

Written evidence submitted by Wayve (SDV0036)

Introduction to Wayve

Wayve is a London-based British startup pioneering a scalable way to bring automated vehicles (AVs) to the UK and beyond. Wayve's unique 'AV2.0' approach – driven by data and AI – enables our fully driverless technology to learn and adapt its 'driving intelligence' to any city or vehicle type, much like how people learn to drive but with the benefits of greater reliability and safety. Our Automated Driving System (ADS) is trained on vast amounts of data to continually improve driving performance and enable our system to adapt to changes on the road. We are showcasing the promise of our AI-powered technology via daily testing on public roads across the country, on electric cars and light commercial vans. We are designing our technology to be sustainable, as our AVs will always use EV platforms, and scalable – it's our ambition to be the first to deploy in 100 cities globally.

Major businesses recognise the potential of our technology, both here in the UK and for export globally, demonstrating the huge opportunity for foreign investment that AVs offer. We have signed commercial partnerships with Ocado Group, Asda and DPD, and this year raised \$200 million in Series B funding, bringing our total equity raised to over \$258 million since our inception in 2017. Our investors include world-leading UK institutions and angel investors such as Balderton Capital, Firstminute Capital, Baillie Gifford, Virgin, Microsoft and Zoubin Ghahramani. Our last-mile delivery trials begin this year in London.

Summary

- **AVs offer huge benefits to UK society**, promising £40 billion of economic growth and high-productivity jobs, positioning the UK at the forefront of this emerging technology, and bringing wider benefits including greater safety, affordability and accessible mobility.¹
- **AVs will make our roads safer.** The four leading causes of road accidents in the UK are driver error, reckless behaviour, disobeying traffic laws and driver impairment/distraction.² AVs will reduce the risk to other road users and improve road safety, therefore reducing the £33 billion per year (or 1.5% GDP) lost to the cost of injuries on the road.^{3,4}

- **AVs—particularly those built on EV platforms—will create carbon savings across the UK’s roads and help the UK achieve net zero**, not just through an accelerated transition to EVs, but by making journeys more efficient for other road users, reducing congestion, idling emissions and cutting journey times.⁵
- **To achieve commercial deployment of AVs, the Government should use the Transport Bill to put in place a flexible and technology-agnostic regulatory framework** that ensures no innovative technology is locked out of this nascent market.
- **This framework should build on the recommendations of the Law Commission’s joint report**, working with industry to ensure there is a clear and achievable pathway to widespread commercial deployment. An industry working group would facilitate better co-operation between ADS developers and Government, and we would welcome the opportunity to contribute to such a group.

Our vision for automated vehicles

AVs will enable greater access to safer, smarter and sustainable forms of transportation. At Wayve, we are unlocking the opportunities of AI to rethink how we build AV technology. Across many industrial sectors, AI is redefining the way we think about technology, resulting in an inflection point in economic growth and unparalleled technological benefits. AI and machine learning enable us to build AV technology that is truly scalable. By designing affordable vehicle-agnostic AV technology that can adapt to many different EV platforms and scale to any location in the UK, Wayve will give people greater access to the benefits of this transformative technology.

AVs will reduce emissions. Transportation accounts for the largest share of greenhouse gas (GHG) emissions among sectors in the UK and inefficiencies abound: traffic congestion, stopping and starting as well as underutilisation of fleets.⁶ AVs are expected to facilitate many changes to our transportation system that will reduce energy consumption and GHG emissions. Not only will it accelerate the transition to EVs, but it will also make journeys more efficient, increase vehicle utilisation and reduce congestion from fewer cars on the road.⁷ One life cycle assessment study found that AV’s operational effects of eco-driving practices, reduced congestion and on-demand mobility services that change

travel patterns and vehicle ownership, can result in an additional 10% reduction in GHG emissions.⁸

AVs will make our roads safer. Every 22 minutes someone is killed or seriously injured on UK roads.⁹ These injuries and deaths are preventable tragedies and this risk affects car occupants, pedestrians, motorcyclists and cyclists alike. With the vast majority of accidents caused by human error, AV technology will offer transformative safety benefits at its maturity. While fully automated no-user-in-charge (NUIC) technology is not widely available to consumers today, outside of limited commercial trials in the U.S. and China, the advantages of developing this technology, which removes the human driver from the chain of events that can lead to an accident, can have far-reaching benefits for society. Our technology is designed to constantly monitor the road, identify potential hazards and respond quickly and reliably, preventing accidents that would otherwise be caused by driver error, reckless behaviour, disobeying traffic laws and driver impairment, the four leading causes of road accidents in the UK.

AVs will enable profound daily productivity gains. Polls indicate that the average Briton cumulatively spends almost four years behind the wheel over the course of their lifetime.¹⁰ This is lost time, where people are unable to add value to the economy or do things that enhance their lives like learning new skills or taking time for recreation. By simultaneously reducing the time people spend in transit and allowing them to make better use of that time, AVs will make car journeys into a new opportunity window for Britain's drivers.

AVs will improve access to advanced mobility solutions across the UK. What makes Wayve's technology unique is how we are leveraging AI to develop the on-board 'driving intelligence' to enable any vehicle to drive autonomously, even in places it's never previously been to. This means our technology can be trained on vast amounts of driving data and then it can apply—or 'generalise'—what it has learned to other cities. For example, once our ADS learns to safely drive through a roundabout in London, it can perform the same manoeuvre in other places like Coventry or Cambridge that differ from London in road layout and driving culture. It doesn't need to be re-programmed for every new location, which is a unique attribute of Wayve's AI-driven 'AV2.0' approach. Whilst our initial focus for commercial trials will be in last-mile delivery, ride-hailing and public transport, predominantly in urban areas, these deployments do not preclude our technology from being able to drive autonomously in suburban or rural areas. This capability

is key to unlocking advanced mobility solutions for people and communities in every part of the UK and beyond.

AVs will drive new opportunities for economic growth and job creation. We have already touched on some of the benefits AVs will provide, increasing the ability for people to increase their productivity and economic output, but AVs will also be job creators. 38,000 new green jobs will be created in a UK industry that could be worth £42 billion by 2035. Over 80% of these jobs are expected to be in professional, technical and skilled trade occupations like fleet management and remote operations.¹¹ Moreover, our experience developing cutting-edge applications of AI and robotics in the physical world will unlock new advancements in these technologies that go beyond the domain of software. This gives the UK an opportunity to lead the world in the next technological revolution.

Business model

Our initial focus will be as a business-to-business (B2B) platform, working with commercial fleet operators and ride-hailing companies to develop the technology and deploy commercially. It is our expectation that commercial fleet deployment will be where the early benefits of AV technology are first realised, for applications such as ride hailing, logistics and public transport.

We also expect that commercial deployment of AVs will be first introduced in urban environments, where the cost-to-opportunity ratio is higher for commercial operators to recoup investments. As a commercial partner, Wayve is working closely with a number of major UK brands, including Asda and Ocado Group, to trial the technology ahead of commercial deployment.

Once there is a full regulatory framework in place, we anticipate commercial deployment will be largely market-led and that other factors may have an impact on the cost of purchasing and operating an ADS. Insurance is a key potential barrier, as insurers are unlikely to be able to adequately risk assess the deployment of new technology at scale. We expect insurance premiums early on to be high, or potentially very high, and that will affect the profitability of AV developers' business models in the short to medium term. In our view, it's crucial that the Government bring forward regulation to underpin the necessary comprehensive liability and assurance framework for insurers to offer AV products, across all levels of automation. There is also likely a role for the

Government to de-risk the insurance market, ensuring insurers can offer competitive rates while the market is forming to ensure the continued growth of the sector at this crucial early stage.

In the future, we expect AV technology to be widespread, and we anticipate AV technology will expand beyond urban and suburban environments. Of course, many people will always want to maintain the option to drive, particularly if the vehicle is a recreational vehicle like a sports car. Eventually, we expect fully driverless consumer vehicles to be available in future, and our vision is for a world where most people can reclaim the time spent operating their vehicles, and where safe, reliable and environmentally friendly AVs are the standard for transporting people and goods.

Progress of research and trials

Since 2017, Wayve has pioneered the AI software, lean hardware and fleet learning platform for our new approach to developing an ADS. This resulted in prototyping the world's first demonstration of using end-to-end machine learning to train and autonomously drive a vehicle on UK public roads. We have been road testing on the streets of London and other major UK cities since 2018 without incident. As per the Code of Practice, our on-road trialling is carried out with an expert AV Safety Operator behind the steering wheel at all times.

Other companies are working to deploy fully-driverless (NUIC) AV technology in commercial and consumer trials in other countries. Alphabet's Waymo and GM's Cruise robotaxi unit were authorised in March 2022 by the California Public Utilities Commission to operate their autonomous commercial ride-hail services without a safety driver behind the wheel in San Francisco.¹² Baidu secured permits in August 2022 to offer a driverless commercial robotaxi service with no driver present in Chongqing and Wuhan via the company's autonomous ride-hailing unit, Apollo Go.¹³ Although these deployments are limited in geographic scope and operating service hours, they are key milestones on the industry's path to rolling out fully automated driving services at scale.

We are confident that our uniquely scalable approach to autonomy will give Wayve a significant competitive advantage when deploying commercially at scale. Our AV system is being built to safely navigate London—a hugely complex place to drive—with narrower streets, less structured lanes and more multi-agent

interaction than those where our competitors are currently operating, such as San Francisco. We've already shown that our AVs perform equally well in other major UK cities, demonstrating that we are on track to build AVs that scale faster. Once we solve autonomy for one city in the UK, we solve it for many.

How to get there

Wayve welcomes the Government's commitment to 'safely enable self-driving' in the 2022 Queen's Speech, and its wider commitment to secure commercial deployment of automated vehicles across the UK by 2025.¹⁴ It is crucial for the future of the nascent AV sector in the UK for this schedule to be met, with other countries like Germany, France, The Netherlands, Spain, China and some U.S. states moving ahead quickly to enable commercial deployment. Wayve's pace of development means the need for new primary legislation to create the full regulatory framework is increasingly urgent, if it is going to be ready when we would seek to deploy commercially. If the UK fails to introduce a regulatory framework quickly enough, there is a risk that Wayve and other UK-based AV companies may have to shift focus to other markets. The Government has set out its ambition to see the sector grow to generate more than £40bn in the future, and to see that ambition realised, the UK needs to keep pace with what is an increasingly competitive international market for developers and investment.

In order to realise its ambitions, the Government will need to ensure that the upcoming Transport Bill provides broad powers in primary legislation for the Secretary of State for Transport to establish a regulatory framework for AV development and deployment. The Government will also need to maintain its commitment to consult on secondary legislation as soon as 2023.¹⁵

Wayve's technology, as indicated above, is still in testing. Our vehicle-agnostic technology is specifically designed for scalability, not only ensuring it will work in electric vehicle platforms from a variety of manufacturers but also in almost any geography. This means there will be a wide variety of possible use cases we will be able to take on early in our commercial journey. Our future business model relies on this adaptability, and our technology will be capable of use in a wide range of driving domains, allowing us to scale quickly and reach our ambition of being first to deploy in 100 cities. It is crucial for Wayve that the regulatory framework has sufficient flexibility for companies that intend to sell such a combined software-hardware ADS for use in a variety of vehicle types.

It is also crucial that the proposed authorisation pathway does not disincentivise innovative and independent ADS development. In particular, an ADS should be authorised as 'self-driving' after a single instance of authorisation by the regulatory authority, expected to be the Vehicle Certification Agency (VCA). When an ADS is approved, as integrated into an example base vehicle, approval should be accompanied by conditions regarding the type of vehicles in which it can be installed, in addition to technical specifications. This proposal aligns to the Law Commission's proposals in Consultation Paper Three, for an 'ADS approval scheme'. The Commission's final proposals recommend a more traditional route of authorisation of the ADS with the vehicle, which is traditionally led by automotive Original Equipment Manufacturers (OEMs). This route risks independent ADS developers, who are not typically OEMs, struggling to bring innovative new products to market in a flexible way.¹⁶

Allowing independent characterisation of an ADS as 'self-driving' is key if the Government intends to support ADS developers who have spent billions making ADS systems a reality. Allowing ADS developers to maintain self-driving status independent of a specific base vehicle will allow the largest return on investment, and avoid disincentivising innovative ADS development. To this end, CCAV and the VCA will need to work closely with ADS developers as separate entities as opposed to solely through automotive OEMs, who traditionally lead type and whole vehicle approval processes.

Our business model is not intended as a traditional supplier for OEMs but as an independent developer of ADS technology which can be integrated into a wide variety of vehicles with relative ease. It is crucial that the assurance framework recognises this and factors this difference into its design. Systems and components are typically designed and built for OEMs base vehicle specifications. It's likely in future that OEMs build base vehicles to accommodate ADS requirements, flipping traditional approvals routes. This should be viewed as a transformation of existing approvals processes rather than an evolution.

Safety Standard and regulations

Wayve agrees with the Law Commission that the final decision over whether a vehicle is safe involves asking whether any remaining risks are publicly acceptable. This makes the safety standard a political question which must be addressed by the Secretary of State¹⁷ and we welcome the Government's

commitment to establishing a safety ambition in its recent strategy.¹⁸ Any safety standard for AVs should be comparable to that imposed on traditional vehicles, and should not set specific targets for AVs, in the same way it does not set them for human drivers today.

AVs are likely to bring cumulative safety gains as they remove distraction, reckless behaviour and driving under the influence. The best way to measure this is to focus on statistical outcomes rather than prescriptive metrics, which will naturally differ between ADS developers and between an ADS and a human driver. We also suggest that safety should be reported at aggregate level, where we are likely to see cumulative safety gains as the number of AVs in use increases. We agree with the Government that such statistics should be shared with the in-use regulator, to establish the real-world effect of AVs.¹⁹ We see no reason why this should diverge from the traditional way motor vehicle performance is already aggregated by the Department for Transport in its annual report on road casualties.²⁰

We also suggest closer collaboration between Government and industry could be better facilitated through an industry working group. Co-operation between ADS developers is essential to developing the expertise and rationale for the safety case. We welcome the opportunity to contribute to such a group. Alternatively, we would strongly support including industry representation on the joint Committee on AV Ethics and Safety (CAVES), as proposed by the Centre for Data Ethics and Innovation (CDEI). ADS are complex technologies and industry expertise is critical for developing regulation.

Collision investigations

We disagree with the evidence referenced in the Law Commission's joint report, that AV collision detection systems are unlikely to provide sufficient data to establish what happened in road traffic collisions.²¹ Vehicles enabled with Wayve's ADS are designed to take in enormous amounts of data every second they are on the road. Our AVs have 360-degree camera coverage and no blind spots. This means that, in most cases, our ADS may be able to present a more accurate account surrounding road collisions than a human driver or witness. Steps will be taken to protect this data during storage from corruption or tampering, and this should be a key regulatory requirement, but in our view the data itself will be sufficient to determine the sequence of events for the vast majority of incidents.

It is also our view that it will not be difficult to ascertain whether ADS software was defective and the root cause of a collision. With raw timestamped data, we will be able to determine whether a software system was defective or not. We would nonetheless appreciate further clarity from the Government on the issue of software liability, including how the Consumer Protection Act 1987 applies to over-the-air software updates.

For these reasons, we think there is a strong argument that in the longer term, the insurance industry will be supported to offer commercially-viable rates to ADS developers and commercial bodies who deploy ADS technology. With the right safety assurance scheme in place, the ADS will be an enormously reliable tool, not just for preventing collisions, but also investigating collisions that have happened in AVs and other modes of transport.

The role of Government and other responsible bodies

Government's role in creating a framework for deployment

Most legal responsibilities for driving currently fall on the human driver. In the absence of a human driver, these responsibilities will need to be fulfilled in other ways. Wayve urges the Government to establish in primary legislation three new legal actors to fill this responsibility gap:

1. Authorised Self-Driving Entity (ASDE);
2. User-in-Charge (UIC); and
3. No-User-In-Charge Operator (NUIC Operator).

We endorse the Law Commission's definitions of these legal actors, in particular the recommended flexibility on the identity of what organisations—or partnership of organisations—an ASDE can be.²²

We also welcome the Government's commitment to establish an in-use regulatory scheme to ensure self-driving vehicles remain safe and legal throughout their lives. The in-use regulator should be under a statutory obligation to collect and analyse data to measure the safety of AVs, and publish its findings.²³

Wayve urges the Government to rapidly clarify the sanctions an in-use regulator could impose. We highlight the Law Commission's recommendation that sanctions should be outcome-orientated, specifying the result to be achieved, instead of the means for doing so.²⁴ This supports our view that all AV regulation should be technology-agnostic, if the UK wants to seize the opportunity the sector

represents. We agree with the Law Commission's recommendation that the best outcome for continued innovation and growth in the sector is to see 'a no-blame safety culture that learns from mistakes...achieved through a system of regulatory sanctions rather than by replicating the criminal sanctions applying to drivers of conventional vehicles.' This is similar to what is already in place in the aviation industry, and once embedded in the AV industry will ensure the focus is on improving user safety and learning lessons to improve outcomes.

We believe that the system of regulatory sanctions outlined above, rather than the introduction of criminal sanctions like those that apply to the drivers of conventional vehicles, will best ensure a fair and responsive culture of safety among NUIC operators. For clarity, we are not opposed to the raft of new criminal offences the Commission recommended to ensure the duty of candour of operators.²⁵

Government's role in supporting AV businesses to grow in the UK

As a growing UK-based tech startup, Wayve has benefited from many of the Government's recent initiatives to encourage investment in the UK tech sector, and these have contributed to our decision to start and grow a company here. We are now a company of more than 180 employees, many of whom hail from different parts of the world, and who bring truly world-leading academic, engineering and professional skills to the UK.

However, we are part of a highly competitive international market that presents barriers for our continued growth. First, there is a role for the Government to play to ensure companies like Wayve can continue to offer attractive recruitment packages to world-class talent. Beyond this, while R&D credits have been a huge help, more is needed if we want to compete on equal terms with other companies. Companies in nascent markets face an ambiguous environment without a well-established industry value chain. The UK needs to take a pragmatic approach to the AV sector in its early-stage of formation, if it is to realise the ambition of providing a UK-built solution to a growing world technology opportunity.

A vital part of enhancing UK business competitiveness, particularly for fast-growing and capital-intensive technology companies, will be vastly expanding the eligibility of the Enterprise Management Incentives (EMI) Scheme for companies like Wayve that have grown beyond the size and asset limitations of the

programme. While the UK's EMI scheme is a great support for early stage companies, it requires a step change in the asset value and size of the company that it supports to be appropriate for the deep tech sector—both thresholds need an increase of multiple orders of magnitude. Companies, such as Wayve, developing high tech innovations require large amounts of patient capital to bring a product to market. This typically requires billions in investment and up to 10+ years of development which is not aligned to the current thresholds of £30million asset value and 250 employees.

Without further relief for our employees, competition with other share income relief programmes internationally puts us at a clear disadvantage compared to competitors in other countries looking to take talent out of the UK with highly attractive compensation packages. With a next-stage relief programme in place, we can attract first-class minds to come and work for UK companies like Wayve, keeping homegrown talent in the UK and supporting the growth of the UK economy.

Wayve finally welcomes the Government's consultation on Solvency II and its aim to support insurance firms and pension funds in providing long-term capital to support growth. Reforming Solvency II has the potential to significantly increase the flexibility with which the insurance sector can invest, unlocking capital for scale-ups such as Wayve. While we are pleased that the FCA has authorised a new long-term asset fund (LTAF) that will enable investment in long-term, illiquid assets, we want to see UK pension savers benefiting from British ingenuity, and believe the Government can go further, faster. To take one example of the impact this reform could have: in 2020 the Canada Pension Plan Investment Board became one of the first external investors in Waymo. The Government should seek to unleash the same investment in the UK.

Government's role in supporting the transformation of jobs

As AV technology becomes more widespread, we expect there to be a transformation of the transport sector towards greater automation. Job transformation has happened in a wide variety of sectors throughout the course of the 20th and 21st centuries and has often been used as an argument against embracing a new technology. In our view, the benefits of AVs far outweigh the costs to society, but we also acknowledge that, for some, this transition will be difficult and may represent a risk to their livelihood and preferred way of earning a living.

There is clearly a role for Government in ensuring that any worker who is likely to be displaced by the transition to AVs is supported to find a new career. Our expectation is that the shift to AVs in the delivery and ride-hailing sectors will be gradual and not result in sudden job losses or involuntary redundancy. In fact, commercial fleet operators and ride-hailing providers are facing increasingly challenging recruitment conditions, with high turnover rates and shortages across the sector.²⁶ In July 2021, the Road Haulage Association estimated that there was a shortage of more than 100,000 HGV drivers²⁷ and data from March 2022 showed a 67% churn in the under-30 driver group, indicating a generation reluctant to take on the relatively low-wage jobs in the sector.²⁸ AV technology is likely to ease these constraints and should add to the UK's economic output without threatening job security.

As AVs scale they will create new high-skilled jobs of the future in supercomputing infrastructure, cloud services, data labelling and programming technology, simulation technology, data science, machine learning operations and platforms to build and maintain the onboard intelligence of our system. We work with partners that vary in size from growing startups to big tech companies who are ramping up their capabilities in these areas to service the growing AV industry.

AVs will also create a new industry around the technical maintenance of vehicles, particularly for the fleet operators we expect to be the early embracers of this new technology. We are excited to see the variety of new companies, industries and jobs that will develop as a result of innovation in the mobility sector, taking advantage of the new capabilities offered by AV technology. These could include rapid response services for medical transportation, new mobility options for the elderly or disabled, or on-demand public transport, to name just a few possible examples.

AVs also present an opportunity for the growth of the UK's automotive sector. We work with Jaguar Land Rover, an iconic British brand, to build parts for our fleets and we use UK proving grounds like Millbrook to test our vehicles. AVs offer an opportunity to inject new innovation into the UK's automotive sector.

Government's role in preparing society for AV technology

Public awareness and familiarity is critical to the success of any new technology, and is particularly important to enable the adoption of AVs. To prepare society for this transition, there are important contributions that the Government can make

around advancing public education, promoting transparency around the framework for deployment, identifying local needs and opportunities to assist ADS developers, and bringing together key interest groups, associations, universities, companies, and community groups that will be directly or indirectly impacted by this technological change. The Centre for Connected and Automated Vehicles (CCAV) should continue to work closely with local authorities and other transport bodies, supporting the convening of industry and transport stakeholders. It is our view that Government-backed initiatives to educate the public on this new technology will create greater confidence and credibility than if this were left to industry alone and we support the Government's recent commitment to 'engage the public on this area'.²⁹

The public may be sceptical at what is a dramatic change in most people's day-to-day experience of driving but we are also confident that in time this technology will be embraced and become commonplace. For example, investing in public internet infrastructure might have seemed unnecessary in 1995 when only 14% of adults (in the US) had internet access, but today the countries that embraced the power of the web first are leading the world in technological innovation.³⁰ The more we can work together to prepare society for AV technology, the better prepared we will be to manage public expectations about its deployment and to capture the prize that early adoption of this technology can offer society.

Implications for infrastructure

Wayve's AV technology uses vast amounts of data and machine learning to observe and safely manoeuvre in the existing road environment around it, even when there are temporary changes like roadworks. By using AI, our system can easily adapt to any environment, as well as changes to the Highway Code. As it observes other road users manoeuvring around new obstacles, it learns to do the same and the AV's on-board 'driving intelligence' gets smarter. This means that EVs powered by our AV technology will not require bespoke road infrastructure. Instead, they will operate safely in the existing environment in which they are deployed. Our AVs are specifically designed to coexist safely with current road designs and other road users.

It also means our technology can adapt to changes in the future. Once AVs are a key part of a sustainable multi-modal transport ecosystem, we envision a world where roads can be simplified and decluttered. One research report claims that 6,300ha of land in London could be reclaimed from car parks and parking spaces

through the widespread adoption of AVs, which is enough space to build 180,000 new homes.³¹ It is our hope that a truly integrated multi-modal transport system will offer people greater options to make their journeys quicker, cheaper and easier.

Today, however, our priority is to see a significant expansion in the number of public electric vehicle charging points across the country. All vehicles that will use Wayve's ADS will be EVs and the accessibility of charging points can be a potential barrier to the faster rollout of AVs across the UK. During a multi-city tour last year - when we visited Cambridge, Coventry, Leeds, Manchester and Liverpool, to prove our AVs could operate in places they had never seen before, access to EV charging became a major concern for operational deployment. These trials also showed that further EV infrastructure development is necessary both to support the expansion of the AV sector and to help the UK achieve net zero.

We see this as the first step in a longer journey that will culminate in a fundamentally new system of mobility and green transport for the UK and the wider world, helping us remove driving time from our lives, eliminate accidents and reduce carbon emissions from travel. As we take on these challenges and create a new way to connect people and places, we are excited to see how Wayve's technology will be used in a variety of contexts by different communities, to have the greatest impact on our collective progress to address the most pressing challenges of our time.

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²⁶ Kieran Smith, Driver Require, ‘Bulletin: HGV Driver Shortage Crisis - Q4 2021 Analysis’, 2022.

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²⁷ Road Haulage Association, ‘A Report on the Driver Shortage’, 2021.

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²⁸ Kieran Smith, Driver Require, ‘Bulletin: HGV Driver Shortage Crisis - Q4 2021 Analysis’, 2022.

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²⁹ Department for Transport, ‘Connected and Automated Mobility 2025’, 2022.

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³⁰ Susannah Fox and Lee Rainie, 'The Web at 25 in the U.S.', 2014.

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³¹ New Civil Engineer, 'Arcadis claims autonomous vehicles would free up 6,300ha in London', 2018.

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