Chartered Institution of Highways & Transportation response to the call for evidence on the future of transportation

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CIHT is a charity, learned society and membership body with over 14,000 members spread across 12 UK regions and four international groups. We represent and qualify professionals who plan, design, build, manage and operate transport and infrastructure networks. Our vision is for world-class transportation infrastructure and services Our values are to be Professional, Inclusive, Collaborative and Progressive.

CIHT believe that the future of transport infrastructure must be recognised as a key policy and investment priority. Fit for purpose infrastructure will:

- support economic growth, create jobs and improve the UK's competitiveness
- improve connectivity of society – enabling services to be provided (with health, social and environmental benefits)
- be inclusive and meet the needs of all groups in our society from the youngest to the oldest
- be safe for operators and users
- encourage innovation and technology to deliver infrastructure fit for the future

Q1. We have identified above the main technologies and trends that we believe will affect urban mobility in the coming decades. Are there any missing?

1. CIHT believes the background information is a well thought out and comprehensive summary of the major technological and demographic trends that will affect how we will move through our town and cities in the near future. It is important to note that many of these trends are neutral in themselves and can deliver both positive and negative effects, therefore it will be necessary for Government, local government, industry and professional organisations to ensure that the outcomes are managed positively.
2. One trend that is not addressed is *devolution and local government reform* which is creating new geographies for technology and business models to be trialled. Continued transfer of power and funding from the national level to the local level will shape how our transport systems are built, maintained and used.
3. Further the establishment of statutory subnational transport bodies, allows for different regulations in different regions. This includes varying ability to monitor, regulate and enforce regulations as the legal tussles with Uber, Airbnb and Deliveroo have shown that capacity is limited within local government.
4. This regulatory variance and uncertainty can both benefit and hinder innovation. Either way it causes economic and social uncertainty for significant numbers of people employed in those areas. Therefore, the implementation at the local level should be considered a vital part of any vision for the future of mobility.
5. CIHT also argues that the future of mobility is explicitly tied to the *asset management and maintenance of infrastructure* and that while linked to topics such as drones, connectivity and big data its worth highlighting as a goal in itself. Connected vehicles with built in sensor packages could allow for automated assessments of carriageway condition, traffic conditions and preventing bridge strikes amongst other things. These benefits must be realised to maintain assets in the face of declining budgets and ageing structures.
6. Further we stress that the ultimate benefits of any infrastructure can only be realised with proper maintenance, regulation and enforcement. Given the continuing pressures on the condition of our local highways network it will require a sustainable funding solution and structured asset management to ensure that we can support the positive aspects of these trends and deliver full benefits to society.

Q2. We want our urban infrastructure to support these trends and deliver benefits to society. What changes are required to urban infrastructure?

7. Electric cars will deliver cleaner transport but will also require a great deal of adaptation from the urban environment to enable mass usage, in terms of national grid infrastructure, local sub stations, and crucially, on street charging stations. We are already seeing moves to enable this, with the London Plan requiring passive provision for car charging in all new developments with parking and numerous local authorities beginning to install charging infrastructure on street.
8. CIHT agrees that new technological capability is making **autonomous vehicles** more of a reality than ever before and supports government preparing the regulatory and investment environment for them to be permitted on UK roads. However, a recent survey of our members has shown that very few believe that autonomous vehicles will be the majority of the fleet before 2040. There must be an understanding that the potential benefits of autonomous cars are a long-term approach to the issues facing the transport industry and that other solutions are needed in the short-to-medium term.
9. In a more optimistic scenario, our members believe that safe roads for autonomous vehicles will require clear road line markings, signs that can be reliably detected by sensors, and road users able to anticipate AV decisions accurately to enable safe, highway usage. The European Road Assessment Programme Regional Director says "Roads that cars can consistently and unequivocally read will be key to safety in the transition period as the common factor of reliance for both driver operated and automated vehicles,"[1]
10. Current highway infrastructure in urban environments does not meet these standards and would require increased investment from highway authorities and better training of highway engineers to ensure that they can be reached. This could also have an impact on the feel and amenity of the public realm if increased signage is necessary, and is in opposition to the goals of many local authorities, which is to declutter their environments of as much signage as possible.
11. CIHT recognises that the growth of **Data and Connectivity** has the capacity to radically reshape how we use our transport networks and the public sector has a major role to play in establishing the rules for the services that are provided on public networks. For transport services this requires getting regulation, standards and contracts correct to reap the economic and social benefits.
12. For example, bus, coach and taxi companies are unable to provide the same level of service integration or joint planning as train operating companies despite delivering far more passenger journeys per annum.
13. CIHT is also supportive of using data to maximise the capacity and resilience of our transport networks however data analysis must be carefully applied to support the Future Mobility Strategy's stated goals. There is a tendency to target what can be easily measured, which often means commuting journeys, tickets sold or traffic speed. However, if the Strategy wants to encourage healthy environments and active travel it must aim to tackle more difficult data challenges such as non-commuting journeys, cycling and walking.

Q3. What evidence do you have to enhance our overview of the impacts of these trends on cities and their use of urban space? Are any impacts missing?

14. CIHT believes that a well-designed transport system should enable and encourage active and healthy lifestyles, but is possible that a number of these new developments could undermine that goal. It will be important to assess the health impacts of implementing new schemes to achieve societal goals rather than looking at modes in isolation.
15. In terms of electric cars CIHT agrees that these offer a major contribution to reducing air pollution and carbon emissions but highlight that they can create a conflict with other transport modes over using urban space. Narrowing footways, wires and flashing lights designed for

[1] 13/06/2018, EuroRAP "NEW REPORT TACKLES THE TRANSITION TO AUTOMATED VEHICLES ON ROADS THAT CARS CAN READ"

branding purposes can all have a detrimental impact for other road users and reduce the attractiveness and accessibility of walking and cycling.

16. Guidelines for highway authorities should be introduced to ensure that vehicle infrastructure is not placed on footway or cycleway infrastructure; streets must be inclusive, accessible and attractive. The design of charging stations should have as limited a visual impact as possible.
17. CIHT recognises that in recent years many new modes of transport are being used on public streets, from electrically powered bikes, scooters and roller blades to luggage carrying autonomous pods. These all affect how people use public space, which is just as important as the built environment, with differences in speed, weight and manoeuvrability affecting perceptions of safety and comfort.
18. To adapt to the challenge this presents requires fresh thinking about how we share limited road space as it is clear that very few of these modes are happy sharing footway or carriageway space. For example, they could be too large and too fast for pedestrian comfort, and too small and too slow for driver preference. It will be important to investigate the development of a 'third lane' that can accommodate traditional vehicles such as bicycles and mobility scooters; as well as electric bicycles, 'hoverboards' and electric scooters to enable more space efficient modes to thrive. To avoid difficulties over regulations specifying particular modes these could be delineated by speed, weight and mass of the vehicle.
19. CIHT is aware of discussions about providing dedicated lanes for autonomous vehicles to avoid conflict between them and other road users; CIHT recognises that all highways are shared spaces to varying degrees and would caution against this as it could compromise other modes of transport in an already constrained environment.
20. Dedicated shared spaces, which deliberately remove lane markings, signage, and rely on human interaction, have been a major topic of discussion in recent years. But given the human psychological traits of risk avoidance, eye contact, and Theory of Mind[2] these schemes rely upon, there will be unique challenges for autonomous vehicles to navigate within these spaces. CIHT recommends using our review 'Creating Better Streets' as a framework for understanding these issues.

Q4. What possible market failures might emerging technologies and trends give rise to that could require intervention by Government?

21. CIHT believes that a well-designed transport system should enable and encourage active and healthy lifestyles, it is possible that a number of the new developments highlighted in the consultation document could undermine that goal. It will be important to assess the health impacts of implementing new schemes in order to achieve societal goals rather than promoting particular modes.
22. CIHT believes that transport should be inclusive and meet the needs of all groups in our society and argues that the trends outlined are not neutral in their impact. The economic and social impact of transitions to new technology will have winners and losers, as it is likely that wealthier, younger and more technologically able users will adopt new technology first and if that has a detrimental impact on other residents this will need to be addressed. For example, many current e-hailing apps do not provide for disabled people and in some areas these apps are coming to dominate the market. By selecting a cheaper to serve section of the market it can create barriers to opportunity for disabled people.
23. The infrastructure which provides fossil fuel power is also open to 'market failure' as the growth of electric vehicles will have a financial impact on service providers. If petrol and diesel fuel powered cars become less common then this could lead to fewer customers and conversion of facilities to other uses, a similar affect has been seen within London's congestion zone. This will leave those dependant on non-electric powered vehicles open to

[2] 2012, Michael D. Breed, Janice Moore, in Animal Behavior, 2012, "*Theory of mind is the ability to form hypotheses about the thoughts of surrounding animals. This requires an understanding of other animal's mental state*"

increased financial and time costs. This may be welcomed as a market push towards cleaner vehicles, but the overall impact must be considered on residents and businesses which are unable to switch.

24. Completely free market approaches to public transport and mobility may also lead to sub-optimum outcomes and the strategy should acknowledge the role government has to play in helping different sectors work together as an honest broker. In the UK, transport modes have tended to work in isolation, with some claiming the nearest to integration a passenger meets, is a taxi rank at their local rail station. Overcoming these divisions to deliver a globally competitive digital infrastructure will require implementing the correct governance and incentives to drive cooperation in the market and may require varying models in different parts of the country. Our members have highlighted the need for;

    - Requirements to share data between providers, including timetables, fares and real-time information.
    - Secure standards for digitally sharing data between providers.
    - Development of application programming interfaces to create room for innovation and
    - Improve the ability to purchase door to door tickets from a single point of contact.
    - Cooperation between the public and private sector.

25. The unwillingness of providers to share data, a desire to protect their current commercial position and the difficulty in allocating customers and revenue are all barriers to building a digital first society. This can be seen in the limitations to existing mobile applications and services, they can be used to order a car on demand, however it cannot be linked with your train arrival. A user can find out journey details including distance and price based on TfL services, e-hailing services, cycling and walking on a single screen in the Citymapper app, but is not able to book tickets or plan journeys using multiple providers. These silos must be overcome to realise the full market benefits from a digital transport strategy. This is an opportunity for government to encourage commercial growth through setting out the appropriate frameworks.

26. Train operators have faced their own issues in providing joined up services but have been able to establish joint standards for buying tickets (and sharing that revenue between the point of sale and the operator), as well as a variety of data feeds and API's for developers to build apps and services around rail passenger journeys. CIHT would encourage that services and infrastructure are ‘designed for people’ rather than looked at in isolation, and that applies equally to digital services.

27. CIHT are concerned that autonomous vehicles may lead to greater congestion and reduced use of active travel and suggest this could be addressed by market mechanisms that fairly price road usage and externalities.

Q5. We are committed to a transport network that works for everyone. What role should Government play in helping ensure that future transport technologies and services are developed in an inclusive manner?

28. CIHT supports ambitions for an inclusive, sustainable and people focused transport system, especially due to the ageing and increasingly less healthy population it will serve.

29. Currently, however, many new transport entrants are not regulated by the public service vehicles accessibility regulations, which requires the provision of wheelchair space, boarding ramps, propriety seating and colour contrasting handholds which enable many people to travel independently. The government is also consulting on expanding those requirements to include audio announcements, route tracking and more. New services may not be subject to these requirements which will lead to a gap in provision, and consideration should be given as to how to address this.

30. Government should also play a role by using its purchasing power and requirements to ensure that all services it supports meet accessibility targets.

31. CIHT conducted a review on shared space[3] which was published shortly before the Government called for a pause on all schemes that introduced shared spaces[4] due to concern about their impact on people with disabilities. CIHT sees this as an opportunity to carry out work that considers how spaces should be delivered and to recognise that visually and mobility impaired users have rights that have not always been fully understood in the past.

32. However, there will be continuing pressures placed upon local highway authorities and others to continue to deliver these sorts of schemes because the drivers are often economic regeneration, city and town centre redevelopment and better placemaking. This indicates that there is a strong need to gather appropriate research and update guidance to deliver successful improvements.

Q6. How can government ensure that future urban transport systems support people's wellbeing and flourishing healthy communities?

33. CIHT would urge a holistic approach in the future of mobility strategy. This approach would require not concentrating the review primarily on technology types but looking at the wider issues they claim to solve. In terms of health and wellbeing there are three major areas for concern, the individual health benefits that can be generated by active travel, the direct risk of harm from unsafe highways and poor air quality. The CIHT Report 'A Transport Journey to a Healthier Life' contains further information.

34. For individual health, we should not ignore the major gains that are possible by reprioritising our streets for cycling and walking to achieve a healthier and happier population. The well-established health benefits of existing modes of active travel should be a benchmark by which new mobility forms can be appraised.

35. Highway design in the UK has historically been aimed at the needs of motorised vehicles with a great deal of economic and business case supportive methodologies, data analysis, innovation, and investment taking place in that area. There has been less focus on the needs of pedestrians and cyclists, addressing that discrepancy will be a vital part of ensuring that future urban transport systems support people's wellbeing and flourishing healthy communities. CIHT's work on Manual for Streets 2[5] and through Planning for Walking[6] and Planning for Cycling[7] will assist in that goal.

36. For road safety there is the potential to make our roads, safer, more resilient and more efficient through greater use of data and measurement systems. This requires using innovative techniques to better understand what causes fatalities on the road network; and considering what contributions new technology can make in preventing accidents, shaping behaviour and encouraging awareness.

37. The safety benefits of autonomous vehicles are a key reason for such strong support from the UK Government however, to fully realise these benefits will take decades. The Government must ensure that the transport sector is incentivised to take full advantage of existing technology such as cameras, LIDAR and speed governors to improve safety sooner rather than later. CIHT also notes that the UK has adopted the internationally recognised Safe Systems approach to road safety and that our Future of Mobility strategy should embrace the standards and practices within that approach.

38. For poor air quality CIHT have provided a comprehensive response to the Draft Clean Air Strategy which sets out concerns and opportunities for improving air quality relating to transport now and in the future. Delivering better air quality must be a key part of any future urban transport system.

[3] 2018, Phil Jones et al, 'Creating Better Streets: Inclusive and accessible Places' published by CIHT

[4] 2018, CIHT, 'Government calls for shared space pause', Press Release

[5] 2010, 'Manual for Streets 2' Published by CIHT

[6] 2015, Kit Mitchell & Terence Bendixon, 'Planning for walking' published by CIHT

[7] 2014, Rob Gallagher & John Parkin, 'Planning for cycling' published by CIHT

Q7. What role should Government play in understanding, shaping and responding to public attitudes to emerging technologies and services?

39. CIHT welcomes the governments work on regulatory, insurance and safety strategies for autonomous vehicles, which will enable technology to be adopted by users with greater confidence.

40. CIHT would also advocate that strong requirements for transparency and accountability are put in place to ensure that the public are able to have confidence in new technology, and so that practitioners are able to evaluate the quality and impact of their designs.

41. A broader concern is not of the public alone, but of the thousands of engineers, transport planners and construction workers who will be responsible for designing and building the infrastructure emerging technologies and services work on. According to a CIHT survey, when asked: 'Do you think the industry has a clear understanding of CAV and its requirements' – 87% reported they thought the industry has a 'Limited level of understanding about CAV' and 13% reported a 'Very limited level of understanding'.

42. There is therefore a more immediate issue of preparing the industry for CAVs. This requires a need for future cross-sector planning (how policies for transportation, housing and telecommunications can assist and support CAVs); guidance (to raise awareness around standards); design parameters (to ensure that transport infrastructure schemes are future proofed); and that they use a 'real options appraisal' approach to investment to account for future uncertainty[8].

Q8. What changes do you expect to the mobility-related labour market? How can Government best support people and businesses affected by these changes?

43. It is widely acknowledged that, as an industry, transport infrastructure is suffering a severe skills shortage at a time when investment in major projects is increasing and the demand for skilled technicians, planners, designers, engineers and managers is growing. Engineering UK recently found that we need 182,000 new engineers and technicians a year until 2021[9] and the National Infrastructure Plan for Skills estimated a shortfall of nearly 100,000 workers by the end of the decade.

44. Therefore, CIHT welcomes the establishment of the Strategic Transport Apprenticeship Taskforce and other efforts to address skills in the transport sector.

45. Exiting the EU may increase these pressures, with nearly 12 per cent of the 2.1 million construction workers coming from abroad,[10] if the final agreement results in curtailment of free movement of people, the UK may lose a reliable pool of labour and this may slow down the delivery of projects, at least in the short-medium term while the UK 'skills up' to cope with demand.

46. Possibly losing the ability to recruit skilled workers from EU countries could lead to wage inflation, high staff turnover, pressure on the supply chain to deliver savings and negative impact on customer/end user choices. To maximise opportunities for infrastructure we must focus on recruiting and training people with the right skills and abilities to meet the Government's infrastructure targets and remain competitive in a global market. It is therefore imperative that government continues working on an over-arching skills strategy for the construction, infrastructure and built environment industries that mitigates against changes in the labour market.

47. There are also likely impacts on the future of mobility strategy through changes in, research and development, funding pots, standards and legislation. The UK must consider expertise in science and research and benefits from international collaboration e.g. EU Horizon Scanning

[8] 2016, Glen Lyons, 'Uncertainty Ahead: Which Way Forward for Transport' published by CIHT

[9] 2016, Anil Kumar, Dr Alexander Moss and Elliott Johnson, 'The State of Engineering'

[10] 12/05/16, Julia Kollewe, "Brexit would lead to shortage of construction staff, says Barratt boss" published by The Guardian,

work, the C-Roads Platform[11]. Any future arrangements should not preclude the UK from being involved with science and research with European partners.

48. With specific reference to electric vehicles, we can see they pose new challenges for mechanics, as they require reduced maintenance in terms of changing oil, spark plugs, brake pads and other minor maintenance jobs. This represents a saving to the user but a loss of income to many small businesses. Further, hybrid and full electric cars will require new skills to maintain and repair vehicles which will require schools and training colleges to adapt their teaching syllabus and careers advice.
49. There is also a growing number of car models which use software to prevent maintenance work from being done by any mechanic not explicitly authorised by the manufacture, often for a significant fee. This can drive up prices for the customer and make it more difficult for small businesses. There may be a case for regulation of these practices to allow small owner operated businesses to continue.
50. CIHT members do not expect autonomous vehicles to make up a significant part of the national fleet for several decades, therefore while it would be unlikely to see significant job losses before 2050, it does mean there is time to educate and change the workforce.

Q9. What other actions should Government prioritise to help people, businesses and cities prepare for the future?

51. CIHT believe that a National Transport Strategy should be developed to provide clear direction and clarification for UK transport policy and that innovation should be a key aspect of it. Innovation takes many forms and if encouraged can make a positive contribution to many areas including technology, education, accessibility and funding. A National Transport Strategy should include the strategic and local level for roads, rail, aviation and ports and set out how these networks integrate with one another.
52. The devolved nations are already seeing the benefits of a transport strategy and CIHT believe this needs coordination at a UK level. A National Transport Strategy would require the support of the infrastructure commission to coordinate delivery across the UK's Transport Network.

Q10. Which 'missions' in the areas we have identified could be most effective in driving innovation and investment? Please refer to the criteria suggested in paragraph 2.6

53. CIHT would encourage a mission to be developed that can create better resilience for highways in the face of extreme weather conditions and high levels of usage as this is an important area where specific policy goals would help future innovation.

Q11. How should Government funding be targeted to help UK innovators build and scale transport solutions?

54. CIHT welcomes support from Government to bring more innovation into highway operations, for example with the trialling of a 'pothole' spotter in Thurrock and York. Such targeted funding should enable new technologies to be developed and trialled and, if successful, should show that the industry is able to support such innovations.

Q12. Which laws or regulations not currently being addressed need to be amended or created to help harness the benefits and mitigate any risks associated with new transport technologies or services?

55. No further comment.

[11] Accessed 10/09/2018 'HARMONISATION OF C-ITS RELATED DEPLOYMENTS THROUGHOUT EUROPE' published by C-Roads

Q13. How could the experience of working with local and/or national regulators be improved for transport innovators?

56. No further comment.

Q14. What further actions should Government prioritise for resolving barriers to data sharing and use in the mobility sector while protecting privacy and security?

57. No further comment.

Q15. Do you have any further suggestions or comments on the subject of this call for evidence?

58. The Future of Mobility strategy should consider the future of how we pay for that mobility, and the issue of revenue and the tax base is notably absent from the Call for Evidence. With disruptive changes likely through a shift from diesel and petrol vehicles to electric vehicles and mobility as a service reducing vehicle ownership this will need to be addressed in the near future.

59. The current pressures on UK public spending combined with an improved public understanding of what is required have created an opportunity to consider the introduction of road pricing. An algorithm that could calculate a price in real time according to distance, congestion, time of travel, occupancy, emissions, size of car is feasible. Therefore, CIHT believe a future of mobility strategy should have as sustainable approach to funding and maintaining our roads at its heart. Fair road pricing stands out in its potential to deliver economic, social and environmental benefits.