Transport for Greater Manchester (TfGM) – Written evidence (AUV0027)

Greater Manchester Combined Authority (GMCA) is the transport authority for Greater Manchester (GM). Supported by the Transport for Greater Manchester Committee (TfGMC), a joint committee of the GMCA and the ten constituent district authorities, its transport policies are delivered by Transport for Greater Manchester (TfGM).

In line with our recently published draft 2040 Transport Strategy, TfGM are dedicated to developing an innovative city region. This includes utilising new technologies and innovations that add real value to the customer experience, improve overall connectivity for passengers, and integrate services across modes and sectors.

As part of this, TfGM has developed an Agenda for Intelligent Mobility (AIM) which details the wider goals for technology and innovation in Greater Manchester, including utilising advanced solutions such shared mobility, giving public transport the opportunity to deliver first- and last-mile transport solutions, and being part of multiple collaborations to explore Connected and Autonomous Vehicles and the future opportunities and implications of their deployment in our city region.

What are the potential applications for autonomous vehicles?

The potential applications for autonomous vehicles are numerous and varied, and offer a range of potential benefits, including: increased capacity, improved safety, and improve efficiency. TfGM sees one application of Autonomous Vehicles (AV) as a natural progression for public transport, complementing a wider transport offering, including systems such as rail, bus, light-rail, cycling and walking. The vehicles themselves could offer a range of diverse opportunities, including fixed route and demand responsive small vehicles that carry up to 20 travellers, and larger public transport modes such as buses, trams and trains. Alongside this, AV could enable a greater frequency of services for evening and weekends: times which have traditionally had lower patronage and as a consequence, costs are harder to cover with revenue.

Passenger applications

AV has the potential to facilitate a shift in how customers access mobility services. Private vehicles are parked between 90-95% of the time (80% at home and 16% elsewhere)\(^1\). AV, which can pick up and drop off travellers without needing to be parked throughout the day, could create an environment that provides door-to-door mobility opportunities whilst also removing the need to own a vehicle for a significant number of car owners\(^2\). This also presents a new opportunity to open up land which has previously been devoted to parking spaces. This has the potential to enable customers to utilise multiple mobility services as part of their journeys, without compromising on accessibility. TfGM, in line with the draft 2040 Transport Strategy, has already developed a detailed proposal for how Mobility as a Service might work in the city region, and we believe AV would complement the proposal, adding significant value in Greater Manchester’s dense urban areas.

Road Safety

\(^1\) Royal Automobile Club (2012)

Perhaps the most potentially important application for AV, is to significantly improve the safety of travellers using the road network\(^3\). Human error accounts for approximately 90% of road accidents\(^4\). AV would utilise multiple systems such as LiDAR, RADAR, GPS and, eventually, Artificial Intelligence, which will gradually remove the human element from key decision making. The vehicles would be connected to each other and to surrounding infrastructure. This will enable AV to have a wider awareness of the environment they are moving through, and the movements of other connected vehicles, and take this into account during the decision making process. The vehicles will also be able to make judgements quicker and more efficiently, and react at quicker than human speeds, potentially reducing the number of accidents.

**What are the potential user benefits and disadvantages from the deployment of autonomous vehicles?**

TfGM believe that the key social and economic benefits of AV lie in their potential to provide more efficient door-to-door solutions for public transport users and enable mass transit options access to more remote or dispersed communities and out-of-town employment areas, where it is currently unsustainable to provide a traditional public transport scheduled service. AV would also enable travellers to utilise services that traditionally may have been inaccessible due to the lack of viable public transport provision to their area of residence, work, or time of travel.

However, in the rush to deploy AV we should not be blinded by the need to justify the technology through a range of perceived benefits, without fully considering all potential impacts or consequences. In the case of deploying a technology that will have full access to our national road infrastructure, it is essential that all aspects of cybersecurity, and physical safety, related to AV are investigated and strict targets should be enforced to ensure both citizens using the vehicles, and the spaces around them, are adequately protected. The technology itself must also be rigorously tested, to meet the expectations of local and national government bodies, before it is trialled in an open urban environment.

**How much is known about public attitudes to autonomous vehicles?**

While we believe the technology for AV to be already advanced, one important challenge in shaping a domestic market is consumer acceptance and experience. Also, it is important to understand the benefits to potential users and businesses. Therefore, we see research exploring how potential customers will interact with this new technology as essential to achieving acceptance. However, TfGM believe research into public attitudes of AV is currently limited, and this would best be tackled through pilot testing in live environments where customers can interact with the vehicles, whilst also being assured the technology is being continuously monitored for their safety.

**What is the scale of the market opportunity for autonomous vehicles?**

Changes in customer expectations and choices in how they access mobility in recent years has shown that travellers are progressive and open to new mobility configurations, including shared mobility, if they provide cost, time, reliability, ease of use and/or connectivity benefits\(^5\).

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\(^4\) Yan, Ping and Liping (2013) Analysis of Road Traffic Accident Caused by Human Error. ICTIS: Improving Multimodal Transportation Systems-Information, Safety, and Integration

Shared services and alternative fuel types

Subject to the principle of asset sharing becoming more mainstream, the majority of AV will be shared, rather than privately owned, allowing users to share and reduce costs and access a range of modes as part of their journeys. Alongside this, in a public transport context, the savings from no longer requiring a driver to operate a vehicle will enable more marginal services to be maintained.

As the vehicles themselves are developed, a focus on fuel and energy types is being applied to the projects. Many publically and commercially funded projects have featured electric only AV. As the vehicles will be able to drive autonomously to electric charging point locations, and/or re-charge other cars that are in need of a top-up, this could play a key role in addressing how electric cars could be realistically adopted by the majority of customers.

As previously mentioned, AV could also provide transport authorities with the opportunity to offer door-to-door transport choices without the need to own a private vehicle. TfGM has already developed a detailed proposal for how a Mobility as a Service pilot might work, and this proposal can be tested in a pilot offering, in combination with other public transport services.

Freight and Logistics

AV could also provide delivery services during times when demand for vehicles from passengers is less. This opens up the opportunity to use AV as feeders for urban consolidation centres (and last-mile deliveries in cities), reducing the need for HGVs to move through dense urban spaces during certain hours.

In the short-term there are also opportunities for bus operators and the logistics industry to utilise autonomous systems that allow remote operation of the vehicles, enabling them to take advantage of significant operational savings and safety benefits without removing the human operator from the equation entirely. This will enable a smoother transition for users of the technology in a commercial environment.

Creating an enabling environment

Is the scale of current and planned demonstration facilities for autonomous vehicles sufficiently broad and ambitious?

TfGM recognise that testing facilities will enable the technology to be trialled in a variety of environments and situations, before then being tested alongside other modes. It must be noted, however, for a trial site to exploit and maximise potential opportunities it must be sited in an area that fulfils a number of essential criteria, such as a concentration of relevant skills and expertise, an area that already benefits from close public/private sector collaboration, and an area with strong local political support for the implementation of new technology and innovations in an urban context.

Alongside the above, it is also essential the UK has a long-term plan, which is supported with funding and supportive legislation, to ensure organisations, such as transport authorities are able to invest in safety measures, infrastructure updates, and customer acceptance and

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experience programmes at a level that ensures AV are introduced to cities and city regions across the country equally, sustainably and safely.

**Is the Government doing enough to fund research and development on autonomous vehicles, and to stimulate others to do so? Should it be doing more to coordinate UK actions?**

The technology for AV is developing rapidly, and as such a collaborative approach is needed between cities and city regions to ensure experience and best practice is effectively shared. The Government will gain significant insight by continuing to work in close partnership with cities and city regions to understand the needs and challenges each area is facing and how AV could be used to combat these issues.

The Government would also improve opportunities if it recognised and supported areas which already display the capabilities and resources required for testing AV technology. Preference should be given to areas that demonstrate an ability to add to the AV sector, instead of being required to compete for funding based on project specifications which can limit instead of support innovation.

**Real world operation**

**Will successful deployment of autonomous vehicles require changes to digital or physical infrastructure?**

Some sections of the transport network and supporting infrastructure will require updating to support AV services. The most challenging environments for AV would require significant investment. Investment of this kind could see AV deployed in urban environments, where the greatest benefits will be realised, at an accelerated pace. However, questions relating to local or centralised control centres and the acceleration of AV technology past the point of needing supporting infrastructure on highways rendering investment wasteful, will need to be considered prior to investment and AV deployment.

**How might a move from current levels of highly automated vehicles to their extensive deployment best be managed? What do you see as the key milestones?**

An essential area for consideration prior to the deployment of AV, at both small and large scales, is the supporting policies, regulations and guidelines for cities and city regions. These areas have densely populated, multi-modal urban spaces which will require AV to meet very clear safety restrictions to satisfy the local authorities and citizens moving around the spaces.

TfGM believe it is the role of Government to work with transport authorities to ensure AV are able to meet these safety restrictions from the outset, otherwise AV implementation will be fragmented and unsustainable. Transport authorities also require tools which enable them to ensure AV deployment is in the best interests of all residents, and does not positively impact a few users, while having a detrimental impact on others using the same spaces.

Key milestones in AV deployment include:
- Adequate testing in a variety of virtual environments (simulations);
- Research into customer expectation and acceptance of AV;
- Policy development which satisfies the safety concerns of local governments, organisations and travellers;
- Limited testing in urban, semi-rural and rural environments; and,
- Testing along different road corridors including congested urban areas and strategic highways routes.

These milestones will not be met by single projects operating separately and outside of a wider collaborative effort. Instead investment needs to be made in key areas which support AV and AV technology development, as part of a wider strategic piece which acknowledges the importance of partnership and information dissemination across areas directly and indirectly involved, and those not involved at all.

**Does the Government have an effective approach on data and cybersecurity in this sector?**

The rise of connected devices in recent years has opened up citizens to potential threats relating to their digital and personal security. It is imperative that Government works in partnership with a range of organisations to devise clear standards, regulations and legislation to protect citizen’s information and safety.

To effectively approach data and cybersecurity, and implement sustainable measures that provide businesses, organisations and public bodies with the tools they need to adequately ensure citizens are protected, the Government needs to work collaboratively with a variety of organisations (including global corporations and SME’s) to better understand the current cybersecurity landscape from a transport and technology point of view, and the potentially threatening areas that must be focused on.

**What, if any, ethical issues need to be addressed in the substitution of human judgement in the control of vehicles by algorithms and Artificial Intelligence?**

In 2014, there were 1775 reported road fatalities, and 195,000 casualties of all severities, reported in the UK. While the number of accidents is falling, over 90% of them are still caused in some way by human error.

In the same way it is accepted there will never be an “absolute zero” fatality rate where human drivers are concerned, there will also be times when an AV has to choose between options which will ultimately lead to humans being harmed. TfGM acknowledge the importance of informed debate on ethical considerations relating to new technologies entering spaces which are occupied by people, and we recognise there are a number of questions currently posed to this form of technology due to the lack of trials on British transport networks. However, we also believe AV development should not become stagnated due to ethical questions which demand absolute safety in all areas. In this case, TfGM believe Government, and other public bodies, have a role in determining the future of these technologies operating in close quarters with citizens, and this decision should be based on evidence collected through pilot projects, research studies, and risk and safety assessments.

TfGM also believe it is important to remember one of the key differences between AV and human drivers that may positively impact road safety will stem from the lack of indirect actions that often cause a crash, for example, an AV will not fatigue, be intoxicated, distracted by other devices or passengers, etc. However, it is important to understand that AV cannot, and will not, remove every chance of danger for humans within the vehicle or around it, in all circumstances.

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That said, it is vital the technology undergoes rigorous tests to ensure high safety standards are met.

**Wider governance**

**What does the proposed Modern Transport Bill need to deliver?**

The Modern Transport Bill should examine the opportunities for AV, and other developing technologies, to add real value to the customer experience, and generate wider socio-economic benefits. Focus must be given on developments which enable cities and city regions to implement solutions to local challenges which enable all residents to benefit, and support an “all inclusive” mobility package.

In reflection of this, consideration may need to be given to the current vehicle sharing regulations, allowing amendments that endorse and facilitate new mobility patterns and car-share possibilities, which would support AV and enable the reduction of congestion and emissions pollution.

**How effective is the UK’s education system in delivering people with the right skills to support the autonomous vehicles sector?**

There is a significant skills gap in the STEM sector, in Greater Manchester and other city regions around the UK. Investment is needed to ensure these career paths are highlighted to young people, those interested are able to access education to support these career aspirations, and for local government to ensure there are wider supportive services, such as transport, to enable residents to access education and training facilities. Local government also requires a range of tools to enable these sectors to flourish and retain the skills that have been nurtured in each area.

**Is the Government’s strategy and work in this area sufficiently wide-reaching? Does it take into account the opportunities that autonomous vehicles offer in a wide range of areas, not just on the road?**

The focus of investment up to this point has been almost entirely on small, privately owned vehicles. TfGM believe a wider focus, including the development of autonomous public service vehicles (including road, air and water vehicles), is needed to ensure all potential opportunities are fully exploited and maximised. In particular, focus should be given to vehicle classes which ‘integrate demand’ for peak-time travel and off-peak last mile deliveries, such as mini-buses which carry up to 20 passengers. By focusing on AV which could be utilised for public transport now, there will be more time and opportunity to influence the regulatory framework with public transport included, otherwise the future of AV will be mainly shaped by the car industry. Current regulatory frameworks should be adapted to enable transport authorities to launch public transport pilots which allow for the utilisation of innovations such as AV.

**What are the implications of exit from the European Union for research and development and the autonomous vehicle industry in the UK? Are specific actions from the Government needed to support or protect the autonomous vehicles sector in the short term or after the terms of Brexit have been negotiated?**

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8 The Greater Manchester Strategy (2013): Stronger Together
9 UITP (2016) Tomorrow’s mobility: What should be the role of public authorities?
There are a variety of potential issues that may arise due to Britain’s exit from the European Union. First and foremost is the potential loss of funding, which is often collaborative with other cities across the continent, that offer a joint opportunity for research and development and information sharing. Opportunities for collaboration with European academic and research institutions may diminish along with the loss of funding, as they will continue to partner with funding consortiums. This in turn may cause a reduction in knowledge exchange and information sharing between the UK and European Countries. However, TfGM are aware the future economic and social implications are still unclear, and believe it the role of Government to provide clarity on potential future implications, both positive and negative.

TfGM also recognises the step the Treasury has taken to ensure agreed funding commitments will be met. However, this is only a short term solution, and a commitment will need to be made, from the Government, to continue to fund research and development in this area, if the AV sector is a priority.

In future, TfGM will continue to work with international organisations to share best practice and ensure new opportunities in technology and innovation are fully exploited, to add real value to the customer experience in Greater Manchester.

25 October 2016

Appendix

Greater Manchester Combined Authority (GMCA) is the transport authority for Greater Manchester (GM). Supported by the Transport for Greater Manchester Committee (TfGMC), a joint committee of the GMCA and the ten constituent district authorities, its transport policies are delivered by Transport for Greater Manchester (TfGM). TfGM oversees transport and travel across GM, home of the UK’s largest city region economy outside London. It:

- is responsible for delivering the GM Transport Fund, a £1.5bn transport investment package comprising Metrolink expansion, new interchanges at Altrincham, Bolton, Rochdale and Wythenshawe and additional bus priority schemes
- owns and manages the Metrolink network, which currently covers 58 miles with 93 stops across seven lines – hosting 35.5 million passenger journeys every year
- is delivering the Metrolink Second City Crossing and is working on preparations for a new line through to Trafford Park
- has delivered a network of Quality Bus Corridors comprising bus lanes and high quality bus infrastructure and is now completing a further package of bus priority to improve bus links between Leigh, Atherton, Salford, Middleton, Parrs Wood and the Regional Centre
- builds, maintains and staffs bus stations, Travelshops and interchanges, and installs and maintains 12,000 bus stops and 4,400 shelters (the majority under contract with JCDecaux)
- works closely with over 30 bus operators
• is overseeing an investment of more than £40m into cycle routes and facilities, alongside a programme of cycling information, education and training

• works with Job Centres, job-seekers and local businesses to encourage sustainable commuting

• is a key partner in Rail North

• manages the Key Route Network in partnership with all ten district highway authorities and Highways England

• is developing GM’s Transport Strategy, alongside district authorities and the GM Local Enterprise Partnership [http://www.tfgm.com/2040/Pages/strategy/index.html]