Future of Transport Regulatory Review – Call for Evidence

ITEN response

This response relates to Micro Mobility only. The International Transport Expert Network (ITEN) is a group of small expert consultancy companies from a range of different technical backgrounds in transport infrastructure, environment and safety. Specific contributors to this document were:

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Micromobility vehicles

Question 2.1 Do you think micromobility vehicles (such as those in Figure B) should be permitted on the road? Please explain why.

ITEN as a group neither advocates nor opposes the legalisation of micromobility vehicles on UK roads. We do not think sufficient evidence currently exists to conclude that DfT's own 9 principles for facilitating innovation have been satisfied in the case of Micromobility. Our considered view is that the option should be explored and the decisions on permitting this type of vehicle on UK roads should be informed by objective evidence. In particular:

- **New…mobility services must be safe…by design**: Evidence around the safety of micromobility is in its infancy. The expression 'safe by design' is relative because no current vehicle can guarantee absolute safety on public roads at this time. The obvious benchmarks against which to compare the relative safety of micro-mobility are pedal cycles and electrically assisted pedal cycles. However, emerging evidence from hospital studies of casualties from scooter injuries is starting to suggest that injury patterns may be significantly different to those of traditional pedal cyclists. The causes of these patterns need to be understood in order to have confidence in predictions of what will happen with widespread usage.
- **Non-motorised and, where possible, active travel such as walking and cycling, must remain the best options for short urban journeys**. The extent to which micromobility vehicles represent 'active' travel is open to interpretation and variable between different devices. A kick scooter will clearly represent exercise, a self-propelled scooter would clearly offer relatively little exercise. However, even just standing (e.g. on a Segway) is likely to provide more exercise than sitting on public transport, although less beneficial than more active modes (walking and cycling). See the 2018 TRL Report PPR 877 "Innovative Active Travel Solutions" for more details. The extent to which journeys by micromobility would be newly generated trips or would replace journeys by mass transit, private car, motorcycle, pedal cycle or walking has not yet been proven in the UKs specific traffic situation, culture and climate.

The number of studies internationally of the effects of micromobility is growing rapidly but results are variable with many local factors likely to be of influence. As a body of evidence, it is not yet conclusive and even then, there may be differences between international findings and what would happen specifically in the UK.

ITEN therefore strongly supports well-defined trials aimed at filling the knowledge gaps in terms of both benefits and risks. Note that the best methods for filling the knowledge gaps may not always be a large-scale trial with real users, but may also include off-road trials, simulations etc. Other options could include anonymous tracking of scooters to assess journey length and journey topography.

Question 2.2 If you can, please provide evidence to demonstrate the potential: a) Benefits of micromobility vehicle use. b) Risks of micromobility vehicle use.

A number of studies are available that were not referenced in the DfT consultation document.

A Benefits

Almost all micromobility devices are electrically powered and so zero emission at 'the tailpipe'. Most are also lightweight with excellent potential for high efficiency (ratio of passenger mass to dead weight mass is high). This would be expected to offer environmental benefits where the usage replaces more polluting modes, providing the whole life environmental performance matches the operational performance.

Particular opportunities for benefits may include young people transferring to micromobility journeys for travelling to schools/colleges, work, errands and leisure because they are seen as 'cool' and give more independence than relying on lifts from friends and family. It could also include persuading those that are unfit and unlikely to walk or cycle significant distances out of their cars. This could provide environmental benefits but the direct health benefits would be less than if they transferred to electrically assisted pedal bikes, which are reported to have significant take up by people who otherwise would not consider themselves fit enough to cycle.

On inclusivity, standardisation of removable mountings for seat posts could allow certain categories of mobility-impaired persons to access (seatless) scooter fleets in cities worldwide by carrying only a personal seat.

B Risks

A number of studies are emerging around safety and comparisons with pedal cycles are growing. An OECD-ITF report https://www.itf-oecd.org/safe-micromobility considered a range of evidence and concluded the safety risk was broadly similar to that of pedal cycles. While a fair conclusion on the balance of the evidence available at the time, the confidence with which conclusions have been expressed and subsequently quoted by others is not supported by the large uncertainty inherent in the data used. The available data was small sample, disparate and often based on quite unscientific sources (e.g. media reports), all of which are appropriately acknowledged in the detail of the report.

Even since the publication of this study, further evidence has emerged, particularly in the form of studies of hospital visits and emissions in connection with the use of eScooters. ITEN is aware of such studies in Arizona, San Diego, Washington, Berlin, several cities across Belgium, and Frankfurt. Most if not all were published after the OECD report. Some consistent themes emerge from the research, for example, most injuries are relatively minor but a substantial number of head and facial injuries occur. Inexperience is stated in a remarkably high proportion of cases in some studies and several note that injuries from collisions with motor vehicles are a substantially lower proportion of scooter casualties than they are for cyclist casualties. Most scooter injuries are reported in single vehicle collisions, which the studies often referred to as 'self-inflicted'. In most but not all areas, helmet use is extremely low. Other areas are somewhat conflicting. One study reported alcohol was rarely a factor except in certain evening times. Others have reported alcohol to be a very prevalent factor.

One, as yet unpublished study, of which we are aware has been able to calculate injury rates per mile travelled and compare the rate between cyclists and eScooter riders. They found that the injury rate for scooters per mile travelled was substantially higher than that for cyclists.

Question 2.3 If micromobility vehicles were permitted on roads, would you expect them to be used instead of:

Vehicle type	Often	Sometimes	Never
Private vehicles		X	
Taxi or private hire vehicles		X	
Public transport		X	
Delivery vehicles		X	
Cycling		X	
Walking		X	
Other (please specify) New journeys		X	

Demand for micro-mobility services and the existing journeys they will replace is complex to predict. Many factors will be of influence, including cost, convenience, and perception, for example, the cool factor, perceived risk, attitude to exercise & fitness. These perceptions are likely to be influenced by cultural background. In the UK, weather is likely to be a strong factor affecting choice and usage may prove to be strongly seasonal. The weather influence would be expected to be similar to that for bicycles, such that data ought to be available from cycle hire schemes to quantify this. Like EAPCs, micromobility may be able to attract people who do not consider themselves fit enough for fully active modes. Some of those may move away from car, bus, tube, or tram use but others may prefer micromobility as being quicker and less effort than walking or more convenient than cycling (e.g. not turning up at work sweaty).

Most of these factors will be relative to the competing modes currently used (e.g. is it cheaper, quicker, more fun to use a scooter than the bus) and so usage will depend on concurrent changes within existing modes that affect their attractiveness. The level of regulation or restriction applied could also strongly affect this balance. For example, technical standards of devices could influence cost, requirements for helmets or training could limit ad-hoc usage and shift more towards a private ownership model.

Experience during COVID 19 lockdown will clearly be a strong influence on this, at least in the short term. For example, people may feel less at risk from infection on micromobility compared to mass transit modes, but at higher risk compared to a private car.

With the UK weather to contend with and the existing city traffic mix, demand for these new micromobility devices may be limited compared with passenger numbers on other modes. Some will be privately owned; others will be hired (presumably). Demand will also be influenced by cost, availability and network covered etc.

So, all of the suggested substitutions will be possible at least "sometimes" but the extent may be limited compared with other modes, at least in the short-term.

Question 2.4 a. In your opinion, which of the following micromobility vehicles should be permitted, if any, on roads, lower speed roads, and/or cycle lanes and cycle tracks?

● All types ● Electric scooters ● Electric skateboards ● Self-balancing vehicles ● Electrically assisted cycle trailer ● Segway ● Other (please specify)

Subject to the findings of trials and the development of appropriate performance based standards, then all types should be permitted. That is, vehicles should not be prohibited based on their 'type' or configuration but only bases, for example, on an inadequate safety performance. Decisions on which roads to permit devices on, minimum performance criteria and training should be phased, starting with specific trial locations with the simplest to use vehicles, moving progressively to wider permission as evidence to demonstrate benefits and manageable risks increases.

b. Please explain your choices for using micromobility vehicles (or not) on roads and/or only lower speed roads, providing evidence where possible.

Micro-mobility has proved to be a fast-paced, innovative sector of industry and this type of development should be encouraged and should not be hindered without good reason. The DfT has proposed that only certain types of device should be permitted, based on a short simple set of design restrictions. These are built around a traditional kick scooter configuration plus limits on speed and power. This approach has the advantage of initial simplicity for both approval authorities and manufacturers developing devices. However, regulatory approaches that are design restrictive in this way have been shown in other areas of automotive regulation to significantly inhibit innovation and can risk becoming very complex over time.

In overly simplistic terms, the design restrictions are in place as a proxy for the safety performance of the vehicles. Handlebars provide for easy steerability and access to controls, a minimum wheel size helps ensure an ability to ride bumps/potholes without instability etc. An inline wheel configuration helps to ensure some familiarity of characteristics with kick scooters and cycles etc. However, in response to this, research and development into new and improved micromobility devices that don't conform with these simplistic requirements may be substantially reduced. This may mean that approaches that would otherwise have found better ways of ensuring safety than the design prescriptions based on existing designs may never get developed. This can stifle innovation.

In contrast, at least part of the market could go the other way. Manufacturers of devices that they believe can be as safe as the permitted version, will not be pleased that their offering remains illegal and will press for inclusion. This may be accommodated with another set of simple design prescriptions. The process may be repeated for lots of different types or configurations of device. In addition to this, the standards for each type of device may evolve over time as technology develops. In this way, what started as a simple regulatory approach can become extremely complicated. Type approval categories for L category vehicles (motorcycles, tricycles and quadricycles) are an example of how vehicle categories can multiply when based on very specific aspects of design in an area of innovation competing with more established modes with heavier regulatory burdens.

The alternative to this approach is to develop performance-based standards that seek to measure the safety performance more directly. Thus, if the concern is stability over potholes, then develop a stability test that drives the device over a defined obstacle and measures the effect in terms of forces destabilising the rider. It may be that, for example, a smaller wheel with good suspension and a longer wheelbase gives better stability than a larger wheel that would otherwise comply with a design restrictive approach, fitted to a device without suspension and a shorter wheelbase. A representative performance would ensure a minimum safety standard while permitting manufacturers to innovate to find the best design solution to the problem. Much less adaptation will be required for new types of device and as technology evolves, the test is unlikely to change but the limit value for what represents a 'pass' can be easily changed to demand greater safety.

Performance based standards are initially more complex for both approval authorities and manufacturers because designing and then executing the performance tests takes time and equipment and can seem to be 'overkill' for relatively simple devices.

A compromise position is often possible in terms of a planned transition from design prescriptive regulation to performance based regulation as an industry develops over time. In addition, the two can be run in parallel such that a default 'safe' design can be approved very simply but performance based tests are available as an option to allow manufacturers of alternative designs to gain approval if they are good enough.

To-date, much discussion of where micromobility should be used has focussed on consideration of them as analogous to cyclists. However, emerging results from recent hospital studies have suggested key differences. In particular, inexperience and lack of PPE are highlighted along with a much lower likelihood of injuries being caused in collision with a motor vehicle and a much higher proportion being single vehicle collisions uninfluenced by other road users. This could suggest that segregation of micro-mobility devices from higher speed traffic is less important than for cycles. It may be that they are safer than cycles on high speed roads as a consequence and/or that confining use to segregated cycles lanes is less beneficial than it is for cyclists. Alternatively, it is possible that users of these devices do a smaller proportion of their mileage on roads than do cyclists. Furthermore, each of these studies have been undertaken in defined locations, usually where scooter rental services have recently been introduced (usually major cities), and with a wide variety of restrictions in terms of type of scooter, speed capability, use on pavements, enforcement of rules etc. As such, these existing pre-conditions as well as general inexperience with devices could be strongly biasing results such that these results would not be valid in a UK wide context.

As such, a step by step approach would allow the risks to be measured accordingly, starting in lower risk environments and expanding to higher risk environments only if/when the results from earlier phases give confidence that it will be safe and beneficial to mobility and environment to do so.

This could in parallel consider the implications for the road space and infrastructure needed to support safe use of micromobility devices. For example, local authorities vary in their definition of the nature (the depth, sometimes combined with the extent) of potholes at which they carry out repairs: in the Annual Local Authority Road Maintenance Survey (2019) it is reported that [only] three quarters of authorities use a definition of 40mm or less. The Road Surface Treatments Association report significant differences, with depths up to 60mm in some cases before maintenance is considered. These criteria are probably based on the needs of vehicular traffic, and research should be considered to determine appropriate thresholds of surface condition for micromobility devices (and, for that matter, cyclists) on routes where these devices are expected.

A restriction to low speed roads would be an obvious baseline and most roads in city areas where devices have so far proved popular would indeed be low speed.

Usage in cycle lanes would also make sense, provided the speeds are limited to those consistent with the most common ranges of pedal cycle speeds

Usage on pavements would create a differential speed risk between pedestrians and micromobility so would not seem likely to fit a definition that initial usage should be limited to a low risk environment. However, if technical means could be found of enforcing a differential speed capability in pavement and road use, then in future this risk could be eliminated. People with certain levels of mobility impairment, particularly those living in flats or other places where traditional mobility scooters create difficulties with access or storage, could potentially benefit substantially from, for example, micro mobility scooters equipped with seats. An ability to use them safely on pavements at speeds consistent with pedestrians and traditional mobility scooters and also in cycle lanes or on roads at higher speeds would be an advantage.

Evidence of lesser interaction with motor vehicles in early scooter studies could be a function of exposure to risk. Initial rental schemes etc may not be operative in areas where high speed roads are, whereas bicycles are more universal. As such, use on high speed roads also seems inconsistent with the initial phase of a staged approach based on risks. However, users in rural areas, poorly served by public transport may also be of benefit in future so the option should be examined at a later stage as more evidence develops.

Defining appropriate locations for each stage in such an approach will need criteria to assess suitability. These criteria will relate back to local place and planning, road hierarchy, condition of the surface, minimum width, etc as well as the vehicle performance limits proposed. There could be pricing implements in future to encourage use of public transport, e.g. single tickets for bus/rail and scooter, so vehicles could be used to extend the reach of public transport and potentially streamline bus routes.

In future, a two-dimensional hierarchy of requirements could be conceived based on matching the characteristics of the devices (measured by performance-based standards) to the type of infrastructure it could be used to access. This could be analogous to the Intelligent Access Programme used to manage permits for oversized goods vehicles in Australia, though clearly simplified and tailored to the completely different characteristics of the sectors.

c. Please explain your choices for using micromobility vehicles (or not) on cycle lanes and tracks, providing evidence where possible.

As per b above.

d. What impact do you think the use of micromobility vehicles on cycle lines and cycle tracks would have on micromobility vehicle users or other road users?

DfT has proposed a maximum speed capability of 12.5 mile/h or 15.5 mile/h (20-25 km/h). Pedal cycles are clearly capable of higher speeds than this in the hands of fit riders, although electrically assisted pedal cycles must stop offering assistance at speeds in excess of 15.5 mile/h. Thus, the fastest cyclists will be able to go faster than the micro mobility devices.

On the other hand, although Vmax for cyclists will be greater, the average speed over a journey may be quite different. An eScooter will be able to maintain Vmax indefinitely (subject to range) on a flat road and will only slow on an incline or in the face of a headwind if the power is also limited. Only the fittest cyclists will be able to maintain a speed in excess of 15.5 mile/h over significant distances, up hills or in the presence of a head wind. Fifteen point 5 mile/h is only 25% greater than 12.5 mile/h. However, the difference in rider effort and fitness required to achieve the higher speed as an average over varied terrain and a long period is much larger.

Many cyclists using a bike as a means of commuting work will not want to arrive hot, sweaty or excessively tired and some will be considerably less fit. They may choose to cycle much slower.

As such a wide variety of speed differentials could exist. These will already exist with only pedal cycles and electrically assisted cycles and it is unlikely eScooters with the limits suggested would change the extremes possible. However, they may increase how busy the cycle lanes are and may well increase the average speed of traffic on the cycle lane as a whole. Both of these factors could affect the interactions between different speed riders and the extent of weaving and other bad behaviours that can sometimes be observed. With motor vehicle traffic, the rate of collisions has been shown to be strongly related to both the average speed of given class of road, AND the spread of speeds around that average.

Growing demand for micromobility would make the sharing of foot and cycleways less feasible (apparent during the Covid lockdown) and could make access particularly difficult for visually impaired pedestrians. Physically separating pedestrians from all higher speed traffic would have significant advantages.

Question 2.5 Mobility scooters and pedestrian operated street cleaning vehicles are already permitted on the footway. Should any other micromobility vehicles be permitted to use the pavement or pedestrian areas? If so, which types of devices should be permitted and in what circumstances?

It is differences in speed and direction between road users that creates the risk of collision. Devices with a maximum speed consistent with that of pedestrians and where mass is low to minimise risk where collisions do occur could potentially be operated safely on pavements. This could include the use of eScooters equipped with seats, as mobility aids provided adequate means of enforcing low speed in pavement mode could be established.

Question 2.6 a) What do you think the minimum standards for micromobility vehicles should be? b) Should different standards be set for different types of micromobility vehicle? Please provide evidence.

See answer 2.4b for detailed background and rationale around the philosophy behind the standards. Safety is relative, there is no vehicle that guarantees safety on roads or cycle lanes at this point in time. Nearly all consideration of whether micromobility devices should be legalised have used pedal cycles and electrically assisted pedal cyclists as a benchmark against which to compare relative safety. As such, any legalisation that did not ensure that micro-mobility devices met the same basic minimum safety requirements as pedal cycles would be inconsistent with the evidence used to justify their legalisation.

The standard of pedal cycles is governed by the General Product Safety Regulations 2005, the Pedal Bicycles (Safety) regulations (2010), the Pedal Cycles (Construction and Use) Regulations 1983 and the Electrically Assisted Pedal Cycle Regulations (2015). These standards do not impose major restrictions and include basics such as a requirement for brakes, standardisation of brake controls and activation of front/rear brakes, lighting (at night), reflectors and a bell etc. Electrically assisted pedal cycles also have a mass limit, a speed limit for the assistance function and a power limit as well as a requirement to meet the bicycle standards. Standards for micromobility should at least ensure a level of safety equivalent to that implied by those measures.

Pedal cycles are inherently stable. For example, losing balance and falling to the right will cause the bike to steer to the right which creates a centrifugal force which acts to the left to help the rider restore balance. The mass distribution and steering geometry also contribute to good stability. However, there is a huge diversity of devices that could be included within the umbrella term 'micromobility'. These will have different means of operation and very different characteristics. Escooters have the same basic configuration as pedal cycles (two inline wheels, the front of which is steered) but may vary significantly in terms of their wheelbase, centre of gravity position and steering geometry. Anecdotally, many scooters are described as more responsive and less stable than pedal cycles.

Pedal cycles do not need direction indicators because it is assumed riders will be capable of making appropriate hand signals. A greater responsiveness of scooters may make it harder for riders to turn to look behind them while maintaining a straight line and the need to keep applying a throttle controlled by hand may reduce or eliminate the ability to make turn signals by hand, at least in one direction. These differences may justify differences in the vehicle standards applied.

Powered skateboards, Segways and hoverboards are all quite different in terms of their dynamics and control. Those that have only one wheel or 2 wheels on a lateral axis directly embody the concept of active riding (movement of the rider's centre of gravity) in their control concept. Thus, the ability of the device to stop quickly in an emergency (equivalent to the brakes required on a pedal cycle) will depend very strongly on rider skill. A vehicle with the ability to decelerate quickly but an unskilled rider on board may create an increased risk of collision if the high deceleration can be triggered without the appropriate rider positioning or readiness.

If a design prescriptive approach to regulation is followed, then different devices will justify different standards. However, if a performance based approach is followed it should be possible for one single performance standard to be used uniformly across a wide variety of devices with minimum deviation or subcategorization (perhaps max speed and/or the embodiment of active riding within the means of control). Problems such as the example of direction indicators can be managed via conditional alternatives. For example, "if the throttle control is activated by hand, or where a single brake control activated by hand is used, then direction indicators must be provided that can be activated at the same time as accelerating or braking".

Other vehicle performance standards could include:

- Minimum braking deceleration, longitudinal stability and controllability
- Minimum steerability, lateral stability and controllability
- Ability to ride bumps

As well as linking to potential infrastructure standards for where vehicles can access, there would also be potential to link the vehicle standards to a need for training and/or licensing. Some studies have suggested that up to around one third of all hospital visits in connection with eScooters have involved a rider on their first journey. Inexperience does therefore appear to be a very large potential factor in the risk. However, the degree of rider skill required will vary considerably according to the type of device. As such, the stability, steerability and controllability metrics mentioned as vehicle standards could be linked to a requirement for training with only the easiest to use devices available for use without training. Alternatively, the vehicle design could be modified in relation to rider experience. E.g. the max power or speed of a device could be limited by the hirer for customers using that fleet of vehicles for the first time.

Question 2.7 Are there other vehicle design issues for micromobility that you think we should be considering? Please provide examples.

Some of the problems associated with microscooters in other cities relate to the parking/storage of "dockless" devices. Restricting hire fleets only to the docking variety would ensure such problems are avoided in the UK. However, doing so may affect the attractiveness of the mode. One of the advantages of dockless bikes and scooters is that you can take them to the door of your destination, not only to the dock nearest your destination. If the benefits are to be fully exploited without the risks, then more creative solutions will be required.

There is an environmental risk if the devices are not durable enough to avoid entire units requiring frequent replacement. Devices should be designed with maintenance in mind and standardisation of component specifications would offer significant benefits. For cycles, the standardisation in wheel sizes, tube sizes, bearing sizes, threads, suspension and braking components, etc., mean that it is perfectly possible to maintain older cycles using components / services obtained from Tier 1 / Tier 2 suppliers. This would support the market for UK businesses supplying such components and services.

Question 2.8 In your opinion, what should the requirements be for micromobility users, with regard to:

User requirements	**Like EAPCs**	**Like mopeds**	**Other requirements (please provide details)**
Vehicle approval			Initially like EAPCs but moving toward a performance based standard integrated with infrastructure and training requirements
Vehicle registration and taxation			Identification may be beneficial both for enforcement and subsequent research on the safety of different types of device
Periodic vehicle testing			Little information yet available on the role of defects in collisions or in relation to sustainability
User driving licence			
Insurance			Risks appear to be predominantly to the first party who would predominantly be considered 'at fault' from an insurance perspective (single vehicle collisions). 3rd party risk to motor vehicle occupants is low frequency but could occasionally involve a scooter causing a vehicle to swerve and suffer a more substantial secondary collision. 3rd party risks to pedestrians do

			exist. They are thought to be similar to pedal cycles but are not yet well quantified. They should be low if devices are kept off the pavements.
Helmet use			While pedal cycles provides a precedent for not requiring mandatory helmet use, there is mounting evidence to suggest helmet use is really low on scooters and that head injury is a major risk, perhaps due entirely to lower helmet use but perhaps also a consequence of differences in the types of collision (less motor vehicle involvement, more single vehicle falling off). If mandatory helmet use is not imposed, then backing the proposed 'recommendation' with substantial action to encourage voluntary take up is essential if casualties are to be minimised
Minimum age			
Speed limits			Management of speed limits should inter-relate with other requirements.

If you believe regulating micromobility vehicles like EAPCs or like mopeds would be problematic, please explain why.

The table is not helpful because the requirements should depend on the nature of the device. Extrapolating from The "Safe Micromobility" report (2020) by the International Transport Forum and considering variables in this response suggests that devices could be sub-categorised by speed, mass and rider control mechanism (use of rider centre of mass position as control mechanism) and remaining requirements could vary according to those sub-categories. Regulation of high speed/mass devices could be very similar to motorcycles. Low speed/mass devices not requiring 'active riding' as a control mechanism could be like EAPCs, other categories could lie between the two and/or include special requirements not applied to other vehicle types.