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Editorial correspondence
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"
Piazzale Tecchio, 80
80125 Naples
web: www.tema.unina.it
e-mail: redazione.tema@unina.it

The cover image is Rue de Rivoli - an emblematic street of Paris connecting Bastille to Concorde – that since May 2020 has been reserved for bicycles and pedestrians, Paris, France, Saturday, Nov. 6, 2021.

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Mobility scooters in Italy: the reason of a "missed revolution". A potential resource for individual mobility in the Covid-19 era needs legislation

Giuseppe Cannata [a*], Marialisa Nigro [b], Concetta Ljoka [a], Mihaela Murè [a], Guerino Coluccia [c], Laura Giordani [a], Umberto Crisalli [d], Calogero Foti [a]

[a] Physical and Rehabilitation Medicine
Clinical Sciences and Translational Medicine Department
Tor Vergata University, Rome, Italy
e-mail: giu.cannata@virgilio.it
cljoka@gmail.com; acon.mihaela@yahoo.com;
laura.giordani@uniroma2.it; foti@med.uniroma2.it
ORCID: https://orcid.org/0000-0001-7384-6785
https://orcid.org/0000-0003-2246-348X
* Corresponding author

[b] Department of Engineering
Roma Tre University, Rome, Italy
e-mail: marialisa.nigro@uniroma3.it
ORCID: https://orcid.org/0000-0003-0640-5810

[c] Officine Ortopediche S.r.l.
via Casale Ricci 3, 03100 Frosinone, Italy
e-mail: guerino.coluccia@alice.it

[d] Department of Enterprise Engineering "Mario Lucertini"
Tor Vergata University, Rome, Italy
e-mail: crisalli@ing.uniroma2.it
ORCID: https://orcid.org/0000-0002-2672-8054

Abstract
Mobility scooters have evolved up to modern cabin versions and to application of still futuristic solutions in the automotive sector: they could even be a resource for individual mobility in the Covid-19 era, but in Italy they seem unable to establish, mainly because of lacking and approximate legislation. Article 46 of the Italian Highway Code generically delegates the definition of "machines for disabled persons" (not considered vehicles) to "current Community provisions", but the explanatory note of heading 8713 of EU Combined Nomenclature of goods and EU Regulations 718/2009 and 2021/1367 equate mobility scooters to motor vehicles: as such they are an unknown entity for the Highway Code, therefore they should be considered unregulated atypical vehicles, which are forbidden in public areas. We propose the classification of mobility scooters as "motor vehicles" for both able and disabled persons and a specific regulation of their characteristics and circulation. Our legislative proposal could be useful even outside Italy, since some disputes at the European and National Courts and the absence of mobility scooters among the three-wheel vehicles and quadricycles categorized by EU Regulation 168/2013 are a symptom that they are still a controversial topic even abroad and need a clear-cut national and international legislation.

Keywords
Mobility scooters; Electric wheelchairs; Electric micromobility; Urban mobility; Legislation.

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1. Introduction

Mobility scooters in Italy are called "electric scooters for the disabled and elderly" ("scooter elettrici per disabili e anziani"). This negative name has its roots in the Italian Classification of Medical Devices, where they are still indicated by the extremely generic term of "electric scooters" ("scooter elettrici", code Y122124). Currently the Italian Highway Code does not consider them vehicles nor does its classification of vehicles provide for a vehicle specifically called "scooter". Regardless of whether they are considered vehicles or not, calling them "electric scooters" is misleading, especially since in recent years electric road scooters have become established (from mopeds like Vespa Elettrica L1 to maxiscooters like BMW C Evolution, today in Italy you can choose from more than 70 electric models) and now the confusion between categories reigns supreme. On the other hand, we reject the more specific but restrictive and ghettoizing denomination of "electric scooters for the disabled and elderly", being convinced that they can prove to be a formidable aid also for the mobility of so-called able persons and that their success in other countries is due to the lesser connotation of disability compared to electric wheelchairs, especially if we consider also the innovative paradigm of autonomous vehicles that will characterize our future mobility. Therefore, personally we have adopted the international name of "mobility scooter" in our Italian language and we propose that it should be adopted even in the Italian Classification of Medical Devices.

But the real problem is something else. While we were trying to set up a scientific study on the modern and versatile cabin versions, suspicious of the too many difficulties that we were facing in finding them in shops and on road, we detected a bad flaw in the legislation of mobility assistive devices which dramatically compromises the possibility that any mobility scooter is allowed to circulate in areas open to the public, and which seems definitely unknown even to sector operators. Therefore, we want to raise awareness of this problem and to propose a comprehensive solution, since mobility scooters are systematically ignored by any decree on electric micromobility instead of being valorized as the most serious micromobility device for both disabled and able persons, and are still a matter of controversy even abroad.

2. Why "scooters"? The legislation background of these "motor vehicles"

The "scooter" is defined as a motor vehicle of motorcycle origin characterized by a frame which is centrally open in the upper part and by a lower platform that allows the driver to sit in an upright position with parallel legs. The term scooter originated from the existence of the platform, which recalls the kick scooter. The diffusion of the term is mainly due to the success of a model produced by the English company ABC, called "Scootamota" with the clear intention of recalling the term "scooter motor" by assonance, many years before the world-famous Italian Vespa made it a real custom phenomenon.

Mobility scooters in fact follow the structure and the driving setting of a motor scooter, more comfortable than a motorcycle, and the modern cabin mobility scooters approximate the comfort of a car.

2.1 Mobility scooters today

There are currently various types of mobility scooters (Cannata & Foti, 2020): portable, three-wheel, four-wheel, and cabin (Fig.1).

Portable models can be folded or partially disassembled to find accommodation in the trunk of an automobile. They are the most manageable and those with the smallest turning radius, but are less sturdy and have a limited carrying capacity.

The three-wheel mobility scooters, faithful to the first historical models of the 50s and 60s, are equipped with two rear wheels and one front steering wheel. They are more powerful, robust and comfortable than the previous ones, maintaining good doses of manageability and size that allow their use even at home. In the external environment they work best on flat and uniform surfaces.

Fig.1 The various types of mobility scooters: portable, three-wheel, four-wheel, and cabin *(source: Officine Ortopediche S.r.l.)*

The four-wheel mobility scooters ensure better stability: they are the fastest and most reliable models and are stable in the external environment on uneven surfaces, with a wider turning radius and less maneuverability. The cabin models are equipped with a closed body, which makes them almost as versatile as small cars.
Mobility scooters are a great advantage, in travelling short and medium-haul routes, for all those people who have reduced mobility due to disability or old age. Thanks to these assistive devices, in fact, these subjects can receive autonomy and independence in daily life activities, also benefiting from safety and comfort (Thoreau, 2015; Gitelman et al., 2020). Some models can accommodate two seats and allow companionship and assistance to patients with disabilities; others have the ability to overcome differences in level even higher than 20-25%, allowing the removal of urban barriers with a consequent important progress also socially (Mortenson & Kim, 2016). An important difference between the cabin mobility scooter and the open one is the possibility of using the first even in the colder months as it guarantees total protection from the outside, in addition to the presence of internal heating devices; in the same way it offers shelter from the sun in the warmer months and even air conditioning on some models. In addition to the protective function of the cabin structure also against impacts, security measures are represented by cameras and parking sensors. The use of these scooters, promoting greater autonomy in external mobility (and therefore a greater possibility of social contact), reduces the risk of the onset of depression (especially in the elderly). Autonomy is also seen as personal growth, as the acquisition of power by the individual capable of making decisions, relating to others, managing and planning his own life, which is not measurable but which is appreciated in a completely individual and personal way from the subject and improves his quality of life (Akhavan & Vecchio, 2018; Battarra et al., 2018). Finally, judged from the outside, the use of these devices in patients with visual impairments may seem careless, however recent studies have shown an improvement in autonomy in this population in parallel with a conscious and safe use of the device itself (McMullan & Butler, 2019). The safety equipment, and not only for this particular category of subjects, could be further increased by the adoption of automatic emergency braking, now widespread on conventional cars.
Mobility scooters can be prescribed to patients who are unable to push a wheelchair or who require comfortable and fatigue-free assisted mobility, provided they have sufficient upper limb validity for driving, good head and trunk control and the ability to carry out postural passages independently. Furthermore, a certain control of the lower limbs must be preserved, in the absence of contractures that hinder the flexion of the knees. The turning radius of a mobility scooter, especially of a four-wheeled, is greater than that of an electric wheelchair, making it more suitable for use in the external environment (Cannata & Foti, 2020).

2.2 From assistive devices to new vehicles for a sustainable mobility?

Can it be hypothesized that these assistive devices, originally designed for disabled and elderly people, could become a further alternative in mobility also for able people? According to the International Classification of Functioning, Disability and Health (ICF) model, disability is defined as the "result of the correlation between a person's health condition and environmental factors that represent obstacles or facilitators to the exercise of

rights and participation". Among the environmental factors that negatively affect the participation of individuals, the psychological stress that results from spending many hours in traffic or finding parking, which a small vehicle could improve, should also be considered; in the same way, from a strictly physical point of view, the decrease in time spent sitting behind the steering wheel could help to reduce the incidence of disabling problems such as low back pain. The "electric scooter for the disabled and elderly", therefore, could help to remove in a broad sense the physical and social barriers that hinder the exercise of rights and participation even in subjects considered still able. Accessibility is also a cornerstone of the European disability strategy 2010-2020, with particular attention to removing obstacles to mobility.

Another aspect to consider is the strong debate that is currently involving the transport sector, with particular reference to land vehicles, which represent one of the main culprits of PM10 e CO2 emissions. The phenomenon of climate change, the fluctuation of oil prices and the important technological innovations in sectors relevant to the automotive industry (for example in the battery production) have given a strong boost to the use of electric and hybrid vehicles and to the development of charging infrastructure. In Italy, for example, 2019 marked an important milestone for the spread of the electric car, since for the first time, in April, the threshold of 1,000 vehicles registered in a month was exceeded (data from the third edition of the Smart Mobility Report). In this sense, a greater diffusion of mobility scooters would be a potential aid to environmental issues; it would also help to reduce the purchase costs of modern and versatile cabin scooters, which are still relatively high compared to those of open scooters albeit lower than those of an electric car, to the benefit of the often low-income categories for which they were originally designed.

The driving range of mobility scooters is a few tens of km, sufficient for an urban use without particular restrictions; users may find an effective range lower than the theoretical range declared by the company, but it is a common problem also for electric cars. Being light and relatively slow, they need a fairly small and not too expensive battery pack, which can also be detached from the scooter and taken home for recharging. Additional batteries are available if required. A myriad of models of mobility scooters are marketed worldwide to rival the variety offered by the automotive market: slower and faster, single and two-seater, open and covered, they meet the most varied needs for autonomy of the disabled persons and can easily be adapted even to the needs and modalities of urban mobility of able persons.

Unfortunately, these encouraging premises in Italy have to deal with a regulatory situation that is far from favourable, even for disabled persons themselves.

2.3 What the Italian Highway Code says: a delegation to "current Community provisions"

The "machines for use by disabled persons" are taken into consideration in Articles 46 and 190 of the "New Highway Code" of 1992 and in Article 196 of the related "Implementing Regulation" of the same year, which were subject to some updates in later periods.

The first draft of Article 46 of the 1992 Highway Code specified that machines for the use of disabled people, even if serviced by an engine, whose characteristics do not exceed the limits established by the Regulation, do not fall within the definition of vehicle; according to Article 190, they are allowed to circulate on the parts of the road reserved for pedestrians.

Article 196 of the 1992 Implementing Regulation, modified in 1996, lists the construction characteristics of the assistive devices for disabled persons, which must be such as not to exceed the following limits: a) maximum length 1.10 m; b) maximum width 0.50 m, with the exception of the area between two vertical planes, orthogonal to the median longitudinal plane of the "vehicle" and 0.60 m distant from each other, where the maximum width can reach 0.70 m; c) maximum height 1.35 m, in the area where the maximum width of the device can reach 0.70 m, linearly variable from 1.35 m to 0.80 m, the maximum value that can be reached at the front end of the device; d) single seat; e) mass in running order 40 kg; f) maximum engine power 1 kw;

g) maximum speed 6 km/h for devices equipped with engines. This limit is obtained by design and refers to the maximum number of revolutions of use of the engine declared by the manufacturer and to the higher gear ratio. The test is carried out on the road by the driver in an upright position (mass 70 ± 5 kg).
Exceeding even one of the indicated limits involves the inclusion of the machine in the actual vehicles.
The law 29 July 2010, n. 120 "Provisions on road safety" has drastically modified Article 46: any reference to the limits established by the Implementing Regulation disappears, and it is specified that machines for the use of disabled persons, *which are included in medical assistive devices according to the current Community provisions*, do not fall within the definition of vehicle, even if they are serviced by an engine.
According to some interpretations of the provisions of Italian Highway Code (Gagliano, 2014; Cappellini, 2020), including the modification to Article 46 occurred in 2010, the "electric scooters for the disabled and elderly" do not fall within the definition of vehicle and must anyway respect the limits imposed by Article 196 of the Implementing Regulation. If they exceed even one of these limits, they are included in the vehicles, but since they are not homologated as such, they can only circulate in private areas that are forbidden to the public. On some models the 6 km/h speed limit can be manually deactivated with a switch and brought to higher speeds; also in this case the device must be used exclusively on private areas closed to the public, since the Regulation orders a maximum *design* speed of 6 km/h.
However, we believe that the modification of Article 46, paragraph 1 of the Highway Code laid down by the Law of 29 July 2010 offers a different reading key, which articulates the regulatory interpretation of motorized assistive devices for the mobility of disabled persons with even more worrying implications for mobility scooters.
In fact, in the new Article 46, the right weight must be given to the phrase *included in medical assistive devices according to the current Community provisions* which has replaced the phrase *whose characteristics do not exceed the limits established by the Regulation*. Consequently, the technical characteristics of the "machines for the use of disabled persons" provided by Article 196 of the Implementing Regulation are exceeded by those identified by the "current Community provisions": in other words, if according to current Community provisions a mobility scooter is included in medical assistive devices, it derogates from all the dimensional, weight and performance limits laid down by the Regulation to authorize its circulation in areas open to the public, it being understood that it does not fall within the definition of vehicle and can therefore only circulate on parts of the road reserved for pedestrians.
A note in the document "Urban mobility scooters and the rules of the Highway Code" of the Seniorlife company corroborates this different interpretation: "The law 120/2010 Article 8 paragraph b amends Articles 46 and 190 of the Highway Code eliminating the dimensional prescriptions of the same, referring to community provisions, and not to Article 196 of the Implementing Regulation 495/1992".
But what are the "current Community provisions" on mobility scooters?

2.4 What the "current Community provisions" say: a drastic split in "carriages for disabled persons"

The goods nomenclature of the European Community, called the "Combined Nomenclature" (published on 7 September 1987 in the Official Journal of the European Communities L256 and updated in 2004), identifies with the code 8703 the "Motor cars and other motor vehicles principally designed for the transport. of persons", distinguishing them from goods with code 8713 designated as "Invalid carriages, whether or not motorized or otherwise mechanically propelled: 87131000 Not mechanically propelled and 87139000 Other". Mobility scooters seem to fall under the heading "87139000 Other", although this heading is very generic and without technical specifications.

But in the Official Journal of the European Union C1 of January 4, 2005, an explanatory note of the heading "8713 – Carriages for disabled persons, whether or not motorized or otherwise mechanically propelled – 87139000 Other" was published:

"Motorised vehicles specifically designed for disabled persons are distinguishable from vehicles of heading 8703 mainly because they have:

- a maximum speed of 10 km per hour, i.e. a fast walking pace;
- a maximum width of 80 cm;
- 2 sets of wheels touching the ground;
- special features to alleviate the disability (for example, footrests for stabilising the legs).

Such vehicles may have:

- an additional set of wheels (anti-tips);
- steering and other controls (for example, a joystick) that are easy to manipulate; such controls are usually attached to one of the armrests; they are never in the form of a separate, adjustable steering column.

This subheading includes electrically-driven vehicles similar to wheelchairs which are only for the transport of disabled people. They can have the following appearance:

Fig.2 According to the explanatory note of the heading 8713 of the EU Combined Nomenclature of goods, this is a "carriage for disabled persons" ***(source: Official Journal of the European Union C1 of 4 January 2005)***

However, motor-driven scooters (mobility scooters) fitted with a separate, adjustable steering column are excluded from this subheading. They can have the following appearance and are classified in heading 8703:"

Fig.3 Instead this device with a steering column is a "motor vehicle principally designed for the transport of persons" ***(source: Official Journal of the European Union C1 of 4 January 2005)***

Therefore, according to this European regulation, the presence of "a separate, adjustable steering column" classifies mobility scooters as *motor vehicles*, not as carriages for disabled persons.

While motorized wheelchairs benefit from an improvement of their characteristics (maximum width and speed increased to 80 cm and 10 km/h, no limit to other dimensions, mass, power and number of seats), for mobility scooters only the presence of the steering column and their equivalence to motor vehicles are specified.

For further clarification, on 4 August 2009 the Commission of the European Communities produced the Regulation No. 718/2009 specifically concerning the classification of mobility scooters in the Combined

Nomenclature, that was published in the Official Journal of the European Union L205 of 7 August 2009. This Regulation explains the reason for the classification of mobility scooters under code 8703 rather than 8713 in the following terms, together with an approximate and questionable description of their technical characteristics.

Description of the goods

Four-wheeled vehicle with an electric motor powered by two rechargeable 12 V batteries. It is approximately 48 cm wide, 99 cm long and 58 cm high (with the backrest folded down), with a total weight without batteries of approximately 34.5 kg. The maximum load is approximately 115 kg.
The vehicle has the following characteristics:

- a horizontal platform connecting the front and rear sections,
- small wheels (approximately 2.5 × 19.0 cm) with anti-leak tyres,
- an adjustable seat without armrests and grips whose height can be set in one of two positions, and
- a steering column that can be folded down.

The steering column has a small control unit including a contact switch, a horn, a battery output display and a button to set the maximum speed.
The vehicle has two thumb-operated levers for accelerating, braking and reversing. There are anti-tip wheels at the back of the vehicle to prevent it from tipping over. It has an electronic dual braking system.
When its batteries are fully charged it has a maximum range of approximately 16 kilometres and can reach a maximum speed of approximately 6.5 km/h.
The vehicle can be disassembled into four light components. It is designed for use at home, on footpaths and in public spaces, for activities such as shopping trips.

Fig.4 According to the EU Regulation 718/2009, this four-wheeled device is a "special type of a vehicle for the transport of persons" which is not specially designed for the transport of disabled persons and has no special features to alleviate a disability *(source: Official Journal of the European Union L205 of 7 August 2009)*

Three-wheeled vehicle with an electric motor powered by two rechargeable 12 V batteries. It is approximately 61 cm wide, 120 cm long and 76 cm high (with the backrest folded down), with a total weight without batteries of approximately 46 kg. The maximum load is approximately 160 kg.
The vehicle has the following characteristics:

- a horizontal platform connecting the front and rear sections,
- small wheels (approximately 8.9 × 25.4 cm) with anti-leak tyres,
- an adjustable seat with armrests and grips whose height can be set in one of three positions, and
- a steering column that can be folded down.

The steering column has a small control unit including a battery meter, a contact switch, buttons to activate lights, a horn and a button to set the maximum speed.
The vehicle has two thumb-operated levers for accelerating, braking and reversing. There are anti-tip wheels at the back of the vehicle to prevent it from tipping over. It has an electronic dual braking system.

When its batteries are fully charged it has a maximum range of approximately 40 kilometres and can reach a maximum speed of approximately 8 km/h.
The vehicle can be disassembled into seven light components. It is designed for use at home, on footpaths and in public spaces, for activities such as shopping trips.

Fig.5 Even this three-wheeled device is a "special type of a vehicle for the transport of persons" not specially designed for the transport of disabled persons *(source: Official Journal of the European Union L205 of 7 August 2009)*

Classification (Combined Nomenclature code): 8703 10 18

Reasons

Classification is determined by General Rules 1 and 6 for the interpretation of the Combined Nomenclature and by the wording of CN codes 8703, 8703 10 and 8703 10 18.
The vehicle is a special type of a vehicle for the transport of persons.
Classification under heading 8713 is excluded as the vehicle is not specially designed for the transport of disabled persons and it has no special features to alleviate a disability. (See also the Harmonised System Explanatory Notes to heading 8713 and the Combined Nomenclature Explanatory Notes to subheading 8713 90 00.)
The vehicle is therefore to be classified under CN code 8703 10 18 as a motor vehicle principally designed for the transport of persons."
So the change to Article 46 of the Italian Highway Code has produced the result that, regardless of exceeding even one of the limits indicated in the first paragraph of Article 196 of the Implementing Regulation, the "current Community provisions" imply the inclusion of mobility scooters "in the vehicles referred to in the first sentence of Article 46, paragraph 1". As such they are an entity unknown to the classification of vehicles operated by Article 47 of the Italian Highway Code, *and therefore in Italy could not even circulate in areas open to the public*.
Apart from the distorted effects of this combination between the Italian Highway Code and the Community provisions, in the European Union States the devices for the disabled persons enjoy exemption from customs duties and other tax breaks, and therefore the legal disputes at the Court of Justice of the European Union were not late.
The judgment of the European Court (Seventh Chamber) of 22 December 2010, Case C-12/10, Lecson Elektromobile GmbH (importer of mobility scooters) v Hauptzollamt Dortmund (German customs agency) has strengthened and developed the provisions from the explanatory note of 2005:
"Heading 8703 of the Combined Nomenclature in Annex 1 to Regulation No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff, as amended by Regulation No 1810/2004, must be interpreted as covering three or four-wheeled vehicles designed for the transport of one person *who is not necessarily a disabled person*, powered by a battery-operated electric motor, reaching a maximum speed of 6 to 15 km/h and equipped with a separate, adjustable steering column, known as 'electric mobility scooters'. *(omissis)* The mere fact that those electric mobility scooters may be used, where appropriate, by disabled persons or even may be adapted for use by disabled persons does not affect the tariff classification of such

vehicles, given that *they are suitable for use for several other activities by persons who do not suffer from any disability*, but who for one reason or another prefer to travel short distances other than on foot, like golfers or persons going shopping."

Therefore, this judgment reiterates that mobility scooters are to be considered vehicles and are not assistive devices for the disabled person.

But a few years later, in a completely analogous controversy, the judgment of the European Court (Tenth chamber) of 26 May 2016, Case C-198/15, Invamed Group Ltd, Invacare UK Ltd, Days Healthcare Ltd, Electric Mobility Euro Ltd, Medicare Technology Ltd, Sunrise Medical Ltd, Invacare International SARL (UK importer of mobility scooters) v Commissioners for Her Majesty's Revenue & Customs (UK custom agency), reaches diametrically opposed conclusions:

"That reasoning confirms, *a contrario*, that the fact that the vehicles at issue in the main proceedings may, in some circumstances, be used by non-disabled persons is irrelevant to the tariff classification of such vehicles under heading 8713 of the Combined Nomenclature, since by reason of their original purpose, *those vehicles are unsuitable for other persons who do not suffer disabilities*. *(omissis)* Heading 8713 of the Combined Nomenclature set out in Annex I to Council Regulation (EEC) No 2658/87 of 23 July 1987 on the tariff and statistical nomenclature and on the Common Customs Tariff, as amended by Commission Regulation (EC) No 1810/2004 of 7 September 2004, must be interpreted as meaning:

- the words 'for disabled persons' mean that the product is designed solely for disabled persons;
- the fact that a vehicle may be used by non-disabled persons is irrelevant to the classification under heading 8713 of the Combined Nomenclature;
- *the Explanatory Notes to the Combined Nomenclature are not capable of amending the scope of the tariff headings of the Combined Nomenclature*."

The European Court therefore sanctioned in 2010 that mobility scooters are suitable for both the disabled and the able persons, but then in 2016 it specified that they continue to be considered "carriages for disabled persons" since, due to their initial destination, they are not suitable to people who do not suffer from disability, even going so far as to deny the explanatory note of the European Community itself and thus giving rise to dangerous ambiguities, contradictions and regulatory gaps that hinder the usability of mobility scooters for both the disabled and the able persons.

In fact the 2016 sentence fostered a series of contradictory sentences of the UK National Court. The last sentence issued on 25 February 2020 (appeal of Invamed Group Ltd and other companies, case No. A3/2018/2938) conformed to the 2016 sentence of the European Court. At the same time it pointed out that the Regulation No. 718/2009 came too late to apply to the mobility scooters imported in the period 2004 to 2007 which featured on that dispute. Had it applied then, it would have been binding and definitive, subject only to a possible challenge to its validity in the European Court. Nowadays it remains crucial as confirmation of a general and consistent treatment of mobility scooters as vehicles falling within heading 8703. It is considered even more mandatory than the previous 2005 note to the heading 8713.

The positive aspect is that a common thread emerges from these contradictory judgments: mobility scooters are considered vehicles for the use of both able and disabled persons.

The search engine of the portal of the European Commission of Mobility and Transport, entering the words "mobility scooters" in quotes, merely provides a document dated 8 January 2016 (just before the second judgment of the European Court) relating to a community decision in customs matter with regard to the United Kingdom, in which the incorrectness of classifying mobility scooters with the "duty free" code 8713 instead of the code 8703 is marginally recalled.

Quite recently, on 6 August 2021 the European Union has felt the need to issue a further clarifying document on its classification of mobility scooters, the Commission Implementing Regulation (EU) 2021/1367 *(Official Journal of the European Union L294 of 17 August 2021)*, which puts a tombstone on any possibility that

mobility scooters may be "included in medical assistive devices according to the current Community provisions", albeit leaving open the possibility that a national authority may carry out a post-clearance assessment of the vehicle for purposes other than those laid down in customs legislation:

Description of the goods

Four-wheeled vehicle with a DC 24 V 800 W electric motor powered by two 12 V rechargeable batteries with 45 Ah-capacity. It is approximately 65 cm wide, 125 cm long and 129 cm high (measured at the seat back, 85 cm with the seat back folded down). Its total weight is approximately 107 kg (108 kg including the batteries). The maximum load is approximately 130 kg.

The vehicle has the following characteristics:

- a horizontal platform connecting the front and rear sections; the platform cannot be adjusted in any way (e.g. folded or tilted) to suit the user's needs;
- two sprung axles, rear-axle drive and an 820 mm wheelbase;
- gradient capability 13°;
- turning circle 210 cm,
- two sets of inflatable tyres (the rear tyres being larger than the front ones);
- a configurable, height-adjustable rotating seat with supports and armrests and a non-slip surface for the feet;
- an adjustable fold-down steering column with oval-shaped handlebars;
- front and rear lights, direction indicators and rear-view mirrors.

The steering column also has a dashboard featuring a switch box, a speed control, a horn button, an engine-idle button, a blinker switch, a light switch, a battery-status indicator and a speed adjuster.

The vehicle has two manually operated levers for accelerating, braking and reversing. The steering can be adjusted to allow operation with one hand. It has a 'smart' regenerative electromagnetic braking system.

With fully charged batteries, the vehicle has a maximum range of up to 45 kilometres and can reach a maximum speed of approximately 15-16 km/h.

It may be fitted with small anti-tipping wheels at the back, a shopping basket, a walking-stick holder, etc.

The vehicle may be stowed for transport purposes. It may be used on roads, pavements, footpaths, pathways in parks, cycle paths and certain leisure trails, or in pedestrian areas (e.g. shopping precincts).

Classification (Combined Nomenclature code): 8703 10 18

Reasons

Classification is determined by General Rules 1 and 6 for the interpretation of the Combined Nomenclature and by the wording of CN codes 8703, 8703 10 and 8703 10 18.

Classification under heading 8713 as a carriage for disabled persons is excluded as the vehicle is not specially designed for the transport of disabled persons: it has no special features to alleviate a disability.

Although the vehicle is designed so that the steering can be controlled with one hand and features a comfortable rotating seat with supports and a non-slip surface for the feet (and may optionally be fitted with small anti-tipping wheels), such characteristics do not objectively constitute special features designed to alleviate a disability (see also the Combined Nomenclature Explanatory Notes (CNEN) to subheading 8713 90 00, the Harmonized System Explanatory Notes to heading 8713 and HS classification opinion 8703.10/1).

In addition, vehicles fitted with a separate, adjustable steering column and those reaching a maximum speed over 10 km per hour are excluded from heading 8713 (see also CNEN to subheading 8713 90 00).

The vehicle is used for transporting persons and upon presentation to customs authorities it is not recognisable as a vehicle designed solely for disabled persons (see Case C-198/15: Judgment of the Court of 26 May 2016, *Invamed Group Ltd and Others v Commissioners for Her Majesty's Revenue & Customs*, ECLI:EU:C:2016:362), based on its objective characteristics and properties which must be assessed at the time of customs clearance (see Case C-286/15: Judgment of the Court of 26 May 2016, *Latvijas propāna gaze*, ECLI:EU:C:2016:363, paragraph 33). Any subsequent post-clearance modification of the vehicle is disregarded as is any assessment of the vehicle that may be carried out by a national authority for purposes other than those laid down in customs legislation.

The vehicle is a special type of vehicle for the transport of persons.

It is therefore to be classified under CN code 8703 10 18 as a motor vehicle principally designed for the transport of persons, similar to golf cars."

Fig.6 According to the EU Regulation 2021/1367, this device is to be classified as a motor vehicle similar to golf cars and may be used almost everywhere *(source: Official Journal of the European Union L294 of 17 August 2021)*

The Community Regulation No. 168/2013 of the European Parliament and of the Council of 15 January 2013 on the approval and market surveillance of two- or three-wheel vehicles and quadricycles, with subsequent amendments and adjustments *(Official Journal of the European Union L060 of 2 March 2013, L53 of 21 February 2014, L77 of 23 March 2016, L30 of 31 January 2019)*, has profoundly updated the classification and approval procedures of two or three-wheeled motor vehicles and quadricycles, but the mobility scooter category is still not envisaged. It should be emphasized that mobility scooters, although they share a basic design and various functions, represent a somewhat heterogeneous category with some characteristics also shared by electric wheelchairs. There is no "the" mobility scooter, and it is precisely this relative lack of homogeneity in form and functions that makes it difficult to regulate them (Birtchnell et al., 2018). But this only confirms how indispensable it is now to make them the subject of specific and precise legislation, and not only at national level.

Confusion reigns in this regulatory vacuum, even among professionals. Almost everywhere on the web, when looking for legislation according to which mobility scooters are to be considered medical devices so that they can circulate as "non-vehicles" pursuant to the provisions of the reformulation of Article 46 of the Highway Code, we come across this typical explanation:

"It is necessary that the manufacturer declare that the product is built according to the current Community provisions. Specifically, the manufacturer's declarations should certify that the vehicle has been designed for people who are unable to walk or have difficulty in walking and are physically and mentally able to drive an electric vehicle, and that it has been produced in accordance with the European standards (e.g. EN 12184) and is entered in the Register of Medical Devices in accordance with the decree of the Minister of Health of 20 February 2007. Better if the vehicle has been successfully tested for its safety according to German and international standards."

The code EN 12184 indicates a European construction standard that concerns the requirements and test methods for electrically powered wheelchairs, mobility scooters and their chargers. *This is not the same as saying that mobility scooters are medical assistive devices.* It would be like saying that since a car adapted for a disabled person needs automatic gearbox and power steering, then any car equipped with automatic gearbox and power steering is a medical assistive device. The inclusion in the Italian Register of Medical Devices and the successful tests according to German and international standards are even less relevant.

2.5 Mobility scooters according to the UK legislation: two classes of "motor vehicles" that can also be driven on the road

In United Kingdom, manual and motorized wheelchairs and mobility scooters are considered medical devices for people who are unable to walk or have difficulty in walking; in legal language they can still be found with the definition of "invalid carriages", but are currently defined as "mobility vehicles". The UK Government website provides a guidance classifying "vehicles, bicycles, parts and accessories" for import and export (HM Revenue & Customs, last updated october 2018) where mobility scooters are defined as *vehicles* designed for use in the home, on footpaths and in public spaces. They are classified under heading 8703 subheading 8703 10 18.

There are three types of "invalid carriage" defined in "The Use of Invalid Carriages on Highways Regulations 1988":

- Class 1: manual wheelchairs, not electrically powered;
- Class 2: powered wheelchairs and mobility scooters, intended for footpath or pavement use only with a maximum speed limit of 4 mph (6,4 km/h);
- Class 3: powered wheelchairs and mobility scooters, that can also be driven on the road, with a maximum speed of 8 mph (12.8 km/h) but equipped with a speed limiter at 4 mph for use in pedestrian areas.

Requirements for a Class 2 vehicle: unladen weight excluding driver up to 113.4 kg; maximum speed 4 mph (6.4 km/h); lights and reflectors only if used on the carriageway between sunset and sunrise; braking system.

Requirements for a Class 3 vehicle: width up to 0.85 m; unladen weight excluding driver up to 150 kg; maximum speed 8 mph (12.8 km/h); front and rear lights and reflectors; direction indicators capable of operating as a hazard warning signal; amber flashing light when used on dual carriageways; rear view mirror; audible warning instrument; braking system.

In essence, a detailed and precise regulation where necessary, realistic enough, which extends the usability of "mobility vehicles", clearing the field of ambiguity and misinterpretation. Many countries follow the UK model in distinguishing two categories of mobility scooters and in differentiating the maximum speeds they can reach in pedestrian areas or on the road (Steyn & Chan, 2008).

The downside is that in United Kingdom mobility scooters may only be used by disabled persons, while two-seater scooters are not allowed to circulate in public areas, whether they are roads or sidewalks. However, this restriction does not prevent United Kingdom from being at the forefront throughout Europe in the diffusion of mobility scooters, which are even more common than two-wheeled electric kick scooters used by younger people as a rapid and economic alternative in urban transport. Around 80,000 mobility scooters are sold each year in United Kingdom and up to 350,000 mobility scooters and motorized wheelchairs are estimated to travel (Research Institute for Consumer Affairs, 2014). "Mobility shops" can be found just about anywhere and new ones open every month. It is easy to observe flocks of mobility scooters around shops, promenades, tourist attractions and public parks, symbolizing freedom, progress and independence. People who in the past were relegated to their homes now have the opportunity to go to bar, restaurant and shopping with a vehicle that does not stigmatize their motor limitations like an electric wheelchair. A clear and well-drafted legislation is always beneficial, even for purely economic aspects, leading to an epochal change if one considers that until

the 1980s these devices were almost unknown in United Kingdom. In Italy they continue to be semi-unknown and those few that circulate are held up as a symbol of "handicap".

2.6 Country you go, legislation you find: but when in Rome don't do as the Romans do

We have taken the UK legislation as a reference because it seems to us particularly complete and somewhat adaptable to the characteristics of the Italian context, but the laws in Europe and in the world concerning motorized assistive devices for mobility are very variable.

Another country where mobility scooters are quite widespread is Holland, but if we compare its legislation with the UK one, there are profound differences. In the Netherlands, mobility scooters are registered vehicles, which can be driven from 16 years of age, can circulate on the road and reach a speed of 45 km/h (practically like Italian light quadricycles), just below the limit of 50 km/h which applies in built-up areas. They are subject to the obligation of insurance, the mark of which must be clearly displayed. At the same time, they are allowed to circulate on the wide network of cycle paths, where they cannot exceed 30 km/h in the town and 40 km/h outside the town: speeds significantly higher than the average of cyclists, but usually, when they use cycle paths, mobility scooter drivers limit their speed to 20 km/h, in order to favour "cohabitation". It being understood that they can also circulate on pavements, where they are considered pedestrians and cannot exceed the speed of 6 km/h. The maximum dimensions are surprising: width 1.10 m, height 2 m and a length of 3.50 m.

Steyn & Chan (2008) carried out an extensive review of the regulations for mobility scooters in various countries: UK, Denmark, Sweden, the Netherlands, France, Spain, Australia (state of Queensland), New Zealand and British Columbia (Canada). The selection of countries and regions was based on the availability and clarity of information on regulations: it is probably no coincidence that Italy was missing, and we do not believe that the subsequent advent of the amendment to Article 46 of the Italian Highway Code would have made it part of the selection. Spain did not have national legislation but recommended following UK legislation; currently each local authority can establish its own rules.

This review highlighted that most jurisdictions make a distinction between slow and fast mobility scooters: the intent seems to be to regulate their speed in different road or traffic contexts. There is a consensus that mobility scooters need to travel at lower speeds in pedestrian environments such as pavements, where they should be treated as pedestrians. Mobility scooters capable of higher speeds can only reach them on the road and are classified as vehicles. In general, their classification as vehicles is accompanied by the obligation of registration and vehicle equipment; in some jurisdictions there is also an insurance requirement. Speeds in pedestrian areas vary from 4-5 km/h in Sweden to 10 km/h in Queensland (Australia), passing through 6 km/h in France and 6.4 km/h in UK. Mobility scooters are allowed on cycle paths in the Netherlands, but it is unclear whether this is also the case in other jurisdictions. New Zealand legislation is the most explicit in terms of consequences for those who break the rules: driving a mobility scooter carelessly, recklessly or at dangerous speeds can result in a penalty. If it causes injury or death, the user of a mobility scooter could even be sentenced to imprisonment.

In the state of Queensland (Australia), user registration is required, who needs a medical certificate to prove that the scooter is intended to compensate for mobility problems. The requirement for proof of a mobility problem appears to be a unique feature of the Queensland regulatory model. Furthermore, none of the jurisdictions examined require mobility scooter users to have a driving license and they are not required to provide proof of fitness to drive. The medical certificate required in Queensland only certifies that the user of the mobility scooter must use it due to a serious impairment of mobility and not suitability to use it. However, Queensland legislation stipulates that a mobility scooter must only be used by the registered operator. A regulation for the education and training of users was not found in any of the countries examined.

The Israeli Transport Regulations issued in 2013 provide that mobility scooters can also have two seats, with a width of up to 1 m and a maximum speed of 12 km/h, allowing driving on the road if the sidewalk is impassable; electric propulsion is mandatory (Gitelman et al., 2016).

We also examined two Eastern European countries, Romania and Poland. In Romania the situation is still evolving: the laws are constantly being modified and updated, with attempts that are not always fruitful, to align with European trends. Only recently has a clear distinction been made between "mopeds" (mopeds, tricycles and light quadricycles with a maximum speed of 45 km/h) and mobility scooters. The latter can have a maximum speed of 25 km/h and are also allowed on cycle paths. It should be noted that mobility scooters are not considered assistive devices for the mobility of disabled or elderly people, but a means of transport to reduce traffic and pollution. In Poland there are no explicit regulations, but the tendency is to conform to UK law; mobility scooters are allowed on pavements and roads, but not on cycle paths.

The research by Steyn and Chan (2008) included a stakeholder survey of their views on regulations, as well as a stakeholder and user survey of the routes and difficulties encountered while using a mobility scooter in terms of architectural barriers. Only a minority of stakeholders supported a "deregulation", considering it sufficient to rely on individual common sense. The majority, on the other hand, considered it essential to have legislation that regulates at least the areas of circulation and speeds, up to proposing a formal and structured classification and a specific regulation for mobility scooters.

Based on the information obtained from stakeholders and users, the researchers were also able to identify and document the problems of routes for users of mobility scooters, existing in any community that is not declared "mobility scooter friendly", with a rich iconography: narrow or non-existent sidewalks; permanent (poles) or temporary obstacles (construction sites, removable fences, vegetation) and inadequate spaces to bypass them; uneven, slippery, soft or steep surfaces; joints, curbs and differences in height; high and angular sidewalk edges; lack of ramps. Regarding some particularly congested areas of Italy, we would like to add among the temporary obstacles: cars and motorcycles parked wild on sidewalks, ramps and walkways.

The paper by Steyn & Chan (2008), which constitutes the final report of a research project of the University of Fraser Valley – Centre for Education & Research on Aging, funded by the Province of British Columbia (Canada), to our opinion remains a point of reference for regulatory and infrastructural planning on mobility scooters even after many years.

The most consistent finding of this study concerns the importance of mobility scooters in maintaining and improving the quality of life, which met with a strong consensus among all the participants in the research, including stakeholders and users. The general sentiment is that mobility scooter use "must be protected", and that any change in legislation and/or regulation must be considered with extreme care in terms of impact on the user's habits and quality of life.

The lack of adequate infrastructure is an element that can compromise a person's propensity to use a mobility scooter, making it perceived as a potentially dangerous means of transport. The impracticability of a sidewalk can force the user to drive the mobility scooter on the road, where he has to deal with larger and faster vehicles. Statistics on mobility scooter accidents are scarce, but the percentage of collisions with other vehicles seems very low in the face of falls, which indicate problems with infrastructures (Cassell & Clapperton, 2006). Mobility scooter users are careful in choosing their routes, with an intuitive preference for slow traffic conditions that probably helps prevent road accidents. However, in low traffic conditions, it is not uncommon that some users tend to disregard traffic rules even if the sidewalks are practicable, driving mobility scooters on the road in the directions and lanes that are convenient for them at that time (Gitelman et al., 2016).

How many differences exist in traffic conditions between cities in different countries and continents and within the different areas of the same city. It is impossible to find a uniquely "ideal" city to travel on a mobility scooter. There are areas where even pedestrians have difficulty moving from one point to another, even very

close as the crow flies (Gaglione et al., 2019). A recent urban plan is no guarantee of a "mobility scooter friendly" community: users can experience the same difficulties in Old Europe as in the Brand New Continent. How appreciable are Rome and the Italian ancient towns of any size, which allow people to live "in a walkable way" except for a few areas: thanks to the mistreated senescence of their urban layout (and to the questionable viability of the most recent built-up areas), they are more suitable to be travelled in mobility scooters rather than in SUVs or, if you say well, in "city cars" which now systematically start from a width of more than 1.70 metres. In our urban realities, mobility scooters can prove to be necessary means for travel, not only for people with disabilities, but also for those who do not have any apparent and clinically evident ones. Just like any other electric micromobility device.

Anyway, the above confirms that each nation regulates mobility scooters on its own based on the characteristics of the territory, the roads, the infrastructures, the transport needs and even the personality of the citizens: therefore, it appears even more out of place that the Italian Highway Code generically refers to "current community provisions" to parameter characteristics and circulation of motorized assistive devices for the disabled.

The motor disability rate in the population does not seem to be a determining factor and is not easily correlated with the spread of mobility scooters and the type of related legislation, given that, apart from the categorical provisions of Queensland, the requirement of "motor disability" seems to be understood in a rather broad sense and fades into the need for greater comfort in mobility universally felt by aged subjects (Bricocoli et al., 2018; Papa et al., 2018).

2.7 The "electric micromobility decree": a missed opportunity

Returning to Italy, on June 4, 2019 the Ministry of Infrastructure and Transport issued the decree for the experimentation of electric micromobility devices on the road. It deals with hoverboards, segways, electric kick scooters, monowheels, but there is no trace of mobility scooters. Yet, in all frankness, mobility scooters would be a much more versatile and stable device of electric micromobility than devices that require a dose of balancing that is not common even among perfectly able subjects.

2.8 The situation worsens after the conversion into law of the "milleproroghe" decree: the spectre of… destruction

Article 33-bis of the law of 28 February 2020, n. 8 "Conversion into law, with amendments, of the decree-law of 30 December 2019, n. 162, containing urgent provisions regarding the extension of legislative terms, the organization of public administrations, as well as technological innovation", the so-called "milleproroghe" decree ("thousand-extension" decree), in addition to postponing the end of the experimentation of the aforementioned electric micromobility devices for twelve months, has extrapolated the electric kick scooters, which have been compared to bicycles and liberalized on the road. Kick scooters with electric motors of continuous rated power not exceeding 0.50 kW and meeting the other technical and constructional requirements indicated in the decree of 4 June 2019 can be driven by users who have reached the age of fourteen and can circulate on urban roads with a speed limit of 50 km/h where the circulation of velocipedes is allowed, as well as on extra-urban roads if there is a cycle path and exclusively inside it. They cannot exceed the speed of 25 km/h when they travel on the roadway and 6 km/h when they travel on pedestrian areas. To drive at night and in low light conditions, lights must be provided, while the driver must wear the high-visibility reflective vest or braces. Helmets are mandatory for drivers under the age of 18. In any case it is forbidden to transport other people, objects or animals, to tow vehicles, to drive animals and to be towed by another vehicle. Rental services have the obligation of insurance coverage.

Mobility scooters could easily have been included in the decree for the experimentation of electric micromobility (Cannata et al., 2019), but this "milleproroghe" decree-law would lend itself even better to accommodate them alongside kick scooters, with some minor regulatory differences.
Instead, this same decree-law indirectly presents even darker scenarios to mobility scooters.
As we said, the "current Community provisions" to which Article 46 of the Highway Code refers do not consider mobility scooters as medical assistive device but equate them to motor vehicles.
But as such, mobility scooters, due to their specific characteristics, are not among the vehicles defined in Chapter I "About vehicles in general" of the Highway Code. Therefore, according to Article 59 "Vehicles with atypical characteristics" (modified by Legislative Decree 162/08 converted with modifications by Law 201/08), paragraph 1, they are to be considered atypical vehicles.
Pursuant to paragraph 2 of the same article (paragraph thus amended by law no. 120 of 29 July 2010), the Minister of Transport and Navigation, having heard the Ministers concerned, establishes, with his own decree:
a) the category, among those identified in this chapter, to which atypical vehicles must be assimilated for the purpose of circulation and driving;
b) the technical eligibility requirements for the circulation of the same vehicles, identifying them, with equivalence criteria, among those envisaged for one or more of the above categories.
To date, no categories and no technical requirements have been established for mobility scooters.
Article 33-bis, paragraph 3, of the conversion into law with modifications of the "milleproroghe" decree, added the following paragraph 2-bis to Article 59 of the Highway Code:
"Anyone travelling with an atypical vehicle for which the technical and functional characteristics indicated in paragraph 2 have not yet been defined is subject to the administrative sanction of paying a sum from € 200 to € 800. The violation is followed by the accessory administrative sanction of the confiscation of the vehicle, according to the rules of Title VI, Chapter I, Section II. In any case, its destruction is carried out".

2.9 A counterproductive "solution"

The issues between Italy and the European Union on the classification of mobility scooters as "vehicles" indeed have an outdated precedent. In 2007, an Italian parliamentary question called for regulatory changes to the Highway Code, approving this device and recognizing it, as planned by European legislation, as a "light moped" or including it in the "atypical vehicles" category. At that time, the original draft of article 46 of the Italian Highway Code with its reference to article 196 of the Implementing Regulation was still in force, while the explanatory note of code 8713 "Carriages for disabled persons, whether or not motorized or otherwise mechanically propelled" of the Combined Nomenclature had just been published in the Official Journal of the European Union. A draft decree was therefore drawn up by an Italian commission in order to establish, for wheelchairs and mobility scooters, construction characteristics other than those now anachronistic indicated in article 196 of the Implementing Regulation. The Italian Ministry of Transport notified the draft decree to the European Commission: but the latter, surprisingly and in open contradiction with its own explanatory note, stated that wheelchairs and mobility scooters were indiscriminately included among medical devices and as such could not be regulated by national standards that establish particular technical solutions (Marsicano, 2008). And so, in 2010 Italy chose the solution to modify article 46 of the Highway Code, delegating the definition of the technical characteristics of "non-vehicles" for disabled persons to the European Union. Just the year before, the Commission of the European Communities had issued Regulation No. 718/2009, even more categorical and binding than the previous explanatory note in not considering mobility scooters as medical devices. A catastrophic chain of events, which in Italy ended up drastically compromising the public circulation of mobility scooters, but which also demonstrated a clear inconsistency of the European Union in interpreting and applying its own regulations. Today, after the advent and consolidation of Regulation No. 718/2009 and its recent update by the Regulation No. 2021/1367, probably the response of the European

Union would be different and Italy would be free to regulate the technical characteristics and areas of circulation of these "motor vehicles" on its own, as happens in other countries. However, the European Union for its part should anyway contribute to definitively clarify, by including these "motor vehicles" in the classification of "two- or three-wheel vehicles and quadricycles" of its Regulation No. 168/2013.

3. Summing-up

It is common ground that United Kingdom, by limiting the use of mobility scooters to disabled persons by its own law, had the full right to challenge Community provisions which instead consider them to be motor vehicles for able persons. But it is even more striking how automatically the European Court has overturned the conclusions of a previous sentence of opposite tenor and has even denied the same explanatory note to the combined nomenclature, in fact following the UK legislation and at the same time taking care to specify that each final decision is referred to the national court. Anyway, even UK ended up adapting to the "current Community provisions", since the Regulation No. 718/2009 is considered more mandatory than the previous explanatory note of the heading 8713 even by the National Court. Finally, the recent Regulation No. 2021/1367 has definitively clarified that the European Union does not consider mobility scooters as assistive devices for disability, albeit leaving open the possibility of a post-clearance assessment of the vehicle that may be carried out by a national authority for purposes other than those laid down in customs legislation.
Therefore the substantial error was committed in the modification of Article 46 of the Italian Highway Code which intervened in 2010, by delegating the definition of "machines for the use of disabled" to "current Community provisions" without taking into account the drastic split in "carriages for disabled persons" that the European Community had already deliberated at the time of the modification. Moreover, these "current Community provisions" are still approximate and questionable and, more or less explicitly, could reserve the right to delegate in turn to provisions of the individual nation, at least for matters of dispute prior to the Regulation No. 718/2009, and even the most mandatory Regulation No. 2021/1367 admits the possibility of a re-assessment of the vehicle by a national authority which is anyway disregarded by the European Union classification. Assuming that the "current Community provisions" do not have sufficient decision-making force, the Italian provisions still remain those of Article 196 of the Regulation implementing the Highway Code, never formally suppressed, which imposes extremely restrictive and by now anachronistic limits on the technical characteristics of mobility scooters, putting a good part of them out of play. The intent of the 2010 amendment to Article 46 of the Highway Code was clearly to update these provisions somewhat hastily, making them overcome by "current Community provisions", which instead can put them all out of play.

3.1 Our proposal for a legislation of mobility scooters intended to circulate in Italy (useful even for the European Union)

Our legislative proposal starts precisely from the Community orientation expressed by the explanatory note of heading 8713 of the EU Combined Nomenclature and by the EU Regulations No. 718/2009 and No. 2021/1367, takes some inspiration from UK legislation and is divided into three basic points, which imply first of all modifications of the Highway Code and of its Implementing Regulation:

- Identify mobility scooters as a new category of electrically powered vehicles suitable for both the able and the disabled persons, subject to a specific legislation that entails a real homologation for use in areas open to the public;
- Divide them into two subcategories, called "light mobility scooters" and "heavy mobility scooters", anyway not registered, not subject to property tax and not requiring a license and registration certificate;
  Light mobility scooters: adjust the limits imposed by the current Article 196 of the Implementing Regulation of the Highway Code to those of the community note, specifying only a width limit increased

to 0.80 m, but confirming the maximum design speed strictly limited to 6 km/h; single seat; obligation of automatic emergency braking and reverse gear light with acoustic warning; authorized use on pedestrian areas, cycle paths and reserved lanes; possibility of being used by minors. They should be assimilated to motorized wheelchairs and would be the most suitable subcategory for disabled people who do not need an accompanying person (given the single seat): thus even bariatric disabled persons who need an "oversized" assistive device (however within the width of 0.80 m provided by the community note) could circulate in areas open to the public, having to deal only with architectural barriers sized for assistive mobility devices with standard dimensions;

Heavy mobility scooters: maximum width 0.85 m, mass limit in running order (excluding driver) 150 kg, maximum design speed strictly limited to 25 km/h with the requirement of basic equipment as a real motor vehicle (front and rear lights and reflectors, direction indicators capable of operating as a hazard warning signal, rear-view mirror, horn, safety belts), amber flashing light, speed limiter at 6 km/h with manual and telemetric operation, automatic emergency braking, automatic curve speed reduction, rear view camera, rear parking sensors and reverse gear light with acoustic warning; possibility of a second seat usable either by the authorized accompanying person or by a disabled owner while the accompanying person is driving; authorized use on pedestrian areas (only up to 6 km/h), cycle paths, reserved lanes and on the road in Zones 30 (roads with a speed limit of 30 km/h), possibly equating them to electric kick scooters and liberalizing their circulation even on urban roads with a speed limit of 50 km/h (where they could reach a maximum speed of 25 km/h); possibility of being conducted only by adults and by minors who hold at least a category AM driving license; helmet obligation for open-top versions, not for cabin versions. They would be the most suitable subcategory for able persons (for the possibility of travelling at speeds above 6 km/h outside the pedestrian areas) and for disabled persons who need to be accompanied (for the possibility of two seats);

- Establish the obligation of civic liability insurance for heavy mobility scooters (and in general for any motorized micromobility device with a maximum speed exceeding 6 km/h) that circulate in areas open to the public.

The 0.85 m limit for the width of heavy mobility scooters is not an uncritical imitation of British legislation: the Segway X2 SE, entitled by the "electric micromobility decree" to venture on pedestrian areas, cycle paths and roads, is 0.84 m wide.

According to our proposal, mobility scooters would therefore be classified as vehicles that could be driven by both able and disabled persons. The only difference would be that able persons would buy them by paying them out of pocket and without tax breaks (i.e. reduced VAT, deductibility), whereas the disabled persons could take advantage of tax breaks or even of granting by the National Health Service (which in turn should issue a clear regulation for the criteria of eligibility, avoiding uncertainty among Physicians and disputes with patients).

Furthermore, the regulations for the circulation of "mobility scooter vehicles" conducted either by able or disabled persons in areas open to the public should also be revised without confining them to pedestrian areas, in order to improve their usability and the consequent benefits for traffic and the environment without affecting the road safety. Forcing a mobility scooter to run on a narrow, crowded and rough sidewalk can be much less safe than allowing it to move on certain roads or on selected routes. It would not be out of place to expressly reiterate that in pedestrian areas vehicles considered medical assistive devices by the "current Community provisions" such as motorized wheelchairs must in any case observe the speed limit of 6 km/h even if the aforementioned provisions allow a maximum speed of 10 km/h (which is definitely more than "a fast walking pace"). The broader regulatory review proposed by us could go through an experimental phase. Some targeted additions and amendments to the decree of 4 June 2019 for testing the circulation of electric micromobility

devices on the road and to the "milleproroghe" decree, including mobility scooters, could be the simplest and most immediate solution.

Mobility scooters should also be included among the categories of three and four-wheel vehicles provided by Regulation No. 168/2013 of the European Union. Light mobility scooters, having a maximum design speed not exceeding 6 km/h, should be included among the vehicles in Article 2 to which the Regulation does not apply. Heavy mobility scooters, having a maximum speed up to 25 km/h without pedal propulsion, should be classified as L-category vehicles:

- heavy three-wheel mobility scooters as a new subcategory of category L2e (three-wheel moped);
- heavy four-wheel mobility scooters as a new sub-subcategory of subcategory L6e-B (light quadri-mobile) of category L6e (light quadricycle).

This would also contribute to give a specific location to various electric vehicles on the market equipped with a seat and an electric engine capable of independent propulsion from pedals up to 25 km/h, which are currently hit by severe fines for public circulation without license plate, registration document and helmet or for misleading advertising, not excluding confiscation and destruction.

4. Discussion and conclusions

The regulatory vacuum on mobility scooters opened by the amendment to Article 46 of the Italian Highway Code which occurred in 2010 cannot stagnate yet and the recent decree for the on-road testing of electric micromobility devices, which ignored the objectively most versatile, safe and "serious" device, lost a great opportunity, whereas the more recent conversion into law with modifications of the "milleproroghe" decree indirectly profiles the spectrum of destruction for mobility scooters if they are caught circulating in public as atypical unregulated vehicles.

This situation must be remedied without waiting for this regulatory flaw to come out on the occasion of some dramatic event such as a road accident. The classification of mobility scooters as "vehicles" suitable for both able and disabled persons – also in accordance with the European Union orientation – and a specific regulation of their circulation in public areas through the desired changes to the Highway Code, its Implementing Regulation and the decrees for the on-road experimentation of electric micromobility devices, as well as the identification of a control and information body, would easily put an end to this regulatory vacuum and to the confusion and misinformation that derived from it, finally favoring the well-deserved diffusion of mobility scooters to benefit of all: able, disabled, urban traffic and the environment. Among other things, on mobility scooters circulating abroad, in addition to the hoped-for automatic emergency braking, solutions that are still futuristic in the automotive sector are already being applied, such as solar energy supply and drive-by-wire.

The latter, which has long been yearned for cars where it is still confined to salon prototypes, in mobility assistive devices represents rather a "return" to the joystick of electric wheelchairs which, like the automatic gearbox for cars, from a disability stigma (implemented as such even by the explanatory note to heading 8713) is about to become a "must" of advanced driving for mobility scooters. How will the European Union deal with mobility scooters that will lose the fateful "steering column"? It would be regrettable if Italy were still cut off from all this innovative ferment because of a legislation to be redone. We are convinced that even the European Union should redefine the main difference between mobility scooters and electric wheelchairs, which leads it to classify mobility scooters as "motor vehicles": not the presence of a steering column, but the presence of a steerable front axle, regardless of whether steering action is determined by a steering column or by an electroactuated system (Fig.7). It should also clarify whether a manual wheelchair electrified by a front power assist drive unit with steering column remains a medical assistive device or becomes a "motor vehicle" as well (Fig.8).

Fig.7 This device should be classified as mobility scooter because of the presence of a steerable front axle, even if it steers with a joystick *(source: scoozy.nl; photographer: Jorrit Lousberg)*

Fig.8 Manual wheelchair electrified by a front power assist drive unit with steering column: medical assistive device or motor vehicle? *(source: Officine Ortopediche S.r.l.)*

We are available for any initiative aimed at raising awareness of the problem and of the need for a regulatory reform among the competent bodies, hoping that something similar to the "mobility scooter revolution" started overseas more than 40 years ago will also come out in Italy and worldwide.

In the meantime, we continue our information work in the healthcare field, where our Italian colleagues admit that they know little about mobility scooters and that they are doubtful even on the prescriptive criteria. Without prejudice to the top priority of the desired regulatory reform, without which there will be no possible prescriptive criteria and in Italy mobility scooters will never be able to realize their positive effects.

Cabin mobility scooters could even be a safe, protective and affordable resource for individual mobility in the Covid-19 era. Their enclosed bodywork in itself offers protection against airborne infectious agents, and it would be sufficient to equip both inlet and outlet air intakes with adequate filters to allow users to move without fear of contagion even inside closed public environments. Apart from the "integral protection" offered by cabin models, even the agile and economical open-top mobility scooters, compared to mass transport, could help limit the airborne spread of infectious agents, while benefiting from greater stability and comfort than other devices of individual electric micromobility and without further worsening the conditions of traffic, parking and environment as is happening with the now massive use of individual transport by cars and motorcycles.

Another unique feature that can be deduced from the set of regulations of the various countries and from EU Regulation 2021/1367, taken up and revised by our proposal, could also induce "able and young persons" to prefer mobility scooters to other small electric vehicles that are more attractive in terms of the ratio between size and performance (mopeds, light quadricycles): *these are the only vehicles allowed to circulate both on the road, in pedestrian areas, on cycle paths, on pathways in parks, and indoors.*

A more pleasant and less "assistive device for the disabled" aesthetics would certainly improve their attractiveness: however, it should be considered that abroad there are already mobility scooters that in terms of aesthetics have nothing to envy to other well-known vehicles "for able persons" (Fig.9).

(a)

(b)

Fig.9 (a) from New Zealand *(source: Stuff Limited);* (b) from Canada *(source: Daymak)*

Even the automatic gearbox was once considered "stuff for the disabled"… Who would dare to say it nowadays, given that it has become an indispensable equipment in luxury sedans and sports dreamcars? Perhaps one day even mobility scooters will be considered advanced mobility devices. Legislation permitting, because in Italy, at present, in public they cannot even function as assistive devices for the disabled. Even if with the change in legislation these vehicles remained for almost exclusive use by disabled and elderly, it would always be better than the current situation, in which they cannot be used by anyone in public. But after all, is the elderly person disabled? The progressive reduction of mobility caused by the physiological deterioration of the musculoskeletal system and of other organs and systems such as cardiovascular and nervous systems cannot be identified with a disabling disease. And when should a person be called "elderly"? The chronological age cannot be taken as an absolute value (La Rocca & Fistola, 2018). Therefore, mobility scooters would anyway end up benefiting people who can still be considered "able" and not necessarily "elderly", while on the other hand the quite stringent requirements for driving mobility scooters make them incompatible with most frank disabilities, which can rely on the various types of electric wheelchairs. In the absence of clear-cut criteria to define "elderly enough" or "disabled but not too much", the disputes do not spare even the countries that have been able to legislate better than Italy but still restrict the use of mobility scooters to generic disorders of walking (Lea, 2017): therefore it seems wiser to liberalize them for any type of user, possibly after an aimed medical assessment of ability to drive them accompanied by a specific safe driving course, such as those carried out in UK and Holland (Cannata & Monello, 2021), without however imposing a real driving license.

Any resource for everyday urban mobility is a fundamental contributor to individual's well-being and quality of life (Akhavan & Vecchio, 2018): mobility scooters are a great resource for mobility, but in Italy they are almost ignored and even hindered. And while it is somewhat true that keeping older people driving as long and safely as possible may well be the most feasible and cost-effective mobility option for an ageing society, it is necessary to establish other options that will be available once using the car will not be a feasible option

(Burlando & Cusano, 2018). Mobility scooters are an option, which compared to others has a great advantage: simplicity. You just need to know how to regulate them.

In UK, where mobility scooters can only be driven by people who "have trouble walking because of an injury, physical disability or medical condition", the mobility scooters sold every year are more than half of the Segways sold around the world in twenty years. Furthermore, they appear to be proving attractive to people who have no medical need for them: the number of able-bodied youngsters using them as cheap alternatives to cars is increasing. The vagueness of the wording of the restrictions (no mention of specific disabling diseases or how they should be documented) creates a "grey area" in which anybody can go out and buy or hire one without breaking the law, with consequent parliamentary debates (Lea, 2017). And in recent times, market research reports have been multiplying which universally forecast a significant growth rate in the global mobility scooter market, made even more striking by the negative economic context linked to the Covid-19 pandemic, particularly in the automotive and mobility sectors. Factors supplementing this growth include not only increased percent of senior citizens, but also inclination toward the use of mobility scooters as an eco-friendly and efficient solution, as well as rising awareness for advanced mobility devices (Singh & Mutreja, 2021).

We think that our legislative review and proposal could be useful even outside Italy, since the aforementioned legal disputes at the European and National Courts are a symptom that mobility scooters are still a controversial topic even abroad and need a clear-cut legislation by both national and international bodies. It is also paradigmatic that mobility scooters are not yet included among the categories of three-wheel vehicles and quadricycles provided by Regulation No. 168/2013 of the European Union, even if the European Union itself considers them "motor vehicles" in its explanatory note of the heading 8713 of the Combined Nomenclature and in its Regulations No. 718/2009 and No. 2021/1367. The inconsistency of the European Union in interpreting and applying its own regulations on mobility scooters is also responsible, at least in part, for the current Italian "non-regulation".

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Author's profile

Giuseppe Cannata

MD, Specialist in Physical Medicine and Rehabilitation and in Orthopaedics. Confirmed Researcher and Aggregate Professor at Tor Vergata University of Rome, Italy. Concerned in assistive technology and sustainable mobility, not only for disabled persons.

Marialisa Nigro

PhD, Associate Professor in Transportation Engineering at Roma Tre University, Rome, Italy. Her main research activities include sustainable mobility, travel demand estimation, calibration and validation of demand models, interaction between transportation system and land use.

Concetta Ljoka

MD, Specialist in Physical Medicine and Rehabilitation. PhD in Physical and Rehabilitation Medicine. Professor on Contract at Tor Vergata University of Rome, Italy. Concerned in disability and strategies to ameliorate quality of life in disabled people.

Mihaela Murè

MD, Specialist in Physical Medicine and Rehabilitation. Physicist, Specialist in Biophysics. Professor on Contract at Tor Vergata University of Rome. Concerned in disability and strategies to improve quality of life of individuals with disabilities.

Guerino Coluccia

Orthopaedic Technician at Officine Ortopediche S.r.l., via Casale Ricci 3, 03100 Frosinone, Italy. Master on Clinical Research and Rehabilitation of Diabetic Foot.

Laura Giordani

PT, PhD "Advanced Sciences and Technologies in Rehabilitation Medicine and Sports". Physiotherapist at Tor Vergata University of Rome, Italy. Concerned in rehabilitation processes to improve daily life activities of disabled people.

Umberto Crisalli

PhD, Associate Professor in Transportation at Tor Vergata University of Rome, Italy. Concerned in Transport planning and engineering, modelling and mobility management.

Calogero Foti

MD, FEBPRM, Specialist in Physical Medicine and Rehabilitation. Full Professor at Tor Vergata University of Rome, Italy. Concerned in disability and strategies to ameliorate quality of life in disabled people.