

Title: Proposal to conclude the Longer Semi-Trailer (LST) trial and allow LSTs to enter into general circulation IA No: DfT00423 RPC Reference No: DfT-5003(2) Lead department or agency: Department for Transport (DfT) Other departments or agencies: N/A	Impact Assessment (IA)
	Date: 06/08/2021
	Stage: Final
	Source of intervention: Domestic
	Type of measure: Secondary Legislation
	Contact for enquiries: freightengagement <freightengagement@dft.gov.uk>

Summary: Intervention and Options	RPC Opinion: GREEN
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Cost of Preferred (or more likely) Option (in 2019 prices)

Total Net Present Social Value	Business Net Present Value (NPV)	Net cost to business per year	Business Impact Target Status
£1,098.5m	£841.5m	£-21.4m	Qualifying Provision

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

The current maximum permitted length for articulated semi-trailers is 13.6 metres. Due to the low density of many goods, such as parcels and some consumer goods, many operators who are consistently transporting low density goods run out of space on their trailers before they reach the maximum gross vehicle weight permitted. Consequently, a strong environmental, traffic flow and productivity case can be put forward for increasing the maximum length of semi-trailers as this would allow a greater volume of goods to be transported with the same number of journeys being undertaken, so achieving a reduction in the amount of carbon/pollutants emitted, traffic on the roads and driver hours required as a consequence of those journeys.

In January 2012 the DfT commenced the trial of a limited number of LSTs, with an initial cap of 1,800 LSTs in the trial, where the maximum permitted length of the semi-trailer was extended to 15.65 metres while gross vehicle weight limits were maintained. Where this space is fully utilised by operators this allows the surface to load 30 as opposed to 26 UK standard pallets for a single-deck trailer with actual loads also depending on whether pallets are stacked. Other deck layouts such as dual deck would be able to carry up to 60 pallets instead of 52.

The LST trial has seen a reduction in journey numbers and pollutants compared to articulated heavy goods vehicle (HGV) operators, and whilst under trial conditions, LSTs were operated as safely, or indeed more safely, as articulated HGV trailers.

The LST trial is not due to end until 2027 following an extension in 2017 which also increased the LST cap in the trial from the original 1,800 to 2,800. However, it is now considered that continuing the trial would not bring any further value as it would be unlikely to provide any additional data to increase confidence in the existing results. The Department is therefore now considering how to proceed, particularly how the benefits achieved under the trial could be maintained if there were no limit placed on the number of LSTs in general circulation, whilst ensuring the safety records of LSTs are maintained. The Department wishes to maintain the efficiency, environmental and safety benefits seen in the trial environment if LSTs are utilised more widely. Currently, the Road Vehicles (Construction and Use) Regulations 1986 set length limits of HGVs, trailers and combinations. Secondary legislation would be required to change these limits and permit wider use of LSTs.

What are the policy objectives and the intended effects?

The main policy objective is to enable the transport of the same volume of freight through fewer journeys. The intended effects of this are a reduction in emissions, congestion, and reduced drivers' hours whilst enabling the freight industry to utilise vehicles more efficiently and at least maintaining road safety levels for all road users.

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

Do Nothing (Baseline): Under this scenario the LST trial would run until 2027, after which point LSTs would no longer be allowed on UK roads. This is the baseline against which other options are measured.

Policy Option 1 (Lighter additional regulation – preferred option): Remove the cap on the number of LSTs in the trial, allowing the market to decide the quantity which would be in operation. There would be no automatic end (sunset clause) to this regulatory easement. We would introduce some additional regulations designed to ensure the retention of positive outcomes for the public related to safety and effective use in comparison to the operation of 13.6m trailers. This is the preferred option, on the basis that the key drivers of safe and efficient utilisation of LSTs is maintained, while encouraging the widest realisation of efficiency and environmental benefits. A number of control mechanisms will be introduced to control the use of LSTs in general circulation along with annual reports and regulation to monitor their continued use and compliance. This supports the majority of findings from respondents, while maintaining safety.

Options previously considered

Other policies had been considered at the consultation stage, with an option of 'Heavier additional regulation' and one of 'Widening existing regulation to LSTs', which would have regulated LSTs the same way as standard 13.6m trailers. However, these have been removed after the consultation stage. This is partly due to the consultation responses bringing up a consensus from operators that the regulations within option 2 would be too burdensome for operators, with the consultation stage impact assessment (IA) revealing a Business NPV which was negative in the low and central cases. A major concern during the consultation was the safe operation of LSTs, and therefore option 3 was also removed because safety practices would deteriorate and there would be risks of less effective use of LSTs and reduced public outcomes (e.g. carbon reduction). The trial on LSTs that has been running since 2012 has shown that LSTs are safe under strict conditions where measures are taken to ensure the safe operation of these vehicles, such as specific driver training and route planning – which are all included within the preferred option. A precautionary approach to pre-trial running in the context of safety is being taken.

Policy Option 2 (Heavier additional regulation): This option was similar to Policy Option 1, but with an increased regulatory burden on operators aimed at providing the efficiency benefits and associated environmental benefits of operating LSTs whilst also (like Option 1) aiming to better ensure LSTs remain at least as safe as 13.6m trailers. It is recognised that, given the increased regulatory requirement in this policy option in comparison to Policy Option 1, the implementation of this policy option may deter more operators from choosing to operate LSTs than Policy Option 1. It could also result in a reduction in the level of environmental benefits achieved.

Policy Option 3 (Widening existing regulation to LSTs): This option would have regulated 15.65m trailers in the same way that standard 13.6m trailers are currently regulated. This is lower cost than Option 1 but does not take into account the specific operating issues associated with LSTs. The results from the trial showed that LSTs are safe to be operated under specific conditions, such as with driver training and route planning.

There is no evidence showing that this safe operation would be possible if LSTs were operated the same way as standard trailers. This is further backed by the anecdotal evidence gathered from the trial and haulage stakeholders who have experience of operating these LSTs, which brought out that the trailer is more dangerous than regular trailer. The positive safety stats from the trial were therefore due to the way LSTs were operated and were treated specially by operators.

This option does not include any measures to deal with the safety risks associated with LSTs, such as the requirement for training and route planning to ensure the roads used can accommodate LSTs. Policy Option 3 therefore would not be fulfilling the Department's strategic objectives of ensuring the transport network is safe. It has not been taken forward because a cautionary approach is being taken for road safety due to the risks longer semi-trailers could pose on roads if they were treated as standard trailers. The potential beneficial environmental and efficiency benefits from LSTs would also have been hampered in this option through ineffective use of LSTs.

Alternatives to regulation: In order to use LSTs outside a trial setting legally, the Road Vehicles (Construction and Use) Regulations 1986 must be amended. We have not considered other methods of reducing the number of freight journeys per tonne of freight in this policy assessment.

Will the policy be reviewed? It will be reviewed at least 7 years from the date the legislation is implemented					
Does implementation go beyond minimum EU requirements?			N/A		
Is this measure likely to impact on international trade and investment?			No		
Are any of these organisations in scope?		Micro Yes	Small Yes	Medium Yes	Large Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded: 0	Non-traded: 1.20	

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: Minister: Richard Holden

..... Date: 4 May 2023

Summary: Analysis & Evidence

Policy Option 1

Description: Lighter additional regulation
FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2022	Time Period Years 20	Net Benefit (Present Value (PV)) (£m)		
			Low: 933.3	High: 1391.6	Best Estimate: 1176.7

COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	26.5	1	32.8	487.0
High	39.8		42.0	632.9
Best Estimate	33.2		37.4	560.0

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

Freight operators (private sector) - the additional cost of purchasing longer semi-trailers (on top of normal replacement costs), plus the costs from increasing the regulatory burden and familiarisation costs on operators.
 The costs of applying to the DVSA to operate LSTs will be an additional £250 per operator per year relative to standard licencing for HGVs.
 These costs will only apply to businesses that choose to utilise the additional regulatory freedom.
 Central government (public sector) - further costs have been calculated to assess the impact of reduced taxation revenue as a result of lower fuel consumption.

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

Freight operators and their clients (private sector) – the costs to operators through the increase in accident reporting and costs associated with licensing requirements. Additional costs to industry on infrastructure adaptation costs.

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0.0		116.7	1566.2
High	0.0		140.7	1878.6
Best Estimate	0.0		129.8	1736.7

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

Freight Operators (private sector) - benefits include lower fuel usage, increasing productivity due to increased labour output from fewer HGV journeys required to deliver the same amount of freight. Some benefits are realised by the haulier's customers via lower rates.
 Wider society - lower external costs to society including congestion, air quality and greenhouse gas emissions, infrastructure and noise impact reduction.

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

LSTs are expected to reduce the risk of accidents through the removal of HGVs from traffic, but longer vehicles have the potential to increase the risk of accidents if this risk is not managed carefully. The trial has shown positive safety statistics for LSTs, but the outcome partly depends on the way the trial operates. Although we expect the net impact to be positive, the size of it will be dependent on behavioural responses of operators from removing the LST trial cap and implementing LST regulation. Since the safety requirements that were implemented within the trial will be similar to this option, we expect there to be a benefit in terms of a reduced risk of accidents. A range of possible outcomes has been estimated, but they will not be included within the NPV. This is because, although safety is the main concern with LSTs, the safe operation of LSTs has been proven possible through the trial and the NPV will ignore the safety monetisation so that it measures this policy against its main objectives.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5
<p>A number of key assumptions have been used in this analysis which are explained in more detail under each option. These are around the number of operators using LSTs, costs of LSTs against 13.6m trailers, rigid drawbar and trailer combinations, and the costs involved in the regulatory options. It is assumed that the take-up will be slightly restricted given the regulatory burden. However, the efficiency savings and safety outcomes from using LSTs will be nearer those achieved in the trial compared to without extra specific regulation. Sensitivities have been included to capture a range of the costs to business, including regulation, familiarisation, and purchasing costs. These risks and uncertainties are discussed in further detail in the 'risks and uncertainty' section and throughout the analysis.</p>		

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m: £ -106.9
Costs: 24.8	Benefits: 47.7	Net: -22.90	

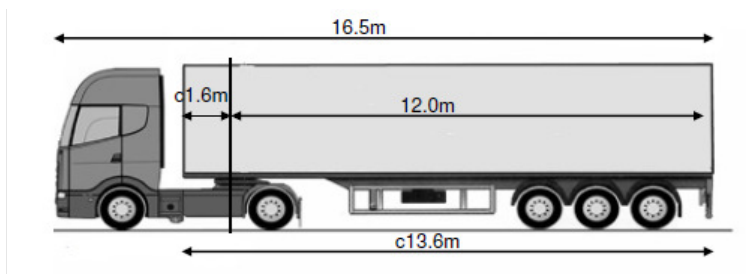
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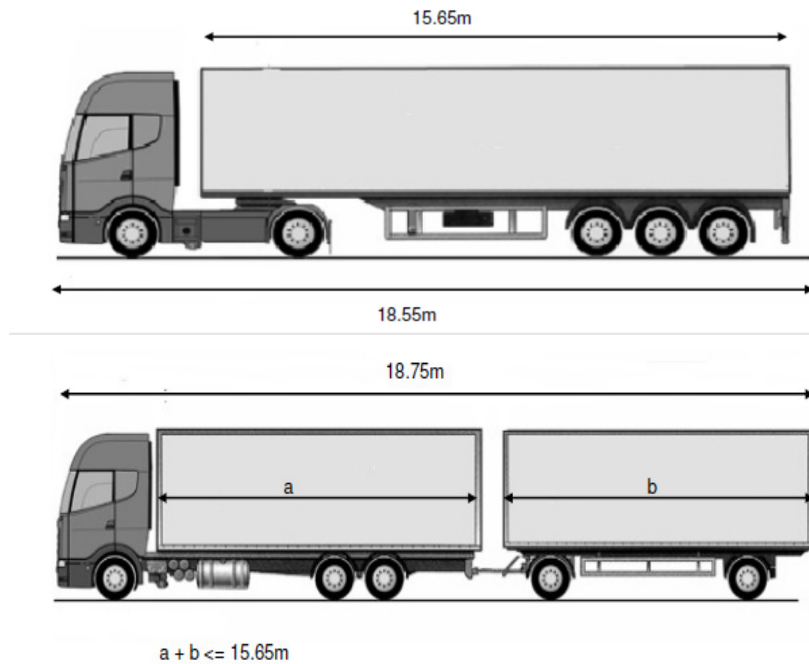
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Background

1. The trial of LSTs, (LSTs are articulated goods vehicles) began in January 2012 with a total allocation available of 1,800 semi-trailers. The length of time the trial was to be conducted for was set at 10 years in order to ensure that operators taking part in the trial could recover the additional costs of purchasing and operating the LST through the efficiencies achieved by the end of its expected useful life.
2. In January 2017 the trial was extended by 5 years and the number of LSTs increased by an additional 1,000. This was to enable more operating experience to be gained, including spreading the trial to more operators. The time extension was also designed to ensure any new operators joining the trial would be able to recuperate the costs of purchasing LSTs by being able to use them up to their expected useful life.
3. Ahead of the trial, it was anticipated that the use of LSTs should lead to journey reductions which in turn would lead to a reduction in congestion, carbon dioxide emissions and air pollutants (PM10/NOx). The trial sought to find out if the expected benefits of allowing operators to operate LSTs in place of standard 13.6m articulated trailers would be realised in practice (hereon referred to as 'standard' trailers). Modelling based on trial data has shown that these outcomes have been achieved. If LSTs were allowed to enter into general circulation these benefits are expected to be partly maintained. The extent to which they would be maintained would be dependent on the way LSTs were used outside the conditions of the trial and what, if any, additional regulations (on top of those already in place for the operation of standard trailers) would be applied to operators of LST trailers.
4. The LST trial has seen a reduction in journeys and pollutants compared to standard HGV operation. The trial to the end of December 2019 thus far has seen an average 8% distance reduction across operators within the whole of the trial and savings of over 45,500 tonnes of CO2 emissions and 82 tonnes of NOx. Post-trial, this would be expected to have a positive impact on emissions and congestion. Modelling has been undertaken on the basis that the distance reduction would continue as modelled from the trial observations. In the trial, the highest pollutant savings per mile were on minor roads and 6.2% of the emission savings were found to be within 200 metres of Air Quality Monitoring Areas. We would expect these proportions to continue should LSTs be allowed to enter into general circulation subject to LSTs operating in the same way as they did under the conditions of the trial¹.
5. The schematic below illustrates the differences between a current standard articulated lorry (top), the proposed articulated lorry with a longer semi-trailer (centre) and the standard rigid truck/drawbar trailer combination (bottom) permitted to operate in the UK. Despite stakeholder concerns about the increased road safety risk posed to vulnerable road users resulting from the increased length of the trailer, it should be noted that the total LST combination length is the same as the rigid truck/drawbar trailer combination. It also allows for the same overall loading length in a single trailer body, which may be of benefit in some limited circumstances.



¹ Risk Solutions, Annual Report 2020



Problem under consideration

6. Although the trial is not due to end until 2027, the trial has reached a point where continued evaluation is unlikely to provide enough additional data to increase confidence in the existing results regarding emissions reduction which would change our current assessment of benefits of operating LSTs in certain circumstances. Also, it is becoming unviable for further LSTs to be added because they have to be taken off the road by February 2027. Statistically, significant results have already been obtained, so more expenditure on evaluation of the trial is increasingly difficult to justify. The additional key remaining questions relating to the safety of LSTs in use may only be answered outside of a trial setting. Under the conditions of the trial it has been demonstrated that, with the right management, LSTs can be operated as safely as regular articulated HGV trailers, or indeed more safely, per mile travelled, and also give a safety gain per tonne moved (through making fewer trips) and for total tonnage of load moved. However, until LSTs enter into general circulation and, while still being operated under some appropriate special conditions, are not subject to the rigorous external scrutiny of the trial, we will not know how much of the positive safety differential will be kept. Continuing the trial in its current form is therefore providing limited value for money given that any future data obtained would not change the assessment and only wider circulation will answer the additional questions raised.
7. LSTs have thus far been operating under trial conditions, with requirements as to route planning, reporting journeys, driver training and selection, and a cap on the maximum number of LSTs which can be operated as part of the trial. This creates an operational environment which is unlikely to be replicated beyond the trial. However, by imposing some additional operational requirements beyond those applicable to standard trailers, we expect that the benefits seen during the trial can be maintained and safety risks mitigated. The behavioural impact from drivers moving outside of trial conditions and removing the cap on the maximum number of LSTs is unknown, and no modifications to the trial, such as increasing the cap on LSTs, would truly give us certainty as to what will happen once LSTs get out of trial.
8. The LST trial originally sought to prove whether the operation of LSTs could improve the efficiency of road transport and, if improvement could be achieved, whether this would have the expected positive environmental benefit when compared to moving the same amount of freight by standard HGVs. The use of LSTs in an inefficient way, such as regularly using larger-than-necessary vehicles for a given quantity of freight, would lead to additional emissions. However, a single LST has been modelled to reduce emissions by 4.2 tonnes of CO₂ per year, if LSTs are used as efficiently as the trial average.

9. There is a widely reported lorry driver shortage. The Road Haulage Association², Logistics UK³ and the All-Party Parliamentary Group for Road Freight and Logistics, all report the industry currently being short of many tens of thousands of drivers and expressing concerns at the scale of this shortage. This shortage has worsened due to a number of factors including; Cabotage rights - which allows international hauliers to move goods within another country for a certain number of journeys - for example EU operators in the UK were reduced from 3 to 2 laden journeys within 7 days of arrival of a laden international journey from 1 January 2021. So, there is likely to be a reduction in EU cabotage activity and hence more journeys within the UK. The reduction in EU cabotage is one of a number of factors liable to increase the pressure on driver resources. The shortage of drivers is well-documented and serious. Market adjustments and government actions will affect shortages. By increasing the volumes of load moved per journey, LSTs will help use driver resources more efficiently.
10. Whilst there are efforts being made to remedy this and recruit new talent to the industry the shortage is likely to be a medium-term challenge.
11. The use of LSTs would lead to a reduction in the number of journeys required to transport the same volume of goods as they could remove up to 1 in 8 journeys⁴ where deployed, providing additional capacity to the industry as drivers would be able to move more goods through less journeys and therefore reducing the number of HGVs on the road. The introduction of LSTs should not change the overall demand for haulage, but it is likely to affect the supply by making the moving of lighter goods more efficient. The impact therefore lies generally towards the removal of HGVs from the road and a reduction in journeys needed to move the same amount of goods.
12. The consultation sought stakeholder views on; the future of the trial - feedback on the preferred policy option to end the trial and roll out LST usage more widely and the modelling presented in the previous impact assessment. As the evaluation is providing limited value for money, given that any future data obtained would not change the assessment and only wider circulation will answer the additional questions raised, the consultation provided an option that the trial should continue to the current end date.

Rationale for government intervention

13. Legislation to govern the maximum dimensions of HGVs exists because there are a variety of external costs associated with vehicle length and weight. These include accident risk, damage to infrastructure and impacts on congestion. The private market would not be expected to result in the use of optimum sized vehicles from society's perspective and would possibly lead to an inefficient number of journeys being made as operators did not minimise their external costs on society.
14. Currently, there is a 13.6m maximum for semi-trailer length. The trial that began in 2012 has shown there are a number of potential benefits resulting from extending this trailer length to 15.65m. This intervention is therefore designed to be deregulatory and address a historical regulatory burden.
15. However, it is important that these vehicles are operated safely. Due to the size and mass of HGVs, any significant incident may potentially cause severe injury or fatality to road users. Under the conditions of the trial, LSTs have shown they can be operated more safely than standard length semi-trailers, though it must be noted that this is under very specific conditions. Additional safety measures carry additional costs that are fully borne by the operator. A reduction in the number of accidents benefits the operator and wider society. Given the social benefits are higher than the private benefits, without intervention, safety measures may be under provided. Government intervention may be required to ensure road safety standards are maintained.

Current regulatory regime

16. As part of the conditions of the trial, operators must apply for Vehicle Special Orders (VSOs) from the Vehicle Certification Agency (VCA) in order to legally operate LSTs on GB roads. Applications for

² <https://www.rha.uk.net/news/press-releases/2019-04-april/driver-shortage-%E2%80%93-parliamentary-group-needs-to-hear-from-hauliers>

³ <https://fta.co.uk/media/press-releases/2019/october-2019/hgv-driver-shortage-climbs-to-59-000>

⁴ <https://www.gov.uk/government/publications/longer-semi-trailer-trial-evaluation-annual-report-2019/gb-longer-semi-trailer-trial-2019-annual-report-summary>

VSOs are assessed on a case-by-case basis. They initially lasted for five years, however they now run until the proposed end date of the trial (January 2027).

17. Legislation derived from Europe, particularly Council Directive 96/53/EC, places constraints on the size of vehicles that EU Member States (and the UK post transition) may permit in national or international traffic. For example, for tractor unit/semi-trailer articulated combinations Council Directive 96/53/EC specifies that the maximum length of a combination is 16.5m and the maximum length of a semi-trailer is effectively 13.6m (12m to the rear + 1.6m to the front of the kingpin). Rigid and drawbar trailer combinations are permitted up to a maximum length of 18.75m. The UK/EU trade and co-operation agreement commits the UK to these common standards for transports into, out of, within or across the EU (and effectively all international transports). The UK government considered that the EU rules were consistent not only with the trial operation of LSTs (which was permitted by the EU prior to Brexit) but also for use outside trial operations (a point disputed by the European Commission). But the UK now has the clear freedom to change these rules for domestic transport outside trial conditions.
18. The key item of domestic legislation governing vehicle weights and measures is the Road Vehicles (Construction and Use) Regulations 1986, which transposed EU legislation into domestic UK law and forms the basis for UK enforcement and roadworthiness testing regimes.
19. The Road Vehicles (Construction and Use Regulations) 1986 (as amended) also prescribe manoeuvrability requirements. These govern the ability to negotiate tight turns.

Policy Objectives

20. The objective of this policy is to facilitate more efficient and environmentally beneficial freight transport. It seeks to permit the transport of an equal amount of freight in fewer journeys by allowing longer vehicles, which will achieve an emission saving as less pollutants will be emitted during the transport of the same amount of goods. It is also anticipated that this will have a positive benefit on congestion and productivity as fewer trips will be required.
21. The only policy option put forward proposes that additional regulations (on top of those which currently exist for the operation of standard trailers) be put in place with the aim to support the safe and productive operation of these vehicles.

Description of options considered

22. Each of the policy options that were considered aim to maintain the same broad technical specifications from the trial, extending the length of semi-trailers whilst maintaining the existing gross vehicle weight limit. As explained previously, Options 2 and 3 are not in consideration anymore after the consultation stage but are mentioned in the 'options previously considered' section, where their details are outlined.
23. The Department proposes a permanent extension to the currently allowed UK maximum 13.6 metre semi-trailer length by up to an additional 2.05m, leading to an overall maximum semi-trailer length of 15.65m and total vehicle length of 18.55m. Such a vehicle would have to comply with all other regulations, including on manoeuvrability. This would consequently bring an articulated HGV length in line with a rigid/draw-bar trailer combination (in terms of total vehicle length and the load-platform length). The additional 2.05m of length of a semi-trailer allows an additional 4-8 pallets to be transported, depending on whether the height of the trailer permits pallets to be stacked.
24. The current maximum weight for a tractor unit/semi-trailer articulated combination is 44 tonnes gross vehicle weight (GVW)⁵ and this restriction would be maintained. Some road transport operations, particularly those conveying light consumer goods, after filling a standard articulated trailer to capacity, still have a significant amount of their GVW capacity available to them which they are

⁵ NB: Some vehicles are able to run at heavier weights by exception and subject to more stringent requirements.

unable to utilise. Despite the limited increase in trailer weight due to an LST being longer than a standard articulated trailer, such operators would be able to utilise all this extra space and still remain within the 44 tonnes GVW restriction. The Department's proposal would therefore allow such operators to convey more cargo within the same number of journeys (thereby providing for efficiency gains and lower emissions for each tonne lifted)⁶.

25. In deciding specific policy options, we looked at the objectives of the trial and policy to establish the goal of reducing the number of HGVs on the road whilst transporting the same amount of freight resulting in an environmental benefit being achieved whilst ensuring that outside of trial conditions LSTs incident rate remains as good as or better than standard trailers. From this, we identified 8 factors that operators and the trial evaluators believe have contributed to the positive safety results in the trial and established low to high policy options based on these areas.⁷
26. The 8 factors considered were:
- a. **Vehicle quantity** – The maximum permitted total LST fleet size under the trial is restricted to 2,800;
 - b. **Data collection** – Operators who are trialling LSTs are required to provide to the DfT information relating to journeys LSTs undertake, such as distance the LST travelled and how much of the volumetric capacity of the LST was utilised for each journey undertaken;
 - c. **Driver training and/or certification** – Operators are required to provide training to drivers before they operate LSTs, so they are aware of the unique characteristics of how an LST operates in comparison to a standard articulated trailer. The length and nature of the training varied between the options considered until the consultation. Within the preferred option, the length of the training is set to a minimum of half a day, while the nature of the training is for each individual operator to determine. However, it is proposed that operators will be required (when planning their training) to give consideration to guidance on training that should be provided. It is intended that this guidance will be put together in consultation with operators who have taken part in the trial in order to capture established best practices;
 - d. **Incident reporting** – Operators are required under the conditions of the trial to notify the Department where the LST is involved in an incident, where an injury is caused to a person, and are required to notify the Department of any incident involving an LST causes damage to property;
 - e. **Controls on road usage** – Under the trial the government has set no restrictions or guidelines on the roads LSTs can operate on. The expectation is that LSTs would for the vast majority of each journey operate on the Strategic Road Network in England and the equivalent networks in Scotland and Wales (throughout the remainder of this document where “Strategic Road Network is used” this should be taken to include the equivalent networks in Scotland and Wales as well). As with standard articulated trailers the expectation is that they would be moving large loads between distribution centres and between distribution centres and suppliers and retail sites;
 - f. **Operator licensing regime** – Under the trial, operators are not required to seek approval from the traffic commissioner to operate LSTs. The only requirement is that operators have sufficient capacity on their operator's license to operate the number of LSTs they would like to. If they do not have sufficient capacity, they are required to make an application to the traffic commissioner to request that the capacity on their license be increased in the same way as they would if they required additional capacity to run more standard articulated trailers;
 - g. **Vehicle specification** – Under the trial, operators have the choice of two lengths of LST: the 14.6 metre and the 15.65 metre. They also have the choice of whether the trailer should operate a command steer, self-steer system or active steer system which affect the tail swing behaviour and driving characteristics of the trailer. In the case of the self-steer option there is a requirement when commissioning the manufacture of a self-steering LST that consideration should be given as to whether there is a technical requirement for the trailer wheels to

⁶ Risk Solutions

⁷ <https://www.gov.uk/government/publications/longer-semi-trailer-trial-evaluation-annual-report-2019/introducing-and-managing-lsts-an-industry-led-summary-of-good-practice>

automatically lock in place (i.e. the wheels are unable to turn as they would if the trailer were going round a corner) when the LST is travelling at speed;

- h. **Maximum trailer age** – Under the trial no maximum operating life, either in terms of age, distance travelled, or tonnes lifted, has been placed on LSTs.

27. Additionally, we looked at what to do with longer semi-trailers that are currently on the trial should the government not allow unrestricted numbers of longer semi-trailers to operate.

Option 0: Do nothing (baseline)

- 28. The trial continues as planned until the current end date, 31 January 2027. The cap of 2,800 vehicles and each of the 8 conditions described above would be maintained. Operators would continue having to apply for an allocation of LSTs and be required to apply for a VSO covering each LST they wish to operate. Operators would also be required to continue to have to submit data returns every 4 months regarding each trailer's journey log.
- 29. At the end of the trial, trailers would cease to be able to operate as the VSOs would expire and as it stands LSTs are not permitted under the Road Vehicles (Construction and Use) Regulations 1986. This may be before the end of a standard lifecycle for some trailers which have been purchased by operators at their own cost.
- 30. This option would not achieve the policy objectives. However, a 'do nothing' counterfactual is used as the baseline against which the impacts of other options are estimated in line with HM Treasury Green Book principles.

Option 1: Lighter additional regulatory option (PREFERRED POLICY)

- 31. This option is the preferred policy option as it allows the whole of the freight industry to have unrestricted access to LSTs whilst taking into consideration the concerns about road safety. Where operators identify that LSTs could be of benefit to their business, they will be able to operate them, which enables the industry to make an important contribution to reducing emission levels. The regulations proposed are in addition to those operators would be required to adhere to if they were/are operating standard trailers. They take into consideration concerns which several interest groups have about LSTs being operated on inappropriate roads. Concerns include damage to street furniture and increasing the road safety risk, particularly to vulnerable road users such as cyclists and pedestrians. The regulations are designed to ensure that the excellent safety record of LSTs under the trial is maintained outside of the trial conditions.
- 32. This option would see the removal of the cap on the total number of LSTs allowed to be operated by the road haulage industry, therefore allowing the market to decide the quantity which would be in operation based on commercial need. This option would reduce the amount of regulation and monitoring of LSTs required by the Department, compared to the trial, on the basis that the environmental and economic case for operators using LSTs in certain circumstances has been proven, and that to maintain such reporting requirements would only discourage operators where there is a sound business case for switching to operating LSTs. To help maintain the good safety record of LSTs operated under the trial this option proposes that regulatory measures a and b listed below are continued, whilst regulatory measures c to g will be introduced to ensure LSTs are being operated only on roads appropriate for their operational characteristics:
 - a. Reporting to the Department where an LST is involved in an incident which results in a loss of life, injury and (subject to further review) serious incidents that have caused severe damage or required a major emergency response;
 - b. Additional LST-specific driver training and guidance being issued and encouraged before operating LSTs;
 - c. Operators would be required to use the Vehicle Operator Licensing (VOL) system when they start to operate LSTs confirming they will operate them according to the conditions being set out in regulations and amplified by guidance. They could be required to maintain records in a timely manner to convey the identity of which LSTs they operate as this would enable the number of LSTs and who is operating them to be monitored.

- d. Before allowing an LST to operate a fresh route, the operator will be required to undertake a risk assessment to ensure the route proposed is appropriate for an LST to follow. A fresh route risk assessment can refer to existing risk assessments for sections shared with previously assessed routes;
 - e. Operators will be required to retain a record of all risk assessments undertaken prior to LSTs undertaking journeys for up to five years and will be required, if requested to do so by the police, Driver & Vehicle Standards Agency (DVSA), Office of the Traffic Commissioner (OTC) or traffic commissioner, to provide the records or records of risk assessments undertaken;
 - f. Operators will be required to put in place a system where drivers are able to provide feedback (either before or after a journey has been undertaken) where they believe it is not appropriate for the LST to operate on the route proposed/followed. It will be a requirement that a record of this feedback and the response provided by the operator is retained for five years;
 - g. Operators will be required to undertake an appropriate level of compliance monitoring to ensure LSTs are being operated on the routes set and to take appropriate action where deviations are identified. It will be a requirement that a written record of compliance checks undertaken, the outcome of such checks and the outcome of any action taken is kept for five years. Whilst this requirement relates primarily to monitoring driver compliance with the set route, this also requires operators to have a protocol in place to be followed in the event that the route becomes unavailable (a) with time available to plan an alternative and (b) where the route is closed suddenly, including during a journey (road works, accidents, etc).
33. LST operators would be required to report any incident on a public highway or on private land which resulted in a death or injury being caused. It is possible that, in the future, we could specifically identify any LST involvement in accidents resulting in deaths and injury on roads through Stats19 data. There are no firm plans and this may be a disproportionate requirement for the Stats19 process, including for police forces who record much of the data.
34. Operators would be encouraged to provide drivers operating LSTs with training specifically related to the driving of the LST design before they are permitted to operate those LSTs. The suggested training lasts around half a day and that operators would follow an LST training best practice guidance document when considering what training they would provide to drivers. Operators would also be expected, where a driver of an LST is involved in an incident, to consider whether both the driver involved in the incident and all other drivers entitled to operate LSTs should undertake further training or be provided with information about the incident to minimise the risk of the incident happening again. Guidance will suggest how operators might also need to consider whether they need to make any adjustments to the training and LST awareness of other staff (other than drivers) where their role relates to the use of LSTs, to support compliance with the regulations, although no separate requirement for this is envisaged.
35. For vehicle specification, no changes are proposed to be made to the technical regulations which govern the design and operating requirements of LSTs, given the experience of the trial.
36. It is proposed in this option that no upper age limit should be placed on the life of LSTs as with standard trailers, however they will be subject to roadworthiness testing.

Options previously considered

37. Two of the options which had been considered until the consultation stage are not in consideration anymore. These are Option 2, heavier regulation of LSTs, and Option 3, which looked at allowing LSTs to enter into general circulation and operate on the same basis as standard trailers.
38. The reason that Option 2, heavier regulation of LSTs, was removed from the final IA was that it was deemed too heavy of a burden on operators, especially smaller businesses. The extra requirements on businesses were even more stringent than the trial ones and included measures such as tracking the journeys of every single LST by GPS and storing the data, which was considered too high of a cost and created a substantial barrier to entry into the LST market for small and micro businesses. The estimated Business NPV calculated for the consultation stage IA were negative in the Low (£ -114m) and Central (£ -14m) scenarios and were in turn also not likely to be able to achieve the policy objectives of a positive environmental impact.

39. The views gathered through the consultation from those who had previous experience within HGV operations and understood the level of compliance required to operate LSTs in a safe environment showed a consensus in favour of lighter regulations. The main message from operator and trade associations were that heavier regulation was either excessive or surplus to requirements. The prescriptive approach taken in Option 2 was also not expected to increase safety and is probably why the responses to the consultation from operators and road haulage associations were against it, as many of these additional regulations were already fulfilled through their obligations under current regulation of commercial vehicle operators – such as training requirements and health and safety regulations.
40. In contrast, individuals and charities that responded were keen on the heavier regulation as they had concerns for vulnerable road users, however the statistics on those during the LST trial were very positive. The aim of the preferred option is to try and maintain these positive impacts to the real world by also having similar safety requirements in place as within the trial.
41. Option 3 was removed primarily due to concerns surrounding the safe operation of LSTs. Anecdotal evidence from operators within the trial is that particular care is needed when operating longer trailers, and that LSTs were operated and treated specially by operators – hence the positive safety statistics per mile of operation. The trial is associated with drivers having the necessary training to operate them and routes being assessed before journeys to make sure LSTs can operate on those roads. Not having these added measures would reduce, and place at risk, the safety benefits. It is also possible that Option 3 – allowing LSTs into general circulation – could lead to a situation where these heavier vehicles are badly run and the overall carbon impact would be lesser than the preferred option, or even have an overall negative carbon impact.

Option 2: Heavier additional regulatory option (not in consideration anymore)

42. This option was similar in principle to Policy Option 1, but with a few key differences which increased the amount of regulation related to operating LSTs. It was removed due to it being considered the least viable of the options due to the burdens it imposed on operators, with too many restrictions on businesses operating LSTs.
43. Like Option 1 (lighter regulation), Option 2 (heavier regulation) did not place any restrictions on the total LST fleet size and applied the same reduction in regulatory and monitoring measures required by the Department in relation to the operation of LSTs using the same rationale as mentioned in the lighter regulation option (Option 1).
44. This option sought to bolster the regulatory measures proposed under Option 1 in order to better ensure the safety record of LSTs was maintained. Like under Option 1 the same reporting measures were required where there was loss of life, injury and also damage. This option would have strengthened the driver training requirements, required LST operators to run at least 80% of each journey on the Strategic Road Network⁸ and Abnormal Road Network, and required operators to be able to accurately record the route each LST took for each journey, keeping a record of that route and being able to provide data of journeys undertaken on request.
45. To achieve the 80% requirement, operators would have been required to ensure appropriate route planning was undertaken before each journey, while undertaking an appropriate level of compliance checks to ensure this requirement was being achieved and also taking appropriate action where this was not being achieved. Operators would also have been required to maintain records to demonstrate that appropriate route planning had taken place before each journey and that compliance checks were being undertaken.
46. To ensure operators were compliant with the 80% requirement, operators would have been required to collect data on the route each LST took for each journey, with the possibility that this data be called for by the regulator to be examined and then further enforcement action could have been taken where appropriate. To ensure operators collected data on every journey that was undertaken by an LST, operators would have been required to accurately track their LSTs by GPS and have a system in place to collect and store this data for an indefinite period. The operators would also have been

⁸ The Strategic Road Network (SRN) comprises the nation's motorways and major A roads, and is managed and maintained by Highways England.

required to, upon request of the police, DVSA, OTC or the traffic commissioner, format the data in such a way that they could provide a map of the route(s) in order for the requestor to be able to identify whether the 80% requirement was being achieved.

47. The police, DVSA, OTC and the traffic commissioner would have been able to request such information whether the matter that was being considered related specifically to that operator's operation of LSTs or not.
48. Where operators considered that it would have been beneficial to their business to operate LSTs, operators would then have been required to apply to the traffic commissioner for permission to operate a permitted number of LSTs. The application would have been made in the same way and would have followed the same process as if it were for permission to operate standard trailers. Given the increased risk of operating LSTs when compared to standard trailers because of their greater tail-swing (the amount the rear of the trailer swings out during tight turns), the traffic commissioner would, when considering a first application, be free to take into consideration the same points as set out in Option 1 and in addition:
 - a. The process the operator intends to put in place to assess the routes it is proposed LSTs will undertake to ensure routes comply with the 80% requirement;
 - b. The process the operator intends to put in place in respect to undertaking compliance checks and actions they propose to take where failures are identified.
49. When considering any request by an operator to increase the maximum number of LSTs they are permitted to operate, traffic commissioners would have been free to give consideration to the same points as listed in Option 1.
50. With regard to driver training, the requirements would have included those considered under Option 1. However, there would have been the additional requirement that drivers would have been, as part of their ongoing learning in order to renew their certificates of professional competence (CPC) every 5 years, required to undertake a specifically approved LST training course prior to operating LSTs and to be able to continue operating LSTs.
51. In respect to incident reporting and vehicle specification, the requirements would have been the same as under consultation Option 1.
52. Finally, for trailer age it had been decided that operators would have been required to apply to the traffic commissioner on an annual basis for approval to continue to operate an LST once the trailer was over 10 years old. This requirement was felt necessary to ensure the expected benefits would continue to be achieved as there was a possibility that, particularly once LSTs had been sold on the second-hand market, they may become the default option for a large portion of the industry. This may lead to inefficient usage of LSTs, whereby goods that would fit in a 13.6m trailer are carried in the 15.65m trailer, thereby unintentionally increasing carbon emissions from the use of LSTs.

Option 3: Allowing LSTs to enter general circulation and operate on the same basis as 13.6m semi-trailers (not in consideration anymore)

53. This policy option, like Options 1 and 2, did not place any restriction on the total LST fleet size. In addition, it proposed that LSTs should be allowed to operate under the same restrictions as standard trailers do, therefore placing no additional regulatory burden on operators.
54. Although the introduction of LSTs would have provided operators with another option in regard to how they transported goods, operators would not have been required to apply to the traffic commissioner for specific authority to operate LSTs. The operator would have been provided with authority automatically under the maximum number of standard trailers they have authority to operate. Operators would only have been required to make an application to the traffic commissioner if they did not have sufficient capacity on their operator's license to run the number of LSTs they wished to in the same way as if the operator wished to increase the number of standard trailers operated but had reached the maximum permitted on the license.
55. Under this option, operators would have still been required to ensure that drivers operating LSTs had undertaken appropriate training in the same way as required under Option 1 with the exception that no minimum amount of time would be set as to how long this training would have to last.

Recommended option

56. Our preferred option is Option 1. This option allows the whole of the freight industry to have unrestricted access to LSTs where operators identify that LSTs could be of benefit to their business and so ensure the industry makes an important contribution to reducing emission levels. Since the consultation, the exact way this option would be implemented legally has been developed, including the way in which some of the additional controls would be implemented.
57. Option 1 would reduce the amount of regulation and monitoring of LSTs required by the Department on the basis that the environmental and economic case for their use in certain circumstances has been proven, and that to maintain such reporting requirements would only discourage operators when there are both business and societal benefits to operating LSTs.
58. This option is designed to support maintaining a good safety record for the operation of LSTs, without placing significant additional burdens on operators that do not have a demonstrable impact on safety. The trial has shown that operators are individually able to identify and provide the training they feel their drivers require to understand the unique operating characteristics of LSTs and for LSTs to be operated at least as safely as standard articulated trailers. Given the success of the training provided to drivers operating LSTs under the trial (shown by the very favourable safety record of LSTs being operated), this option suggests the broad replication of what has been done in the trial.
59. The requirement that LST operators notify the Department of having LSTs would allow the Department to quickly identify and take action should the rate at which LSTs are involved in such incidents/accidents appear to be significantly above the rate expected. The Department will estimate the distance travelled by LSTs, which is necessary to calculate rates and not require returns from operators about the mileage travelled. The purpose of this reporting is to provide assurance to DfT that operators continue to operate LSTs safely, as well as enabling the Department to effectively monitor their use and flag up where other requirements, such as route risk assessment and compliance, are not being properly carried out by operators. In addition, it could help facilitate further investigation of issues associated with an incident connected to a breach of the operating conditions of LSTs.
60. Not only does this option present the highest NPV out of the options that were considered previously, it provides benefits that align with the policy objectives while balancing the potential increased safety risks that could emanate from this regulatory change. If LSTs are regulated too tightly, the impact could be under-utilisation and therefore not maximising the possible benefits to society. If the use of LSTs were not regulated, there would be a risk of over-utilisation and inefficient use of LSTs which may have an overall negative impact by putting safety at risk and increasing CO₂ emissions and other pollutions. This preferred option of lighter regulation represents the best balance to fulfil the policy objectives.

Innovation Test

61. Further to the sensitivities and risks outlined throughout this IA, we have specifically considered both how these regulations may affect future innovation, but also how future innovation may affect these regulations. This is particularly the case where the legislation being sought to be changed here could hinder future development of technologies and require changes in the future, or where new technologies can change the policy risks, we aim to mitigate this through regulation.
62. Given the policy intervention here, and its deregulatory nature, the impacts on future innovation are expected to be low. This is given that we are prescribing that it is solely the length of the LSTs themselves that will be subject to this new regulation and not the length of tractor and trailer combination. However, there has been some innovation – and more is possible – relating to the steering of trailers which must meet requirements for turning, while limiting the tail-swing. The Department is currently considering a technical feasibility study on an even longer and heavier vehicle combination. To emphasise, this is in consideration of whether it would be safe enough to be operated and if so, how to do a trial, which would be needed before any out-of-trial running was considered. Should the operation of even longer length vehicle combinations be brought forward, it is likely that given how close a 15.6m trailer and tractor combination is to the maximum permitted combination length, regulations would require more radical revision. However, before doing so a number of questions would need to be answered:

- a. Would allowing an even longer trailer to operate have any benefit, or is it unlikely that any additional volumetric capacity would be utilised due to the additional weight of the trailer? It is likely this would require that the current maximum GVW of 44 tonnes be increased which would necessitate an assessment of bridges to identify whether any restrictions should be placed on the maximum permitted GVW at particular bridges. This would be expensive and time consuming, as was the case during the 1990s when the GVW limit was increased.
- b. What would be the potential road safety impact of operating such trailers? A road network currently already exists which is approved for loads over 44 tonnes or longer than the maximum permitted combination length to travel on. It is likely that roads outside this network would have to be reassessed to identify whether such vehicles could safely operate on these roads.
- c. Will future innovation see the adoption of more hybrid or electric tractor units which might lead to a change in the cab size of HGVs, which could increase the length of the vehicle? Through only specifying the trailer length, this would have no impact on future regulatory changes based on this regulation change.

2.0 Costs and Benefits

Summary of analysis and results

£million, 2019 prices, Present Value Base 2022, PV 20 years	Option 1		
	Low	High	Best Estimate
Direct Business costs	438	292	365
Non-business costs	195	195	195
Business benefits	657	803	702
Non-business benefits	910	1076	1035
NPV	933	1392	1177
Business NPV	219	511	337

63. The preferred policy option of lighter regulation would be a permissive regulation, and although there are certain steps operators would or may need to make to be able to operate an LST – such as applying to change their licence to the OTC, and subsequent driver training – this regulation change is considered to be the only thing holding businesses back from operating as they would otherwise do and use LSTs. Following guidance from the RPC, these are considered to be direct impacts to businesses.
64. The use of LSTs leads to changes in the patterns of private and societal costs and benefits, through two main channels:
 - a. the change in articulated HGV mileage, and
 - b. the change in the impact of each articulated HGV mile driven.
65. The use of LSTs can enable the same overall amount of goods to be transported with reduced overall lorry mileage, given their additional capacity. This should deliver private benefits (e.g. reduced operating costs for hauliers) as well as social benefits (e.g. reduced congestion and emissions). However, we expect these benefits to be partially offset by an increase in the private and social costs per mile driven (e.g. increases in emissions) associated with the increase in vehicle size and weight and its impacts on more challenging manoeuvrability. In this IA, we have been able to quantify and monetise the beneficial impact of changes in lorry mileage, but not the scale of the additional cost per mile driven. The question of whether LSTs have a fuel penalty has been much discussed during the

trial. As part of the first data submissions within the LST trial from operators to Risk Solutions, average fuel consumption and its ranges were collected, and discussions were held during the trial with groups of operators which concluded that any penalty would be very small and would be impossible to distinguish from the other factors in real world use – such as weather conditions, efficiency of the driving, engine, nature of the route and weight of the vehicle and cargo. The only way to properly assess this would be to carry out a 'head-to-head' trial between an LST and a standard trailer, which has not been done. The pre-trial research suggested the difference was about 1.8%. In a small real-world trial, attempting to verify this level of difference would be liable to be lost in data noise and other factors differing between the vehicles and driving in a head-to-head trial. The consultation stage was used to try and develop the evidence base to better monetise some of these impacts but did not return any answers.

66. There is uncertainty about the level of uptake which has been generated based on trial data and scaled up to the post-trial environment using established data sources. However, this uncertainty has not been reflected in the high/low range of costs and benefits. The NPV will, broadly, be proportionate to uptake. This means that if the scale of uptake is higher/lower than expected, the NPV will follow the same direction. This should not significantly change the relative costs and benefits, but only change the scale of the NPV.
67. There is also a trade-off around the degree of regulation for LSTs. Regulatory measures, such as route risk assessments and the proposed driver training are intended to ensure that LSTs are used in a way that maximises their benefits and minimises their costs. However, regulations need to be balanced against the burdens they impose on operators which could lead to lower levels of uptake and use of LSTs which have proven under trial conditions to deliver the desired policy outcomes. These assumptions affect both the level of uptake, as driven by the regulatory burden imposed, and the resulting distance savings which are the behavioural response resulting from the use of LSTs under the preferred option. There is moderate uncertainty around the broad determination of these assumptions as discussed in the risks and uncertainty section.
68. This analysis has been conducted using data from the trial up until the end of 2019, and the latest 2020 year is not included because of the effects the pandemic has had on traffic which are unlikely to be representative of LST usage over the policy appraisal period. Additionally, Risk Solutions have noted no significant changes in the overall conclusions between the Annual Reports for 2019 and 2020. We still believe the trial data between 2012 and 2019 is sufficient in determining the impact of LSTs on HGV usage, despite the end of the transition period, because LSTs were only to be used domestically within the UK and were not impacted by the UK being part of the EU or not.

The scaling model

69. The scaling model underpins the whole of this analysis by providing a way of forecasting future uptake and estimating the societal impacts from the LST trial data. This is applied in Option 1 to compare the impacts against the baseline of the trial simply continuing until its planned end in 2027.
70. The Department commissioned Risk Solutions to design a process to collect data to support the evaluation of LST performance and set up the initial systems for data collection from operators. Risk Solutions act independently to review the operation of the trial and then report back to the Department on the usage of the LSTs including key statistics that have been used in this IA.
71. The production of a scaling model was commissioned by the Department as part of the trial contract to provide a method for scaling up the trial data to the wider haulage population and reporting the results suitably for use within the economic analysis for the IA. The description below is a simplified explanation of its workings and for any further details please look at the Annex 4A from the 2019 LST trial Annual Report⁹. The data received throughout the trial period, alongside sample data from the Continuing Survey of Road Goods Transport (CSRGT), allows the forecast of uptake and usage of LSTs until 2040. The CSRGT data is a survey of GB-registered HGVs which provide details of their UK activity within a specified week to allow the Department to build a picture of domestic activity of GB-registered hauliers. Further detail and aggregated statistics can be [found here](#).

⁹ LST 2019 Annual Report available at: <https://www.gov.uk/government/publications/longer-semi-trailer-trial-evaluation-annual-report-2019>

72. Operators within the LST trial were found to have an average reduction of 8% in vehicle kilometres to move the same amount of goods, which was found to be different depending on which types of goods were carried and therefore was clustered by types of good carried, with some showing a higher reduction in vehicle kilometres, and therefore savings, than others. These clusters were combined with data on projected take-up of LSTs gathered from operators in 2017 by Risk Solutions and mapped to the goods type. The projected uptake was taken from a survey launched in 2017 which had 126 responses from operators to validate information sources and inform the further analysis. The survey yielded information on the drivers for replacing vehicles and the time horizons involved, which are key inputs into the scaling model. A more detailed breakdown of this cluster analysis is available within Annex 4B of the Annual Report linked above.
73. Within the CSRGT data, the goods types identified above were mapped to the 'Commodity' field and specific exclusions were applied to those segments of the CSRGT data which would not be amenable to the use of LSTs. These exclusions cover scenarios where the operators are not amenable to use LSTs because they carry goods which are too heavy to benefit from the extra spatial capacity as the weight would exceed the current payload limit of 44 tonnes. These journeys are assumed to remain eligible for the appraisal period and they represent the 'Do Nothing' scenario that the LST trial data is compared with to get estimates of the vehicle kilometres reduced by operating the LST, as well as the emission savings. The future projection model then calculates the number of LSTs and miles saved based on when future policy changes might occur. The distance savings calculated from the model are also used to build estimates of avoided emissions using emissions factors generated from emissions and route modelling based on actual trial data.
74. These emission factors are built using the National Atmospheric Emissions Inventory's figures for both the Euro V and Euro VI estimates¹⁰ and the projected fleet composition between the two for the next two decades. The change from Euro V to VI primarily affects the projections for air quality impact from NO_x, with little or no influence on the modelled greenhouse gas emissions. This is captured in the modelling, which uses both Euro V and Euro VI emissions factors and profiles the fleet composition between the two from BEIS' (Department for Business, Energy & Industrial Strategy) projections¹¹. As CO₂ emissions are (and NO_x is less so) based on fuel consumption, there is some variability in these numbers as vehicles become more efficient over time, and it is expected that the benefits from lower emissions will decrease over time as greener vehicles start becoming available in the later stages of the appraisal period.
75. The scaling model utilises two different scenarios relating to the take-up of LSTs, take-up A and B, which are based on a survey of operators on whether they plan to take-up LSTs. Under take-up A, which is a scenario where the infrastructure remains the same, it uses the initial findings from the survey to forecast the increased usage over the first 10 years of the policy introduction. After this, there is an assumption that a signalling effect would take place and the infrastructure improvements would be more accommodative to LSTs being used – this is taken into account within the sensitivity using the take-up B scenario which shows a scenario where the infrastructure is adapted 10 years after the introduction of LSTs to accommodate for them which increases the uptake of LSTs by operators. The assumption of 10 years has been used from conversations with industry on how long it would take to factor these into improvement plans and for these works to be carried out. There is some uncertainty around this which is discussed in the risks and uncertainty section. We have omitted the second uptake scenario (extending take-up A assumptions for the full assessment period) from the main forecasts given the uncertainty, but there is a sensitivity using this take-up B scenario. Since the consultation has not brought back any responses specifically on the consultation stage IA, we are keeping to this conservative approach and the figures are therefore a conservative picture of the take-up, and impact, of LSTs.
76. Further to the take-up scenarios, we also have a modelled transition year whereby there is low growth in LST numbers or modelled distance savings. This is due to the expectation that there would be a delay in understanding and implementing business changes after the regulatory changes, coupled with a delay in manufacturing the LSTs required to meet demand. This expectation was tested at consultation and brought back no responses. The trial fleet renewal is included within this transition

¹⁰ These are European emission standards for large goods vehicles, with Euro VI being the latest standard, while Euro V was the standard when the LST trial started in early 2012.

¹¹ Available at: https://naei.beis.gov.uk/resources/rtp_fleet_projection_NAEI_2017_Base2019r_v1_1.xlsx

year, where LSTs from the trial that are reaching the 10-year life cycle of the trailer (which is one of the assumptions used within this IA) are being replaced with new ones due to the regulation being implemented. Currently we have assumed a regulation introductory year of 2022, and therefore 2022 is a transition year with modelled uptake starting from 2023. In theory, further LSTs may begin operating before 2023 if they place orders early, but these would be captured in the following year.

77. We have been conservative on some of the assumptions and have used a sensitivity on the outputs reflecting the uncertainty surrounding the uptake based on the regulation against that of the trial conditions. Therefore we have assessed that any savings would be lower outside trial conditions as some inefficiency might occur, and that the regulation imposed may act as a barrier to deciding to use LSTs – although less of a barrier than the trial as the regulation would give certainty about the future of LSTs for operators to make decisions and the second-hand market will likely enable easier entry.
78. Use of the scaling model has allowed us to forecast the number of LSTs we would expect to be in operation based on the average miles saved per LST observed in the trial. The LSTs considered within Option 1 are the additional LSTs taken-up from the implementation of regulation. They therefore do not include the LST trial fleet until the end of the trial in 2027 within the Option 0 scenario, except when the LSTs from the trial fleet get replaced due to the preferred policy option being implemented. These have been summarised in 5 yearly periods in the table below for each option.

LSTs in operation	2022	2027	2032	2037	2041
Option 1	429	13,318	18,645	18,645	18,645
Take-up B sensitivity	429	13,318	27,299	27,299	27,299

79. Furthermore, the scaling model allows for the calculation of the miles saved through the introduction of the policy, based on the approaches set out above. This currently assumes that the vehicle kilometres saved in the real world will be slightly below the observed trial savings, as there is potential that this would decline as LSTs enter general circulation.
80. These vehicle kilometres saved are summarised in the table below in 5-yearly periods, with the sensitivity looking at the take-up B scenario, which takes into account a higher take-up in LSTs after 10 years once the infrastructure has been updated to accommodate them. Similar to the table above, these figures represent the vehicle kilometres saved from the LST take-up from the regulation being implemented, and therefore do not include the LSTs from the trial except when these are replaced due to the regulation being implemented.

Vehicle km saved (million km)	2022	2027	2032	2037	2041
Option 1	1.65	67.29	99.50	105.09	109.80
Take-up B sensitivity	1.65	67.29	145.68	153.87	160.75

Option 0 – Baseline

81. There are no direct costs associated with this option as this is the counterfactual and will be used to compare further options against. The counterfactual considers the current policy whereby the trial continues to operate until it expires then operators would return to the baseline of the continued use of standard trailers. Therefore, it is only necessary to model the remaining trial period to calculate the impact from increasing the numbers of trailers to those observed in Options 1 to 3. Currently the trial will end on 31 January 2027, however, for simplicity we have modelled the trial ending at the end of 2026.

82. Throughout the analysis, the costs and benefits have been modelled by taking the difference in the numbers of vehicles (and the resulting distance and emissions savings) under the baseline and the take-up modelled for each option through the scaling model. Therefore, Option 1 presents the additional impacts compared to the trial continuing until the end of the period, capturing the diminishing usage which is explained below.
83. It is assumed that freight operators with current LST VSOs will continue to use their LSTs as they have currently throughout the trial period, replacing the trailers in line with expectations of wear and tear or damage incurred. However, once a trailer reaches its end of life, we have assumed that the operator would replace the trailer with a standard one even if this is before the end of the trial. This is due to both the increased cost in purchasing an LST and the risk of a 'stranded asset', whereby they buy a new LST with an approximate lifespan of 10 years that they can only use for a small number of years until the end of the trial in 2027. Based on the current evidence, the average life expectancy of an LST trailer is around 10 years¹², and for the purposes of modelling, those already in use will cease to be operated when they reach 10 years of age. However, we do acknowledge that a trailer's life expectancy is based on the miles travelled as well as age, and this might be different for the first and subsequent owners, but we will use the average of 10 years for modelling purposes until a more reflective average is obtained. Currently, trailers are only a maximum of 9 years of age, so the first trailer lost in the counterfactual will be in 2022. Although advice was sought on this during the consultation, no response was received and we are assuming LSTs have the same life expectancy as the industry life cycle for trailers, which is currently at around 10 years¹³.
84. When the LSTs reach the end of their life expectancy, we have assumed that they will be scrapped as they no longer have useful remaining years and the resale market will diminish as the trial nears its completion. This is in line with observations from discussions with industry, as many LSTs which are being operated on a lease/hire basis which are due for renewal are not being renewed until a positive decision is made, which will contribute to this decrease. Within the modelling we have assumed there would be no net gain from scrapping LSTs (i.e. the costs of disposal equal the scrappage value of the trailer). Again, clarification on this assumption was sought at the consultation but did not result in any responses.
85. Throughout this analysis, a 20-year appraisal period has been used. This differs from HM Treasury Green Book default practice as there are factors specific to this intervention that justify a longer appraisal period. This is due to the expectation that most operators who are small or medium businesses will not purchase LSTs immediately and will wait until they need to replace a trailer. Upon discussions with our evaluation consultant, Risk Solutions¹⁴, it is expected that this could take up to 10 years for these businesses to replace their trailers. Given the expected life expectancy of the trailers being 10 years, we have modelled this 20-year period out to 2041 to capture the life-cycle benefits of the trailers introduced in 2030.

Option 1 – Lighter additional regulation (PREFERRED POLICY)

86. This section presents the analysis undertaken for the first option, whereby the number of LSTs being operated is forecast by modelling undertaken by Risk Solutions but using cautious assumptions about the uptake. Under this option, conservative assumptions have been used and it is assumed that, due to the proposed changes in regulation and the lower monitoring imposed than under the trial, the expectation would be lower total savings from LSTs than were achieved in the trial. Given there are also some restrictions and regulation in place, there will be reduced incentive for adopting LSTs compared to if they were regulated in the same way as standard trailers, an option that was dismissed following consultation.
87. We sought during the consultation stage any information to strengthen the assumptions used in this analysis for the final stage of this policy.

¹² Some sources (such as the [Transport Engineer Report](#)) cite a trailer life of 11 years, so the 10-year assumption may be conservative.

¹³ 'Overview of the UK Commercial Vehicle Industry', 2016. Available at: <https://motortransport.co.uk/wp-content/uploads/2018/04/Texaco-Report-2016-1-3.pdf>

¹⁴ In the 2017 future uptake survey conducted by Risk Solutions, 55% of respondents suggested a replacement cycle of 5-10 years.

Impact	Type of impact	Direct/Indirect
<u>Costs</u>		
Initial assessment	Business, Transition cost	Direct
Viability assessment	Business, Transition cost	Direct
Trailer replacement costs	Business, Ongoing cost	Direct
Regulation costs	Business, Ongoing cost	Direct
Reduced fuel taxation revenue (Impact on government)	Non-Business, Annual cost	Direct
<u>Benefit</u>		
Fuel saving	Business, Annual benefit	Direct
Labour saving	Business, Annual benefit	Direct
Tyre saving	Business, Annual benefit	Direct
Repairs and maintenance savings	Business, Annual benefit	Direct
VED and RUL savings	Business, Annual benefit	Direct
Congestion (non-business)	Non-Business, Annual benefit	Indirect
Congestion (business) - 8% representing percentage of business traffic in terms of total journey kilometres ¹⁵	Business, Annual benefit	Indirect
Air Quality	Non-Business, Annual benefit	Indirect
Greenhouse Gases	Non-Business, Annual benefit	Indirect
Infrastructure	Non-Business, Annual benefit	Indirect
Noise	Non-Business, Annual benefit	Indirect

¹⁵ The 8% figure is based on stats from the National Travel Survey, 5-year average (2015-2019) on the average distance travelled by purpose and main mode (Table NTS0409b).

Summary

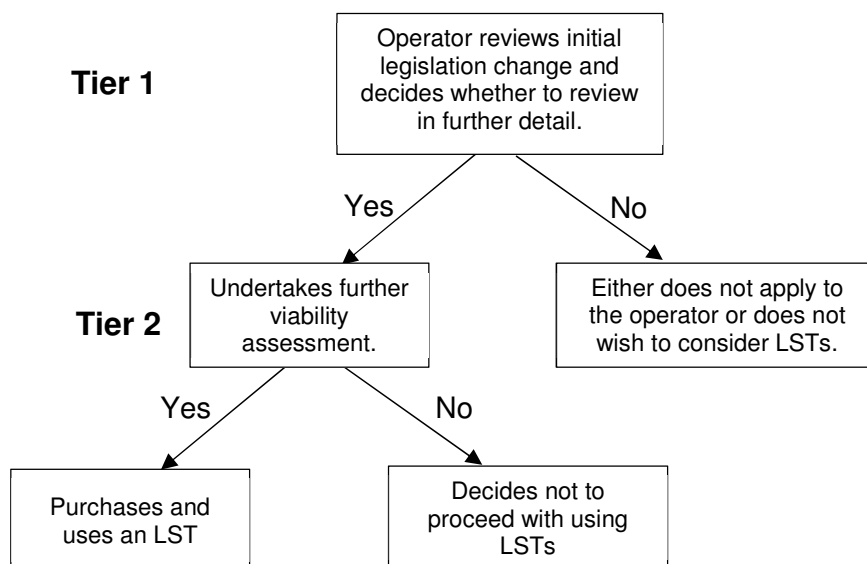
£million, 2019 prices, PV 20 years	Option 1		
	Low	High	Best Estimate
<u>Costs</u>			
Trailer Replacement	236	157	196
Taxation Revenue	195	195	195
Regulation costs	162	108	135
Initial assessment	11	7	9
Viability assessment	29	19	24
Total Costs	633	487	560
<u>Benefits</u>			
Fuel Saving	318	380	349
Labour Saving	278	347	289
Congestion	488	654	614
Air Quality & Greenhouse Gases	227	227	227
Infrastructure	133	133	133
Noise	61	61	61
Tyre saving	12	15	13
Repairs & Maintenance saving	39	49	41
VED and RUL saving	9	12	10
Total Benefits	1566	1879	1737
NPV	933	1392	1177

Costs

Transition costs

Costs associated with familiarisation

88. Within this category the familiarisation costs have been broken down into two tiers, the first being those who will review the regulatory change to identify at a high level whether there is an opportunity for their business to operate LSTs. The second tier is where the answer to this initial question is yes, and they will then review the changes in more depth and assess whether it would be viable for their business. This is summarised in the diagram below.



Transition costs (i) Review legislation

89. It has been assumed that all operators who operate standard trailers will choose to familiarise themselves with the regulatory change to then identify whether the opportunity to use LSTs will enable their business to operate more efficiently or to ensure that it does not affect their business, regardless of whether they choose to adopt the change or not. This is referred to as a 'Tier 1' cost. These costs are likely to arise from a single individual or group of individuals within an organisation reviewing the regulatory change to ensure they are still compliant and the potential scope to utilise this regulatory change within their business, which will result in some time costs. Similar to the other time costs assessed, these have been estimated from the amount of time we would expect this to take and applied this to calculate the overall cost based on an average day rate. This is presented as a direct cost in this policy as the expectation is that all operators would do this irrespective of whether they wish to use LSTs or not.
90. The operators in scope for the Tier 1 cost are those who have an HGV operator's license, which has been obtained from Table 1 in the traffic commissioner's Annual Report¹⁶. This report provides us with all the goods vehicle operator licenses in the UK by the type of licence: restricted, standard national and standard international. It is assumed that the only operators in scope to review this legislation will be those in the restricted and standard national category given that these cannot be operated under international regulations and therefore those operators will not use LSTs. This could be overestimating the number of operators in scope as some of these may not choose to review the regulatory change and will act on an initial instinct, or some will operate on hire for reward with no trailers of their own¹⁷ but will still be within the scope of the data as they will have a license. Given this, we have estimated the cost based on the individuals involved at different levels of the business which would be involved in making the decision. For example, in smaller operations this is likely to be the owner-operator or director and in larger businesses, transport managers with final sign off from directors or a board.
91. Given this range, we have assumed that transport clerks, and either a transport manager or director would make this assessment. Using the ONS (Office of National Statistics) ASHE (Annual Survey of Hours and Earnings) data by detailed occupation¹⁸, we have derived estimates for time based on the hourly pay for 'managers and directors in transport and distribution' (SOC code 1161) and 'transport clerks' (SOC code 4134) to estimate these. Combining the hourly pay, the non-wage labour uplift (NWLU) of 26.5% as specified in the Transport Analysis Guidance (TAG) Unit A4.1¹⁹, and hours

¹⁶ [Traffic Commissioners 2019 report](#)

¹⁷ For example, we would not expect a large proportion of the rigid HGV operators to consider LSTs given the nature of their use and would be largely overestimating the costs.

¹⁸ <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashtable14>

¹⁹ <https://www.gov.uk/government/publications/tag-unit-a4-1-social-impact-appraisal>

worked provides an average day cost of £289. The hours worked per day are calculated by the weekly hours divided by 5. This is summarised in the table below in 2019 prices.

Employee type	Hourly pay (median)	Weekly hours (median)	NWLU	Day pay
Managers and directors in transport and distribution (SOC 1161)	£17.16	40	26.5%	£173.66
Transport clerks (SOC 4134)	£11.87	38.8		£116.52

The average day cost is then applied per organisation using the assumption of half a day's time taken. Information was sought at the consultation stage on whether this estimate could be improved. This did not result in any responses, so we have kept the same approach.

Number of operators in scope	62,415
Time taken for each operator	0.5 days
Day cost	£289

Transition costs (ii) LST viability assessment

92. In the modelling, all operators with a restricted or standard national license in the UK would have made an initial review of the legislation changes. However, once operators have understood the change, may decide to seek further information regarding the change and decide whether they are applicable within their business. We have referred to these as the 'Tier 2' costs within this IA.
93. It is expected that most operators who currently operate standard trailers and rigid HGVs with a drawbar combination would do a Tier 2 assessment to discover if LSTs are viable for their business or not. While there are no specific figures on these number of operators, we have assumed that these would represent 50% of those on standard national licenses and 10% on restricted licenses which would sum to around 16,618 operators within scope. The maximum number of operators of LSTs within the take-up A scenario of the modelling, which is calculated through taking the forecasted LST take-up from the lighter regulation option and the average number of LSTs per operator seen within the trial, is estimated to be about 1,657 operators, which is around 10% of the operators considered in scope of the viability assessment. The rationale behind choosing this scope was that it would include all the operators who would be interested in getting LSTs and therefore would fall within the viability assessment's scope, but also to slightly overestimate the number of operators that would be interested in LSTs to ensure that the impact of the regulation on them would be captured. Given this, we can estimate the number of operators who would incur costs in Tier 2. Clarification was again sought at the consultation which did not yield any responses and we are therefore keeping with our best estimate of the operators within scope of the Tier 2 review, as well as the estimate on the amount of time this is likely to take.
94. Once we have identified the number of operators in scope for Tier 2 review, the next step is estimating the total days' worth of work involved with this assessment. Given the detail around the change and the likely regulation option, it is assumed this would take around 5 days to complete. We consulted on this figure and received no feedback to suggest otherwise. This is made up of the following activities:
 - a. Review and understand the legislation change – a more detailed assessment than the initial Tier 1 review.
 - b. Identifying the business needs for using LSTs going forward – assessing those business areas where the load capacity is reached but are running underweight. This would include understanding whether the facilities of these journeys could accommodate LSTs.

- c. Understanding the specifications of the trailers – understanding specifics around the trailer design, such as the different steering axle options and their behaviours, and the potential costs and benefits of each trailer in their fleet.

Number of operators in scope	16,618
Time taken for each operator	5 days
Day cost	£289

Ongoing costs

Ongoing costs (i) Trailer Replacement Costs

95. Should a business decide to utilise the additional regulatory freedom, the key ongoing costs experienced by operators relate to the additional cost of replacing a standard trailer with an LST variant. The costs represent the marginal increase in purchasing a trailer which is above the existing cost for a standard trailer. From the VSO data, we know the first registration date of each trailer and therefore the age of the trailers in the current trial. This allows for the modelling of the trial LSTs being replaced with new trailers once they reach 10 years of age. In the further uptake resulting in this option, it is assumed that once a new trailer reaches 10 years of age it is also replaced with a new trailer. For example, a new trailer bought in 2021 will last for 10 years and be replaced in 2032. We have also assumed that there is no second-hand market currently for LSTs and that any additional trailers bought will be at the full market value. Naturally it is expected that a second-hand market will become more prominent, especially for the smaller operators but given this will be a price transfer from one operator to another, at the aggregate level it would have no effect. The average life expectancy will therefore allow for modelling of the expected purchase of new trailers to model the replacement costs of new trailers.
96. These costs have been provided to the Department for two different variants: the cost for a 14.6 metre trailer and a 15.65 metre trailer which are now increasingly common. As the trial continued, according to Risk Solutions, the 15.65 metre trailer with a single self-steer axle presented the best value for money for most operators and has become the prominent LST used, however the smaller variant is still used by some where access requirements remain limited.
97. These costs are presented in the table below as averages as the data is commercially sensitive. These numbers of trailers in each category (as of 30th June 2020) are provided in the table below:

Length of trailer	Number of trailers on live trial use	Percentage of total
14.6 metres	287	11%
15.65 metres	2,278	89%
Total	2,565	100%

Length of trailer	Average marginal additional cost to purchase	Range of values	Average marginal cost (2019 prices)
14.6 metres	£2,500 (2010 prices)	£1,000 - £3,000	£3,250
15.65 metres	£7,500 (2016 prices)	£5,200 - £8,600	£8,186

98. The costs have been weighted according to VSO information from the VCA on the numbers of trailers in each category, and we have assumed that this split is representative of the future as we have not received any further information on this from the consultation. However, as previously mentioned there have been observations from Risk Solutions that demand for licenses for the shorter LST length of 14.6m has been reducing, as had been shown within their annual reports on the LST trial.

99. To give some perspective on what the cost of a standard articulated trailer is relative to this additional marginal cost for an LSTs, the Transport Engineer Report²⁰ of 2018 estimated the cost of a trailer for a 44 tonne articulated trailer to be around £22,488.
100. Therefore, with the number of LSTs on the road obtained from the Scaling Model, and those in each year which are replaced when they reach 10 years of age, the total cost per year can be calculated to represent the business cost of purchasing new LST trailers.
101. These costs are based upon the current costs of LSTs, however these would be expected to change over time as they enter circulation. On the supply side, permitting wider circulation will allow manufacturing processes to change and be more amenable to producing LSTs. There may also be further competition in the market which may decrease the marginal prices to nearer the standard trailer prices. However, this may be offset by the potential demand side impacts, as demand rises with inelastic supply, short term prices may rise to reflect the rationing of the current stock of trailers. Given this uncertainty, we have included this in the sensitivity scenarios and used the current prices in the best estimate.

Costs associated with regulation

Ongoing costs (ii) Routing requirements

102. When an operator is planning their upcoming business needs, the Department would reasonably expect them to be reviewing whether the routes used for both current and upcoming business are suitable for travelling on, and in the short term, whether roadworks may adversely affect planned routes and deciding on more appropriate routes. This is emphasised through having to carry out risk assessments of routes under this regulatory option. Considering the potential impacts surrounding the LSTs, the Department would expect operators to take more time to assess the routes than for standard trailers given the current design of the trailers and the larger tail swing, which comes as an additional cost to business. The additional costs that operators would incur are the additional route planning and resulting route changes for LSTs. The form this planning might take would vary depending on the size of the LST fleet and the repetitiveness of the operational patterns. Further to this, there would be some form of risk assessment made which enables an auditable history of any risks that this risk poses. Similarly, where there is feedback required from drivers regarding the routes, this is done so and captured within these costs.
103. Similarly, it is expected that there would be some compliance checks in place by operators to understand whether the roads or routes used by drivers of LSTs since the regulatory change were in fact in line with those planned and approved in advance and were compliant with the regulation. This would apply to those routes that were used under the trial where a risk assessment would be needed, and future compliance checks undertaken. As with certain other aspects there would be a transitional process for operators and vehicles currently on the trial to join the new regime.
104. Under these requirements in the lighter regulation option, we have made an assessment based on the average LST fleet size of operators during the trial and the average time spent per LST each week in carrying out these checks to get an estimate of these costs in a given year. When estimating these costs, an assessment was made on the number of hours taken by different individuals within the business to assess the cost in doing so. There would be planning, and risk assessments undertaken, possibly in practice by a transport manager, an administrator or driver themselves at an increased time of 10 minutes per week per LST, but with the operator or transport manager being required to sign off new proposed LST routes as the proposed regulations place ownership for route planning on the operator.
105. Given the nature of the task, we expect that there would be efficiency gains from route planning, as LSTs may be used on prescribed routes so less planning is required or route planners will be able to become more efficient in planning routes which avoid known problem areas. This may also be the case for additional LSTs owned by an operator, where the time taken for additional LSTs will be significantly lower. Further to this, these costs would also be reduced given the viability assessment already carried out, as operators would decide to purchase LSTs based on how they would use them.

²⁰ Available at: http://www.transportengineer.org.uk/article-images/199509/Operator_costs.pdf

If it is not viable for operators to use them on their main routes then they would not use them, and if it is viable then lower amounts of continuous route planning is required. These would be the additional cost experienced by operators above that for standard trailers in the baseline, as more thorough route planning would be necessary to ensure the route is suitable for the longer trailer length.

106. The estimated cost for this is based on the employees that would be required to carry out this assessment. It has been assumed in this analysis this will take around 10 minutes of additional time for a driver and a transport manager. Again, information was sought at consultation on this, with no responses. Using the 'large goods vehicle driver' (SOC code 1161) and 'managers and directors in transport and distribution' (SOC code 1161) hourly pay from the ONS' Annual Survey of Hours and Earnings²¹ and the non-wage labour uplift of 26.5% allows us to estimate hourly pay of £15.18 and £21.71 respectively. The total cost of £6.15 per week per LST has been calculated in the table below.

Employee	Hourly cost (ASHE)	NWLU	Cost per time taken (10 minutes)
Managers and directors in transport and distribution	£21.71	26.5%	£3.62
Large goods vehicle driver	£15.18		£2.53

107. Separately, the Department expects the compliance checks to be undertaken by transport managers or owner-operators but take a reduced amount of time compared to planning the routes initially. Overall, given the difference in hours taken for each task and the difference in the wages of the employees carrying out these tasks we have judged these to be around the same cost including any follow-ups to driver feedback based on the routes undertaken. Like the points above, there is the expectation that compliance checks would be less frequent than every week and become more efficient over time so keep the time taken low. These estimates have been presented in the table below. To note, some operators may already have advanced IT systems which aid route assessment and compliance, however we have not analysed this, and we have assumed it would be undertaken if it was advantageous for them to do so (i.e. lower cost than manually reviewing this). The consultation was used to try and get more details on this.

Cost type	Annual cost per LST
Route planning	£319.69
Route compliance	£319.69

Ongoing costs (iii) Training requirements

108. Under this option, operators would be encouraged to provide employees operating LSTs with some training before they begin using the trailer. As this training is considered as optional, but encouraged, we have included the monetised cost in this assessment to represent the maximum potential costs to operators. The regulation under the preferred option does not specify the exact type of training required but does suggest around half a day of training, with details of training requirements included in guidance documents, and it is up to the business how to implement it. Based on evidence discovered throughout the trial, most small to medium operators were providing high-level training by explaining the different components of the trailers to standard trailers as well as the key risks associated with their use. This is often followed by a physical demonstration on a trailer and in most cases a test drive with an experienced driver. In some larger organisations, an internal training structure was developed to provide more detailed classroom learning and demonstrations though in some circumstances this was one topic covered as part of a more general training session.

²¹ Office of National Statistics, Annual Survey of Hours and Earnings (ASHE), 2019 prices, available at: <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/regionbyoccupation2digitsocashetable3>

109. The costs associated with training present in two different variations, which have been described in more detail in the following paragraphs:
- a. The cost to the business of providing the course;
 - b. The cost of the driver's time while attending the training.
110. It was advised by Risk Solutions that, based on company information submitted by operators, the training across operators has amounted to around half a day's work and most businesses will choose to do this internally. Based on the hours of those providing the training course, which is assumed to be a transport manager or owner/director and separate from the lost driver time, we have an estimated cost of £145 based on the opportunity cost of their working time. We are then able to calculate the total cost to the business by multiplying this cost by the number of drivers that would require training to understand the total costs to the business. It is assumed that the number of drivers is the same as the LSTs in operation and that this training will be carried out on a one-to-one basis. Clarification was again sought at the consultation on this topic but no responses were received so we have continued with our best estimate. There may be a further cost to a business in identifying whether to provide an in-house training course or seek an external company to provide this and the flexibility within the regulation as to how to implement the training, coupled with the guidance documentation, should cut those costs.
111. There are also the opportunity costs associated to the business through the driver not being able to carry out their normal role and therefore reducing the amount of revenue for the business. These are applicable to all the drivers who need to attend the training course in order to be qualified to operate an LST. These costs have been calculated by using the HGV driver's Value of Time provided by the TAG to provide the cost of a driver's time per hour during work, with the additional non-wage labour uplift (NWLU) of 26.5%. The number of hours a driver is working by assuming the maximum number of hours given by the EU working time directive divided by 5, the average working days per week. These values are provided in the table below. Within these costs, the cost of the trainer has not been captured as this was captured in the trainers cost in the paragraph above.

Cost description	Value
Driver Value of Time	£15.77
Driver cost including NWLU	£19.95
Average driver working hours per day	9.6
Total cost of half a day	£95.76

Ongoing costs (iv) licencing requirements

112. Where an operator identifies that operating LSTs would be of benefit to their business, the operator may be required to use the VOL system to confirm they will operate LSTs according to the conditions to be provided for in the regulations and amplified in guidance. This will be associated with costs at the OTC and DVSA, estimated to amount to £250 per year per operator (2021 prices, £240.8 in 2019 prices) above the costs of a regular licence for standard trailers. A wider review of and changes to operator licensing fees is envisaged, at which point specific fees are liable to be applied. In the interim, costs could be applied to the operator licensing scheme accounts and thereby recouped from industry in due course. Given the uncertainty of whether these costs will be levied on operators, they have been included in this assessment, but may not be included at a later stage, reducing the burden on businesses. Specific fees will be essentially a cost-recovery scheme from the OTC as well as DVSA and covers the following costs, which are all per operator and in 2021 prices:
- DVSA's compliance costs per operator, estimated at £100;
 - the DVSA/OTC's licensing administration £100 each year;
 - and £50 for OTC work arising in relation to compliance.
 - The operator's license is reviewed typically in 5-year intervals.

113. There could also be the time element costs involved with writing, reviewing and submitting the application. The consultation stage was used to try and get more information on these time costs on operators so as to monetise them but did not result in any responses regarding these questions. The section regarding the time element is therefore non-monetised and is in within paragraphs 116.

Non-monetised Costs

Non-monetised costs (i) Accident reporting

114. Under this option there would be a requirement for operators to report any accidents which result in injury (on public or private land) to the Department. Since the reporting of accidents would happen under normal circumstances (as required by the police or in the context of health and safety legislation), we therefore do not expect it to take much additional time for operators to provide the necessary information to the Department to understand why the accident had occurred. Injury incidents will be a relative rarity in a typical year for an operator. The requirements are likely to be implemented via an annual return using existing operator licensing IT, which would also remind operators of the specific conditions for running LSTs, although the Department is likely to require the notification of any fatal incidents specifically. In the non-monetised benefits section of the safety impacts of LSTs, some numbers are estimated but within a wide range.

Non-monetised costs (ii) Licensing requirements

115. Initially, costs related to operator licensing could be met by the existing fees structure for operators. If and when the structure of operator licensing fees is reviewed (and there are some wider reasons for doing that soon), any costs that are specific to LST operations may be charged to LST operators. The estimated level of such specific costs could be around £250 per operator per year (2021 prices) and is covered in the monetised section above in paragraph 110 as a worst-case estimate. Whilst most operators, following the understanding applied in the viability assessment cost, would understand their own business requirements before deciding the number of LSTs to purchase for their business, there is some uncertainty around this. Information was sought at consultation, with no responses. The current expectation is that when the operator notifies the OTC that they have LSTs on their operator license, they would include the quantity of LSTs, along with trailer identifiers to ensure these trailers are easily identifiable over standard-length trailers. This will also assist with roadside checks by DVSA and other government departments.

116. Aside from the potential ongoing fee for operators to vary their license, there is also the time element involved with writing, reviewing, and submitting information. To minimise the risk of double counting the time costs, this is separated from the viability assessment, as the time taken to identify LSTs in operator licensing returns after deciding how many LSTs is distinctly different. This is likely to take a range of people in the business to first draft the application for the number of LSTs they wish to operate and then for this to be reviewed within the business before submitting the application. It is anticipated this would take several hours among an office administrator to draft the application and then be reviewed by a manager within the business. It is assumed this to be around half a day's work across the business at a cost of £145 to each new operator over the appraisal period.

117. If hauliers are required to make an application to vary their operator's license, they would also be required to advertise the proposed variation in the local newspaper(s) for the location(s) of the operating base(s) where the increased number of trailers it is proposed will be operating out of to make residents aware. However, changing one of their trailers to an LST would not require any change to their operator licencing, only using the VOL system to operate the LST, and therefore this is not monetised within the NPVs of the IA. Indeed, for the purposes of variations and applications operators would not be required to identify whether or not there are LSTs in their fleets.

Non-monetised costs (iii) Adapting freight infrastructure

118. An additional cost that could be incurred to businesses because of this regulatory change would be the costs associated with adapting existing freight infrastructure to accommodate the growing number of LSTs being used. The freight infrastructure that might need to be considered would be those around distribution centres, industrial estates, testing facilities and any other facilities that an LST

might interact with. The costs would be incurred by the business who owns the infrastructure to make the sites more accessible to the growing number of LSTs when standard articulated HGV are gradually being replaced.

119. Risk Solutions produced an industry insights document from a workshop held in November 2019 with a group of 25 representative companies participating in the trial, where operators reported the current and future requirements on the infrastructure to accommodate relevant LST designs. There are immediate changes that can be made to facilities at minimal cost (such as painting new lines), while the medium-term plans are for major changes to existing facilities, and longer-term planning for future depots to be built, leased or purchased. The majority of the infrastructure costs are expected to be absorbed into longer term plans.
120. These costs are also interrelated with the uptake that we forecast in the scaling model, as it could be argued that if infrastructure is more accommodating to LSTs then there are fewer barriers to owning and operating one which will increase the demand for LSTs. This is the same as described in the 'B' uptake scenario in the scaling model section of this IA, but we have omitted the demand changes resulting from this, and therefore it is prudent to do the same with the costs. There is a sensitivity scenario using the take-up B scenario. Furthermore, these costs are also non-monetised as these are likely to be a commercial decision by the owners of infrastructure. Improvements to adapt existing infrastructure would only be done if there is sufficient demand for owners to do so and there is a profitable reason for them doing so, which one could argue is outside the scope of an indirect cost associated with this regulatory change as it is a secondary order effect by others in the industry.
121. More information was sought during the consultation stage which did not result in any responses.

Benefits

Benefits (i) Reduction in standard trailer miles

122. The benefits of LSTs are generated through calculating the number of miles saved compared to the situation where LSTs are able to continue to operate until the end of the trial. Within the Option 0, 'Do Nothing' scenario, the trial continues until its end in January 2027 and it is expected that when the current fleet of LSTs within the trial reaches their maximum lifecycle, they are then assumed to be replaced by a standard trailer - this is then used to compare the benefits with option 1. The scaling model mentioned above uses the trial data, survey data and CSRGT data to forecast the distance savings throughout the appraisal period. The distance savings capture those already being saved from the LSTs on the trial until its conclusion as per the description in Option 0.
123. Using these reductions in miles projections received from the scaling model, this permits the calculation of the specific benefits highlighted in the following benefits sections (ii) to (viii). Further to the reduction in miles by standard trailers, Risk Solutions have also provided forecasts on the savings from pollutants such as Carbon Dioxide, Nitrous Oxide and Particulate Matter based on routing data and modelling using detailed LST journey and loading information gathered on the trial. These emissions are scaled and then forecast to inform the environmental benefits calculations, which are more accurate than using the standard Department produced emissions benefits which are based on average fleet projections and loading factors.

Benefits based on DfT's Marginal External Costs (MECs) Methodology

124. The following benefits (ii) to (v) are based on the Department's MECs methodology as outlined in [TAG Unit A5.4](#). The MECs method calculates the external cost (or benefit) of an additional (removal) mile of vehicle traffic for use within appraisal. The values for this have been modelled by the Department's National Transport Model (NTM) and subject to rigorous quality assurance and approvals process before the values are updated and published for use within appraisal by practitioners. The values are provided in the table below for each 5-year period. These have been linearly interpolated to find intermediary year benefits.

MEC Values (pence/mile, 2019 prices)	2020	2025	2030	2035	2040	2045
Congestion	62.01	70.51	84.76	95.60	112.27	123.10
Infrastructure	15.41	17.74	19.08	20.51	22.15	23.79
Noise	6.86	8.06	8.79	9.44	10.13	10.84
Indirect Taxation	-35.41	-36.14	-37.49	-38.47	-37.70	-37.18

Benefits (ii) Congestion

125. The removal of HGV traffic leads to a reduced congestion impact on all other vehicles given the decreased number of vehicles using the road and the resulting amount of delay experienced by all vehicles using the road. This presents a benefit to wider society as there is reduced amounts of delay being experienced by all other individuals using the road.
126. These reductions in journey times are modelled through the NTM and provides the monetised benefit through utilising the values of travel time to convert to a monetary value for use within appraisal. Therefore, the benefits presented within this IA represent the total decongestion benefits associated with the resulting reduction in miles travelled by standard articulated vehicles on all other vehicles using the road network. It is expected that some of these benefits would accrue directly to hauliers as a business benefit rather than solely to society, but given the complexity in estimating these benefits, it is assumed these are all societal benefits.

Benefits (iii) Infrastructure impact

127. The impacts on the road condition and general wear and tear of the roads is considered as the infrastructure impacts within the Department and this analysis. These values derived using the MECs approach look at the impact of an additional unit of traffic on the overall infrastructure and the associated expenditure necessary to maintain the road network. The reduction in the amount of traffic leads to a benefit in terms of lower necessity for infrastructure expenditure associated with the reduction in traffic levels.
128. The benefit therefore reflects the reduced expenditure necessary to maintain the existing standard of the road network. The infrastructure MECs have assumed that lorries are fully laden, and therefore reduces the need to model the increased weight of LSTs carrying more goods. Given the objective of LSTs is to increase the capacity of trailers for lighter goods, those operators that utilise LSTs will see higher average weight capacity per journey. As a simplifying assumption the effect of the higher unladen weight of LSTs is discounted because weight-related road wear occurs predominantly when vehicles are laden (and the maximum laden weight of LSTs is the same as a standard articulated lorry. There are also beneficial effects on reducing road wear from LST self-steer, which reduces tyre scrub when turning, over standard units have not been assessed. The journeys by standard trailers being reduced are likely to be doing so at lower weights than assumed in the modelling (given volumes are maximised before the weight is) and therefore we would be overestimating the benefits as the journeys removed are not 44 tonnes in weight. Information was sought at consultation, with no responses.

Benefits (iv) Noise impact

129. The impacts associated with road traffic are quantified using a common methodology outlined in TAG, using an established and robust methodology to appraise the impacts. This methodology is employed by the MECs method to determine the impact of an additional unit of traffic on the road network. These values are calculated and are dependent on a variety of factors including the vehicle weight, the design, the number of axles, the receptor population and the time of day.
130. The monetary values for noise are calculated on a per mile basis to allow for a proportionate application when looking at a reduction in miles and the associated benefits. The lower number of miles travelled by articulated lorries due to the continued use of LSTs against the baseline will lead to

an increasing amount of benefits to the wider society and are calculated to reflect the increasing use of LSTs throughout the appraisal period.

131. There is no evidence that LSTs produce any more noise than a standard 13.6m trailer, and no issue has ever been reported within the trial or at the consultation.

Benefits (v) Indirect Taxation impact

132. For every litre of fuel purchased, the pump price (123.97 pence per litre) is made of three components. There is the factor (resource) cost of fuel (45.57p), fuel duty (57.74p²²), and 20% VAT added on to the resource cost and fuel duty (TAG Databook, unit A1.3.7, 2019 prices, 2022 PVB - retrieved May 2021).
133. Both forms of indirect tax (fuel duty and VAT) do not affect the NPVs as they are transfers from the taxpayer to the government. However, these distributional impacts will affect the government and have implications for the Business Impact Target Score reporting.
134. Businesses can already claim back VAT on business related purchases, so we have not considered VAT in these calculations.
135. Where a business saves a litre of fuel, there will be two impacts:
- The economic factor cost of fuel saved (45.57p per litre). This is a benefit accrues to the business.
 - The fuel duty not paid (57.74p per litre). This represents a benefit to the business, but an equal and opposite cost to government, who lose out on that fuel duty.
136. As we have assessed these fuel savings to be direct benefits to business for the purposes of the Business Impact Target Score, both impacts a and b are considered direct costs to business. Impacts from b are also a cost to government and therefore only impact a will have an impact on the NPVs.

Prices 2019, Present value base 2022 (£ millions)	Low	High	Best Estimate
Factor fuel cost and fuel duty saved by businesses	£318	£380	£349
Fuel duty lost to government	£195	£195	£195
Net impact on NPV	£123	£185	£154
Net impacts on EANDCB	£318	£380	£349

Environmental Benefits

Benefits (vi) Environment

137. The removal of HGV traffic leads to a benefit for the wider environment due to improvements in air quality and the reduction in greenhouse gases. The introduction and proposed increased uptake in LSTs lead to less standard trailer miles being travelled and therefore lower amounts of Carbon Dioxide (or Greenhouse Gases), Nitrous Oxide and Particulate Matter emissions which are damaging to the environment and those in the immediate vicinity. Throughout the trial, freight operators using LSTs were required to report on the number of miles saved, and through modelling, Risk Solutions have provided the Department with the emissions savings as part of the trial programme²³. The

²² TAG Databook, A1.3.7, retrieved March 2022

²³ Further information on the emissions modelling can be [found here](#).

analysis carried out by Risk Solutions uses the emissions factors from the National Atmospheric Emissions Inventory and applies these to the data collected from the trial on journey legs, weights carried and average speed of the operators, and then the fleet composition projections between Euro V and Euro VI engines from BEIS' to get the projected future emissions. Furthermore, some anecdotal evidence from manufacturers state that the self-steer systems reduce the tyre scrub which would reduce the Particulate Matter emissions resulting from tyre wear, however there is little evidence publicly available to support this and therefore we have not captured this. The table below shows the reduction in emissions from the fewer kilometres travelled due to the introduction of option 1 (for the individual years).

Reduced emissions from fewer kilometres travelled due to LSTs	2022	2027	2032	2037	2041
CO2e tonnes	1,639.6	38,679.1	57,188.7	60,404.1	63,106.0
NOx tonnes	0.6	8.0	10.6	11.2	11.7
PM Exhaust tonnes	0.0	0.2	0.3	0.3	0.3

138. Given the emissions, the impacts can be monetised following the standard TAG procedures. For Carbon Dioxide, the tonnes of emissions saved can be converted using the CO2 equivalent non-traded prices to provide the monetary value in pounds. Similar for Nitrous Oxide and Particulate Matter, these can be converted to their monetary equivalents using the damage cost approach as prescribed by TAG Unit A3, using the road transport national value to estimate the total impacts from a reduction in these air quality-related emissions.
139. The value placed on changes in greenhouse gas (GHG) emissions is currently under review, now the UK has increased its domestic and international ambitions. Accordingly, current central carbon values are likely to undervalue GHG emissions, though the scale of undervaluation is still unclear. The potential impact of placing a higher value on GHG emissions can be illustrated by using the existing high carbon values series, in addition to the prescribed central values. HMG is planning to review the carbon values during 2021.
140. Following the interim recommendation outlined above, a further sensitivity using the higher series of the non-traded CO2 equivalent costs has been provided to estimate the further impacts from greenhouse gas emissions savings. Based on this sensitivity, for this option there would be a 50% increase in the carbon dioxide reduction benefits, which increases the NPV in the best estimate case by 9% to £1,282.24m (2019 prices, 2022 PV).

Benefits (vii) Fuel Saving

141. Associated with the reduction in the amount of HGV miles travelled, there is a direct benefit to businesses around the reduction in the expenditure on fuel. The total amount of fuel consumption associated with the reduction of HGV miles is not provided by the operators to Risk Solutions, but a conversion can be made from the modelled CO2 savings. Given the CO2 savings from the model, the estimated litres of fuel saved can be calculated using conversion factors provided in the TAG Data Book which calculate the number of litres associated with the emissions generated throughout the forecast period. It has been assumed for this benefit that the fuel consumption rates for LSTs are the same as those incurred by standard articulated trailers. Clarification was sought at the consultation on the amount of fuel that LSTs consumed relative to regular artic HGVs but did not result in any responses. Mentioned previously is that there is little evidence that LSTs do use more fuel. This was considered under the trial, and the feedback received from operators indicated marginal improvements which is offset by other costs associated with LSTs. It was indicated that robust estimates could be sought from strict head-to-head tests between LSTs and standard trailers under controlled conditions.
142. To ensure this is not double counting the costs associated with fuel duty, this calculation is based on both the resource element and fuel duty, while the VAT is not included as businesses are exempt.

The indirect tax lost to the government from the reduction in fuel consumption is estimated to get the cost associated to wider government through lower taxation revenue.

Benefits based on the Transport Engineer Operator Costs report

143. The following on-going benefits have been indicatively monetised based on the costs outlined in the Transport Engineer Operator Costs report. These benefits are savings related to; labour, tyres, maintenance and repairs, insurance, Vehicle Excise Duty (VED) and Road User Licensing (RUL). For most of these benefits, this takes fixed annual costs and converted them to variable costs to provide a proxy for the potential benefits to business. This is explained in further detail below. This might present some inaccuracy and uncertainty given the costs are often not perceived in this way.
144. The calculated benefits are based on the miles travelled by the average articulated vehicle and assumed that LSTs have the same benefits as standard trailers. Clarification was sought during the consultation stage, but no response was received.

Benefits (viii) Labour Saving

145. Following the reduction in the number of HGV miles because of the introduction of LSTs, there will also be an associated decrease in the number of drivers required to move the same level of goods. This presents an indirect cost saving to business due to the lower number of drivers necessary to move the goods, which coupled with the driver shortage observed in the industry will lead to lower pressure in recruiting and replacing drivers. Given this shortage, the benefits represent a productivity improvement for drivers as they can be re-distributed to other tasks.
146. The costs for a reduction in labour have been estimated by the Department based on the estimated yearly salary and mileage information provided by the Transport Engineer report. This calculates the cost of an HGV driver by taking the salary that is paid to the driver themselves and including the non-wage components such as national insurance to calculate the total salary. This may be an underestimate as most drivers will supplement their salary with overtime payments, but as these are not guaranteed we have not included this in the analysis. The annual salary can then be divided by the average annual mileage to arrive at the below rate of £0.44 per mile. Details on the specific values are provided in the table below.

Metric	Value
HGV driver salary per year	£37,184
Annual vehicle miles travelled	85,000
HGV driver salary per vehicle mile	£0.44

147. Given the reported driver shortage outlined in the rationale for government intervention section, any reduction in the number of drivers required for current work provides the potential for businesses to utilise them elsewhere and increase their productivity. It is expected that most operators would re-distribute their drivers internally within their business or fill other vacancies to carry out more movement of freight and therefore generate revenue for the industry. It is assumed that, given the increase in driver productivity, the business will at least receive increases in revenue according to the salary they would pay their drivers, representing an increase in the revenue based on the extra capacity of the business.

Cost type	Cost per year	Miles per year	Cost per mile
Tyre savings	£1,567	85,000	£0.02
Repairs and maintenance	£5,041		£0.06
Vehicle Excise Duty and Road User Licensing	£1,200		£0.01

Benefits (ix) Tyre savings

148. Due to the reduction in travel associated with increasing the number of LSTs in general circulation, there are net benefits associated with less tyre wear and replacements. The annual costs of tyres have been obtained from the Transport Engineer report and have been calculated on a per mile basis for the purposes of this IA (see below). The benefits represented therefore show the net benefit from reducing standard trailer miles but increasing the LST miles.
149. At this stage it has been assumed that LST tyre costs are equal to the tyre costs for a standard trailer, however this might not be the case given there have been observations of lower tyre scrub associated with the steering axle systems employed by LSTs which would reduce the frequency of tyre replacements. Although clarification was sought during consultation, there was no answer.

Benefits (x) Repairs and maintenance savings

150. Similarly, the reduction in miles travelled leads to fewer repair and maintenance costs due to less vehicles on the road leading to lower wear and tear on vehicles, representing a cost saving for operators. These are calculated on a per mile basis and applied to the miles saved from the trial, which assumes that the same repair and maintenance costs apply for LST trailers. Manufacturers have claimed savings, and on the trial, operators have confirmed there are savings. However, we have not been able to access the underlying data to verify any savings.

Benefits (xi) Vehicle excise duty and road user levy

151. Vehicle excise duty and road user levies are payable by freight operators to contribute towards the cost of building and maintaining the roads in the UK as regular business users. Such costs are paid per vehicle in operation and, given the introduction of LSTs leads to a reduction of vehicle use, it is assumed there are savings to be gained from paying less of these taxes. Therefore, taking the average annual costs for these and converting to a per mile basis allows for an estimation of the benefits of not paying such taxes when miles are reduced. However, this assumes that there is an overall decrease in the number of trailers used which has been identified throughout the trial²⁴ where 38% of respondents would reduce their fleet by some degree, and 52% said they would keep their fleet the same.

Non-monetised Benefits

Non-monetised Benefits (i) Accidents reduction

152. This section is unmonetised due to uncertainty regarding the safety impacts of LSTs going out of trial, as there is no way to know what behavioural impacts this will have on operators – even though the same safety measures used within the trial will be implemented within the preferred option of lighter regulation to try and keep the same positive safety outcomes – and also due to the contentious nature of the safety of LSTs. The possible safety benefits are therefore not included within the NPVs. Thus, the NPV only represents the benefits of LSTs in terms of its main objectives of making operations more efficient, with the productivity and externality benefits derived from it. The trial has proven that LSTs can be operated safely, exhibited by the statistics in the table below which

²⁴ 2019 Annual Report, Table 12

compares LSTs to regular HGVs, with collisions down 53% and casualties down 58% relative to HGVs per vehicle kilometres.

Summary comparison of LST public road collision and casualty three year rolling average rates (2017-19) vs. GB articulated HGVs (2016-18). *Source: 2019 Annual Report (Table 12)*

Injury incidents	LST Rate per billion vehicle km	GB artic HGV Rate per billion vehicle km	Mean Rate Ratio LST to GB-HGV
Collisions	54	114	0.47
Casualties	68	162	0.42

153. The introduction of LSTs would lead to two differentiating impacts on the accident rate. These are accident prevention through the reduction in standard articulated lorry miles, and the changes in the risk of accidents due to having LSTs in operation, which are longer than the standard trailer length, instead of standard articulated HGVs. The reduction in accident risk is analysed using the risk rates identified in the trial, and an additional scenario where the safety risk of LSTs is similar to the ones seen with regular articulated HGVs where the safety benefits accrue from the reduced vehicle kilometres due to the efficiency of LSTs. These estimates are then used with the value of prevented fatalities from TAG to get an estimated range of possible monetised impacts, although these are not included in the NPV as for the reasons explained above.
154. The figures presented are reflective of the forecast uptake from the scaling model to get the projected outcomes for the next 20 years. As this is observed trial data, it could also be presenting a false positive in terms of the overall net reduction in accidents given the reduction in distances travelled and the possible increased risk rates of LSTs through their greater tail-swing, even though all of the same safety measures seen within the trial will be kept.

Indicative modelling

155. By using the safety statistics from the LST trial, the impacts on road safety of introducing the LST regulation has been estimated. It is important to note that the higher estimate in this case does use the safety figures obtained from trial conditions and are not directly applicable to the real world as there are likely to be behavioural responses from operators. Although Option 1 contains comparable safety requirements within the regulation as per the trial, such as driver training being encouraged, and route assessments and operators needing notify LSTs using VOL, there is still uncertainty regarding the exact impacts on accidents resulting from moving out of the trial and implementing this regulation, and the behavioural responses that will arise from operators. The outcome is likely to lie between two scenarios explained below.
156. The safety statistics used are the three-year averages for the pre-pandemic years (2017 to 2019). Due to uncertainty, there is a range where the higher scenario is looking at the safety impact of removing the standard articulated HGV vehicle kilometres and the accident rates associated with these, then adding the impact of LSTs seen in the trial with the forecasted LST uptake and subsequent LST vehicle kilometres. The lower scenario takes the assumption that the LST accident rate is the same as HGVs and therefore the safety benefits are derived from the vehicle kilometre savings from the efficiency of LSTs. The assumption that the ratio of the accident rate between the various casualty severities with LSTs is similar to regular HGVs based on their casualty rate, again using a 3-year average (2017 to 2019), is used to build on the avoided casualty statistics estimated to also produce estimates of the number of serious and slight injuries avoided. All the safety measures used within the trial, such as the suggested extra driver training and route assessments, are included within the regulation of Option 1. This is to try and maintain the safety record that was seen within the trial. These have been given a monetised value using the figures from TAG on the values of prevented accidents and using the assumption that the rate of various severity of accidents with LSTs is similar to regular HGVs from their casualty rate (again using a 3-year average of statistics from 2017 to 2019).

157. The tables below show the estimated impacts for the two scenarios, with the monetised benefits built using TAG values for the prevention of accidents (Table A 4.1.3, from the March 2022 update).

Scenario where only the reduction in vehicle kilometres from LST efficiency reduces accidents

Year	2025	2030	2035	2040	Total
Fatalities avoided	0.22	0.67	0.70	0.74	10.88
Serious injuries avoided	1.01	3.02	3.19	3.37	49.30
Slight injuries avoided	4.05	12.08	12.76	13.48	197.31
Benefits monetised (PVB 2022, 2019 prices)	£863,545	£2,167,395	£1,927,490	£1,714,140	£31,465,707

Scenario where a reduction in vehicle kilometres of HGVs and then safety statistics from the trial data are applied to LST vehicle kilometres

Year	2025	2030	2035	2040	Total
Fatalities avoided	1.63	4.86	5.14	5.42	79.40
Serious injuries avoided	7.39	22.04	23.28	24.59	359.91
Slight injuries avoided	29.59	88.21	93.17	98.41	1440.36
Benefits monetised (PVB 2022, 2019 prices)	£6,303,723	£15,821,605	£14,070,339	£12,512,918	£229,694,108

158. There are also various controls that can be used to mitigate against the risk of an increased casualty rate. These are:

- i. Vehicle design – steering axle design that reduces the tail-swing or kick-out of the trailers. Other designs such as active steer or other technologies could also provide mitigation;
- ii. Operating standards – operator licensing requirements, qualifications, guidance on driver training;
- iii. Controlled trial conditions – replicating route assessment conditions from the LST trial.

159. Therefore, although LSTs are longer and have a larger tail-swing which increases their risk to road safety, mitigating actions can be put in place that will prevent the LST casualty rate increasing to a significantly higher rate per mile than standard articulated HGVs and with appropriate operational management could lower the accident risk, as has been demonstrated in the trial.

160. As mentioned earlier in this document, there are also some mechanisms in place to monitor the impact of LSTs, and to therefore enable the Department to quickly identify and take action should the

rate at which LSTs are involved in such accidents or incidents be significantly above the expected rate.

Impacts on pedestrians and cyclists

161. It has been argued that, given the longer length of LSTs, there may be additional risks which are presented directly to pedestrians and cyclists where LSTs operate which may be more pronounced in urban areas. Over the course of the trial, operators have submitted accident reports to the Department whenever an incident occurs which resulted in an injury or damage only. As part of the annual reporting process, Risk Solutions have provided summaries of these reports which indicate the severity, a description of the incident and those involved and determination of whether it was caused by the LST specifically.
162. Up to the end of 2019, there have been 33 reported incidents involving an LST on public roads which have been reported to the Department, two of which have involved either a cyclist or a pedestrian, with an additional incident in 2019. These are described in further detail below:
- An incident in 2015 where an LST hit a pedestrian with a tail end of the trailer while making a turning manoeuvre in an urban location during a driver assessment. This resulted in a 'slight' injury and was judged to have been caused by the longer length vehicle. The route is no longer used for driver assessment.
 - An incident in 2016 where an LST hit a cyclist from behind when moving from a slip road to a dual carriageway. This resulted in a 'serious' injury which was judged to be not LST-related and would have occurred if the trailer had been a standard one.
 - An incident in 2019 which resulted in the death of a cyclist, where the cyclist fell off while an LST was overtaking. From engagement with the policy, it was judged that the LST was not the cause of this incident.
163. Further to this, we commissioned our partner Risk Solutions to consider the casualty rates for LSTs when compared to standard articulated HGVs to determine the overall impact. Based on this analysis, the following casualty rates were calculated:

Cyclists and pedestrians²⁵ casualty rates	Casualty rates per billion vehicle kilometres
Articulated HGV (2012-2018)	11.27
LST (2012-2019)	4.02

164. From this, it can be inferred that the cyclist and pedestrian casualty rate for LSTs appears to be lower than the corresponding articulated HGV fleet average casualty rate, though this is based on a very small sample size. For that reason, while we can conclude that the casualty rate for LSTs appears lower than that for articulated HGVs, the difference in the rates is not statistically significant (at the 95% confidence level) due to the small number of incidents recorded. This will be examined in further detail during any post-implementation review.

Business Impact Target Calculations

165. Based on guidance set out by the Regulatory Policy Committee on the accounting of direct and indirect costs in permissive regulation for the purposes of the Business Impact Target²⁶, we have

²⁵ This assessment does not consider other vulnerable road users such as those on mobility scooters or horse riders.

²⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/869392/Permissive_legislation_-_February_2020.pdf

assessed the majority of impacts to be **Direct**. This is due to the change in regulation being seen as the only thing effectively ‘holding back’ businesses from operating LSTs (for businesses where LSTs are viable), and these costs and benefits are therefore immediate and unavoidable results of the regulatory change.

166. The table below breaks down the benefits and costs that are considered to have an impact on businesses and whether they are direct or indirect.

Description of cost or benefit	Type of impact	Direct/Indirect impact on Businesses
<u>Costs</u>		
Initial assessment	Business, Transition cost	Direct
Viability assessment	Business, Transition cost	Direct
Trailer replacement costs	Business, Ongoing cost	Direct
Regulation costs (including potential training costs)	Business, Ongoing cost	Direct
<u>Benefit</u>		
Fuel saving	Business, Annual benefit	Direct
Labour saving	Business, Annual benefit	Direct
Tyre saving	Business, Annual benefit	Direct
Repairs and maintenance savings	Business, Annual benefit	Direct
VED and RUL savings	Business, Annual benefit	Direct
Congestion (business) - 8% representing percentage of business traffic in terms of total journey kilometres ²⁷	Business, Annual benefit	Indirect

Sensitivity Analysis

167. Most of the data used for this analysis has been obtained from robust and well-established sources which provide us with a limited range for sensitivity testing. For the Departmental MEC values, high and low values have been applied for this analysis. There are some further assumptions that we can test for different scenarios: the purchase prices of trailers, regulatory costs and the running cost savings expected from LSTs. These are summarised in the table below and explained in further detail in the high and low NPV sections below.

	Central (Best Estimate)	Low NPV	High NPV
Marginal External Costs (MECs)	Central DfT MECs	Low DfT MECs	High DfT MECs
Purchase price of LSTs	Observed market prices	Central plus 20%	Central minus 20%
Regulation and familiarisation costs	Central DfT estimate	Central plus 20%	Central minus 20%

²⁷ The 8% figure is based on stats from the National Travel Survey, 5-year average (2015-2019) on the average distance travelled by purpose and main mode (Table NTS0409b).

Annual cost savings	Central DfT estimate	Central plus 20%	Central minus 20%

168. Further side sensitivities have been carried out using a scenario of higher take-up of LSTs (take-up B), and another one taking an assumption of the introduction of green HGVs in 2035 which reduces the CO2 benefits. The resulting NPVs of these two sensitivities are provided within the table below and the sensitivities used within the main estimates are broken down in the sections below.
169. The sensitivity on green vehicles entering the market assumes that in the year 2035, 10% of HGVs using LSTs will be green with an increase of 10% every year until 2041. The sensitivity on the take-up B scenario assumes the infrastructure will have changed by 2032 to be more accommodating of LSTs, and therefore the take-up of LSTs increases. The resulting NPVs from both sensitivities are presented in the table below (2019 prices, 2022 PVB) as well as the main estimate for comparison.

NPVs of sensitivities (£ million, 2019 prices, 2022 PVB)	Low	High	Central
Green vehicle sensitivity	894.58	1352.91	1138.01
Take-up B scenario	1223.66	1814.22	1537.47
Main NPV for comparison	933	1392	1177

Sensitivity Analysis Low NPV

170. For the low scenario, a reasonable worst-case scenario is presented to understand what a possible lower range for the NPV could look like and what drives these changes. This scenario includes the low valuation for the MECs which have been estimated by the Department using the NTM. These are presented below.

MEC Values (pence/mile, 2019 prices)	2020	2025	2030	2035	2040	2045
Congestion	58.99	62.87	68.50	75.49	84.03	89.39
Infrastructure	15.41	17.74	19.09	20.52	22.16	23.79
Noise	6.86	8.06	8.80	9.45	10.14	10.85
Indirect Taxation	-35.38	-36.06	-37.35	-38.26	-37.42	-36.85

171. Within the analysis, we have been provided with market data by Risk Solutions on the marginal purchase price of LSTs above that of standard trailers. This is a key input which allows the determination of the direct costs to business given the uptake of LSTs across the appraisal period. The values obtained by Risk Solutions have come from a range of suppliers and an average value has been taken, which presents a suitable average value to be used as the best estimate. For the low scenario analysis, we assume that these costs would increase by 20%. The underlying theory behind this could be a pessimistic view of competition in the market for LSTs with an excess of demand leading to higher prices in the market to purchase LSTs. This would pass through in the analysis to show higher direct costs to business.
172. A further sensitivity is to adjust the regulation costs borne by businesses by the regulation options, familiarisation, and annual cost savings from running LSTs. Like the purchase costs, these have been increased by 20% to present a worst-case scenario and lowered the annual cost savings by 20% to understand the range of impacts under this option.

Sensitivity Analysis High NPV

173. In the high scenario an optimistic case, where the benefits realised are higher and the costs borne by operators are lower, has been presented. On the benefits, the NTM produces outputs which represent a reasonably high scenario for the valuation of the MECs, which is explained in the TAG guidance. These are presented below.

MEC Values (pence/mile, 2019 prices)	2020	2025	2030	2035	2040	2045
Congestion	62.01	70.72	86.00	100.17	131.63	139.62
Infrastructure	16.61	15.41	17.74	19.08	20.52	22.16
Noise	6.86	8.06	8.79	9.44	10.12	10.83
Indirect Taxation	-35.41	-36.14	-37.51	-38.55	-37.87	-37.47

174. Conversely in the low scenario, a reduction in the trailer costs of 20% has been assumed based on theory which suggests that economies of scale and competition in the production of LSTs is reached which lower the supply costs to businesses and reduce the direct costs. The regulation and familiarisation costs have 20% deducted and the annual cost savings have 20% added to identify a reasonable upper bound on the valuation.

Wider Impacts

Small and Micro Business Assessment

175. The LST trial initially appeared to have higher barriers of entry for Small and Micro Businesses (SMBs). SMBs are less likely to have the resources to comply with the requirements of the trial, especially with regards to data collection and submission. SMBs may also have a lower risk appetite and would have avoided investing in a trial that may stop and not bring a return on their investment – and we would expect to see lower take-up from these smaller businesses, especially micro-sized businesses. The emergence of the second-hand market in the last year of the trial has shown that it would further reduce the non-regulatory barriers to entry and give easier access to the LST market for SMBs, especially micro-sized businesses. These barriers should reduce further for the final regulations under the preferred option; as the lighter regulation would provide regulatory certainty, as well as removing the data collection/submission requirements to limit the administrative burden that SMBs would face. Although it is believed that the regulation change should lower the barriers of entry for SMBs, it is still uncertain what the exact impact will be, and further monitoring is planned through the Post-Implementation Review.

176. No quantitative analysis has been undertaken to assess the possible impacts for the small and micro business assessment (SAMBA) as, while we have data on the current operator sizes, we are not certain on the uptake of the regulation post-trial. Information was sought at consultation to get a better idea of the impact of LST regulation on SMBs, with no responses. The data from the LST trial has revealed in the last few years a higher rate of entry for SMBs due to the emergence of the second hand-market for LSTs which has lowered the financial barriers to enter the market.

177. The Business Population estimates 2020²⁸ provides a breakdown on the number of businesses, employees, and turnover of businesses by different sizes in the freight transport industry. The breakdown of businesses by the number of employees is provided in the table below. It shows that the number of SMBs represent around 97% of businesses within the road freight industry, which emphasises the importance of ensuring this permissive regulation change can be accessed by the

²⁸ Table 7, Code 494, <https://www.gov.uk/government/statistics/business-population-estimates-2020>

entire market. Even though large business represents 0.3% of all businesses, this corresponds to nearly 32% of the industries revenues.

Size of business	Number of businesses	Business share (%)	Turnover (£ million)	Turnover share (%)
Micro (1 – 9 employees)	22,510	84.4	6,859	22.1
Small (10 – 49 employees)	3,495	13.1	8,130	26.2
Medium (50 – 249 employees)	585	2.2	7,435	23.9
Large (250 or more employees)	70	0.3	8,631	27.8
Total	26,660	100	31,055	100

178. As the trial has been running since January 2012, Risk Solutions have been collecting data on the size of businesses that are using LSTs under the current trial regime (based on the number of drivers in the business²⁹ which is different to the methodology used from BEIS' Business Population estimates), which are provided in their annual report³⁰ and summarised below. As shown below, although the industry is made up of mostly SMBs, this only represents 42% of the total share of companies within the trial and around 13% of the trailers. This suggests that currently SMBs could face a barrier to using LSTs as the trial is mainly made up of medium and large companies. The trial currently overrepresents the small businesses and underrepresents the micro-operators, which may impact future take-up of these businesses. Some of the reasons for this could be:

- a. Larger businesses tend to be in a better position to trial new technologies as they have sufficient revenue, better access to finance, and operations to fall back on should the benefits not be realised;
- b. Smaller businesses tend to be more risk averse and may be waiting for a formal regulatory change before they commit to purchasing and using LSTs;
- c. The data collection and submission may be too burdensome on small and micro operators which deters them from using LSTs;
- d. Larger businesses are more likely to carry higher capacities of goods through regular route(s) to yield the business savings associated with operating LSTs;
- e. The cost of new LSTs is too expensive to warrant joining the trial and SMBs may prefer to buy them second-hand, where the market is relatively underdeveloped.

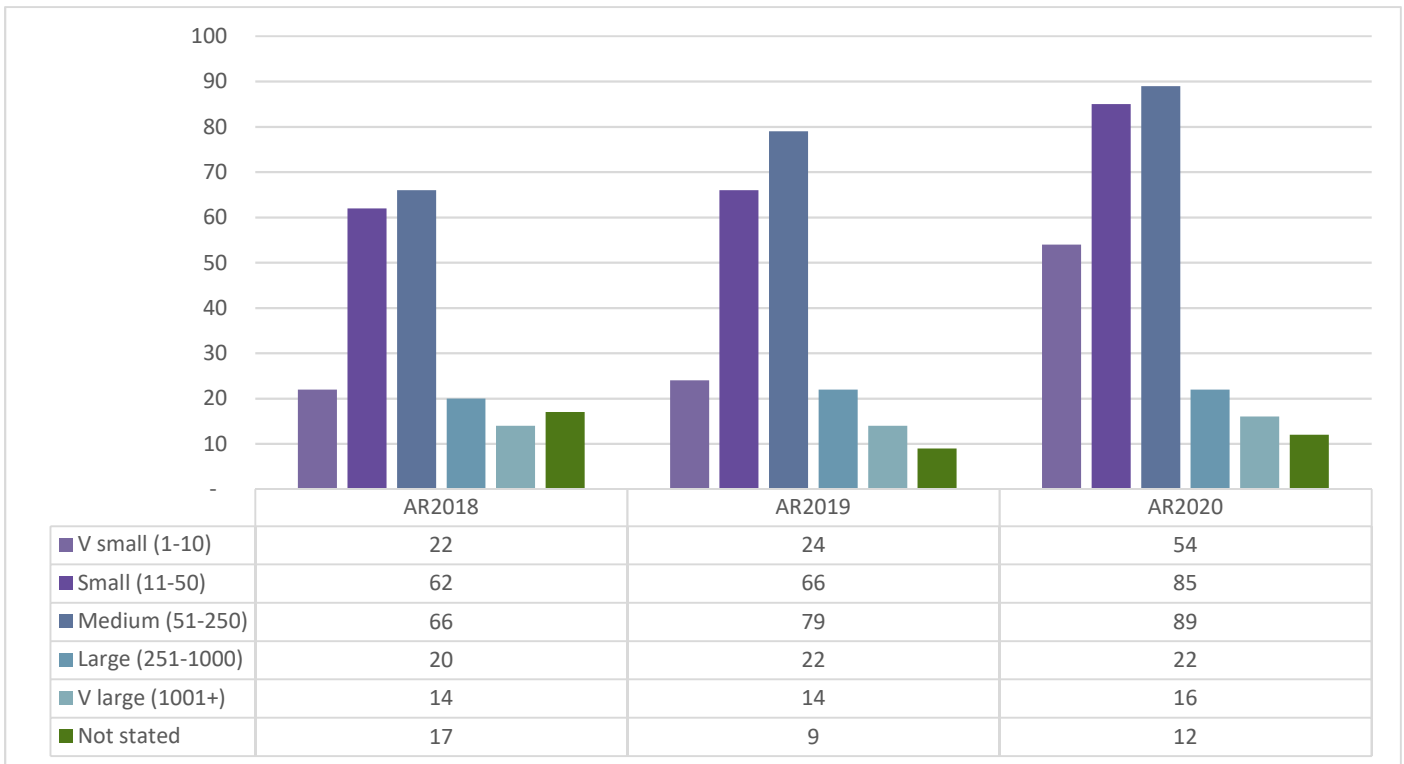
Source: LST Trial Annual Report 2019

Size of business (by number of drivers)	Number of trailers	Trailer share (%)	Number of companies	Companies share (%)
Micro (1 – 9 employees)	47	2.1%	24	11.2%
Small (10 – 49 employees)	248	10.8%	66	30.8%
Medium (50 – 249 employees)	752	32.8%	79	36.9%
Large (250 or more employees)	1,211	52.9%	36	16.8%
No data	33	1.4%	9	4.2%
Total	2,291	100.0%	214	100.0%

²⁹ This differs from the BEIS estimates which use all employees. Under the trial it was judged that drivers provides a more accurate representation of operator size, however comparative headcounts to the BEIS estimates will be provided in the final stage impact assessment.

³⁰ Calculations based on LSTs and operators submitting data under the trial, as provided in the 2018 Annual Report

179. Based on the proposed regulation under this option, it would remove disadvantages that SMBs faced under the trial. The main burden from the trial was the collection and submission of data which may have been preventing take-up by these businesses, and this is relaxed under the preferred option. There are minimal data collection requirements proposed in the regulation and these relate only to the operator acting to ensure compliance, so it is thought that this will vastly reduce the administrative barriers surrounding the operation of LSTs.
180. Although the regulation does not intentionally disadvantage SMBs, medium and large operators may be better positioned to take advantage of the permissive regulations proposed under the options presented. This is because they have more flexibility in the market and can adapt fairly quickly to new regulation changes, while it might take smaller business more time to adapt to their new market. However, through time, it is anticipated that smaller hauliers would be able to make efficient use of LSTs in the same way that larger operations currently are.
181. Based on the characteristics of smaller operations, they have a higher tendency to own second-hand trailers and run them to an older age than those in larger operations. This would mean that the business costs associated with purchasing trailers is likely to be lower than outlined in the main cost analysis. Although the IA does not specifically model the impact of a second-hand market, the consultation was used to try and clarify how this second-hand market would help SMBs but no responses on this issue were received. The extra cost of an LST relative to a normal trailer should not be high enough to create a barrier to entry for smaller businesses and their longer use by smaller businesses would end up making the cost difference only marginal. In the last few years of the trial there has been an increase in the number of micro businesses getting access to LSTs, primarily through the second-hand market.
182. During 2020, the trial saw the highest number of new operators joining the trial, with 64 new operators (roughly a 30% increase). This has been attributed to smaller and micro businesses joining the trial, as they are responsible for 80% of this increase. An increase of this magnitude has not been seen since the number of spaces on the trial increased from 1,800 to 2,800 in 2017/2018.
183. Risk Solutions believe there are several factors that have led to this rise, with the primary reason being the growth in the second-hand LST market, and secondly that smaller companies have become more open to operating LSTs. Discussions between Risk Solutions and SMBs about their reasons for joining the trial have brought up statements such as 1) the trial seemed to be going well and therefore they decided to investigate it, 2) other companies had suggested they start using LSTs and 3) competitors were starting to use LSTs and therefore they wanted to do the same. As leases on certain LSTs have reached their end (with the standard lease being an average of 7 years), they are then returned to the leasing company which then enter the LST into the second-hand market where smaller businesses are able to obtain them at a cheaper rate. The table below shows the changes in percentage of participating companies by their number of drivers from the 2018 to 2020 Annual Reports, with a large increase in micro businesses operating in the last year, providing evidence that the second-hand market will enable easier entry into the LST market for SMBs and lower any potential barriers they may face.



184. To conclude, although the regulation under this option does not intentionally disadvantage or act as a barrier to SMBs, there may be some elements of operating an LST which they might struggle with or they may incur additional costs compared to larger businesses. Where possible, these have been mitigated through the design of the regulatory change, which is lighter touch than the trial. By providing regulatory certainty, we are expecting this to help SMBs into the market, and the latest data coming out of the trial regarding the increase in SMB participation is promising with regards to how the second-hand market will further remove barriers and ease entry into the market. Although we cannot forecast the take-up of LSTs from SMBs, the regulation changes are expected to reduce the barriers to entry and enable better access into the LST market for SMBs. This will also be further monitored after the regulatory changes are made to limit any unintended consequences arising from this.

Trade Test

185. Under the requirements for carrying out a trade test as part of the IA process, a short explanation has been undertaken to highlight the possible impacts on the value of: imports or exports, investments and trade flows, and domestic and foreign businesses. For the first two requirements, the introduction of LSTs under the preferred option presented in this IA will have no impact on the value of trade and investment flows with other countries.
186. For the final point, the proposed regulatory change does not align with foreign policies and may adversely impact foreign businesses who operate in or from the UK to other countries. Hauliers that both operate domestically and internationally will not be able to make use of LSTs for international journeys given the differentials in the regulatory regimes, however they could use LSTs for domestic operations. Given this is a deregulatory change, hauliers can choose to operate LSTs and it does not place a regulatory burden on foreign operators or domestic operators continuing business in the UK, but rather puts them at a competitive disadvantage. Therefore, although this may disproportionately affect foreign hauliers, this would not act as a barrier to trade as business can continue as it does under the current regulatory regime.

Risks and uncertainty

The scaling model

187. Throughout this analysis, the scaling model has been used to model the forecasted uptake and resulting distance savings, which are in turn used to estimate the costs and benefits. As highlighted in the scaling model section, multipliers have been used in the modelling to estimate the behavioural responses under the different options presented against that of the trial (of which the model extrapolates from). These multipliers are conservative and are slightly lower in terms of efficiency savings compared to the trial, and also slightly lower in terms of forecasting the uptake of LSTs.
188. There is a moderate amount of uncertainty surrounding this due to the prediction of behavioural responses, when it is uncertain how the industry would react to LSTs being legalised for uncapped use on the road. This is also compounded by perceptions of the regulation in place. Although they may appear burdensome at the outset, in practice many of the operators might already be meeting the general forms of the regulation such as the route risk assessment, compliance and tracking of trailers. This may underestimate the uptake and therefore the NPVs would be higher. Conversely, for smaller operators (with the largest market share), the regulation posed may be burdensome and reduce the uptake below that envisaged.
189. Furthermore, on the savings multiplier, we have judged this based on how we would expect hauliers to react to the different levels of regulation put in place. It has been assumed that the higher the regulation, the closer it will be to the trial savings given the compliance checks put in place.
190. There is a significant uncertainty in the estimated take up of LSTs. This is because it was based on the 2017 survey, which only had responses from 126 different operators, and which was based on one single point in time across the trial. The estimated savings factor for each cluster assumes that the trial population is a representative sample of the whole industry, where this might not be the case as goods densities and distance savings could vary as the population of businesses operating LSTs changes in a post-trial environment. Within the IA a conservative approach was taken using scenario A for the estimation of the main NPV, and a sensitivity has been done using the take-up B scenario to show what the NPV would look like if the take-up of LSTs were higher with the results within the sensitivity section.
191. One final aspect to note is that a key driver of uncertainty within the modelling is that operators may simply choose not to implement LSTs, when we have modelled that they would. This would mean that we might not achieve the modelled results set out by this assessment and the benefits could therefore be expected to be lower. Given the nature of the modelling, any deviation from the uptake is likely to impact across all options and, given the conclusions, we would expect that the comparison between options of the net benefits would remain the same, with just the differential in the magnitude following the lower uptake.
192. The uptake of LSTs also depends on what other policies could be put into regulation within the appraisal period of 20 years. Other policies such as '48/48', which considers increasing the weight limit of HGVs to 48 tonnes in a 50-mile radius of rail depots could make LSTs more popular, as the weight limit increase would also affect LSTs. If any other Longer and/or Heavier Vehicle (LHV) types were introduced, that would change the options available to operators and therefore the demand and uptake of LSTs. The introduction of greener vehicles would also have an impact on the environmental benefits of LSTs, however due to uncertainty as to when they might start being introduced, we have simply assumed that they will not be introduced before the end of the appraisal period.

Benefits based on MECs methodology

193. As noted in the benefits section of this analysis, the benefits have been estimated using the Department's standard MEC values, which are based on full laden articulated HGVs. As the journeys being replaced by LSTs are constrained by volume and not weight, it is true that the weight would be less than a full laden articulated HGV and therefore have lower impacts on aspects such as infrastructure and congestion. These journeys are then replaced by LSTs, operating at or near the 44-tonne weight limit. Therefore, we would be slightly overestimating the net benefits from switching to LSTs and we have assumed that the weight of vehicles being replaced is higher than observed.
194. Furthermore, the congestion impacts are expected to face similar uncertainty as these benefits are based on a typical car and scaled up using Passenger Car Uplift (PCU) factors, where the factor for

HGVs is 2.9. One of the key determinants of the PCU factor is the vehicle length, and as LSTs are up to 2.05m longer, we would expect a larger PCU (resulting in larger congestion costs from LSTs). This has similar implications as the scale of the net benefits would be smaller as the congestion impacts from LSTs may be larger. Added to this, it is understood that LSTs operate largely on the SRN where the impact of additional lengths are lower which may offset part of this increase, and therefore we have kept to the TAG MEC figures.

Emissions modelling

195. Linked to the scaling model, there is also the emissions modelling which is based on the distance savings which was discussed above. The emissions are currently based on Euro V and Euro VI emissions vehicles and the vehicle projections by BEIS. This would be impacted upon with the introduction of greener vehicles within the appraisal period, with many of the benefits from LSTs then possibly being over. However, there are no forecasts as to when these may become available. The introduction of greener vehicles in the latter years of the appraisal period is likely to reduce the (monetised) environmental benefits of LSTs with regard to CO₂ emissions. A sensitivity has been carried out regarding the introduction of greener vehicles, with more details within the sensitivity section of the IA.

Trailer replacement cycles

196. As outlined in the costs sections, we have based the costs of trailer replacements on a 10-year replacement cycle, which was the initial expectations at the beginning of the trial, hence the trial length being 10 years. However, we understand that many operators would have shorter replacement cycles or currently lease their trailers for a lower duration which would reduce this assumption. Information was sought at consultation on this, but no answers were received so we are keeping to the best evidence that we have from the LST trial and a 2017 Risk Solutions survey. A lower replacement cycle would mean that the costs of trailer replacement are being underestimated under the options here as the marginal cost of the trailer would be imposed on operators choosing to have LSTs more frequently over the appraisal period which would reduce the NPVs across the options. We did seek clarification on this during consultation to improve the accuracy, but it did not lead to any responses.

Second-hand market

197. Like the trailer replacement costs, throughout the analysis we have assumed that there would be no second-hand market for LSTs and any trailers purchased would be at the full marginal value beyond a standard trailer. However it is widely expected that, under the options presented here, a second-hand market would become more prominent (as it is currently establishing under the trial) as there is no need for Vehicle Special Orders to operate trailers. Under the expectations as seen for standard trailers, operators would be able to purchase used trailers at a lower cost. To accurately estimate the business costs, this should be captured within the analysis, however the number of operators who would buy LSTs and would prefer to purchase them second-hand is unknown. It is also unknown what the future market value of older trailers would be to determine the marginal price above used standard trailers. This increases the level of uncertainty as the costs may be slightly overestimated and therefore the NPVs across the options may be slightly higher than modelled. We have sought clarification during the consultation with a view to improve this for the final stage, however no responses were received, and this is not planned to be re-assessed through the Post-Implementation Review as the impacts are expected to be minimal.

Potential unintended consequences

198. As previously mentioned within the IA, there are risks that LSTs may be used where they are not effective and not run efficiently, making the overall impact on emissions and pollution worse than what it currently is; or there could be low take-up of LSTs which would mean the regulation does not fulfil the full possible positive societal impacts it could have.
199. The overall impact on road safety of moving LSTs from trial conditions to the real world is uncertain and would be dependent on the impact this move would have on operators' behaviour. As mentioned previously, there is monitoring in place to look at the impact of LSTs on road safety, and if figures are disappointing then the position can be reviewed, including through rapid guidance.

200. A possible consequence of LST regulation is that it could set a new standard for deliveries of lighter goods and 'fragment' the market where businesses request deliveries of a certain quantity or pallet load of lighter goods which only LSTs could perform, thereby giving an advantage to hauliers with LSTs.

Annex A: LST Consultation Response - Executive summary

In this summary we will look at the main concerns that are shared by the respondents and the government in order for the preferred policy option to proceed. We think it's important to show these points and address each in turn to show the combined number of responses from both the consultation's online questionnaire (36 questions) and main 14 questions (the summarised version of the questions). If you would like to refer to the full responses to the whole consultation, please use the following [link](#):

In order to proceed after the end of the trial our preferred option is Policy Option 1 (Lighter additional regulation - Annex B) as it allows the whole of the freight industry to have unrestricted access to LSTs and therefore make an important contribution to reducing emission levels. The proposed additional regulation beyond that in place for standard 13.6 metre trailers, takes into consideration concerns raised regarding LSTs being operated on inappropriate roads and increasing the road safety risk, particularly to vulnerable road users as well as damage to street furniture. The objective of this policy is to facilitate more efficient and environmentally beneficial freight transport. It seeks to permit the transportation of an equal amount of freight in fewer journeys by allowing longer vehicles, which achieve efficiency, environmental and safety benefits.

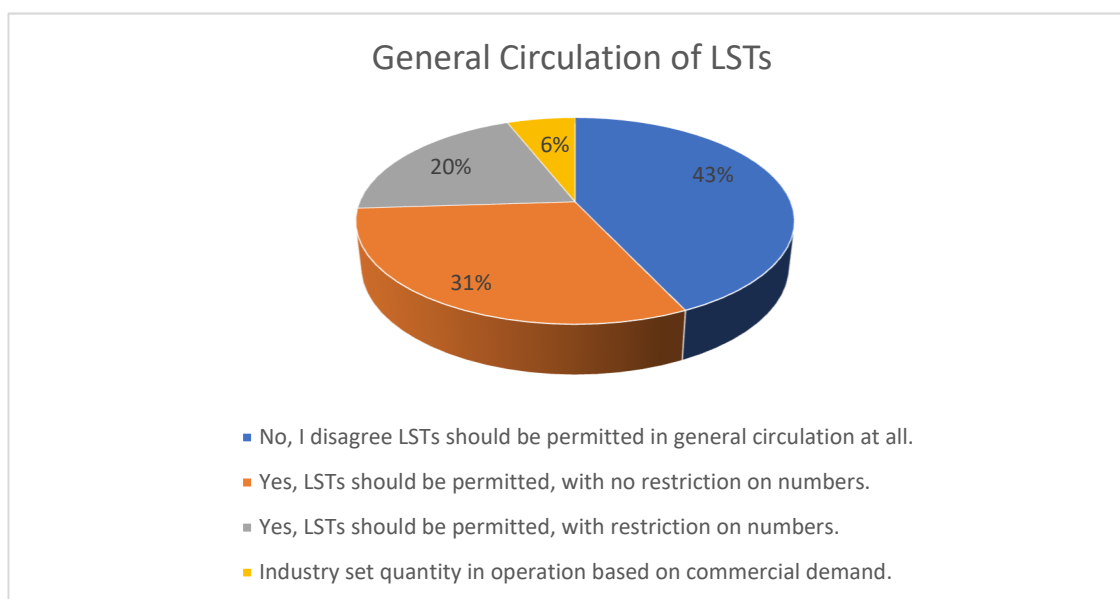
The areas of concern raised throughout the consultation will be addressed in this executive summary, they are as follows:

- The general circulation of LSTs - who agrees/ disagrees and why?
- LSTs being removed from circulation all together - who agrees/ disagrees and why?
- Those in favour of additional regulation - who agrees/ disagrees and why?
- Those against regulation - who agrees/ disagrees and why?
- Concerns regarding safety hazards - who agrees/ disagrees and why?

We will address each of these in turn, give the combined results from both the online survey and main 14 questions, detail the main concerns that have been raised by respondents and confirm the government responses that address those concerns.

Please note that in these figures we have removed the respondents that either made no comment or did not respond to those particular questions, in order to give a true reflection of who agreed or disagreed.

The general circulation of LSTs who agrees/ disagrees and why?



1. Although 43% of respondents felt that LSTs should be removed from circulation all together, the remaining 57% felt that they should be in general circulation and could see the positive effects for the industry and environment.

2. 31% agreed that they should be brought into general circulation with no restrictions on numbers.
3. Proceeding with the government's preferred policy option – allowing general circulation of LSTs with additional regulatory controls. A number of control mechanisms will be enforced to control the use of LSTs in general circulation along with annual reports and regulation to monitor their continued use and compliance. This supports the majority findings from the respondents, while maintaining safety.

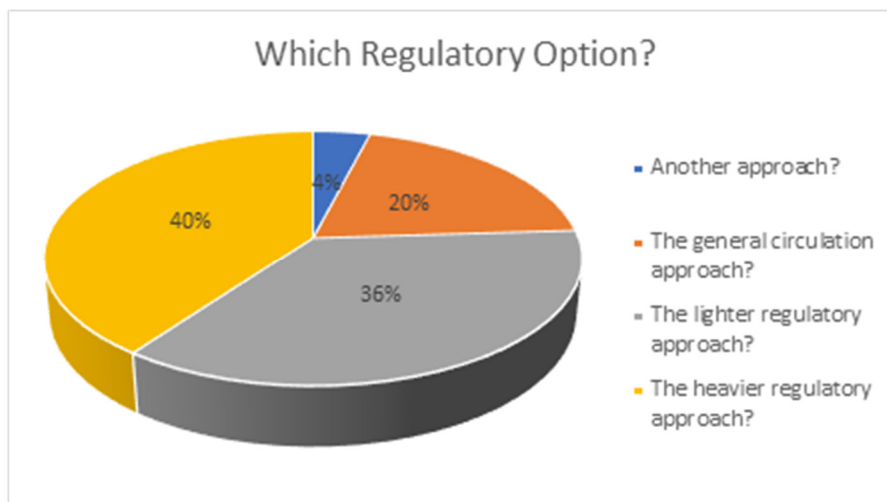
LSTs being removed from circulation all together who agrees/ disagrees and why

4. The 43% of respondents that felt LSTs should be removed all together are private individuals, campaign groups and charities that all work to make the streets safer. These respondents have understandably raised their concerns for vulnerable road users and most state their additional opposition to LSTs being used in urban areas and minor roads, where the dangers to vulnerable road users are considerably increased.
5. All operators of HGVs must comply with the government's operator licensing legislation – the main purpose of goods vehicle operator licensing is to ensure the safe and proper use of goods vehicles and to protect the environment around operating centres. The licensing provisions can be found in the Goods Vehicles (Licensing of Operators) Act 1995, the Goods Vehicles (Licensing of Operators) Regulations 1995, the Road Transport Operator Regulations 2011, and the Goods Vehicles (Licensing of Operators) (Fees) Regulations 1995.
6. The government wishes to reassure all respondents that all HGV operators are accountable to a traffic commissioner. In Great Britain, the traffic commissioners are regulators of the road transport industry. Their function is to ensure that only safe and reliable operators of goods and passenger vehicles are permitted to be licensed. Traffic commissioners may take regulatory action against an operator – where they may revoke, suspend or curtail an operator's licence.

By introducing the government's preferred Policy Option 1 – unrestricted access of LSTs with lighter regulatory control – this ensures the following measures must be adhered to in addition to those outlined within their operator's license to ensure the safety of vulnerable and other road users, as well as road access concerns relating to minor and urban areas within the routes of LSTs;

- Operators may be required to apply to the traffic commissioner for permission to operate a permitted number of LSTs.
- Operators being required to undertake a risk assessment of the proposed route for the LST to ensure it is appropriate.
- Operators being required to retain a record of all risk assessments undertaken prior to LST journeys.
- The encouragement of specific driver training, lasting a minimum of half a day.
- Operators being required to put in place a system to allow drivers to provide feedback on routes proposed and followed. A record of this feedback and response provided by the operator will be required to be kept on record.
- Operators being required to undertake compliance checks to ensure LSTs are following the routes set and to take appropriate action where deviations are identified.
- Operators being required to ensure that there is a process for managing road closures.

Those in favour of additional regulation who agrees/ disagrees and why?

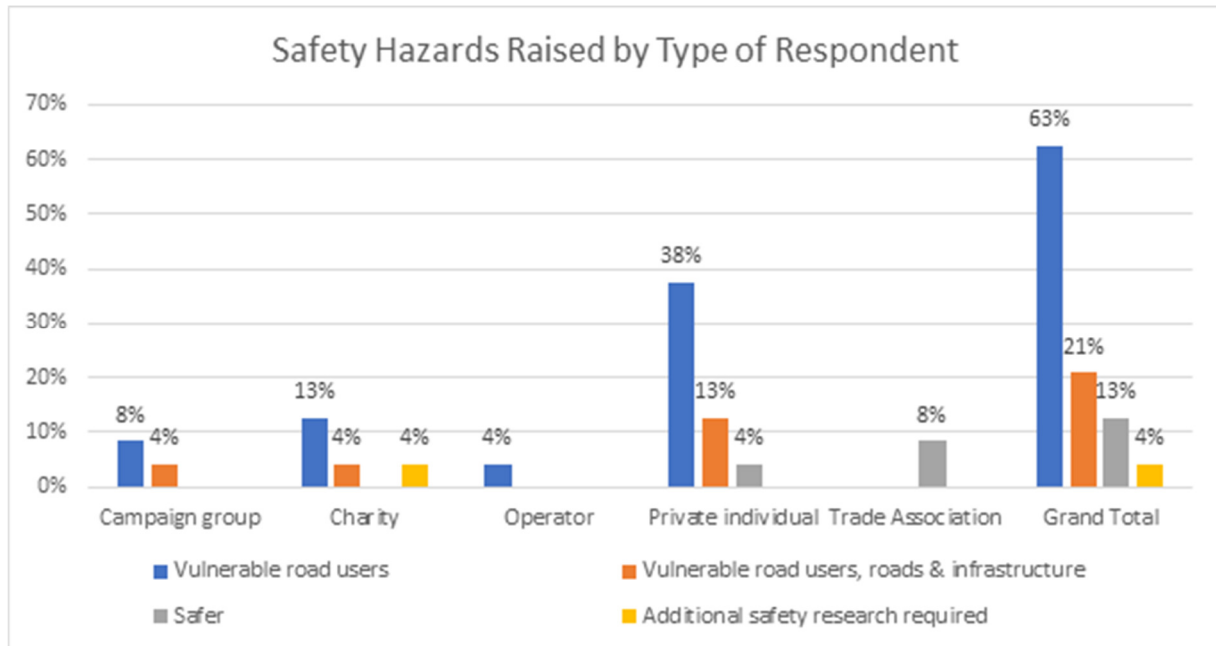


7. 36% of respondents agreed that the lighter regulatory option was the best approach, 20% of the respondents felt the general circulation approach was favoured and 4% felt that another approach should be sought stating that ways of encouraging a modal shift to rail should be encouraged. In total, 60% felt that the heavier regulatory approach was not necessary.
8. 40% preferred the heavier regulatory approach and the major concerns raised were about the safety impact on vulnerable road users and the adequate monitoring of LST usage. Some felt that the proposed training under the lighter regulatory option was not at an adequate level to safely operate LSTs.
9. The majority of respondents were in favour of bringing in some form of additional regulation whether this was via the lighter or heavier options on offer within the consultation, with 40% in favour of heavier controls. Considering the responses and reviewing the IA and trial data from 2012 to date it is the government's opinion that the lighter regulatory option is still the most appropriate option to move forward on as it allows for extra regulatory controls around suggested training, safety, risk, monitoring and usage while maintaining feasibility for operators.
10. The lighter additional regulatory option is supported by those who have previous experience within heavy goods vehicle operations and understand the level of compliance required to operate LSTs in a safe environment.
11. Proceeding with this option also contributes to the government's Transport Decarbonisation Plan and may feed into other multimodal activities throughout Great Britain. All of which would reduce the use of LSTs and lead to journey reductions which in turn would lead to a reduction in congestion, carbon dioxide emissions and air pollutants.

Those against regulation who agrees/ disagrees and why:

12. Most of the respondents that replied said they felt LSTs should complete at least 80% of their journeys on the Strategic Road Network, should be tracked via GPS, required to report on serious incidents, undertake risk assessments for routes, retain data for the traffic commissioner to operate LSTs and gain annual authority to use LSTs over 10 years old. Between 53% and 91% of private individuals, campaign groups and charities agreed that all of these should be a requirement. All of these options collectively will make the roads safer, mean that the use of LSTs can be properly monitored and encourage their safe and proper use.

13. Between 9% and 47% said 'no' to these additional requirements. These responses were mainly from operators and trade associations, and the overriding factor here was that many of these were either excessive or surplus to requirements. These are fulfilled through their obligations under the current regulation of commercial vehicle operators. Regulations for reporting incidents, health and safety issues, training requirements already exist in current legislations under The Management of Health and Safety at Work Regulations 1999 s13, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR). The requirement to report incidents involving LSTs where damage is caused, on public roads, already exists in the Road Traffic Act 1988 s170.



14. Based on the analysis carried out within the IA and the trial data from 2012, even under a scenario where the accident risk rate is higher for LSTs, as indicated by the TRL desktop research, LSTs may provide a net benefit to society through accident reduction. This is due to the reduction in miles travelled by standard trailers outweighing the potential increased risk of operating LSTs. Using the observed data on accidents from the trial, the benefits could be significantly higher, however given LSTs are currently operating under trial conditions, this is not directly applicable to non-trial conditions which we have considered by our policy view. This ensures its likeness to the trial, ensuring a more accurate assessment of the potential safety benefits in using LSTs through a reduction in miles travelled.

Concerns regarding safety hazards who agrees/ disagrees and why

15. The overwhelming majority of safety concerns raised by respondents were in relation to the increased safety risks for vulnerable road users. 63% saw this as the biggest hazard caused using LSTs, of which 38% were private individuals and the remaining respondents were made up mainly of charity and campaign groups that do great work campaigning to improve the conditions for vulnerable road users. Many said that LSTs should only be used on the Strategic Road Networks, ensuring they are kept off minor roads and out of towns and cities.
16. 21% felt that there were safety implications for vulnerable road users, but also for the roads and infrastructure.
17. Mainly trade associations were in the 13% that felt that LSTs are safer in the way they behave and handle and encourage their usage over standard articulated lorries for these improved safety implications, but also the safety aspects of reducing freight on the roads (by reducing the number of vehicles required to transport the same volume of goods) and decreasing emissions (by reducing the numbers of journeys necessary).

18. The LST trial has seen a reduction in journey numbers and pollutants compared to standard 13.6m semi-trailers, whilst LSTs have operated at least as safely as 13.6m trailers. The main policy objective is to enable the transportation of the same volume of freight by fewer journeys on the basis that the key drivers of safe and efficient utilisation are maintained, while encouraging the widest realisation of efficiency and environmental benefits and maintaining road safety levels for all road users.
19. Various controls will be used to mitigate against the risk of an increased casualty rate. These are:
- I. Vehicle design – steering axle design which reduces the tail-swing or kick-out of the trailers. Other designs such as active steer or other technologies could also provide mitigation;
 - II. Operating standards – operator licensing requirements, qualifications, suggested driver training;
 - III. Controlled trial conditions – replicating route assessment conditions from the LST trial
20. Therefore, although LSTs are longer, mitigating actions will be put in place to prevent the LST casualty rate increasing to a significantly higher rate than standard articulated HGVs and with appropriate operational management could lower the accident risk (as has been demonstrated on the trial). These measures will mitigate the main areas of concerns raised by respondents within the consultation by allowing LSTs into general circulation with additional regulatory control post-trial.

Annex B: Summary of Impact Assessment consultation questions.

The consultation ran from the 9th of November 2020 until the 1st of February 2021. No responses were received on any of the Impact Assessment questions listed below.

Question number	Question
1	Does the assumption on the time-taken for infrastructure changes (10 years) follow your expectation? If not, what would you expect this to be and what would drive this?
2	What is the current operating life expectancy of a LST trailer (we currently assume 10 years)? If this is different, what drives this? Is this different to a standard trailer?
3	What are the expected scrappage value of an LST trailer (this should capture the price paid for the trailer minus the costs of disposal)? If the value depends on the specific LST design, please note the factors driving this variance.
4	Is the time taken in the Tier 1 and Tier 2 review reflective of the expected time taken to carry out these tasks? If not, what would be a reasonable estimate for the number of Tier 1 and Tier 2 days? (note, this is 0.5 for Tier 1, and 5 for Tier 2.)
5	Is the number of operators in scope for each Tier 1 and Tier 2 review reflective of the actual number of operators in scope? If not, how many operators would be expected to review in each Tier? (note, this is 62,415 in Tier 1, and 16,618 in Tier 2.)
6	What employees do you expect to be involved with the review of the regulation? How many hours would you expect each individual in your organisation to take to review the options under Tier 1 and Tier 2? (e.g. how many hours for each employee (e.g. director, transport manager, admin staff))
7	Do you foresee any further familiarisation costs necessary to accommodate future increased amounts of LSTs? If so, how long would you expect these to last for and at what cost?
8	What proportion of LSTs would you expect to be using in your fleet that are older than 10 years of age? How long would you expect to continue using these beyond 10 years?
9	How long would you be considering owning a new trailer for? Would you expect to sell this on the second-hand market or scrap the trailer at the end of this period?
10	If you were to consider purchasing a second-hand trailer, how many years would you expect to continue using it for?
11	If you own LSTs of each length (up to 14.6m and 15.65m), how many more of each length would you consider buying?
12	Do you expect that there would be additional time associated with carrying out the route risk assessments or responding to driver's feedback on routes than already considered for standard trailers? If so, how much longer would you expect this to take?
13	Would you expect to train drivers on a group-basis in one go, or one a one-to-one basis? If on a group-basis, how many would you train at one time?
14	If you choose to operate LSTs will you have to provide further training to existing employees for them to be able to operate the LSTs? If so, at what cost per employee?
15	Do you anticipate that you would have to provide future training to employees under this option? If so, what would you expect the cost of this to be per employee?

16	How many drivers would you expect to train in comparison to the number of trailers in your fleet? I.e. what ratio of drivers to trailers would you use.
17	Is the assumption on the loss of business time doubling the training cost follow your expectations? If not, how much more than the training would you expect this to be?
18	Is the assumption on each driver obtaining one on one training suitable? If not, how many drivers would you expect to train in one go in your business?
19	Would you seek to vary your license again if you saw distinct business benefits from your initial experience of using LSTs? If so, when would you expect to re-apply for a variation? (i.e. the number of years)
20	Which employees would be expected to be involved in this work? How many hours would it take for each of these to draft and review the license application before submitting? (i.e. we are looking for the number of hours for each employee).
21	Are the observed average fuel consumption rates from LSTs the same as standard articulated vehicle trailers for a similar cargo weight? If not, how much do LSTs affect these rates?
22	Are the employee costs presented by the Transport Engineer report reflective of your average employee costs (salaries of £37,184)? If not, how much different is this?
23	Is the annual mileage per driver of 85,000 presented in the Transport Engineer report reflective of your average driver mileage? If not, how much different is this?
24	Are current LST operatives paid a premium for operating LST trailers? Do you plan on changing this if LST operation continues/grows?
25	Are the costs provided by the Transport Engineer report representative of the standard trailer annual running costs? These are presented in the table below.
26	Are the annual running costs the same for LSTs as the current standard trailers (see Question 8)? If not, by what percentage are these different?
27	Have you experienced lower tyre costs associated with operating LSTs due to the reduced tyre scrub from the steering axle systems? If so, how much cheaper would you expect this to be per trailer each year? (i.e. what percent were they different)
28	Have you experienced increased/decreased repair and maintenance costs while using LSTs with self-steer systems? If so, how much was this increase?
29	Are there any other factors that we have not mentioned that would change the observed accident rates if we were to allow LSTs to operate outside of trial conditions?
30	How many LSTs do operators with less than 10 employees intend to use in the future?
31	How many LSTs do operators with less than 50 employees intend to use in the future?
32	Are either of these operators (with less than 50 employees) subject to higher costs than those which have been assessed in this consultation document?
33	If you are a small/micro business, how likely are you to buy a second-hand trailer over a brand new trailer? Please provide a percentage where possible.
34	If you are likely to purchase a second-hand trailer, what age of trailer would you expect to purchase?
35	How much is purchasing a second-hand trailer likely to reduce purchasing costs by? Please provide an expected percentage saving in costs.

36	Does the figure of £650, which captures the additional monitoring costs to the OTC and DVSA reflect expectations? If not, what would you expect this cost to be per trailer?
37	Does the cost of a day's training on a CPC-accredited LST module meet your expectation of the cost (£400)? If not, how much would you expect this to be?
38	Would you expect the LST-related CPC module to be captured within another day module for drivers? If so, how much of the course would you expect this to cover? (i.e. what proportion of the day, e.g. 0.5 days reflecting the half day course).
39	Do you already check your existing routes already? Would there be additional time associated with periodic checks on route planning for LSTs? If so, how much longer would you expect this to take?
40	Are the costs of tracker units reflective of your expectations? If not, how much would you expect to cost per unit of each?
41	Are the system costs to store and supply the trackers data in line with your expectations? If not, how much would you expect this to cost per trailer?

Annex C: Draft Post-Implementation Review (PIR) plan

1. **Review status:** Please classify with an 'x' and provide any explanations below.

<input type="checkbox"/>	Sunset clause	<input checked="" type="checkbox"/>	Other review clause	<input type="checkbox"/>	Political commitment	<input type="checkbox"/>	Other reason	<input type="checkbox"/>	No plan to review
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2. **Expected review date** (month and year, xx/xx):

0	1	/	3	0
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This review date has been identified given the significant lead time before LSTs will begin to enter into general circulation in significant numbers. Businesses will need to understand whether LSTs will benefit their operation, order and receive LSTs. As only major operators may be likely to purchase new LSTs, it will then be some time before significant numbers are available and have been in operation before smaller operators may purchase them second-hand.

3. **Net costs/benefits set out in original legislation:**

<p>Net cost to business per year (£m)</p> <p>-£21.4</p>	<p>NPVs (£million):</p> <p>£1,176.7</p>	<p>Total Cost (Present Value) (£million):</p> <p>£560.0</p>
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4. **Rationale for PIR approach:**

Level of evidence and resourcing that will be adopted for this PIR: High

The financial benefits of allowing LSTs to enter into general circulation is expected to be somewhere between £933 million and £1.39 billion over 20 years. Prior to amending the appropriate legislation to allow LSTs to enter into general circulation an extensive trial was conducted which proved operators could, in the right circumstances, achieve significant efficiency savings which resulted in significant emission savings being achieved and demonstrated the potential benefit that the introduction of LSTs may have if introduced in significant numbers on easing congestion. The trial also demonstrated that LSTs could be operated at least as safely as standard 13.6m trailers, if appropriate mitigation measures were put in place to address the increased road safety risk posed by the unique handling characteristics of LSTs. However, once the amending legislation comes into effect, other than information relating to incidents which LSTs are involved, no data which was collected under the trial will continue to be collected due to the impact it is believed such a regulatory burden would have on the take-up of LSTs. As such, in order to identify the level of benefits being achieved by LSTs once they have entered into general circulation, it is proposed that a study be undertaken a year before the PIR is undertaken to capture this and enable comparisons to benefits being achieved under the trial and to the operation of 13.6m trailers to be made. It is likely that stakeholders who operate LSTs will be identified from records the OTC hold on which operators hold licenses to operate LSTs and that they will be contacted directly to ask whether they will be content to take part in the study.

Key Objectives, Research Questions and Evidence collection plans- template

Describe the main objectives of the regulation(s) under review as well as the key questions that will need to be researched to measure whether objectives have been successful. Next, consider any existing data/evidence sources that may help you answer this question as well as any new evidence that you may wish to collect, where proportionate.

<p>Key objectives of the regulation(s) (add rows as appropriate)</p>	<p>Key research questions to measure success of objective</p>	<p>Existing evidence/data Please consider: a) The data/evidence sources b) The <i>timeframes</i> they reference</p>	<p>Any plans to collect primary data to answer questions? Please consider: a) How stakeholder views will be collected b) <i>Timeframes</i> for evidence collection c) Why collecting new data is (or is not) necessary/proportionate</p>
<p>To determine the uptake and usage of LSTs</p>	<p>How many LSTs are in operation? How many new LSTs are being operated by? How many second hand LSTs are being operated? Is there any reasonable expectation that the number of LSTs in operation will continue to grow?</p>	<p>Conduct primary data collection with operators on numbers and use of LSTs.</p>	<p>Conducting primary data collection with operators on numbers and use of LSTs - this will be proportionate as it will be the only way to collect up-to-date figures.</p>
<p>To enable the road freight sector to become significantly more efficient</p>	<p>How many journeys does it take the most efficient operators of LSTs to transport the same volume of goods as operators of 13.6m trailers? How many journeys does it take the least efficient operators of LSTs to transport the same volume of goods as operators of 12.6m trailers? How many journeys does it take operators who fall into the middle group (in terms of efficiency savings being achieved) when compared to operators of 13.6m trailers? How many journeys does it take the average operator of LSTs to transport the same volume of goods as operators of 13.6m trailers?</p>	<p>Conduct primary data collection with LST operators.</p>	<p>Effectiveness of LSTs will be measured through primary data collections via LST operators – this is proportionate as it will be the only way to collect up-to-date figures.</p>

<p>In becoming significantly more efficient this enables businesses in this sector to be put on a more stable operational footing and achieve higher margins</p>	<p>What level of financial saving/benefit is being achieved by operators who are achieving the greatest efficiency saving and how does this compare to operators of 13.6m trailers? What level of financial saving/benefit is being achieved by operators who are achieving the least efficiency saving and how does this compare to operators of 13.6m trailers? What level of financial saving/benefit is being achieved by operators who full into the middle group (in terms of efficiency savings being achieved) and how does this compare to operators of 13.6m trailers? What is the average level of financial saving/benefit being achieved by operators and how does this compare to operators of 13.6m trailers?</p>	<p>Conducting primary data collections (surveys or interviews) with LST operators.</p>	<p>Financial savings of using LSTs will be measured through primary data collections via LST operators – this is proportionate as it will be the only way to collect up-to-date figures.</p>
<p>In becoming significantly more efficient in their operation this will enable the sector to make significant emissions savings</p>	<p>What level of environmental savings are being achieved by the most efficient operators? What level of environmental savings are being achieved by the least efficient operators? What level of environmental savings are being achieved by the middle group (in terms of efficiency savings being achieved)? What is the average level of environmental savings being achieved? What is the estimated total of environmental savings achieved since LSTs entered into general circulation?</p>	<p>Modelling of GHG emissions will be conducted based on the data derived from operators on the number and usage of LSTs</p>	<p>Environmental impact of LSTs will be modelled from primary data collected in the study. This is proportionate as it will be up to date.</p>

<p>The operation of LSTs has been able to contribute to a reduction in congestion</p>	<p>What estimated number of 13.6m trailer journeys has been saved? Has this saving contributed to a reduction in congestion?</p>	<p>Congestion impact of LSTs will be modelled from the primary data collected on uptake and usage in the study</p>	<p>Congestion impact of LSTs will be modelled from the primary data collected in the study. This is proportionate as it will be up to date.</p>
<p>LSTs are able to achieve these benefits whilst operating as safely as 13.6m trailers</p>	<p>What is the casualty rate for LSTs per million kilometres? How does the casualty rate for LSTs per million kilometres compare to 13.6m trailers? Can LSTs be considered to be at least as safe as 13.6m trailers?</p>	<p>STATS19 / regular and standardised road incidence statistics</p>	<p>Secondary data sources on road incidence will be used to compare LSTs to 13.6m trailers. This is proportionate as it will use existing data sources.</p>