

Light electric vehicles have come to stay (problems and regulation in Estonia and Latvia)

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Abstract

The aim of this article is to create a comparative map of the problems related to light electric vehicles in Estonian and Latvian traffic management and outline some of the planned innovations to their traffic laws. The research problem of the article is to find out the main reasons why accidents involving light electric vehicles are so often and so serious. The main methods used are comparative analysis and interpretation of statistical data. The research results conclude that drivers of light cyclists often have poor driving skills, traffic rules are broken when riding a light cyclist in pairs and there are more drunk drivers among light cyclists compared with other groups of road users. The lack of roads for light electric vehicles and the poor quality of the roads used are also major problems.

Keywords

climate neutrality • light electric vehicles • LEV • electric scooter • accidents • speed • pavement • pedestrian

Introduction

The role of transport in today's society cannot be overestimated, as most people's activities and fast pace of life require mobility. Consequently, it is important to ensure that transport is accessible and affordable for all levels of society. At the same time, the principles of environmental sustainability and road safety must be increasingly respected.

In this phase of the study, an in-depth analysis of traffic regulations and legal structures pertaining to light electric vehicles within the Estonian and Latvian contexts are undertaken. This examination encompasses a focused exploration of regulations specific to electric scooters, aiming to uncover any inconsistencies or gaps that play a role in the existing challenges within traffic management. Additionally, a comprehensive data collection approach combining qualitative and quantitative methods is detailed, facilitating the acquisition of insights into accident patterns, underlying factors and areas with potential for enhancement. Climate neutrality in transport means taking steps to reduce dependence on energy, the consumption of which emits greenhouse gasses. The aim is to avoid negative climate change and reduce the negative ecological footprint. There is a link between transport and environmental pollution, as

internal combustion engine fuels emit large amounts of exhaust gases into the air. Various alternatives to fossil fuels are being sought to reduce this. As an alternative, electric vehicles are preferred. For example, while petrol-powered cars emit up to 3 g/km of carbon dioxide, electric scooters emit 10 times less (Kubik, A., 2022, p.10).

Light electric vehicles have several advantages over larger means of transport: (1) they allow pedestrians to follow their route more flexibly; (2) compared with cars and other motor vehicles, they are generally cheaper in terms of both acquisition and maintenance costs; (3) they are environmentally friendly as they do not emit exhaust gases; and (4) light electric vehicles have an important role to play compared with bicycles and other muscle-powered means of transport for people with various mobility issues, allowing them to make faster journeys on their own.

However, with the proliferation of these vehicles, it is essential to think about safety. There have been a number of cases in which a cyclist using a light electric vehicle has been involved in an accident or even lost his or her life, both in Estonia and abroad, and it must also be acknowledged that the new travel solutions will create some problems for existing traffic management. Although today Estonia, as well as the European Union at large, has in place regulations for the safe use of light electric vehicles, it is still important that the renewal of such legislation does not stagnate and is able to keep pace with the increasing complexity of traffic.

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Research Results and Discussion

Definition of light electric vehicles in the Estonian legal order and their entry into Estonian traffic

Pursuant to § 2, point 21¹ of the Estonian Road Traffic Act, a personal light electric vehicle means a battery-driven seatless vehicle designed for carrying one individual, with the exception of a cycle. A self-balancing, single-axle, electrically propelled vehicle designed to carry one person is also considered to be a light electric vehicle (Liiklusseadus, 2022). In a broader sense, light electric vehicles are seatless electric vehicles, for example, electric scooters, balancers and unicycles (Transpordiamet. Liikluskasvatus., 2022). As mentioned above, this article focuses mainly on electric scooters.

An electric scooter is a two-wheeled vehicle with a handlebar for steering, a narrow platform for standing, a gas lift and an electric motor for propulsion. This vehicle is designed for short journeys and is designed for one rider only. The vehicle is easily transportable, has a rechargeable battery and can be driven within the speed limit set by the manufacturer, which is regulated by the European Union of up to 25 km/h. In addition, it is possible to fit an electric scooter with a signal bell, lights for better visibility to other road users and the battery life of a screen pre-installed in some devices (Daingade., P., Shirolkar, A. et.l., 2018).

Today's light electric vehicles, such as electric scooters, electric bicycles and electric balance scooters, started to become popular in Europe in the early 2010s. The first electric scooters arrived in Estonia in 2018, when a company called Bolt (then Taxify) introduced its first scooter service in Tallinn. Since then, light electric vehicles have become increasingly popular and are mainly used in urban traffic. According to the Transport Administration, the number of electric scooter users in 2022 exceeded around 300,000, an increase of around 5% (62,000) compared with 2021. Nearly 27% of Estonia's population are users of light electric vehicles, but only a quarter of them own personal (or family) vehicles. Thus, the vast majority use hired transport (Transpordiamet, 2022). It can be argued that an important market has emerged in Estonia for the provision of such transport services – there are several providers of light electric vehicles in Estonia today, including Bolt, Citybee and Tuul. In Estonia, the regulation and use of light electric vehicles is regulated by the Estonian Road Administration and the Ministry of Roads and Communications by means of relevant laws and regulations.

Requirements applicable to light electric vehicles

Pursuant to § 15 point 11 of the Estonian Traffic Act, the maximum permitted speed of light electric vehicles is 25 km/h (Liiklusseadus, 2022). Clear boundaries to distinguish

between different means of transport ensure that the average person understands the necessary requirements for using a vehicle and the penalties for non-compliance. However, it is possible to remove the speed limiters from some vehicles (Mäekivi, M., 2022). Such an amendment is in substantial contradiction with the above-mentioned provisions of the Road Traffic Act and also the requirement that light electric vehicles comply with the manufacturer's technical specifications (Liiklusseadus, 2022). In the case of non-compliance with such an order, the means of transport can no longer be considered as a light electric vehicle, but already a motor vehicle, and the use of such means of transport in traffic already implies stricter requirements. It is therefore forbidden to use non-compliant light electric vehicles on public roads.

Various provisions of the Road Traffic Act regulate other requirements for light electric vehicles. A light electric vehicle must have a functioning brake or braking system; a signal bell, but this requirement does not apply to equipment without handlebars (e.g. balancers); and reflectors – white at the front, red at the rear and a yellow, red or white reflector or light on the sides (which must be illuminated in the dark or in poor visibility); but once again, driverless light electric vehicles are excluded.

There are also mandatory requirements for the gauge of light electric vehicles, with a maximum width of 0.8 m for two-wheelers and 1.25 m for tri- and multi-wheelers. The only exception is the use of non-compliant vehicles, with the agreement of the road owner and subject to conditions (Liiklusseadus, 2022). Excessively wide pedestrian paths become problematic, especially in areas with heavy traffic, or in areas where the roads used are relatively narrow, or sometimes even a combination of both (e.g. the bridge Kaarsild in Tartu for crossing the Emajõgi River). Such devices constitute a significant impediment to the flow of traffic (where the majority of the road is blocked by such a device) and can also be dangerous if a driver disregards the rules of the road and decides to overtake at high speed on a narrow road. As the restrictions on the width of light electric vehicles do not affect the quality of the vehicle for the user and do not impose an excessive burden on manufacturers in the development of light electric vehicles, and are aimed at ensuring the safety and fluidity of traffic, we can conclude that the regulation is in line with the objectives of the law (Roy J. van Kuijk, Gonçalo Homem de Almeida Correia et.al. 2022).

Thus, in Estonia, light electric vehicles are clearly defined and are subject to essential requirements aimed at increasing road safety for both users and fellow road users. The requirements laid down are in line with the aim of the law and are not overly burdensome in view of their real safety benefits.

Main problems with traffic management today

The number of accidents involving light electric vehicles has risen by 126 over the past year (from 223 to 349), including 1

fatality (Transpordiamet, 2022). The more than 50% increase in the incidence of accidents is a sign, first, of a gradual increase in the popularity of the means of transport (the above-mentioned user statistics confirm this) and, second, the fact that traffic management has not yet sufficiently adapted to the needs of light electric vehicles and their traffic habits.

One of the most serious problems that reduces road safety is the fact that different types of light electric vehicles are directed onto pavements. For more than a century, traffic has been governed by a simple principle: vehicles travel on the carriageway, while pedestrians walk on the pavement or, in extreme cases, alongside the carriageway. In 2011, we broke down one of the foundations of traffic: that pedestrians have their own private part of the road where vehicles are not allowed. Cyclists were allowed to use it under fairly liberal conditions, and in 2021, light electric vehicles were allowed to use it as well (Pandey, A., Kumar, S., Singh, B., 2022).

Indrek Sirk, a renowned traffic lawyer in Estonia, has highlighted a number of problems in this respect: (1) as the pedestrian network is in place and there is generally space on pavements, cyclists and, more recently, light electric vehicles have been directed to pavements. Unfortunately, these roads were not designed for this increase in traffic. Just as our road network has not kept pace with the tripling number of motor vehicles in the past 30 years and the even greater increase in traffic, pavements have not been designed to accommodate not only pedestrians but also cyclists and light electric vehicles; (2) from the outset, efforts have been made to create uniform formulas for the movement of cars: still moving on the right-hand side of the road, signalling a change of direction and the right of way is resolved for both road users and pedestrians. On pavements, however, there are virtually no such rules. Up to now, this has not been necessary, as a pedestrian travelling at a normal speed of 4–6 km/h is able to stand still practically instantaneously from the moment they react to the threat. It is a reaction we have all trained in from the ground up and, when threatened, our feet simply stop moving, which stops us moving. However, if we use an assistive device to get around (be it a car, roller skates, bicycle, etc.), then, in addition to keeping our feet stationary, our brains have to be given an additional command, that is, at least one of our limbs has to make an additional movement to brake the mobility aid being used. It takes extra time, and the inertia of movement still carries us forward (Sirk, I., 2023).

Pursuant to § 22(1) of the Road Traffic Act, both cyclists and other drivers of light electric vehicles must move in the immediate vicinity of a pedestrian at a speed that does not significantly differ from the speed of the pedestrian and must not endanger the pedestrian. However, the mere existence of a rule does not guarantee compliance with it.

Lawyer I. Sirk recalled that electric scooters, or light electric vehicles under the Traffic Act, received clear legal regulation in

Estonia from 01.01.2021. Thanks to this, it was also possible to start collecting statistics.

Statistics on road accidents involving light electric vehicles in Estonia and Latvia

As noted above, in many Estonian cities the infrastructure needed for electric scooters and other light mobility systems remains at the level of the past century. As a result, light electric vehicles travelling at 25 km/h are often forced to use pavements or roads where there is really no room for them.

There were more road accidents on Estonia's roads in 2022 than in 2021, according to the 2022 road safety review. The statistics on road accidents recorded over the past 4 years are as follows: 2019: 1439 accidents; 2020: 1406; 2021: 1571; and 2022: 1699 accidents (Liiklusaasta ülevaade, 2023). Accidents involving light electric vehicles have also shown an upward trend over the years (see Table 1).

Table 1. Road traffic accidents with injuries involving light electric vehicle drivers in Estonia (Transpordiamet, 2023)

Follow	2021	2022	2023
Road accidents	223	349	68
Injuries	230	356	70
Fatalities	0	1	0

Statistics show that almost three-quarters of accidents involving light electric vehicles are one-way accidents. This means that the driver of the light electric vehicle has not been hit by a car, as we mostly see in videos on social media, but has simply fallen down or driven off the road. In 2022, in Harjumaa, Estonia's largest county, 255 road traffic accidents were recorded in which one of the parties was a light traffic driver. However, this is only the tip of the iceberg, as the number of light electric vehicle drivers who received medical assistance was significantly higher. Statistics for the year 2022 were as follows: (1) nearly 80% of all accidents were one-vehicle accidents, where the driver lost control of the vehicle and crashed; (2) in almost 30% of cases, the drivers of light electric vehicles had consumed alcohol before the accident. For comparison, 4% of motor vehicle accident victims have previously consumed alcohol; (3) the highest number of accidents involving light electric vehicles occurred around midnight. The highest probability of being involved in an accident was early Sunday morning at 3 am; and (4) in the case of accidents involving light electric vehicles and motor vehicles, both parties were at fault: drivers of light electric vehicles drove at high speed in front of cars in the crossing lane; drivers of cars made a wrong turn or overtook a stopped vehicle in front of the crossing lane without stopping (Transpordiamet, 2023).

Light electric vehicle accidents do not just happen while the driver is drunk – only a third of light electric vehicles involved in

an accident in 2022 were known to be caused by intoxication. The rest can be blamed on wrong speed or careless driving, but there is no getting around the lack of light traffic routes (Mida ütleb statistika, 2023).

Nighttime one-vehicle accidents often indicate that the driver has been drink-driving. In order to prevent drink-driving, Tuul, the provider of light electric vehicles, cooperates with the police to identify and, if necessary, punish the customers who were driving under the influence of alcohol. In the summer of 2022, a pilot project was launched between Tuul, Bolt and the police to reduce the risks for both light cyclists and other road users.

Drunken driving is now actively monitored by the police; this means that the police can test an intoxicated driver for drink-driving and issue a fine if necessary. In addition, the number of passengers will be more closely monitored – as you know, only one person is allowed on the light electric vehicles at a time. The police forwards the details of the offenders to Tuul, which then decides whether to issue a warning or impose a driving ban, for example, until the end of the year. In the future, such penalties could be operator-wide. This would mean that if a light traffic driver is caught drunk by the police on the Tuul, he or she would not be able to grab a Bolt scooter after getting a driving ban from the Tuul (Miks tõukside piirkiiruse, 2023).

Like Estonia, Latvia has a maximum speed limit of 25 km/h for light electric vehicles and speed limits of up to 15 km/h in most schools and kindergartens, car parks and squares (Latvia mulls electric scooter regulations, 2023).

Latvia's official statistics suggest that the number of injuries involving light electric vehicles has been steadily increasing in Latvia for several years. If statistics on accidents involving light electric vehicles are compiled in Estonia more generally (see Table 1), Latvia differentiates between injuries to drivers of electric scooters (VAS «Ceļu satiksmes drošības direkcija», 2023).

Table 2. Injuries to electric scooter drivers in Latvia (January–May)

Year	2020	2021	2022	2023
Number of victims	10	30	64	91

As a result of the steady increase in the number of victims of road accidents involving light electric vehicles, Latvia is actively looking for measures to ensure road safety and reduce road accidents involving light electric vehicles. The main incentive for considering different measures was the referendum in Paris on 2 April 2023, which resulted in the abolition of electric scooter rental in Paris as of 1 September. The referendum was prompted by the fact that there were 408 road accidents involving scooters, electric scooters, segways, unicycles and similar means of transport in Paris in 2022. Three people were killed and

459 injured in such accidents that year (Pariisis keelatakse, 2023).

The Paris referendum on banning the rental of electric scooters has brought traffic rules back on the agenda in Latvia and possible changes to them, also considering a ban on the rental of light electric vehicles. While people polled on the streets do not entirely agree with the ban, emergency services are alarmed by the high number of accidents. Two months ago, Riga City Council approached the Seimas in preparation for the start of the season, asking the municipality to have the power to regulate and monitor the use of these vehicles in the city, including setting speed limits and carrying out checks on knowledge of traffic rules. The police are calling for tougher penalties for offences, and proposals have also been made by the Riga City Council and the Ministry of Interior (Latvia mulls electric scooter regulations, 2023).

Tougher rules are planned for electric scooters in Latvia in 2023. In accordance with the amendments to the Road Traffic Act and the regulations developed and presented by the Ministry of Transportation on 13 June 2023, the use of an electric scooter requires a permit for a certain type of vehicle, including a bicycle. Penalties for breaking the rules when transporting passengers or cargo, using smart devices while driving, failing to stop at traffic lights, disregarding distance and drink-driving will also be toughened. The amendments also provide that local authorities will have the right to designate no-parking zones for electric scooters and that the traffic of these vehicles will be monitored not only by the state but also by the local police. The Ministry of Transportation also plans to stipulate that only registered electric scooters with a special number plate will be allowed on the road. In parallel, amendments to the traffic rules are being actively pursued, with a view to the entry into force in the near future of a rule obliging all electric scooter riders to wear a helmet. Changes are to be confirmed by the end of summer (Tighter rules planned, 2023).

The Estonian Supreme Court has also taken the position that a driving licence is required in order to drive high-speed electric vehicles. According to the decision of the Supreme Court of 30.05.2023, electric scooters with a speed of >25 km/h and a power of >1 kW, are motor vehicles within the meaning of the law, which require a driving licence to be driven on the road and must be registered beforehand. The decision depends on a specific court decision (Decision of the Supreme, 2023): in 2022, the police fined a man driving an electric scooter at 40–50 km/h in Tallinn by 500 euros. The scooter manufacturer's speed was 95 km/h and the engine had a power of 6 kW. The driver did not have a licence to drive and his vehicle was not registered.

According to the law, a motor vehicle is any device propelled by an engine, the design speed of which exceeds 6 km/h and which is intended for use on the road or is actually used for

that purpose. By way of exception, only motorised vehicles for people with reduced mobility, bicycles, mini-mopeds, light motor vehicles, robot vehicles, all-terrain vehicles and trams are excluded from the definition of motor vehicles.

According to an amendment to the Road Traffic Act that entered into force in 2022, the manufacturer's speed of light electric vehicles must not exceed 25 km/h and the maximum engine power must not exceed 1 kW – the capacity limitation does not only apply to balancers (Toker, K., Tosun, O., 2022). Proposals to amend the Road Traffic Act have recently been drafted by the Ministry of Economic Affairs and Communications to introduce a 0.5 drink-drive limit for cyclists and scooter riders, similar to the 0.5 drink-drive limit at sea. The police are very supportive of this proposal, as it would also give people clearer boundaries and a clearer idea of when they can and cannot drive (Politsei soovib, 2023).

Conclusions

From the above it can be concluded that the problems related to light electric vehicles are quite similar in Estonia and Latvia. Both countries are looking for solutions to these problems in order to improve road safety.

The major risk areas are as follows:

The majority of road accidents (75%) are one-way accidents, which indicates poor driving skills, but also infrastructure problems, such as kerbs, uneven road surfaces and the need to change direction abruptly in certain places, combined with poor driving skills, lead to many crashes;

Unprecedentedly more drink-drivers than any other group – one in three. This is particularly evident at night, when in more than half of the cases the driver of a light electric vehicle is under the influence of alcohol. At the same time, it is unknown today how many drink-driving accidents have been prevented by light electric vehicles, as light electric vehicles are an alternative between driving a car and walking (or a taxi);

Both in the traffic and in the accident statistics, driving in more than one vehicle is also clearly distinguishable, which is very dangerous due to the design of the vehicle and therefore prohibited by traffic law;

The light electric vehicles are not insured. This means that the driver is responsible for compensating for any damage caused by him.

Here are some of the ways to help improve road safety for the individual:

Use of safety equipment. In Estonia, the wearing of helmets is required for persons under the age of 16. Unfortunately, statistics show that in the age group up to 17 years, only 17% of those involved in a road accident were wearing safety equipment. Although the obligation to wear a helmet does not apply to persons over the age of 16, it is strongly

recommended by the Transport Administration, clearly for safety reasons. Based on the statistics for the previous 2 years (2021–2022), only 5% of drivers involved in a road accident involving light electric vehicles drivers were using some form of safety equipment;

Not to drive (including light electric vehicles) while under the influence of alcohol (or drugs). In Estonia, according to data from 2021, intoxicated drivers of light electric vehicles accounted for 30% of all accidents involving light vehicles drivers, and in 2022 they accounted for 32%. The highest number of accidents involving drivers in this condition occurred between Friday and Sunday and between 22:00 and 7:00 in the morning. Slower reaction times, reduced driving performance and increased risky behaviour associated with drink-driving create a dangerous mix, which significantly increases the likelihood of being involved in a road accident and of being injured more seriously than usual;

Avoiding tandem driving. According to the law, a light electric vehicle is a vehicle for one person, but in practice it is also sometimes used for more than one person. Although it is a case of disregarding traffic rules, in 2022, 19% of users (5% of them repeatedly) rode light electric vehicles with passengers in Estonia. There is a significant risk associated with such behaviour: movement of the rear passenger while driving can cause the driver to lose balance and result in an accident;

Changing travel habits and respecting other road users. The tendency of users of light electric vehicles to break traffic laws is becoming apparent in a number of ways. In particular, the law lays down speed limits in certain cases, such as overtaking a pedestrian, which are seriously disregarded. This kind of behaviour has led fellow road users (especially pedestrians and motor vehicle drivers) to be particularly cautious when sharing the road with, or in front of, light electric vehicles. Drivers of motor vehicles are concerned about the sometimes high speed at which light electric vehicles cross the road; pedestrians have the same problem – light electric vehicles often choose the wrong speed when overtaking pedestrians.

It is difficult for drivers of motor vehicles to take into account the movement of light electric vehicles if they do not obey traffic laws when crossing the road and not slowing down. As a general rule, drivers of light electric vehicles have the obligation to give way to motor vehicles (unless crossing is controlled by other traffic management devices). If this is ignored, the risk of a collision will increase and light cyclists will be more seriously injured or even killed.

The concern for pedestrians is that if they are overtaken by light electric vehicles at too high a speed, this causes stress for pedestrians. Since, as a rule, light electric vehicle motors are relatively quiet and the use of a signal bell is relatively selective, pedestrians may not be aware of a passing light

electric vehicle until it has passed them. The situation is even more difficult for people with significant hearing or visual impairments and who may therefore be unable to detect light electric vehicles in traffic, even if the vehicle has passed them. In such cases, the risk of a collision is even higher. In order to avoid such a risk, the law stipulates that the driver must not endanger fellow road users by their actions and special care must be taken with children, the elderly, people with disabilities, people with reduced mobility and visually impaired people.

Incorrect parking of rented light electric vehicles on the streets is a major problem. In addition to the general rules on parking, the law provides that light electric vehicles (as well as bicycles and mini-mopeds) have the right to stop and park on the pavement in built-up areas; however, pedestrians and other road users must have at least 1.5 m of free space on the pavement. This will ensure that parked vehicles do not disturb other road users. The problem, however, is user habits – on the roads, it is not unusual to see light electric vehicles on narrow lanes, which severely impede traffic and can pose a danger to fellow road users. A big role for service providers to play in preventing accidents: they have the ability to set in-app restrictions on the areas where people can park vehicles to end a journey. There are also warnings in the apps for those who have parked incorrectly in the past when using the tool (e.g. Bolt) and, as a general rule, systems are in place to allow bystanders to alert service providers to incorrectly parked vehicles. So there are support systems to reduce risk and influence people's behaviour.

Traffic management is currently moving in the direction of considering giving the right to regulate light traffic to the local level in the traffic law: introduce speed limits for electric scooters, clarifying parking rules and reinforcing penalties for drink-driving. Such provisions allow for location-based restrictions which, in the case of large cities (e.g. Tallinn, Tartu, etc.), are essential to regulate traffic-dense areas more safely. Setting higher speed limits in specific areas will significantly improve road safety for both light electric vehicles and fellow road users. Under the draft, the local authority would also be the supervisory authority, which would make the dialogue between the service provider and local authorities more important, which could lead to significant improvements in road safety cooperation. Whether and when such a draft will be adopted is a separate issue. The fact is that the introduction of regulations at local level creates location-based traffic requirements that take more account of actual local traffic patterns and the general road safety situation in the area.

In conclusion, a light electric vehicle is the most modern means of transport in an urban environment: comfortable, cost-saving and environmentally friendly, but also a challenging vehicle in today's fast and nervous traffic.

References

- Daingade, P., Shirolkar, A., Singh, S., Tamhankar, S., Shelke, R.D. Designing and manufacturing of Electric Scooter. – *International Journal of Engineering Research and Applications*, 8(12) 2018, pp 1549-1552.
- Eesti Riigikohtu lahend. [in Estonian] No 4-22-4021/42. Decision of the Supreme Court of Estonia. Available: - <https://www.riigikohus.ee/et/lahendid?> [rev.06.07.2023]
- Kubik, A. CO2 Emissions of Electric Scooters Used in Shared Mobility System. – *Energies*, 15 (21) 2022, p 10.
- Latvia mulls electric scooter regulations. 04.04.2023. Available: - <https://eng.lsm.lv/article/economy/transport/04.04.2023-latvia-mulls-electric-scooter-regulations.a503583/> [03.07.2023]
- Latvia mulls electric scooter regulations. 04.04.2023. Available: - <https://eng.lsm.lv/article/economy/transport/04.04.2023-latvia-mulls-electric-scooter-regulations.a503583/> [03.07.2023]
- Liiklusaasta ülevaade. [in Estonian] Review of the transport year. Available:- <https://www.transpordiamet.ee/liiklusaasta-ulevaade-2022> [rev. 06.07.2023]
- Liiklusseadus. [in Estonian] Road Traffic Act. – *Riigi Teataja (Official Journal)*. - RT I, 20.06.2022, 70.
- Liiklusseadus. [in Estonian] Road Traffic Act. – *Riigi Teataja (Official Journal)*. - RT I, 20.06.2022, 70.
- Liiklusseadus. [in Estonian] Road Traffic Act. – *Riigi Teataja (Official Journal)*. - RT I, 20.06.2022, 70.
- Liiklusseadus. [in Estonian] Road Traffic Act. – *Riigi Teataja (Official Journal)*. - RT I, 20.06.2022, 70.
- Liiklusseadus. [in Estonian] Road Traffic Act. – *Riigi Teataja (Official Journal)*. - RT I, 20.06.2022, 70.
- Mäekivi, M. Politsei eemaldab liiga võimsad tõukerrattad liiklusest. ERR (2022) – [in Estonian] Mäekivi, M. Police remove overly powerful scooters from traffic. Available: <https://www.err.ee/1608648667/politsei-eemaldab-liiga-voimsad-toukerattad-liiklusest> [rev. 02.07.2023]
- Mida ütleb statistika tegelikult tõuksõnnetuste kohta? [in Estonian] What do the statistics actually say about scooter accidents? Available: <https://digi.geenius.ee/blogi/tuleviku-tanav/mida-utleb-statistika-tegelikult-touksionnetuste-kohta/> [rev.03.07.2023]
- Miks tõukside piirkiiruse vähendamisest tegelikult kasu ei ole? [in Estonian] Why does reducing the speed limit for scooters not really help? Available: <https://digi.geenius.ee/blogi/tuleviku-tanav/miks-toukside-piirkiiruse-vahendamisest-tegelikult-kasu-ei-ole/> [rev. 03.07.2023]
- Pandey, A., Kumar, S., Singh, B. "An Economical Approach with Urban Driving Cycle Based Control Technique for Light Electric Vehicle with Regeneration". *2022 IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES)*. Jaipur, India, 2022, pp. 1-6, doi: 10.1109/PEDES56012.2022.10080415. [rev. 04.07.2023]
- Pariisis keelatakse septembris elektritõukerataste rentimine. [in Estonian] Electric scooter hire banned in Paris in September. Available:

- <https://maailm.postimees.ee/7746016/pariis-keelatakse-septembris-elektritoukerataste-rentimine> [rev. 03.07.2023]
- Politsei soovib kergliikuri juhtidele selge jooeapiirangu seadmist. [in Estonian] Police want a clear drink-drive limit for light vehicles drivers. Available: <https://www.err.ee/1608948568/politsei-soovib-kergliikuri-juhtidele-selge-jooeapiirangu-seadmist> [rev. 03.07.2023]
- Roy J. van Kuijk, Gonalo Homem de Almeida Correia, Niels van Oort, Bart van Arem, Preferences for first and last mile shared mobility between stops and activity locations: A case study of local public transport users in Utrecht, the Netherlands, Transportation Research Part A: Policy and Practice, Volume 166, 2022, Pages 285-306, ISSN 0965-8564, <https://doi.org/10.1016/j.tra.2022.10.008>.
- Sirk, I. Jalakaija – kaitsealune objekt voi kontrollimatu stiimia? [in Estonian] Sirk, I. The pedestrian - protected object or uncontrollable bias?. Postimees, 02.06.2023. Available: <https://arvamus.postimees.ee/7786884/indrek-sirk-jalakaija-kaitsealune-objekt-voi-kontrollimatu-stiimia> [rev. 01.07.2023]
- Tighter rules planned for electric scooters in Latvia. 13.06.2023. Available: <https://eng.lsm.lv/article/economy/transport/13.06.2023-tighter-rules-planned-for-electric-scooters-in-latvia.a512593/> [rev. 03.07.2023]
- Toker, K., Tosun, O., Serteller, N.F.O., Topuz, V. "Design, Optimization and Experimental Study of Axial and Hub BLDC Motors in-Wheel Application for Light Electric Vehicles," 2022 IEEE 21st Mediterranean Electrotechnical Conference (MELECON), Palermo, Italy, 2022, pp. 354-359, doi: 10.1109/MELECON53508.2022.9842975. [rev. 06.07.2023]
- Transpordiamet. Jalgrattaga ja elektritukerattaga liiklemine. 09-2022 aruanne. [in Estonian] Transport Agency. Cycling and electric scooter driving. 09-2022 Report.
- Transpordiamet. Jalgrattaga ja elektritukerattaga liiklemine. 09-2022 aruanne. [in Estonian] Transport Agency. Cycling and electric scooter driving. 09-2022 Report.
- Transpordiamet. Kergliikuri juhi osalusel liiklusonnetused (2022). [in Estonian] Transport Agency. Accidents involving a light vehicles drivers (2022). Available: https://public.tableau.com/app/profile/transpordiamet/viz/Kergliikuri_L/nnetusteldandmed [rev. 04.07.2023]
- Transpordiamet. Kergliikurionnetuste andmed. [in Estonian] Transport Agency. Data on light goods vehicle accidents. Available: - https://public.tableau.com/app/profile/transpordiamet/viz/Kergliikuri_L/nnetusteldandmed [rev. 01.07.2023]
- Transpordiamet. Kergliikurionnetuste andmed. [in Estonian] Transport Agency. Data on light goods vehicle accidents. Available: - https://public.tableau.com/app/profile/transpordiamet/viz/Kergliikuri_L/nnetusteldandmed [rev. 01.07.2023]
- Transpordiamet. Liikluskasvatus: kergliikur. [in Estonian] Transport Agency. Road safety education: light vehicles. Available: <https://www.liikluskasvatus.ee/et/taiskasvanule/1/kergliikur> [rev. 01.07.2023]
- VAS «Ceļu satiksmes drošības direkcija» Elektroskrejriteņu un velosipēdu ceļu satiksmes negadījumi. [in Latvian] "Road Traffic Safety Directorate" Road traffic accidents of electric scooters and bicycles. Available: file:///D:/statistika-mazaizsargatie_csdd.pdf [rev.03.07.2023]