

Title: AVs IA No: LAWCOM0075 RPC Reference No: Lead department or agency: Law Commission of England and Wales and the Scottish Law Commission Other departments or agencies: Department for Transport	Impact Assessment (IA)			
	Date: 26/01/2022			
	Stage: Development/Options			
	Source of intervention: Domestic			
	Type of measure: Primary legislation			
	Contact for enquiries: jessica.uguccioni@lawcommission.gov.uk			
Summary: Intervention and Options			RPC Opinion: RPC Opinion Status	

Cost of Preferred (or more likely) Option (in 2019 prices)			
Total Net Present Social Value	Business Net Present Value	Net cost to business per year	Business Impact Target Status Qualifying provision
£m	£m	£m	

What is the problem under consideration? Why is government action or intervention necessary?

An AV refers to a road-based vehicle that is capable of “driving itself”. AVs offer considerable benefits on Britain’s existing road network. Current legislation does not provide a suitable framework to assure their safety or to determine liabilities in their use. There is fundamental uncertainty over who is responsible for their safe operation. The uncertainty poses a barrier to their deployment. Government intervention is required to enact primary legislation and facilitate institutional arrangements to support the regulatory framework.

What are the policy objectives of the action or intervention and the intended effects?

- To ensure the safe use and responsible deployment of AVs and minimise their risk to the public;
- to provide a clear allocation of responsibility and liability for parties developing and using AVs;
- to enable the benefits from driving automation, through expected improvements in road safety, mobility and productivity;
- to remove regulatory barriers to the commercial deployment of AVs; and
- to provide clear laws governing AV use, supporting the uptake of the technology by the public and investment in the UK AV sector.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Option 0 – Do nothing.
 Option 1 – Create a comprehensive regulatory framework for AVs to clearly define the legal responsibilities of all key market participants and users and establish a clear process for vehicle approvals and monitoring. Also, remove regulatory barriers/uncertainty hindering commercial deployment.

Option 1 is preferred because it reduces uncertainty and provides legal clarity. Legal clarity, in turn, enables development, potentially at a faster pace, and there is the prospect for improved safety, increased mobility and reduced social exclusion.

Will the policy be reviewed? It will/will not be reviewed. If applicable, set review date: Month/Year					
Does implementation go beyond minimum EU requirements?			Yes / No / N/A		
Is this measure likely to impact on international trade and investment?			Yes / No		
Are any of these organisations in scope?		Micro Yes/No	Small Yes/No	Medium Yes/No	Large Yes/No
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded:		Non-traded:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible **SELECT SIGNATORY**: _____ Date: _____

Summary: Analysis & Evidence

Policy Option 1

Description: Comprehensive regulatory framework for AV

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2020	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	High: Optional	Best Estimate:

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional	Optional	Optional
High	Optional	Optional	Optional
Best Estimate	N/A	N/A	N/A

Description and scale of key monetised costs by 'main affected groups'

Other key non-monetised costs by 'main affected groups'

Transition costs: ASDEs' cost of regulatory compliance, IT capital investment, new systems/procedures; forum administrative arrangements (Car Manufacturers); Activities to communicate roles and responsibilities in AVs to drivers and non-drivers (Department for Transport); establishing new safety assurance regulatory schemes – potentially part of an existing organisation; new systems/procedures (insurers); initial confidence building period (members of the public).

On-going costs: operating cost of new safety assurance schemes; data collection liaison between insurers and industry; ongoing financial commitment by car manufacturers post AV sale to customer; new criminal court offences; reduced fixed penalty revenue from traffic violations (local government).

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional	Optional	Optional
High	Optional	Optional	Optional
Best Estimate	N/A	N/A	N/A

Description and scale of key monetised benefits by 'main affected groups'

Other key non-monetised benefits by 'main affected groups'

Transition benefits: none identified.

On-going benefits: improved safety as human error accounts for 90% of road traffic crashes; potentially reduced congestion and fall in greenhouse carbon emissions; less driver stress when user-in-charge; increased productivity potential through ability to perform other tasks; potential investment in GB automotive and technological industries and development with high quality job creation; potential trade gains through enhanced ability to attract international investment; enhanced mobility prospects for low income users and people with disabilities; reduced requirements for policing of traffic violations and crash scene investigations. (general public)

Key assumptions/sensitivities/risks	Discount rate	3.5
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Assumptions: AV industry is and will remain an attractive prospect for investors; flexible regulatory framework will respond to evolving innovation; data will be forthcoming to inform regulation response; appropriate regulatory framework is implemented ahead of the competing economies.

Risk: businesses are not incentivised to invest in AV; regulatory framework does not deliver on-going benefits; transition costs are greater than anticipated.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs:	Benefits:	Net:	

Evidence Base

1. Introduction

Background

- 1.1 The Law Commission of England and Wales and the Scottish Law Commission were asked by the Centre for Connected and Autonomous Vehicles (CCAV) to review Great Britain's regulatory framework to enable the safe and effective deployment of automated vehicles (AVs) on Britain's roads. This is the first time that the Law Commissions have been asked to recommend how the law should be adapted to circumstances that (in the main) do not yet exist, but are in prospect. This requires the Commissions to anticipate what might happen.
- 1.2 This review is part of a package of reforms to support the deployment of AVs in Great Britain. It builds on CCAV's programme of work, which includes a Code of Practice for testing and the insurance reforms contained in the Automated and Electric Vehicles Act 2018 (AEV Act). CCAV funds and supports many AVs projects through Innovate UK.
- 1.3 This impact assessment has been produced alongside a Strategic Economic Analysis commissioned by CCAV which provides further discussion on the economic rationale behind the Law Commission's proposals and the potential economic issues.¹ It draws upon three and a half years of consultation which have led to our final report. During the course of the project we have received thousands of pages of responses to our consultation questions for which we are grateful. These responses and our analysis of the responses are available on our project page along with the consultation papers and our final report.²

AVs and terms of reference

- 1.4 Driving automation refers to a broad range of vehicle technologies and uses. Examples range from widely used driver assistance technologies (such as cruise control or lane changing features which assist the driver with the dynamic driving task), to highly automated vehicles that drive themselves with no human intervention.
- 1.5 The Commissions' terms of reference describe an AV as a road-based vehicle. It must be capable of "driving itself" rather than merely assisting a human driver. In other words, it can operate in an automated mode, in which it is not being controlled and does not need to be monitored by an individual, for at least part of a journey. The review is also focussed on passenger transport as opposed to goods deliveries and does not extend to airborne craft or vehicles that might travel on pavements, footways and footpaths.
- 1.6 The terms of reference are to consider where there may be gaps or uncertainty in the law, and what reforms may be necessary to ensure that the regulatory framework is fit for purpose. That is to say, a regulatory framework that allows the safe and effective

¹ Centre for Connected and Autonomous Vehicles, *Automated Vehicles (AV) Strategic Economic Analysis* (June 2021), <https://www.lawcom.gov.uk/project/automated-vehicles/> and <https://www.scotlawcom.gov.uk/law-reform/law-reform-projects/joint-projects/automated-vehicles/>.

² <https://www.lawcom.gov.uk/project/automated-vehicles/> and <https://www.scotlawcom.gov.uk/law-reform/law-reform-projects/joint-projects/automated-vehicles/>

deployment of automated vehicles on Britain's roads. This includes but is not limited to the following issues:

- (1) who is the "driver" or responsible person, as appropriate;
- (2) how to allocate civil and criminal responsibility where control is shared between the automated driving system and a human user;
- (3) the role of AVs within public transport networks and emerging platforms for on-demand passenger transport, car sharing and new business models providing mobility as a service;
- (4) whether there is a need for new criminal offences to deal with possible interference with AVs and other novel types of behaviour; and
- (5) the impact on other road users and how they can be protected from risk.

2. Problems under consideration

Safety assurance

- 2.1 At present, road vehicles are subject to a complex system of regulatory approval before they are placed on the market. New vehicles for a mass market are subject to a system of type approval of their systems and components, which relies largely on technical regulations set by the United Nations Economic Commission for Europe (UNECE), a United Nations agency. Once vehicles have been certified as conforming to these standards, they may then be registered with the Driver and Vehicle Licensing Agency (DVLA). However, UNECE standards do not cover driving behaviour or drivers' liabilities.
- 2.2 The current legal framework for vehicle approval is inadequate to assure the safe operation of AVs, which relies not only on satisfactory design and manufacture of the vehicle and its components but also on the driving behaviour of its automated driving system (ADS). Few technical regulations exist for such systems and AVs will need to undergo a more robust certification process before being approved for use on public roads. Unlike conventional vehicles, the driver will no longer take care of the driving task once the vehicle is approved and being used. This means that, as part of the approval process, regulators will need to ensure that AVs can safely drive themselves on public roads and interact appropriately with other vehicles and road users.
- 2.3 The current framework for approval will need to be significantly adapted for the increased level of testing required. A new legal framework, specific to AVs, is also likely to be required to determine how an approved vehicle may be used safely as self-driving. Any such changes would however still need to account for, and sit beside, international systems of vehicle regulation and road safety in which the UK is a partner.
- 2.4 The safety assurance of AVs once they are deployed on roads also raises crucial problems which do not exist for conventional vehicles. AVs are expected to require "in-service" updates and systems checks to ensure they continue to drive themselves safely and in accordance with road rules over the entirety of their lifecycle. Road infrastructure changes and changes to traffic laws are a fact of life and AVs' automated driving systems will need to be updated to account for such changes. Specific regulatory mechanisms for monitoring the driving behaviour of a vehicle and its adherence to road traffic laws will be needed to assure safety on an ongoing basis.

Criminal liability

2.5 Currently the human driver is responsible for the driving task when a vehicle is being used. Legal frameworks for criminal liability in relation to driving are predicated on this assumption. Who is “responsible” when an AV is driving itself is a key and undetermined question. There are differing views as to the extent to which criminal responsibility for the driving behaviours of an automated driving system should be reallocated to its manufacturer or software developer while it is engaged. This question will need to be answered so that legal certainty can be achieved. Leaving any uncertainty in this regard could result causing incidents and fatalities occurring with no clear responsibility. This in turn would lead to a loss of public confidence in AVs as a whole. Unfair attribution of liability to drivers has also been cited as a concern in relation to this.

Civil liability

2.6 How injured parties would be compensated in the event of an incident caused by an AV is a key question. The AEV Act introduced reforms to smooth the path to compensation for those injured by self-driving vehicles. Broadly speaking, the AEV Act requires the insurer to pay a victim for any damage caused by a vehicle when driving itself. The insurer may then bring a secondary claim against anyone else responsible for the incident.

2.7 The Law Commissions’ provisional view is that the AEV Act provides the necessary statutory basis for compensating victims where AVs cause damage. However, we have examined whether further guidance or clarification is required on some aspects of the Act. To this end we focus on the meaning of causation; the operation of the contributory negligence provisions; and the need to retain data. It is also important to ensure that victims would be compensated for incidents involving uninsured vehicles which are self-driving, a problem which also needs to be examined.

3. Policy objectives

3.1 The Law Commissions’ proposals seek to achieve the following policy objectives:

- To ensure the safe use and responsible deployment of AVs and minimise their risk to the public. This will be achieved by reviewing the current legal framework for vehicle approval processes and identifying where it needs to be adapted or where new approval processes are required to ensure safety.
- To provide a clear allocation of criminal legal responsibility and liability for parties developing and using AVs. This would be achieved by setting out the legal responsibilities of different legal actors involved in the use and development of AVs in statute and secondary legislation.
- To enable the benefits of automated driving to be obtained through improvements in road safety, access to transport, and productivity and to encourage AV use by British drivers. This would be by creating a legal framework which enables AVs to be safely and responsibly deployed and made available to the public.

- To remove regulatory barriers to the commercial deployment of AVs. This would be achieved by providing a clear legal framework governing the deployment of AVs.
- To provide clear laws governing AV use, supporting the uptake of the technology by the public and investment in the UK AV sector.

4. Rationale for intervention

- 4.1 The conventional economic approach to government intervention in order to resolve a problem is based on efficiency or equity arguments. The Government may consider intervening if there are strong enough failures in the way markets operate or in existing interventions. In both cases the proposed intervention should avoid creating a further set of disproportionate costs and distortions. The Government may also intervene for reasons of equity.
- 4.2 AVs are a new entrant to the existing vehicle market, providing the additional option of self-driving vehicles on public roads. Technological advances often outpace established rules and guidance intended to inform users of their responsibilities. The advent of AVs opens up a legislative gap marked by the absence of a regulatory framework providing clear guidance on the role and responsibilities of market participants such as car manufacturers, insurance companies and drivers.
- 4.3 At present, stakeholders confront uncertainty about their legal liability. This risks serious injuries and, at worst, fatalities, because failing to identify clear responsibilities risks delay in the development of AVs. The reduced take up of AVs directly impacts on safety³ since most crashes are caused by human error. Dependent on users' appetite for risk, incomplete information impacts both the demand for AVs (fall) and the supply of AVs by would-be manufacturers (fall). The AV market is therefore constrained.
- 4.4 There are potentially economy-wide growth implications as clear guidance would enable a British AV industry to be established with the spill-over effect of attracting complimentary activities. The scope for first mover advantage is amplified because business clusters are attracted to the UK, as demonstrated by the Cambridge-Norwich Technology Corridor and Transport Scotland Project CAVForth.
- 4.5 Introducing regulation provides no guarantee of how markets will develop. A level of uncertainty may remain. The legislation needs to be put forward in a way that does not restrict market development. There may be aspects where competition is appropriate, allowing the market to decide. The Government is required to define and develop institutional arrangements that provide incentives and pressures that are in the public interest. This means that other interventions may be needed to deliver the potential benefits of AVs.

5. Scale and scope

³ According to evidence from the Centre for Connected and Autonomous Vehicles (CCAV) in 2019, 85% of road collisions that resulted in personal injury involved human error and only 2 percent were due to vehicle defect. See CCAV, *Statistics Evidence Pack Version 1* (2019), p 2.

Background

Motor car numbers, crashes and insurance

- 5.1 The Driver and Vehicle Licensing Agency (DVLA), is responsible for maintaining databases with registration details of all drivers in Great Britain and of vehicles registered in the UK. As of 2020, the UK had about 32.7 million cars licensed for use on the roads most of which (86%) were privately registered.⁴ According to the Office for National Statistics, about 78% of all households own a car or a van. The greatest proportion of property owners are also car owners (89%), followed by those in private rentals (65%), with those in social rentals least likely to have access to a car (46%).
- 5.2 The number of fatalities from car crashes recorded in any one year continues to fall. Over the most recent 10-year period ending 2019, annual fatalities fell from 1,059 to 736 persons. A change in reporting means that comparisons in serious injuries over a similar 10-year period is not possible, but indications are of modest reduction from a peak of 12,299 (2016) to 11,887 (2019).
- 5.3 As to be expected lockdown months have impacted on the number of fatalities / road accidents for 2020. Road fatalities reduced by 17 percent and injured casualties by 25 percent throughout most of the year⁵. Because of the unusual circumstances of COVID-19 restrictions comparative analysis has maintained the similar points of comparison as that presented in the consultation paper.
- 5.4 According to the Association of British Insurers (ABI), in 2019 the industry processed claims worth about £30 million per day (the average claim being £3,414), most of which were made by private citizens (73%) rather than corporate parties.

Current regulatory landscape

Criminal liability

- 5.5 The regulation of road traffic relies heavily on criminal offences, with most offences aimed at the human driver of a motor vehicle. Drivers have many responsibilities. They are not only responsible for controlling the speed and direction of the vehicle, but also have responsibilities for their own condition (they must be qualified and fit to drive); for insurance; for the roadworthiness of the vehicle; for reporting incidents; and even for the conduct of passengers (such as ensuring that children wear seatbelts).
- 5.6 Failure to adhere to these requirements may result in drivers being issued with fixed civil penalties or penalty notices, or criminal prosecution, amongst other sanctions. In England and Wales, in 2019, about 85% of the recorded motoring offences⁶ were speed limit offences, continuing a trend of year-on-year increases which has been ongoing since 2011. Most driving offences resulted in non-court action of either driver retraining (47%) or a fine

⁴ Includes all cars: privately registered, company registered and those between keepers. See <https://www.gov.uk/government/statistical-data-sets/veh02-licensed-cars>.

⁵ <https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-annual-report-2020/the-impact-of-lockdown-on-reported-road-casualties-great-britain-final-results-2020>. Last visited 29th November 2021

⁶ See Home Office, *Police Powers and Procedures in England and Wales (2020)*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/935355/police-powers-procedures-mar20-hosb3120.pdf, p 42.

(38%), with 14% involving court action.⁷ In Scotland in 2018-19 there were over 27,000 convictions for motor vehicle offences resulting in fines (89%), community payback (4%), a prison sentence (1.5%) and admonition (4%).

Civil liability

5.7 AEV Act introduced reforms to smooth the path to compensation for those injured by self-driving vehicles. Broadly speaking, the AEV Act requires the insurer to pay a victim for any damage caused by a vehicle when driving itself. The insurer may then bring a secondary claim against anyone else responsible for the incident.

International context

5.8 Vehicle design and driving are subject to systems of international regulation. The key organisation is the UNECE. The UNECE was originally established in 1947 as a subsidiary body of the United Nations Economic and Social Council. Its goal was to promote pan-European economic integration. To this end, in 1958 it sponsored an agreement to harmonise vehicle standards, which now extends far beyond Europe and includes (for example) Japan, South Korea and Australia.

5.9 The UNECE currently administers two important international agreements in relation to vehicle approvals and driving.

- (1) The “revised 1958 Agreement” concerns vehicle standards. It aims to reduce technical barriers to international trade in vehicles and vehicle parts. It has 52 contracting parties and we describe it in detail in Chapter 4 of Consultation Paper 1.
- (2) The Vienna Convention on Road Traffic 1968 (the Vienna Convention) aims to promote road safety and “facilitate international road traffic”.

The UK is a party to both of these agreements.

5.10 The UNECE has permanent working parties to oversee the operation of these agreements. The responsibilities of the Global Forum on Road Traffic Safety (Working Party 1) include the administration of the Vienna Convention. Meanwhile, the World Forum for Harmonisation of Vehicle Regulations (Working Party 29) is a group of experts that focusses on vehicle standards. Both working parties are extremely active in regulating the introduction of driving automation.

The role of appropriate regulation

5.11 AVs are a new technological development potentially allowing “driverless” travel on Britain’s existing road network. The assumption is that AVs will use the existing public road network, sharing it with conventional vehicles for the foreseeable future. There is currently no regulatory framework providing guidance to users and manufacturers of AVs on their roles and responsibilities. Without a clear legal framework in place, there is a fundamental

⁷ See Home Office, *Police Powers and Procedures in England and Wales (2020)*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/935355/police-powers-procedures-mar20-hosb3120.pdf, p 43.

uncertainty over who is responsible for the safe operation of the AV under a given set of circumstances. Table 1 below sets out the value of appropriate regulation:

Table 1: Value of appropriate regulation

<p>Potential (high level) risks of not having AV regulation: “doing nothing”</p>	<p>Potential benefits of appropriate AV regulation:</p>	<p>Potential risks (from government failure) if regulation is ill-designed:</p>
<p>On-going uncertainty over issues of legal liability:</p> <p>Which delays development of a market for AV and thus potentially prevents or hinders economic benefits of AV to GB from being realised.</p>	<p>Removes uncertainty over legal liability:</p> <p>Which enables benefits of AV to be unlocked or brought forward (or realised to a greater extent): (e.g.)</p> <p>Improved safety</p> <p>Reduced congestion</p> <p>Lower stress for vehicle occupants</p> <p>Productivity improvements - ability to work while in AV</p> <p>Greater mobility and opportunities for vulnerable users</p> <p>Wider Potential impacts e.g. land use changes (such as reuse land from car parking facilities)</p> <p>Wider economic impacts to GB economy from</p>	<p>If regulation is poorly conceived or designed:</p> <p>Ineffective in addressing market failures</p> <p>Overly costly on business</p> <p>Constraint on innovation</p> <p>Risk of “path dependency” – locking into “wrong” solution.</p> <p>There is a risk of either under (ineffective), or over (“gold plated”) regulation.</p> <p>Ineffective regulation risks imposing additional costs but without achieving its intended objectives.</p> <p>Over regulation risks imposing additional cost burdens, in excess of what is needed to address the identified market failure.</p>

	<p>investing in AV technology</p> <p>Potential gains from “first mover” advantage</p> <p>Potential trade and competitiveness impacts</p>	
Example of specific risk (drawing on data collection proposals):		
<p>Failure to collect information about how AVs are performing in the real-world environment.</p> <p>Data that is collected is in different formats making interoperability difficult.</p>	<p>Minimum requirements regarding data mean that data sets are more interoperable and usable.</p> <p>Which addresses:</p> <ol style="list-style-type: none"> 1. Difficulties benchmarking and comparing AV performance between different providers. 2. Difficulties taking appropriate action in response to near misses and incidents. 	<p>Standards are imposed that are onerous or quickly obsolete or not relevant to different technologies at the risk of stifling innovation.</p>
<p>Ensuring key consumer interests are met by recommending user-centric standards</p>	<p>Addresses potential loss of consumer confidence at early stages of deployment, which could</p>	<p>Stifling innovation by making erroneous assumptions about user needs.</p>

	compromise long-term prospects of the technology	
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This table is from the Automated Vehicles (AV) Strategic Economic Analysis Prepared for the Centre for Connected and Autonomous Vehicles (CCAV) and the Law Commission of England and Wales and the Scottish Law Commission⁸

5.12 Appropriate regulation would provide the basis on which the AV industry is estimated to develop and grow. The following sub-sections expand on the likely socio-economic benefits resulting from a regulatory framework informing the AV market ahead of thinking through the likely UK impact. The degree to which a market grows provides some indication of scope for impact in the identified areas in Table 1. Significant divergence in estimates reflects the high degree of uncertainty, different assumptions and AV features.

Value of the AV market

5.13 In the absence of an existing AV market, estimates of its value are essentially forecasts and speculative - based on assumptions of enabling conditions such as government investments in infrastructure. The estimates cover a broad range, dependent on perceptions of progress.

- In 2020, researchers at Connected Places Catapult (CPC) produced a report on the benefits of AVs. They estimated that the UK connected and autonomous vehicle (CAV) market (including that for CAV associated technologies) could be worth £41.7 billion by 2035 and would add approximately £9 billion in direct contributions to Gross Value Added (GVA) of the UK economy by that date.⁹
- The same report indicated that the global market size might be reasonably estimated as £650 billion. This comprises of £550 billion in vehicle sales and £100 billion for associated technologies. It gave higher and lower bounds for this figure being as high as £1.7 trillion and as low as £234 billion. The report also estimated that jobs in the manufacture and assembly of CAVs would reach 49,000 people in that year, with a further 14,600 indirect jobs created in the supply chain.
- In 2019 the Society of Motor Manufacturers and Traders (SMMT) commissioned Frost & Sullivan to produce its own report on the potential benefits of CAVs to the UK. This 2019 report forecast a total of £62 billion in annual net economic benefits for the UK from CAV deployment.¹⁰ It cited enhanced consumer productivity, improved travel efficiency and reduced mobility-related expenses as the primary

⁸ Centre for Connected and Autonomous Vehicles, *Automated Vehicles (AV) Strategic Economic Analysis* (June 2021), <https://www.lawcom.gov.uk/project/automated-vehicles/> and <https://www.scotlawcom.gov.uk/law-reform/law-reform-projects/joint-projects/automated-vehicles/>.

⁹ Element Energy, Cambridge Econometrics and Connected Places Catapult, *Market Forecast For Connected and Autonomous Vehicles* (2020), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/919260/connected-places-catapult-market-forecast-for-connected-and-autonomous-vehicles.pdf

¹⁰ Society of Motor Manufacturers and Traders, *Connected and Autonomous Vehicles – Winning the Global Race to Market* (2019), <https://www.smmt.co.uk/2019/04/uk-in-pole-position-in-62-billion-self-driving-car-race-if-brexit-roadblock-removed/>. Note this figure assumes £10 billion of government investment in infrastructure and road maintenance.

contributors to this figure. For example, it estimated that CAV deployment would save each driving commuter nearly 42 hours annually.

- Wider impacts of connectivity and automation may also benefit the UK economy. The report also forecast that new revenue streams accruing mainly to adjacent sectors would emerge from the automotive value chain and this would contribute £18 billion.¹¹ Finally, the report produced an extended outlook, predicting that if the right reforms were implemented, the industry could be worth as much as £145 billion by 2040.

AV safety related benefits

5.14 In 2015, the UK Government drew attention to the safety benefits of AV technologies, stressing their “potential to improve road safety and reduce casualties”.¹²

- Human error is generally cited as the major cause of road traffic incidents. Figures vary, but generally speaking it is thought that around 90% of incidents may be caused by some form of human error. It is thought that once AVs are deployed on a large scale, they will greatly reduce the potential for human error on our roads, thus preventing collisions.¹³
- In 2018 McKinsey & Company produced a report which detailed some of the potential safety benefits of AVs. Although acknowledging that there were significant obstacles to overcome before widespread deployment, the report estimated that up to 25% of road traffic fatalities could be eliminated within just seven years of deployment.¹⁴
- Even modest gains in safety have been predicted to have significant results. In 2017, in the US context, the RAND Corporation released a study which modelled the effects of allowing highly automated vehicles for consumer use when safety performance is just 10% better than that of the average human driver, compared with policies under which safety performance had to be 75% or 90% better. They found that over 15 years, many more lives were saved by introducing highly automated vehicles early (when they were just 10% better).¹⁵

¹¹ From the overall gross benefit of £72 billion per annum.

¹² Department for Transport, *The Pathway to Driverless Cars: a Code of Practice for Testing* (July 2015), para 1.1.

¹³ McKinsey & Company, *Ready for Inspection – The Automotive Aftermarket in 2030* (June 2018), <https://www.mckinsey.com/~media/mckinsey/industries/automotive%20and%20assembly/our%20insights/ready%20for%20inspection%20the%20automotive%20aftermarket%20in%202030/ready-for-inspection-the-automotive-aftermarket-in-2030-vf.pdf>.

¹⁴ McKinsey Global Institute, *Smart Cities: Digital Solutions for a More Livable Future* (June 2018), <https://www.mckinsey.com/~media/mckinsey/business%20functions/operations/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.pdf>.

¹⁵ N Kalra and D Groves, *The Enemy of Good: Estimating the Cost of Waiting for Nearly Perfect Automated Vehicles* (2017), https://www.rand.org/content/dam/rand/pubs/research_reports/RR2100/RR2150/RAND_RR2150.pdf, page ix.

Social benefits

5.15 Many potential social benefits are predicted to occur once the widespread uptake of AVs has occurred. Many of these social benefits are interrelated with the potential safety and economic impacts. Having a regulatory framework in place for AVs will help ensure that these benefits manifest themselves and provide for equal access of these benefits throughout society.

- One of the major but non-measurable societal benefits will come from the reduction of individuals who die each year in fatal traffic incidents. Although the number of fatal traffic incidents can be measured, the wider damage that this causes to families, local communities, and work-place communities cannot be so easily measured. The benefits of reducing traffic fatalities are great, but hard to quantify in societal terms. The Department for Transport estimated the total cost of road traffic incidents in 2019 at about £33.5 billion.
- If appropriately regulated, AVs could improve accessibility to transport for those who are unable to drive because of disability or age. A substantial portion of the UK population are disabled, including those with hidden disabilities. The UK also has an aging population, and with advancements in medical care and medical technology there will be more people living significantly longer in the decades to come. Increased access to safe, reliable and on-demand transport for these groups could also translate into increased access to education, employment, social activities, and recreation.¹⁶
- Productivity may also be impacted as AV automation is further developed. Travel time which is currently used only to perform the driving task and monitor the car and surroundings in traffic will be able to be utilised in more productive ways. With the AV performing the driving task and monitoring the vehicle, this time could instead be spent more productively on either work or recreation. In addition to this, AVs may also be able to reduce commute time for those working, with the potential to increase access to employment for all by allowing people to work within a wider area.¹⁷
- Access to transport services may also increase for those living outside of the city centre or in areas previously less well served by transport services. AVs are able to provide last mile services at a much lower cost. AVs will also be able to provide a safer transport option for those living in areas with higher crime levels. As transport services increase, there may be an increase in those choosing to live outside of the city centre and in less built up, less polluted areas.¹⁸

¹⁶ American Planning Association, *Preparing communities for autonomous vehicles* (2018), <https://planning-org-uploaded-media.s3.amazonaws.com/document/Autonomous-Vehicles-Symposium-Report.pdf>; See also RAND, *Autonomous Vehicle Technology A Guide for Policymakers* (2016), <https://planning-org-uploaded-media.s3.amazonaws.com/document/Autonomous-Vehicles-Symposium-Report.pdf>.

¹⁷ McKinsey Global Institute, *Smart Cities: Digital Solutions for a More Livable Future* (June 2018) <https://www.mckinsey.com/~media/mckinsey/business%20functions/operations/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.pdf>.

¹⁸ McKinsey Global Institute, *Smart Cities: Digital Solutions for a More Livable Future* (June 2018) <https://www.mckinsey.com/~media/mckinsey/business%20functions/operations/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.pdf>.

6. Description of options considered

6.1 This Impact Assessment compares one option against the do nothing option (option 0):

- Option 0 – do nothing.
- Option 1 – a comprehensive regulatory framework which clearly establishes liability and processes for authorisation and ongoing safety assurance (**preferred option**).

Option 0 – do nothing:

6.2 The “base” option is to do nothing in the way of regulatory intervention and attempt to continue to use current regulatory frameworks for criminal and civil liability to deal with the approval and the use of AVs.

6.3 It is not straightforward to work out the precise implications of “doing nothing”. The development of AV technology and the market for it is evolving. Regulation itself also changes and is updated in the ordinary course of events. In time, many of the international regulatory frameworks which are currently used to approve vehicles will be adapted and changed to account for new automated technologies.

6.4 However, there are two likely issues with this approach:

- (1) on-going uncertainty over issues of legal liability; and
- (2) delayed development of a market for AVs.

6.5 Firstly, even if current approval frameworks are adapted and create new technical regulations and safety specifications for AVs, this does not solve the issue of legal liability. Users of these vehicles and their manufacturers would still be unclear as to their legal positions and who is criminally liable in the event of an incident or a collision. Users may claim that they should not be guilty for the behaviour of a vehicle “driving itself” (which may also result in the unsafe use of vehicles). Manufacturers having gained approval for their vehicles under technical regulations may feel that the users of such vehicles should bear at least some liability for their use.

6.6 Secondly, in the absence of clear legal responsibilities the development of the AV market is likely to be slowed. Manufacturers and developers are less likely to invest in researching and deploying such vehicles if potential purchasers and users of such vehicles are deterred from using them because of their potential criminal liability. Similarly, those wishing to purchase and use AVs may be less likely to do so if they are unclear as to their legal liability in the event of a “self-driving” car causing or being involved in a collision or incident on the road.

6.7 Both of these issues would thus potentially prevent or hinder AVs’ economic, social and safety benefits to the UK from being realised.

6.8 A third and more hypothetical issue with Option 0 which stakeholders have raised with the Law Commissions is that, without appropriate regulation to set out a specific approval process for AVs, there may be some technologies and use-cases developed which would effectively fall through a “regulatory gap”. One of the examples of this might be where conventional vehicles are bought and adapted by developers and adapted to be able to

drive themselves with no-one behind the wheel at all and with little or no regulatory oversight. This could result in unsafe AVs being developed and driven on British roads.

Option 1 – a comprehensive regulatory framework (preferred option):

- 6.9 Option 1 is to intervene and create a comprehensive regulatory framework for AVs. The aim of this regulatory framework would be to define the legal responsibilities of various actors involved in the manufacturing, development and use of AVs. This would reduce uncertainty and enable development, or faster development, of the AV market.
- 6.10 This regulatory framework would have a clear process for vehicle approvals and monitoring. The framework would set safety standards for AVs to ensure that the safety benefits of AVs are realised. As a knock-on effect, it would also promote public confidence in the technology while giving manufacturers a clear path to obtaining approval for the marketing of a vehicle and its deployment on public roads. This would also provide manufacturers and developers with more certainty in estimating returns on investment.
- 6.11 The regulatory framework would also have processes in place to assure the safety of the AV, including the software in its automated system, on an ongoing basis after its deployment. This will allow the AV to continue to operate safely, and any enhancement of safety could be brought about through updating of software, for example.

Legal responsibilities

- 6.12 The Commissions propose a comprehensive regulatory framework which also provides flexibility to account for different use cases. It allocates responsibility for an AV to three key actors, illustrated in the figure on the next page and further explained below:

ASDE

Needed for all on-road AVs. Puts the AV forward for authorisation as having self-driving features and is legally responsible for the performance of the AV. Responsible for the safety case. Must be of good repute, and have appropriate financial standing in the UK.

User-In-Charge

A User-In-Charge ('UIC') is a human in the vehicle with access to the controls. The UIC must:

- (1) Be qualified and fit to drive
- (2) Be receptive to a transition demand
- (3) Be responsible for the condition of the vehicle
- (4) Report accidents

Examples of use cases where a UIC may be required:

Sub-trip features such as motorway chauffeur or traffic jam assist where an element of conventional driving is needed to complete a journey.

NUIC operator

To obtain NUIC operator licence, the operator must:

- (1) Be of good repute
- (2) Have appropriate financial standing
- (3) Have centre of operations in GB
- (4) Be professionally competent to run the service
- (5) Submit a safety case

Licence conditions of NUIC operator may include:

- (1) Carrying insurance
- (2) Maintain the vehicle
- (3) Check the load is secure
- (4) Report accidents and near misses
- (5) Not impede traffic flow
- (6) Check the route and pay any tolls or charges

There may be additional licence conditions for certain use cases – e.g. for passenger services and freight

Overview of the key legal actors.

- (1) The Automated Self-Driving Entity (or ASDE) is the vehicle manufacturer or developer who puts an AV forward for authorisation as having self-driving features. They must register with the authorisation authority and are subject to the in-use regulatory scheme.

The Commissions' proposals retain some flexibility about who the ASDE is. The ASDE may be a vehicle manufacturer, or software developer, or a partnership between the two. They will be required to put forward a safety case as part of an application for a vehicle to be authorised as having self-driving features and show that they were closely involved in assessing the safety of the vehicle. They must show that they are of good repute and have appropriate financial standing.

- (2) The user-in-charge (or UIC) is an individual who is in the vehicle and in a position to operate the driving controls while an ADS feature is engaged. Under our proposals, every AV will need a user-in-charge unless it is equipped with an ADS feature authorised for use without one and then overseen by a licensed NUIC operator.

A UIC must be qualified and fit to drive, as they may be called on to take over driving following a request by the ADS to intervene and take over. They are not responsible for the dynamic driving task, but they do retain other driver responsibilities.

- (3) A licenced NUIC operator is responsible for the oversight of AVs authorised for use with no user-in-charge. A NUIC operator is likely to be an organisation rather than an individual.

6.13 All licensed NUIC operators will be subject to basic Tier 1 duties relating to remote assistance, fleet operations, maintenance, insurance, safety critical updates and cybersecurity.

Initial approvals and authorisation

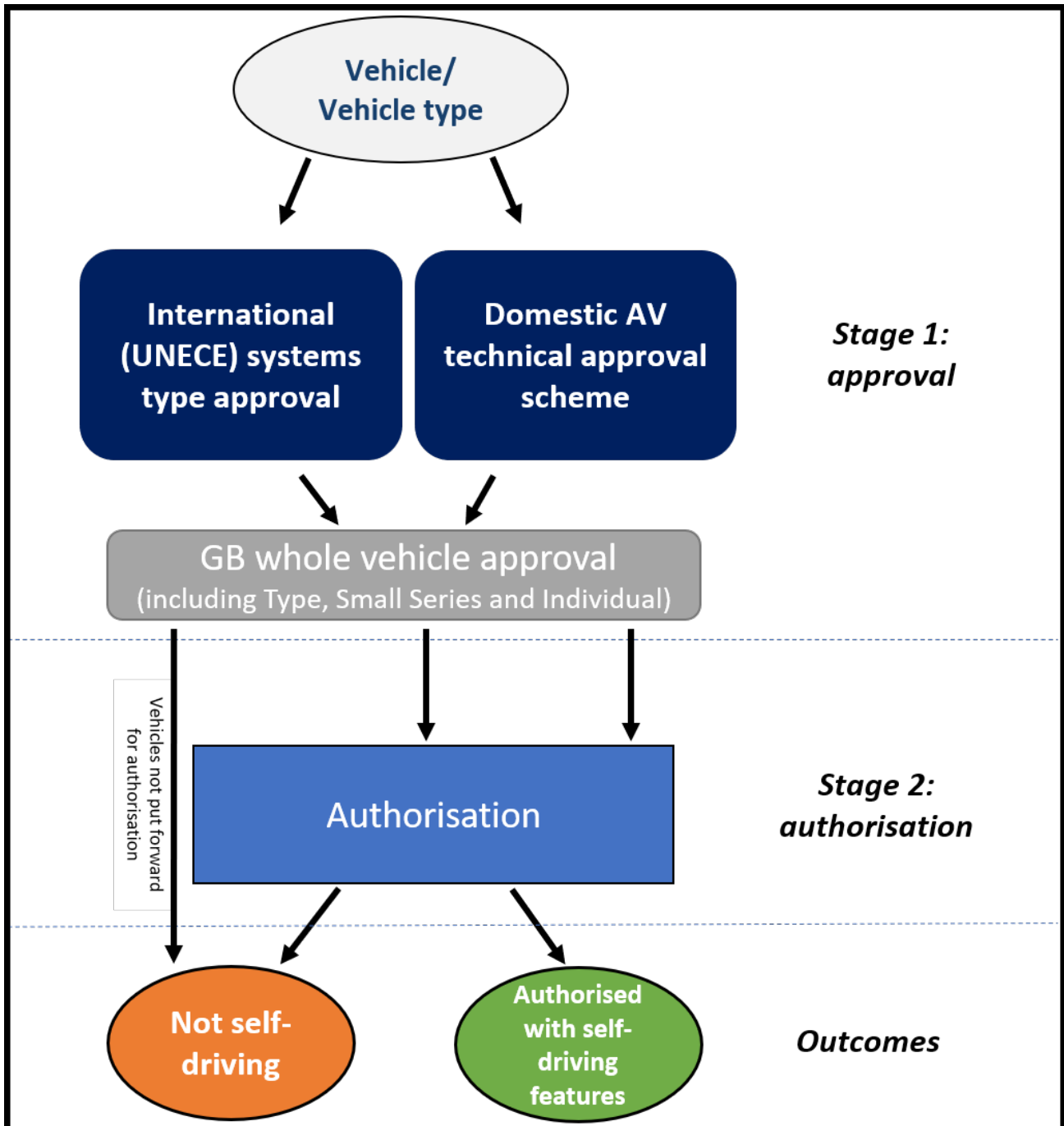
6.14 The Commissions recommend a two-step process for the technical approval of an AV and its authorisation as having self-driving features. As the first step ASDEs could either:

- (1) apply for type approval at international (UNECE) level; or
- (2) apply for approval for systems or vehicles through a domestic technical approval scheme.

Both routes should then allow a vehicle to obtain GB whole vehicle approval which would enable the vehicle to be registered for use on roads in Great Britain.

6.15 However, approval would not, of itself, decide whether a vehicle can be lawfully used without monitoring by an individual. This requires a second, separate stage in the process: authorisation.

6.16 This two-stage process is set out in the figure on the following page.



The two-stage approval process

Stage 1: a choice of international or national approval

6.17 It is likely that most manufacturers selling mass produced vehicles across borders will continue to seek type approval internationally to an international standard which would be recognised in Great Britain. However, where AVs are deployed in limited local contexts, a domestic technical approval scheme could allow Great Britain to pioneer new forms of automated passenger and freight services without waiting for agreement between all the UNECE contracting states.

Stage 2: authorising a vehicle as having self-driving features

6.18 Once a vehicle has received GB whole vehicle approval, the next stage will be to assess the vehicle’s ADS features. The authorisation authority must ask whether each specified

ADS feature can control the vehicle so as to drive safely and legally, even if an individual is not monitoring the driving environment, the vehicle or the way that it drives.

6.19 The outcome of the assessment would place the vehicle into one of two categories:

- (1) the vehicle fails to gain authorisation and is not authorised for self-driving;
- (2) the vehicle is authorised as having self-driving features and the authorisation authority will specify each ADS feature, stating whether that feature can safely be used either with or without a UIC.

Authorising the whole vehicle and its surrounding processes

6.20 The authorisation decision will be wider and more holistic than the approval stage. For example it will consider:

- (1) whether, when the ADS feature is engaged, the vehicle can safely and legally drive itself if an individual is not monitoring the driving environment, the vehicle or the way it drives.
- (2) can the vehicle or vehicle type record location data for detected collisions and ADS activation/deactivation.
- (3) whether the vehicle is supported by a suitable ASDE which has demonstrated its ability to comply with relevant laws (including those on data protection and the environment)
- (4) whether the ASDE can ensure the safety of the vehicle and its continued compliance with road rules, throughout its lifetime.

The authorisation decision will involve a range of questions. Can the vehicle comply with traffic laws? How will software and maps be updated? Are users' responsibilities clearly communicated? Do users understand their repair and maintenance obligations?

Assessing the ASDE

6.21 The ASDE is the manufacturer or developer who puts the vehicle forward for authorisation as having self-driving features. Given the ongoing responsibilities of the ASDE, before a vehicle can be approved as an AV, the authorisation authority will also need to assess the ASDE.

6.22 The ASDE must put its name to a safety case which accompanies the application for authorisation. It will need to show that it has been sufficiently involved in assessing safety that it can vouch for the information in it. If the information is false or misleading, the ASDE or its senior managers might be guilty of a serious criminal offence, which is also part of our proposals for a comprehensive regulatory system.

Ongoing safety assurance

6.23 On-going safety assurance is crucial. With changes to road rules and the driving environment, and updates to available software and technology, AVs will require continuous regulatory oversight throughout their lifetime. In our consultations we have highlighted five areas that will require ongoing consideration:

- (1) software updates;

- (2) cybersecurity;
- (3) updating maps;
- (4) communicating information to users; and
- (5) collecting data to compare automated and conventional driving.

6.24 We also considered how traffic infractions committed by AVs will be investigated by regulators and what sanctions might apply. It is essential that regulators have powers to take steps to resolve safety concerns and ensure AV continue to comply with the law.

6.25 We recommend that legislation creates an in-use safety regulator, with a new set of statutory powers and responsibilities. Its objective will be to ensure the continuing safety and legal compliance of self-driving vehicles while they are in-use by learning from mistakes and preventing their re-occurrence. To this end it will:

- (1) evaluate the safety of automated driving compared with conventional driving;
- (2) investigate road traffic infractions; and
- (3) ensure that ASDEs provide information to users, clearly and effectively.

6.26 These responsibilities will be supported by powers to apply regulatory sanctions, including informal and formal warnings, compliances orders, civil penalties and (in extreme cases) suspension or withdrawal of authorisation.

Data

6.27 Under the UNECE regulations, AVs will have a second system of data capture, known as a Data Storage System for Automated Driving (or DSSAD). Under recent UNECE Regulation 157 on Automated Lane Keeping Systems (the ALKS Regulation), the DSSAD must record each time an ALKS is activated or deactivated or issues a transition demand (together with a date and time stamp). It also records when the vehicle is involved in a detected collision, but no parameters have yet been set. There is a risk that the system may miss “soft” collisions, for example with motor cyclists.

6.28 The ALKS Regulation leaves issues of access to data, privacy and data protection to national laws. The system must be capable of including 2,500 time stamps, equivalent to around 6 months of use. However, contracting states can require that the data is stored for longer.

6.29 To ensure that a comprehensive regulatory framework can work effectively we have made the following recommendations related to access to data.

Location data

6.30 Our understanding is that it would be technically feasible to record GPS co-ordinates as well as a time stamp, but this requirement was omitted from the UN Regulation due to privacy concerns. We recommend that AVs in Great Britain should record location as well as time, which would help establish whether an ADS was engaged during an incident if the

location was known, but witnesses were uncertain about the exact time. We received strong support for this proposal and believe it would be compatible with data protection principles.

Duty to share data with insurers

6.31 We recommend that the new Act should set out a general duty requiring those controlling required AV data to disclose that data to insurers, where it is necessary to decide claims fairly and accurately. This will emphasise the need for manufacturers to share data with insurers and provide a simple legal basis for doing so. However, we recognise that legislation will not resolve all the issues about exactly what data should be shared in what time frame. For this reason, we also recommend that the in-use regulator should also have a power to issue a code of practice on AV data, to which all those disclosing data must have regard.

Storing AV data

6.32 We recommend that required AV data should be retained for the three-year standard limitation period, plus another three months, to enable insurers to find and preserve data relevant to a claim. We are of the view that storage must be long enough to cover the great majority of claims.

Safeguards

6.33 We recommend that ASDEs should present regulators with details of how data will be recorded, stored, accessed and protected. The regulator should only authorise a vehicle as having self-driving features if these systems comply with data protection law.

NUIC Passenger Services

6.34 We have also recommended a new procedure to issue “Interim Passenger Permits”. The current laws for passenger services are predicated on having a responsible person in the vehicle. Where AV passenger services are provided without a user-in-charge, the applicability of current law is uncertain. There is also much that is not known about how to provide safe and accessible passenger services in the absence of a human driver. In our assessment, more evidence is needed before a regulatory scheme specific to NUIC Passenger services could be put in place or existing legislation amended to accommodate such services.

6.35 The recommended Interim Passenger Permit procedure would allow initial trials of NUIC passenger services to be provided and evidence to be collected about the challenges and accessibility of such services. Issues could then be addressed before a decision is made to put new legislation in place or amend existing legislation. The granting of such a permit would be done by the Secretary of State with the consent of the local licensing and transport authorities and an AV accessibility panel. Consultation with relevant highway authorities and emergency services would also be required. Under these permits trials of NUIC passenger services may be subject to additional Tier 2 duties arising from the conditions of interim passenger permits granted by the Secretary of State, or the Scottish or Welsh Ministers. The figure on the next page sets out the requirements for an interim passenger permit.

Interim Passenger Permit

Criteria

- AV Accessibility Advisory Panel consent
- Local licensing authority consent (if service resembles taxi or private hire)
- Local transport authority consent (If service resembles local bus service and bus franchising scheme is in place)
- Consultation with relevant highway authorities and emergency services

Reporting

Permit holders should publish an annual report on operation of service, highlighting how service safeguarded passengers and how it met needs of older and disabled passengers

Conditions

Permit could be subject to conditions e.g. number of vehicles, location, ability to charge fares, and notifying timetables to the Traffic Commissioners.

Overview of the interim passenger permits requirements.

Other recommendations

6.36 Alongside the authorisation and safety assurance schemes, we make other recommendations relating to and supporting the creation of a comprehensive regulatory framework for AVs.

Misleading marketing

6.37 The distinction between driver assistance and self-driving is crucial. It is important that misleading marketing does not confuse people into thinking they do not need to pay attention to the road when in fact they do. We recommend two new criminal offences against those who market driver support features as self-driving.

The duty of candour

6.38 Our aim is to promote a no-blame safety culture that learns from mistakes. We see this as best achieved through the system of regulatory sanctions, rather than by replicating the criminal sanctions applying to human drivers.

6.39 However, safety assurance will rely heavily on information provided by the ASDE and NUIC operator to the regulator. We therefore recommend specific criminal offences where misrepresentations and non-disclosure by ADSEs and NUIC operators have implications for safety. A senior individual must take responsibility for the accuracy of the information supplied and could face prosecution if it is incorrect or incomplete. Other senior managers could also be liable if they consented or connived at the offence.

6.40 The offences would be “aggravated” if the lack of candour leads to a death or serious injury.

Interference offences

6.41 Most conceivable forms of interference with AVs are already criminal offences. We therefore recommend only minor amendments to existing criminal offences to prevent interference with AVs.

Civil liability

6.42 The Automated and Electric Vehicles Act 2018 introduced new legislative provisions to smooth the path to compensation for those injured by automated vehicles. Our view is that, by and large, the Act is “good enough for now”. Any substantive reform should only be done in the light of practical experience. We make relatively minor recommendations for reform of specific provisions.

Overall process

6.43 To respond to these challenges, intervention in the form of Option 1 is required to provide an enhanced scheme to assure AVs when they are in use on the roads. We have also considered targeted reforms relating to data recording, retention and sharing with insurers for example, which can support both in-use monitoring and incident investigation.

6.44 In creating a comprehensive system, legal liabilities are assigned appropriately. This process will also provide manufacturers with clear paths to getting their vehicles to market.

6.45 Importantly the system also allows the regulator to ensure safety and check the safety of AVs on an ongoing basis. This should improve overall safety levels and public confidence in the technology. This would facilitate the AV market, thereby enabling their potential social, safety and economic benefits.

Options considered but not taken forward

6.46 Three further options were considered but not taken forward:

Legislate such that users of AVs continue to be considered “drivers”.

- 6.47 Essentially, this would be similar to Option 0, however regulation would definitively assign liability to a person as a “driver” even if an ADS was carrying out the dynamic driving task. This might ameliorate some of the issues and uncertainties surrounding liability.
- 6.48 Amendments to the German Road Traffic Act allow the use of vehicles with highly and fully automated features that perform the dynamic driving task. The modifications also definitively state that the driver who engages such a feature remains the driver at all times, even when the system is exercising control over the vehicle. They therefore remain liable for the full range of road traffic offences unless it can be shown that the vehicle action comprising the offence was the responsibility of the automated system.
- 6.49 To facilitate the use of AVs, the amendments allow the driver to engage in allowed limited non-driving related activities when the systems is engaged, provided that the system is used as intended by the manufacturer. However, the driver must be in position to take over the driving task when prompted by the automated driving system, or when they realise that they must do so because of “obvious circumstances” indicating that the conditions for the use of the system are no longer met.
- 6.50 The term “obvious circumstances” and therefore whether the driver or the system was responsible for action comprising the offence was subject to debate. Important road signs and inclement weather were cited as examples of things that might be considered obvious, but these would require very different levels of readiness and perception. It is also unclear whether obvious circumstances would include conditions requiring some situational awareness, such as where the vehicle begins to veer between lanes, or cross white lines. Allowing users to take their eyes off the road but still requiring them to notice obvious circumstances causes difficulties in maintaining road safety.
- 6.51 This option has not been pursued in this project. The legal framework in GB places many responsibilities on drivers that would be inconsistent with the definition of self-driving under the AEV Act. The option still presents potential issues around drivers’ liability. Additionally, there may be safety issues where a system relies on a human being expected to remain sufficiently conscious of their surroundings in order to respond to requests to take over even though they have been allowed to turn away from the driving task.

Create different regulatory frameworks for different use cases

- 6.52 Another option is to create different regulatory frameworks for different use cases. Germany has now supplemented its original amendments (as outlined above) with a scheme to approve vehicles which will be used without a driver. This seems primarily aimed at vehicles which are intended to be used for passenger services, perhaps in a specific environment e.g. at an airport.
- 6.53 This new regulatory framework sets out key legal actors including the new role of “technical supervisor”, who will in most cases be located remotely. This supervisor performs a different function from those of a driver – they may only provide high level strategic advice to a vehicle. It is unclear from the currently released framework what criminal liability they may have upon occurrence of an untoward event involving an AV they are supervising.
- 6.54 The German regulatory framework also sets out a two-step process for the approval of AVs without a driver. This process includes a technical step and also a localisation step, whereby the keeper of the vehicle receives approval from regional governments to operate

a vehicle in a specific area. In some ways, this is similar to the comprehensive approval process set out under Option 1 in this Impact Assessment.

6.55 This option has not been pursued because of possible redundancies in attempting to set up a specific regime for different situations of AV use. We note that certain vehicles such as heavy freight vehicles may also require special consideration if automated. There is also the possibility that vehicles in the future may be technically capable enough to be used for different purposes or in different situations. One example of this is where a vehicle may operate with a user-in-charge *en route* to a destination but, once reached, allows the user-in-charge to disembark and instruct the vehicle to park itself.

Incrementally update legislation as required

6.56 This option might be similar to Option 0. As outlined under Option 0, the development of AV technology and the market for it is evolving. In time, many of the international regulatory frameworks which are currently used to approve vehicles will be adapted and changed to account for new automated technologies. The UK could adapt its own laws and vehicle approval processes as these frameworks are updated.

6.57 This option has not been taken forward for three reasons. Firstly, there would be a lack of clarity regarding how the entire regulatory and liability framework would eventually fit together. This risks creating regulatory barriers and legal uncertainty. Secondly, as legislation is updated it might be found that earlier legislation no longer aligns with the later legislation on AVs, creating unnecessary duplication of effort. For example, any definition of “self-driving” cars will likely need to be aligned between safety assurance frameworks and the frameworks governing criminal and civil liability. Incremental updates to legislation may require amendments to all relevant laws governing AVs, whereas Option 1 would create a regulatory framework that would require limited amendment in case of future technological development. Lastly, if legislation is only updated as required the UK may lose out on the opportunity to lead on AV regulation and may rather have to accept regulation similar to that proposed elsewhere via international frameworks but which does not align with existing road traffic law in Great Britain.

7. Public Consultation Process

7.1 The Commissions have undertaken extensive public consultation from a wide variety of consultees including individuals, transport research experts, car manufacturers and developers, safety and disability groups, insurers, the police, local government, lawyers and academics. They have produced three consultation papers throughout the course of the project.

Consultation Paper 1 (CP1): A joint preliminary consultation paper (November 2018)

7.2 CP1 focused on safety assurance and legal liability. It received 178 written responses and over 2600 pages of detailed and interesting discussion.

7.3 Most respondents (79%) agreed that a user-in-charge of a highly automated vehicle (SAE Level 4) should not be considered to be “driving” while the automated driving system (ADS) was engaged.

7.4 Issues around conditional automation (SAE Level 3) proved controversial. A bare majority of respondents (52%) thought that there should be no relaxation of the laws against distracted driving for systems which relied on human intervention to be safe. There were calls for a clear dividing line between driver assistance and automated driving.

7.5 CP1 also considered civil liability for injury or damage caused by highly automated vehicles, asking respondents whether further guidance or clarification was needed on contributory negligence, causation, and data retention under the AEV Act. The overall conclusion was that the AEV Act may be “good enough for now”. An area of concern was the uncertainty over how product liability law applies to “pure” software, sold without a physical medium. Most respondents (61%) thought that the law in this area should be reviewed.

7.6 CP1 looked at offences which arose directly from the way that the vehicle is driven and other offences which do not arise directly from the dynamic driving task. We asked for respondents’ opinions on criminal liability for breaches of driving rules “committed” while the ADS is engaged. We proposed that if the problem appears to lie with the ADS the police should refer the matter to a regulatory authority, who could apply a range of regulatory sanctions to what we refer to, in our final report, as the Authorised Self-Driving Entity (ASDE).¹ The great majority of consultees (86%) supported the idea that each automated vehicle should be backed by an ASDE. There was widespread agreement as 89% of respondents agreed that a regulatory authority should be able to apply a range of sanctions to the ASDE.

7.7 The Commissions asked whether they should review the law on corporate offences where wrongs by an ADS developer resulted in death or serious injury. Most respondents (84%) supported a review.

Consultation Paper 2 (CP2): Passenger services and public transport (October 2019)

7.8 The aim of this consultation was to ensure that highly AVs would be safe and could meet the objectives set by local and central Governments. The consultation asked consultees about how such services should be regulated and how they could be integrated with other forms of public transport. There were 109 written responses to CP2 providing nearly 1300 pages of feedback on the questions asked.

7.9 The major proposal in CP2 was that highly automated vehicles should be subject to a new single national system of operator licensing. This followed the Commissions’ view that such vehicles could provide a new form of passenger service sufficiently different from current passenger services to merit a new regulatory structure. The operator licensing scheme would be in addition to the safety assurance scheme proposed in CP1, which focussed on the design of the ADS. This drew considerable support as 89% of respondents agreed. However, there was much less agreement on how local decision-making should be embedded in the scheme and its relationship with existing regulated modes of public transport like public service vehicles, taxi and private hire services.

¹ In CP1 we had referred to this as the Automated Driving System Entity. We changed the name in response to consultation input which emphasised that vouching for the safety of the ADS was not enough. The original name was therefore too narrow. We changed this to focus instead on the regulated activity it performs.

Consultation Paper 3 (CP3): A regulatory framework for AVs (December 2020)

- 7.10 CP3 focussed on responses to both previous consultation papers, formulated overarching proposals for the way forward and made provisional proposals for a new regulatory system for the deployment of AVs.
- 7.11 The Commissions proposed that, in accordance with the AEV Act, the Secretary of State should decide whether a vehicle is sufficiently safe to “safely drive itself”, as informed by a specialist regulator.
- 7.12 The Commissions also proposed a two-step process before AVs are authorised for release onto GB roads. At Step 1, manufacturers would have a choice. To place an automated vehicle onto the market:
- a manufacturer could apply for type approval at international (UNECE) level; or
 - a manufacturer or developer could apply under a domestic technical AV approval scheme for GB-only approval.
- 7.13 However, technical approval alone would not allow the vehicle to “drive itself”. Before a human user could take their eyes off the road and be free from liability for the dynamic driving task, a second “authorisation” step would be needed. Here the ASDE would submit the whole vehicle to the approval agency. The regulator would ask whether the vehicle as a whole was able to meet the Government’s safety standards, without being controlled or monitored by a human driver. Of the 72 respondents who answered our question on the second authorisation step, 45 (63%) agreed, five disagreed (7%) and 22 (30%) answered “other”. This informed the process described as part of Option 1 above.
- 7.14 The Commissions proposed a scheme for ensuring that AVs continue to be safe once they are in use on the roads. Respondents unanimously supported the creation of an in-use safety assurance scheme, which was seen as an essential part of the new regulatory landscape for AVs. Of the 62 responses received, 55 respondents (89%) agreed, seven (11%) responded “other” and none disagreed.
- 7.15 The Commissions proposed that a regulator administering an “in-use safety assurance scheme” should investigate breaches of traffic rules and apply a flexible range of regulatory sanctions. Respondents were strongly in support: of the 70 respondents who answered, 52 (74%) agreed, three (4%) disagreed and 15 (21%) answered “other”.
- 7.16 The Commissions proposed that every AV used on roads or public places without a driver or user-in-charge should be operated by a licensed operator. In our final report we refer to this as the no user-in-charge “NUIC” operator. The NUIC operator must satisfy important qualifying criteria of good repute, financial standing, professional competence and have a centre of operations in GB. Their key role is in respect of oversight of the fleet of AVs (including intervention if there are break-downs and interacting promptly and effectively with the public and emergency services). Other NUIC operator duties include insurance, maintenance, and reporting incidents. This would apply to all vehicles, including those that are privately owned.
- 7.17 We noted that additional “Tier 2” duties could also apply to AVs depending on the purpose of the use. Additional duties can apply when carrying goods or passengers for example. These would require separate licencing.
- 7.18 A clear majority of respondents agreed with this approach, including most legal respondents, insurance respondents and developers. Of 72 respondents who answered

whether such vehicles should be operated by licenced operators, 56 (78%) agreed, four (5%) disagreed and 12 (17%) answered “other”. Out of 74 respondents who responded to the proposed Tier 1 and Tier 2 duties, 59 (80%) agreed that a licensed operator should be subject to all of the duties. Five respondents (7%) thought that a licensed operator should be subject to some of these duties, while nine (12%) answered “other”. Responses encouraged the Commissions to clarify that the NUIC operator licence can specify that duties are allocated differently for particular use cases (for example, if the ASDE has technology in place to directly report incidents).

7.19 The Commissions proposed four corporate criminal offences which would apply where an ASDE failed to provide information or misled the safety regulator. An offence would be committed by the ASDE as a corporate body, subject to a due diligence defence. An offence would also be committed by senior managers, where the conduct took place with their consent or connivance or was attributable to their neglect. Where the wrongdoing was associated with a death or serious injury, the offence would be aggravated and higher penalties would apply. These offences were based on a review of the law in similar high-risk industries. The proposals were met with strong agreement: 66% of respondent agreed with all proposals (47 of 71 responses), only one consultee disagreed with all proposals and the remaining 32% (23 of 71) responded “other”. Consultees highlighted that senior managers should be liable in the event of consent or connivance but there was less support for negligence liability.

This Impact Assessment

7.20 In July 2021 we published a draft version of this impact assessment on our project website alongside inviting public comment on its content. No comments were received. This may be, in part, due to the lack of certainty as to how the market for automated vehicles will develop. It might also be seen as general agreement that a broad approach to assumptions about the development of AVs are acceptable and pragmatic at this point in time.

7.21 Between the publication of the draft impact assessment in July and the publication of the report there were no material policy differences that might affect this impact assessment. Differences between the two are largely in regards to language.²

The way forward: Option 1

7.22 In light of the response to the Commissions’ consultations, there is widespread agreement that the UK should set in place a comprehensive regulatory framework for AVs in Great Britain. Generally speaking, there is support for the Commissions’ proposed allocation of responsibilities and also for the two-step approval process.

7.23 Importantly, there was no indication that any of the other options for regulatory reform had widespread approval. Almost no consultees were in favour of “doing nothing”.³ There were no strong indications that the Law Commissions should pursue options to allocate

² For example, the Automated Driving System Entity (ADSE) is instead called the Authorised Self-driving Entity (ASDE). See Glossary in the [joint report](#).

³ See 6.2.

responsibility to the driver, bespoke regulatory regimes for different use cases or pursuing a course of incrementally updating legislation.⁴

8. Monetised and non-monetised costs and benefits

- 8.1 This Impact Assessment identifies non-monetised impacts on individuals, groups and businesses in the UK, with the aim of understanding what the overall impact to society might be from implementing these options. There are a number of unknowns which makes it difficult to provide a meaningful indication of magnitude of impact across the identified areas. For example, uncertainty regarding the pace of innovation in the car industry, uncertainty surrounding the take-up of AVs by manufacturers and software developers, etc. It is anticipated that a more complete picture will emerge following further consultation and this will allow for greater insight. As part of the process of evidence gathering, we ask specific questions throughout this section on what kind of information is needed.
- 8.2 The costs and benefits of each option are compared to the “do nothing” option. Impact Assessments place a strong emphasis on valuing the costs and benefits in monetary terms (including estimating the value of goods and services that are not traded). However, there are important aspects that cannot sensibly be monetised. These might include how the proposal impacts differently on particular groups of society or produces changes in equity and fairness, either positive or negative. These are considered separately as part of the Equality Impact Assessment.

Option 0: do nothing (base case)

- 8.3 The “do nothing” option within the UK would take place as technological developments occur at an international level alongside incremental advances within the UK car industry. The relevant regulatory framework has demonstrated its capacity to be adapted in light of innovations for new automated technologies. For example, the AEV Act provides for automatic pay out by insurance companies for damage caused by a vehicle when driving itself. There is also international oversight by the UNECE on issues relating to vehicle approvals and driving. However, this option is problematic because of two previously identified issues:
- uncertain legal liability; and
 - constrained development of the AVs market.

Costs

Transition Costs

- 8.4 None identified.

Ongoing costs

Liability

⁴ See 6.34 -6.55 for an explanation of each options and the issues they present.

Continued uncertainty on civil liability

8.5 There are gaps in responsibilities arising from incidents involving AVs. The AEV Act provides for automatic pay-out by insurers on claims where injuries occur as a result of an incident caused by an AV which is on the recognised AVs list while its ADS was engaged. There is less clarity on the responsibility of car manufacturers or software developers of AVs in situations where an incident occurs – especially where multiple parties may have been involved in the programming and testing of an ADS. Uncertainty also remains over how product liability law applies to “pure” software, sold without a physical medium.

Car Industry

Sub-optimal industry investment

8.6 For new technological advances the initial cost of rollout is generally high but reduces over time following increased competition from new market entrants and efficiency savings from economies of scale.⁵ With the continued uncertainty over multiple issues of liability and safety, investors with a lower appetite for risk will be reluctant to enter the market. This reduces the pool of investment. Investment is identified as one of the most influential factors contributing to economic growth.

Sub-optimal research

8.7 Dampened investment reduces scope for research and stifles innovation. The ripple effect of reduced investment is the reduced potential in attracting other innovators to form a cluster of innovative activity. Some activity may be directly related to AVs, while other activity might be more peripheral and build upon a component used in AVs. Delayed ability or capacity to attract other business reduces the scope for the realisation of first-mover advantages.

Drivers

Constrained demand for AVs

8.8 Consumer demand is influenced by tastes and preferences which are in turn assisted by the persuasive powers of marketing. Consumers receive information about vehicles from many sources, including marketing, the “sales pitch” during a test drive and the owner’s manual. The message given at each stage needs to reinforce an accurate understanding of what the vehicle can (and more importantly, cannot) do.

8.9 The importance of quality information to consumers is highlighted in a recent European Commission study which stated:

One of the most important tasks is the avoidance of known operator errors, such as mode confusion, automation surprises and overreliance... Agreement regarding the minimum requirements for information to be presented to the driver in order to promote user understanding and trust are essential to protect road safety.⁶

⁵ Economies of scale refers to the fall in average cost of production from large volume production. Lower costs arise from volume discounts, increased managerial specialisation, enhanced capacity for lower cost of financing.

⁶ European Commission, *Study on the effects of automation on road user behaviour and performance* (2020), <https://www.efa-eu.com/wp-content/uploads/5-EU-Study.pdf>, p 93.

8.10 Drivers have already become confused about the capabilities of vehicles on the market today.⁷ Communicating information about system functionality may be safety critical.

Reputational safety concerns

8.11 Incremental technological improvement enables drivers to have the opportunity for less hands-on control. For example, cruise control provides the opportunity for a more hands-off approach. Indications are that technological advances provide for improved road safety. Selection bias may partially explain results as those who are more safety aware/conscious purchase vehicles with enhanced safety features. The risk is that incremental technological advances move vehicles towards appearing to be AVs in the public’s mind without actually being so, such that an incident involving a conventional vehicle with high automation but without a safety-approved automated driving system would damage the reputation of AVs and make it increasingly difficult to promote the safety benefits that they can bring.

Benefits

Transition benefits

8.12 None identified

On-going benefits

8.13 None identified

Option 1: a comprehensive regulatory framework

Table 1: summary table of group Impacts

Group	Impacts
Car manufacturers and developers	<ul style="list-style-type: none"> • Initial capital investment (net benefit) – uncertainty over take-up • After sales customer service (cost) • Uncertain impact on traditional car industry • Data retention, data sharing with insurers and regulators
Drivers	<ul style="list-style-type: none"> • Potential increased productivity (benefit) • Reduced driver stress – improved health outcomes (benefit) • Improved safety as most crashes have significant human error element (benefit) • Reduced liability associated with driving
Regulator	<ul style="list-style-type: none"> • Creating new body – lower cost option to add responsibilities to existing organisation (cost) • Responsibilities for safety assurance, data collection, monitoring etc (cost)

⁷ A survey commissioned by Thattham Research, Euro NCAP and Global NCAP in 2019 found that 71% of drivers around the world believe self-driving technology already exists for purchase – see <https://www.thatcham.org/automated-driving-hype-is-dangerously-confusing-drivers-study-reveals/>.

Insurance industry	<ul style="list-style-type: none"> Investment in new systems and procedures facilitating data exchange etc (cost)
Police	<ul style="list-style-type: none"> Potential reduction in road traffic crashes and speed limit offences facilitates increased availability of police resources (benefit) Greater complexity in determining responsibility for incidents
Disability groups	<ul style="list-style-type: none"> Improved accessibility to transport increases mobility (benefit)
Economy	<ul style="list-style-type: none"> Potential first mover advantage, global standard setting in regulation (benefit) Potential increased competitiveness/trade opportunities (benefit) Potential net increase in industry growth (offset reduced demand for traditional cars) Potential reduction in congestion but uncertain depending on AV numbers (benefit)
Courts and criminal justice system	<ul style="list-style-type: none"> Reduced number of court cases through traffic violations (benefit) Increased range of traffic violations (cost)
Lawyers/drafters	<ul style="list-style-type: none"> Initial familiarisation costs (cost) Drafting new criminal offence Code for ASDEs may require additional resources (cost)
Local government	<ul style="list-style-type: none"> Potential reduced revenue through fewer fixed penalty fines (cost)
Members of the public	<ul style="list-style-type: none"> Potential moral hazard (cost)

Costs

Transition Costs

Car manufacturers/software developers

Cost of regulatory compliance

8.14 Amongst other requirements, ASDEs will be required to demonstrate involvement in safety assessment. If found to have provided misleading or false documentation, the ASDE could face criminal sanctions. There will also be on-going safety assurance in excess of what is currently required for regular vehicles. New systems and procedures will be needed to ensure compliance. Data capture and storage may need an investment in capital equipment in order to build capacity to investigate collisions and traffic infractions and to decide insurance claims.

Forum arrangements

8.15 The proposed creation of a forum for collaboration on the application of road rules to self-driving vehicles suggests a voluntary undertaking involving key stakeholders.

Department for Transport

Legislative drafting

- 8.16 As part of establishing a suitable AV regulatory framework, primary legislation will be required at multiple points. For example, primary legislation will be required to provide new definitions, such as: “an ADS may be defined as a combination of software, hardware and sensors, which can be installed in a ‘type’ of vehicle”. There will be new regulation-making powers which amongst other things specify: (a) an assessment process to assure the safety of AVs; (b) the procedure for doing so; and (c) criteria for doing so. An appeals process is proposed similar to that in regulation 19 of the Road Vehicles (Approval) Regulations 2020. Also envisaged is a new range of offences and extension of existing ones relating to vehicle tampering and interference.
- 8.17 It may be that these duties can be accommodated within daily tasks without requiring additional resources. There will, however, be an associated opportunity cost that prevents work in other areas.

Educational activities to build driver and non-driver awareness

- 8.18 As part of a government’s national welfare objective, the government has the responsibility of providing an educational programme aimed at building awareness of the steps that can be taken when AVs are used alongside conventional vehicles.

Regulatory body

Establishing new safety assurance regulator/s

- 8.19 A new authorisation authority is intended to facilitate approval by evaluating manufacturers’ safety case for each vehicle submitted for authorisation and by providing guidance informing a minimum threshold safety standard. The authorisation authority will need to specify each ADS feature in the vehicle, stating whether that feature can safely be used either with or without a UIC. To ensure in-use safety it is also envisaged that the same regulator, or perhaps a separate one, will have comprehensive powers that include the power to require an ASDE to ensure that its vehicles continue to comply with the law.
- 8.20 The resource commitment for establishing new bodies depends on the model used, whether an existing regulator is used and the anticipated number of applications requiring investigation.

New enforcement code

- 8.21 A statutory scheme is envisaged to assure safety when AVs are in-use along similar guidelines to that in evidence for cars. The regulator would have the power to impose regulatory sanctions such as informal and formal warnings; fines; suspension/withdrawal of authorisation. There will be a resource commitment in drafting such a code.

Insurance industry

Familiarisation costs of insurance overhaul

- 8.22 Motor insurance companies have well established systems and procedures in place. The AEV Act already puts in place guidance on claims arising from collisions involving AVs. New guidelines from the proposed regulatory framework impose new duties, such as a duty for those controlling AV data to share data with insurers.

Members of the public

Initial confidence building period as citizens get used to new technology

- 8.23 People are much more attuned to known types of adverse incident than ones that are unknown. Inevitably, someone will be killed or seriously injured by an AV. The victim will be a real person, with family, friends, hopes and aspirations. Following such an incident, public opinion will require careful handling attuned to the potential for loss in confidence. A robust evidence-based case for automated driving requires careful handling. For example, producing figures showing an overall decline in injury rates and mentioning the many people injured by human drivers.
- 8.24 There is the potential for moral hazard through improper behaviour which seeks to “test” AVs and claim an insurance pay-out. A public education campaign may be required to provide guidance on responsibilities.

Ongoing costs

Regulatory body

Operating costs of new safety assurance regulator

- 8.25 Depending on the model envisaged, there will be annual costs associated with any new body. The costs will relate to the number of applications for listing submitted as each application requires a full investigation of its safety to some acceptable safety threshold. Numbers remain uncertain. If the regulator is part of an existing organisation, costs can be expected to be significantly lower, as much of the operational infrastructure will already be in place.

Car manufacturers/software developers

Capital commitment by AV manufacturers/developers

- 8.26 A suitable ASDE will need to be able to show it was closely involved in assessing safety and that it had sufficient funds to respond to improvement notes, pay fines and organise a recall.⁸ Several consultees expressed concern that smaller market participants should not be excluded from the market by onerous capital requirements if they could obtain insurance to cover the risk. On this basis ASDEs need only be able to demonstrate sufficient funds through one of a variety of methods, including insurance.
- 8.27 As is the case with permissive endeavours, it seems reasonable to assume the cost of complying with the proposed regulatory framework are exceeded by the anticipated benefits of investing in the AVs market. The net cost to business is zero at worst.⁹

Licensed fleet operator arrangements

⁸ CP3, Consultation Question 23.

⁹ See Regulatory Policy Committee, *Case histories guidance on the assessment and better regulation framework treatment of the impacts of “permissive” legislation* (February 2020), <https://www.gov.uk/government/publications/rpc-case-histories-permissive-legislation-february-2020>.

8.28 Under new AV arrangements, NUIC operators will have on-going financial commitments after the AV has been purchased. Amongst other things, they will be required to maintain and insure the vehicle as well as install safety-critical updates and maintain cybersecurity.

Data collection

8.29 There is an ongoing duty on car manufacturers to liaise with insurers to have access to data where it is necessary to decide claims.

Courts/criminal justice system

Impact on court system

8.30 The introduction of new offences and the amending of current offences to cover AVs, and any related appeals processes, may have an impact on the court system depending on how these are to be enforced. This would have an impact on the court time, court programming, and staffing demands required to deal with these offences.

Traffic violations

8.31 Traffic violations, mainly through exceeding the speed limit, account for the greatest proportion of traffic offences. With increased AV take up it is highly likely that revenue from fixed penalty fines will reduce significantly. It is uncertain whether revenue from parking fines will also decline.

Benefits

8.32 There are benefits of AVs in general under Option 0, but these will be realised to a greater extent under Option 1 with the certainty of a regulatory framework.

Transitional benefits

8.33 None identified

On-going benefits

Drivers/members of the public

Improved safety

8.34 Self-driving cars remove the human element from driving and with it the major cause of road traffic incidents. According to the latest available statistics from the Department for Transport,¹⁰ car occupants accounted for the greatest proportion of all road fatalities between 2009-19 at about 45% each year.

¹⁰ At <https://www.gov.uk/government/statistical-data-sets/reported-road-accidents-vehicles-and-casualties-tables-for-great-britain>.

8.35 Applying a more conservative 1% reduction in the incidence of UK car incidents yields the potential for the prevention of 8 car related fatalities and 131 serious injuries per year.¹¹ If one were to monetise this value in terms of the benefit of safety measures that preserve human life in preventing incidents the annual impact is in the region of £56.6 million.¹²

Reduced congestion

8.36 AVs may lead to an increased number of vehicles on public roads as they make travelling more accessible. New users could lead to increased vehicle miles travelled by 10-14%.¹³ On the other hand, increased AVs may mean more optimised traffic flow and a reduction in incidents (both of which are sources of congestion). Moreover, AVs may be able to be incorporated into public transport systems, providing “last mile” services which might reduce the need for individuals to own vehicles. The environmental benefit can include reduction in greenhouse carbon emissions through idling in traffic.

Lower stress for vehicle occupants in the long term

8.37 The user-in-charge not having to drive reduces the risk of an incident as they are not tasked with having to maintain the level of concentration demanded from driving. This allows for a more relaxed journey with a reduced stress level.

Enhanced mobility for disabled users

8.38 There are over 11 million people living with a disability in the UK.¹⁴ Just over 50% of disabled people aged between 16-64 years are employed, compared to about 80% non-disabled people in the equivalent age group.¹⁵ Around 20% of people with disabilities have found current transportation provision a hindrance. Guide Dogs UK highlighted that a further advantage of passenger-only AVs could be the elimination of discrimination against assistance dog owners by human drivers. Under the NUIC route, vehicles are not expected to have anyone but “passengers” in the vehicle, though they would need to be supervised remotely by a licensed operator.

8.39 The evidence reveals that disabilities increase with age. As the UK has an aging population, AVs provide scope for continued access and participation in cultural, leisure and sporting activities. AVs also increase the likelihood of more consistent access to health services and by so doing enhance the health and wellbeing outlook for vulnerable groups.

UK economy

¹¹ Based on Department for Transport, *Reported road casualties in Great Britain: 2019 annual report* (September 2020), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/922717/reported-road-casualties-annual-report-2019.pdf.

¹² Department for Transport average value of prevention per reported road incident leading to a fatality (£2.26 million) and £0.26 million for a serious injury.

¹³ Z Waudd, D MacKenzie and P Leiby, “Help or hindrance? The travel, energy and carbon impacts of highly automated vehicles” (2016) 86 *Transportation Research Part A* 1.

¹⁴ See <https://www.gov.uk/government/statistics/disability-facts-and-figures/disability-facts-and-figures>.

¹⁵ Office for National Statistics, *Outcomes for disabled people in the UK: 2020* (February 2021), <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/disability/articles/outcomesfordisabledpeopleintheuk/2020>.

Increased productivity

8.40 Not driving to work provides increased scope for working while commuting and therefore starting the working day earlier, particularly those who are self-employed. Moreover, not having to mentally engage with the rigours of driving enables the prospect for greater productivity when arriving at work. Travelling by private car currently accounts for about 212 hours per year, equivalent to six working weeks based on average working hours in England. For those who work in jobs requiring a fair amount of driving between sites, or which involve customer visits, there is scope for significant benefit as reports and other work-related tasks can be carried out when one might have been otherwise driving, saving time. In this way benefits are enjoyed by both suppliers and customers through improved access. SMMT estimate that the deployment of Connected and Autonomous Vehicles can save every driving commuter about 42 hours in unproductive travel time each year.¹⁶

Increased growth potential

8.41 AVs require a considerable capital commitment, as would any car manufacturing plant. The car industry is particularly important because of its links with other sectors. The multiplier effect occurs as the initial investment in the AV industry leads to the much larger increase in GDP. This comes about through the car industry relationship with upstream industries such as textiles and steel, and downstream with innovation and mobility services. It is the multiple links with other sectors that make it difficult to estimate value, since assumptions made with respect to one aspect have knock-on effects on other sectors.

First-mover advantages

8.42 With the appropriate regulation in place and with well thought out supporting infrastructure the foundation is in place for attracting both domestic and international business. As a result, the UK stands poised to reap the benefits of strong brand recognition and establish the basis for economies of scale to further consolidate its position.

8.43 The traditional car industry continues to be impacted by the growing demand for sustainable options alongside the possibilities enabled through software-based systems. Research and innovation will be focussed on developing new and novel solutions to meet consumer expectations and deliver on the UK Government's ambition of being a global leader on automated mobility.

Potential trade and competitiveness impacts

8.44 The potential to attract international interest arises from access to both domestic and international approval schemes. For example, manufacturers have a free choice to apply for approval under either the UNECE system of international type approvals or through the national scheme.

Police

8.45 Reduced police resources will be needed to administer the road traffic code and to intervene and investigate following road traffic incidents. An increase in the number of AVs aligns with increased safety benefits. Speed limit violations account for the greatest proportion of offences. With increased reliance on AVs, speeding above the limit inevitably

¹⁶ See Society of Motor Manufacturers and Traders, *Connected and Autonomous Vehicles – Winning the Global Race to Market* (2019), <https://www.smmmt.co.uk/2019/04/uk-in-pole-position-in-62-billion-self-driving-car-race-if-brexit-roadblock-removed/>.

becomes an infrequent, if not unlikely, occurrence. Police time can be freed up to be used elsewhere.

Risks and unintended consequences

8.46 The challenge presented in drafting the Impact Assessment accompanying proposed regulatory intervention is that it is difficult to predict how, and at what speed, the future AV market will change. We know the current set up, but recognise there are on-going technological innovations within the car industry. For example, the electric car was a rarity and is now commonplace, and there have been numerous initiatives in driver assistance technology. Each innovation is initially limited to high-end cars but there is subsequent roll-out such that it becomes standard, as in the case of air conditioning in cars.

8.47 The risks of unpredictable and unintended consequences are indicated as follows:

- Risk of low business take-up: we assume that car manufacturers will be incentivised to enter the market as will other business clusters offering complimentary products. The business community may find there to be over-regulation or be concerned about the financial implications of the new AV arrangements. Some issues may be beyond the ability of the government to influence, while others may be manageable. For example, if low take-up is due to confusion caused by the lack of clarity in the approval framework, there is scope for investment in education campaigns.
- Risk of regulation being insufficiently flexible: the Law Commissions' recommendations are designed to create a flexible system to allow for the safe development of the AV market. The approach of the Law Commissions is to establish a broad framework with several components, not all of which will be implemented at the same time. These recommendations accommodate both development paths, through regulation supporting user-in-charge vehicles and no user-in-charge vehicles. Some of these recommendations involve the continual monitoring and updating of AV regulation in light of practical experience and as the AV market develops.
- Risk of failing to keep up with innovation: the regulatory framework also has an important role in enabling better evidence-based policy making for AVs. It is important to put in place a system to collect data so it can be analysed and accessed by key stakeholders in AVs, and inform future standards thereby improving the quality of regulation as the regulatory scheme and technology matures. The Law Commissions' recommendations therefore include a scheme enabling the collection of data for in-use monitoring. Identifying the most useful metrics and standards can enable regulators to assess claims made in the safety case and allow for benchmarking that is meaningful in assuring safety and allowing comparisons between different AVs and with non-AVs (conventional human-driven vehicles).
- Risk of moral hazard: regulation of the AV market and the subsequent use of AVs needs to consider potential unintended consequences that may arise,¹⁷ for example as a result of moral hazard (e.g. other drivers driving aggressively, or pedestrians "jay walking" in front of AV, on the assumption that the self-driving vehicle will always stop). The potential for unintended consequences to arise from regulatory action is relevant for the responses of users and manufacturers/suppliers of AVs. It will be important to

¹⁷ The so-called "law of unintended consequences" suggests that actions – especially those of government – distort behaviour and can lead to effects that are unanticipated or unintended. (In hindsight, the responses can be seen as logical, but were unforeseen at the outset).

keep the emerging evidence of behavioural responses to AV under review. Public education campaigns may help to raise awareness of the public's responsibilities.

- First mover advantage: There is the risk that the proposals will not be consistent with future international regulation for AVs. Path-dependent risks arise when pursuing the wrong path would involve wasting large sums of resources. Real option theory¹⁸ may also suggest delaying a difficult and uncertain decision (in order to retain flexibility). However, failure to agree a regulatory framework for AV is likely to delay the development of the market and potentially prevent or hinder AVs' economic benefits to GB/the UK from being realised. Other countries are currently considering AV regulatory frameworks. It is important to consider the potential consequences of the UK being left behind. There is therefore a potential trade-off as technology and the AV market internationally continue to evolve over time, but also continuing uncertainty about exactly how, and at what speed, the AV market will progress.¹⁹

Wider impacts

Innovation test

8.48 Innovation has been considered throughout this Impact Assessment. It is recognised that innovation in the AV sphere is constantly evolving and requires careful monitoring in order to ensure regulation remains fit for purpose. It is also recognised that innovation is the basis on which to attract new businesses and to grow the industry.

Small and Micro Business Assessment

8.49 The capital investment required by firms intending to be an ASDE is expected to be significant. Several consultees expressed concern that smaller market participants should not be excluded from the market by onerous capital requirements if they could obtain insurance to cover the risk. On this basis ASDEs need only be able to demonstrate enough funds through a variety of methods, including insurance.

Equality Impact Assessment

8.50 Given the nature of the project, it has been particularly important for us to assess the likely impact of our proposals on disabled people. For many people with restricted mobility, access to education, employment, healthcare and shopping facilities is limited. AVs have the potential to remove some of those barriers. It is important to ensure that AVs are not designed in such a way as to prevent the realisation of those potential benefits. It is also important therefore to ensure that consideration of accessibility is built into our proposed regulatory framework.

8.51 We have used existing statistics to identify the number of people with disabilities who may be affected differently by our proposals. There are over 11 million people in the UK living with a disability. Just over 50% of disabled people aged between 16-64 years are employed compared to about 80% non-disabled people in the equivalent age group.

¹⁸ "Real option theory" or analysis is used to estimate the benefit of delaying a decision by retaining flexibility in situations with high levels of uncertainty but where knowledge is increasing significantly over time (footnote taken from the Centre for Connected and Autonomous Vehicles, *Automated Vehicles (AV) Strategic Economic Analysis* (June 2021), <https://www.lawcom.gov.uk/project/automated-vehicles/> and <https://www.scotlawcom.gov.uk/law-reform/law-reform-projects/joint-projects/automated-vehicles/>, footnote 1).

¹⁹ Centre for Connected and Autonomous Vehicles, *Automated Vehicles (AV) Strategic Economic Analysis* (June 2021), <https://www.lawcom.gov.uk/project/automated-vehicles/> and <https://www.scotlawcom.gov.uk/law-reform/law-reform-projects/joint-projects/automated-vehicles/>.

Around 20% of people with disabilities have found that current transportation provision is a hindrance. AVs are likely to improve accessibility to transport and increase the potential for employment, as well as access to education, healthcare and commercial activities such as shopping.

8.52 During consultation, it was highlighted by a member of the Disabled Persons Transport Advisory Committee (DPTAC) that AVs could greatly increase their independence. Mobility and Access Committee for Scotland (MACS) also noted the potential benefits of AVs for disabled people.

8.53 Guide Dogs UK highlighted that a further advantage of AVs which do not require a user in the driving seat could be the elimination of discrimination against assistance dog owners by human taxi drivers. It is a criminal offence to refuse to carry a passenger accompanied by their guide dog. However, research carried out by Guide Dogs UK in 2016 found that 42% of assistance dog owners reported they had been refused service because of their dog over a twelve-month period.

8.54 We have also engaged with major UK mobility and disability advocacy groups throughout our consultation process. Responses to our most recent consultation were submitted by DPTAC, MACS, Anxiety UK and Guide Dogs UK. We have also held meetings with DPTAC, MACS and Motability to discuss the potential impacts of our proposals on disabled people.

Justice impact test

8.55 The creation of a new AV-friendly enforcement code and offences has been identified. There are implications for the court system to a greater or lesser extent depending on numbers and method of enforcement. These issues have been identified throughout the Impact Assessment.

Trade impact

8.56 There is potential for the UK to become the world leader in AV technology as it seeks to put in place the first regulatory framework ahead of the roll-out of AVs. It is likely that most manufacturers selling mass produced vehicles across borders will continue to seek type approval internationally to an international standard which would be recognised in Great Britain. However, where vehicles are deployed in limited local contexts, a national approval system could authorise systems without waiting for UNECE agreement. By developing its own scheme, Great Britain would be in position to pioneer the development of AVs in localised contexts, allowing new forms of highly automated passenger and freight services.

8.57 As a result of developing AV industry there is the potential for complimentary business clusters to also be attracted into the UK to take advantage of the innovation climate. Estimates of AV industry growth vary widely and the underpinning assumptions that inform the estimates are often unclear. However, as the UK is especially competitive in software design and development, the anticipated area of industry focus, there are opportunities for a strong trade benefit.

Health Impact Assessment

8.58 We recognise the scope for improved health outcomes through reduced stress levels from not having to drive. However, the scope for benefit is somewhat diminished as patterns of work are reassessed following the Covid-19 pandemic. With the outlook being less time spent in the office, commuting time has also reduced. The extent to which this is a short-term outcome remains uncertain.

Greenhouse gases impact test

8.59 Potentially AVs may facilitate reduced congestion through initiatives such as smart technology enabling a real time response to smooth out traffic. However, they could also lead to a growth in the number of vehicles that constrains savings in less congestion, motor idling and the emission of greenhouse gases. The net effect is uncertain.