hungary	Not identified	No e-scooter specific rule
Ireland	Not mandatory	Recommended only
Italy	Mandatory for all	Universal rule
Latvia	Mandatory under 17	Age-specific
Lithuania	Mandatory under 18 / all on carriageway	Stricter from 2026
Luxembourg	Not mandatory	Strongly recommended
Malta	Not mandatory	No national rule
Netherlands	Not mandatory	For approved e-scooters
Poland	Not mandatory	No national rule
Portugal	Not mandatory	No national mandate
Romania	Mandatory under 16 on carriageway	Age + location specific
Slovakia	Not mandatory for adults	Age-specific for minors
Slovenia	Mandatory under 18	Age-specific
Spain	Varies by municipality	No uniform national rule
Sweden	Mandatory under 15	Age-specific

3.3. INSURANCE AND REGISTRATION REQUIREMENTS

Legislation regarding e-scooter insurance and registration is closely connected to the classification of the e-scooter according to its speed and power specifications in each country. Table 3 delineates the existing registration and insurance mandates for e-scooters across EU member states, specifically those governed by standard legal frameworks, which apply to vehicles limited to speeds under 25 km/h. The majority of EU member states, accounting for 66.7%, lack legally mandated insurance or registration requirements for e-scooters within the conventional legal framework. The countries listed are Austria, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, Greece, Ireland, Lithuania, Luxembourg, Poland, Portugal, Romania, Slovakia, Slovenia, and Sweden. France, Germany, and Italy possess legislation exclusively concerning insurance. No EU member state has exclusively registration-only requirements, however, Bulgaria, Latvia, Malta, and the Netherlands mandate both insurance and registration by law, with Spain anticipated to join this category in 2026 via Law 5/2025. Portugal represents a notable exception, as per Legislative Decree No. 26/2025, conditional insurance is mandated solely when a designated speed or weight limit is surpassed.

Table 3: Insurance and registration requirements across EU Member States

Country	Insurance	Registration	Category
Austria	Not required	Not required	Neither
Belgium	Not required	Not required	Neither
Bulgaria	Required	Required	Both
Croatia	Not required	Not required	Neither
Cyprus	Not required	Not required	Neither
Czech Republic	Not required	Not required	Neither
Denmark	Not required	Not required	Neither
Estonia	Not required	Not required	Neither
Finland	Not required	Not required	Neither
France	Required	Not required	Insurance only
Germany	Required	Not required	Insurance only
Greece	Not required	Not required	Neither
Hungary	Not required	Not required	Neither
Ireland	Not required	Not required	Neither
Italy	Required	Not required	Insurance only
Latvia	Required	Required	Both
Lithuania	Not required	Not required	Neither
Luxembourg	Not required	Not required	Neither
Malta	Required	Required	Both
Netherlands	Required	Required	Both (model approval)
Poland	Not required	Not required	Neither
Portugal	Conditional	Not required	Conditional
Romania	Not required	Not required	Neither
Slovakia	Not required	Not required	Neither
Slovenia	Not required	Not required	Neither
Spain	Required (from 2026)	Required (from 2026)	Both (transitional)
Sweden	Not required	Not required	Neither

3.4. PERMITTED SPEED LIMITS

Moreover, the classification of e-scooters is closely linked with speed limits, as the legislation in most member states designates e-scooters as vehicles with a maximum design speed not surpassing 25 km/h. Nevertheless, disparities are between some countries, with some establishing lower speed limits in different riding zones and types of infrastructure.

Table 4 presents the legally set maximum speeds, along with specific deviations in maximum permitted speed based on zone or infrastructure classification.
Approximately 77.8% of EU member states implement a standardized national speed limit of 25 km/h, aligning with the technical criteria utilized in the classification of e-scooters. Denmark, Germany, Ireland, Poland, and Sweden have established a legal national maximum riding speed of 20 km/h for e-scooters. Cyprus, Italy, and Malta are part of this group of countries, while they have implemented zone-specific restrictions. In Cyprus, the speed limit in markets and pedestrian zones is 10 km/h, while in Italy, the speed limit in pedestrian zones is 6 km/h. In Malta, the speed limit on sidewalks and bike paths is 10 km/h. Lithuania establishes a practical speed limit of 20 km/h, although the design threshold is 25 km/h, and further reduces it to 7 km/h near pedestrians.

Table 4: Permitted speed limits across EU Member States

Country	Max Speed	Zonal Variations
Austria	25 km/h	None specified
Belgium	25 km/h	None specified
Bulgaria	25 km/h	None specified
Croatia	25 km/h	None specified
Cyprus	20 km/h	10 km/h in squares/pedestrian streets
Czech Republic	25 km/h	None specified
Denmark	20 km/h	Uniform national limit
Estonia	25 km/h	None specified
Finland	25 km/h	None specified
France	25 km/h	None specified
Germany	20 km/h	Uniform national limit
Greece	25 km/h	None specified
Hungary	25 km/h	None specified
Ireland	20 km/h	Uniform national limit
Italy	20 km/h	6 km/h in pedestrian areas
Latvia	25 km/h	None specified
Lithuania	25 km/h (design)	20 km/h riding; 7 km/h near pedestrians
Luxembourg	25 km/h	None specified
Malta	20 km/h	10 km/h on pavements/cycle paths
Netherlands	25 km/h	None specified
Poland	20 km/h	Uniform national limit
Portugal	25 km/h	None specified
Romania	25 km/h	Only on roads with ≤50 km/h limit
Slovakia	25 km/h	None specified
Slovenia	25 km/h	None specified
Spain	25 km/h	Municipal zones may vary
Sweden	20 km/h	Uniform national limit

4. DISCUSSION

A comparative analysis of the four regulatory categories reveals a pattern of fragmentation in national legislation within the EU.

The fragmentation and legislative divergences among EU member states result from the EU's classification of e-scooters as products, which permits individual member states to regulate their use in traffic, while product safety and market accessibility are retained under EU jurisdiction.

The four regulatory categories analysed reflect varying policy priorities, infrastructure contexts, and safety considerations among individual EU member states. This is evident in the first category, the minimum age requirement for riding e-scooters, that was analysed. The absence of any minimum age restriction is present in five countries, including Spain and France, which represent large markets, and suggests a greater emphasis on individual responsibility and ensuring accessibility for all. Kazemzadeh et al. (2023) notes that e-scooter users under the age of 35 are more frequently involved in accidents, as they are more exposed to risk-taking behaviour, which is closely associated with greater accident exposure. Countries that have legislated strict minimum age thresholds above 16 years, or tiered systems requiring prior rider education, place greater importance on a structured approach and the safety of both riders and those around them. Nevertheless, the minimum age thresholds for certain tiered systems remain relatively low, at just 14 years. Cipriani (2024) notes that younger users represent a greater risk of accident involvement. Preventive age restrictions facilitate a decrease in accidents among children, who are more susceptible due to their underdeveloped motor skills, insufficient knowledge and experience in traffic, and immature behavior in crisis situations.

From a road safety standpoint, we note significant disparities among countries regarding legislative helmet mandates. The six countries mandating helmet use for all riders again point to structural policies aimed at the safety of riders who reach high speeds in a standing position. A review of the literature found that Singh et al. (2022) established that 68% of injured e-scooter riders were not wearing a helmet, with some studies reporting figures below 20% (Mehranfar & Jones, 2024), and that 22% of these sustained head and neck injuries, the consequences of which arise from either a primary impact (direct collision with another road user) or a secondary impact (head striking the ground) (Paudel et al., 2023), irrespective of rider age. Countries represent those seeking oversight and safety, with particular emphasis on less experienced, younger riders, of which nine have defined an age threshold below which helmet use is mandatory. These age thresholds can be relatively low, extending as far down as 12 years, which again relates to the elevated accident risk identified by Cipriani (2024). Research indicates that helmet use in e-scooter collisions substantially reduces severe head injuries resulting from ground impact during micromobility (Mehranfar & Jones, 2024). A trend of growing awareness of the severity of the issue is evident, with notable examples including Lithuania and Austria, which are moving towards the introduction of stricter legislative requirements. Nevertheless, a considerable gap remains between the number of countries that legally mandate helmet use and those where it is not required.

The ambiguities surrounding insurance and registration most clearly reflect the EU-level legal classification of e-scooters. In the majority of member states, e-scooters that comply with the legal framework are treated similarly to bicycles, for which neither registration nor insurance is mandatory, despite having greater torque enabling faster acceleration to higher speeds, and being associated with an increasing number of road accidents compared to bicycles (Paudel et al., 2023). As the number of road accidents continues to rise, Bulgaria, Latvia, Malta, and the emerging regulatory regimes in Spain and Portugal represent a possible trajectory toward a broader adoption of registration and insurance requirements.

The Netherlands provides the most thorough example of advantageous practice by mandating model-level approval from the national vehicle authority prior to the insurance and registration of an e-scooter. This ensures a substantial degree of traceability while simultaneously limiting the variety of e-scooters and their operators allowed on public roads.

The 25 km/h limit is a specific EU product classification threshold, below which devices are typically considered light personal transport rather than motorized vehicles. Countries implementing a 20 km/h operational limit aim to mitigate the risk of conflicts with pedestrians and cyclists. Accidents most frequently do not result from collisions with other vehicles, infrastructure elements, or other road users, but rather from loss of balance, poor surface conditions, and inappropriate speed. Singh et al. (2022) indicate that loss of balance accounts for 74% of e-scooter falls, a conclusion corroborated by Uluk et al. (2022). Kazemzadeh et al. (2023) additionally observe that alcohol consumption during riding often contributes to falls.

From the perspective of urban mobility service providers and shared fleet operators active across multiple EU member states, regulatory fragmentation may generate significant compliance costs. A company operating across multiple EU cities must navigate 27 distinct legislative frameworks, with additional local variations layered on top of each national regime. This complexity may confer an advantage upon larger operators with the resources to ensure regulatory compliance, while simultaneously constituting a barrier for smaller providers, thereby reducing competition and innovation within the sector.

CONCLUSION

This paper shows a degree of legislative dispersion in e-scooter governance across all 27 EU Member States with based on minimum age requirements, helmet use, insurance, registration, and speed restrictions. Discrepancies manifest at multiple levels. The variation observed in helmet requirements and minimum age thresholds demonstrates that national strategies for reconciling accessibility and safety in micromobility differ considerably.

Under EU law, e-scooters are classified as products rather than as vehicles, with the consequence that no uniform restrictions have been established at the supranational level. The EU does not legislate in the field of traffic law, such matters instead fall within the competence of national or, in certain instances, municipal authorities. This disparity carries implications for EU transport and urban mobility policy. Both the European Green Deal and the Strategy for Sustainable and Smart Mobility identify micromobility as an essential element of sustainable urban transport. In the absence of a minimum harmonised framework governing the use of e-scooters in traffic, however, the policy objective of integrating them into safe and coherent urban mobility networks remains difficult to achieve at scale.

The findings indicate that EU-level measures establishing minimum harmonised criteria for e-scooter use in traffic, including age limitations and mandatory helmet use, would substantially enhance both road safety and regulatory consistency. Rather than supplanting existing national systems, such standards could provide a common baseline level of protection applicable across all Member States.

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REFERENCES

1. Abduljabbar, R. L., Liyanage, S., & Dia, H. (2021). The role of micro-mobility in shaping sustainable cities: A systematic literature review. *Transportation Research Part D: Transport and Environment*, *92*, 102734. https://doi.org/10.1016/j.trd.2021.102734
2. Bozzi, A. D., & Aguilera, A. (2021). Shared E-Scooters: A Review of Uses, Health and Environmental Impacts, and Policy Implications of a New Micro-Mobility Service. *Sustainability*, *13*(16), 8676. https://doi.org/10.3390/su13168676
3. Cipriani, V. (2024). *How Can We Make Shared E-scooter Systems Safer? Municipal Perspectives on Safety in Shared E-scooter Programs* [Thesis, Toronto Metropolitan University]. https://doi.org/10.32920/25417390.v1
4. *European Shared Mobility*. (2025). [Https://european-index.fluctuo.com/]. Fluctuo. https://drive.google.com/file/d/1LFXxQ-aUjUIodvl-E4oqjgqce4K1aLdZ/view?usp=embed_facebook
5. Guyader, H., Friman, M., & Olsson, L. E. (2021). Shared Mobility: Evolving Practices for Sustainability. *Sustainability*, *13*(21), 12148. https://doi.org/10.3390/su132112148
6. Kazemzadeh, K., Haghani, M., & Sprei, F. (2023). Electric scooter safety: An integrative review of evidence from transport and medical research domains. *Sustainable Cities and Society*, *89*, 104313. https://doi.org/10.1016/j.scs.2022.104313
7. Mehranfar, V., & Jones, C. (2024). Exploring implications and current practices in e-scooter safety: A systematic review. *Transportation Research Part F: Traffic Psychology and Behaviour*, *107*, 321–382. https://doi.org/10.1016/j.trf.2024.09.004
8. Paudel, M., Yap, F. F., Binte Mohamed Rosli, T., Tan, K. H., & Xu, H. (2023). A computational investigation of the dynamic factors governing severity of head injury to pedestrians involved in e-scooter collisions. *Transportation Research Interdisciplinary Perspectives*, *22*, 100972. https://doi.org/10.1016/j.trip.2023.100972
9. Singh, P., Jami, M., Geller, J., Granger, C., Geaney, L., & Aiyer, A. (2022). The impact of e-scooter injuries: A systematic review of 34 studies. *Bone & Joint Open*, *3*(9), 674–683. https://doi.org/10.1302/2633-1462.39.BJO-2022-0096.R1
10. Uluk, D., Lindner, T., Dahne, M., Bickelmayer, J. W., Beyer, K., Slagman, A., Jahn, F., Willy, C., Möckel, M., & Gerlach, U. A. (2022). E-scooter incidents in Berlin: An evaluation of risk factors and injury patterns. *Emergency Medicine Journal*, *39*(4), 295–300. https://doi.org/10.1136/emermed-2020-210268