

Eco-driving for HGVs Final Report

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Glossary of Terms

Term(s)	Definition		
CO ₂ e	An abbreviation of 'carbon dioxide equivalent', the internationally recognised measure of greenhouse emissions.		
Controller Area Network (CANBus)	A vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in applications without a host computer.		
DEFRA	An acronym for 'Department for Environment, Food and Rural Affairs'.		
DfT	An acronym for 'Department for Transport'.		
Driver Certificate of Professional Competence (DCPC)	A qualification for professional bus, coach and lorry drivers which includes 35 hours of periodic training undertaken every five years.		
Driver performance league table	A system that enables the identification of the best and worst performing drivers in a business along with areas of improvement.		
DVSA	An acronym for 'Driving and Vehicle Standards Agency'.		
Eco-driving	A series of driving techniques and maintenance procedures to achieve greater vehicle fuel efficiency.		
Fleet operator	An economic entity which operates a vehicle fleet.		
FTA	An acronym for 'Freight Transport Association'.		
Green House Gas (GHG) A gas in an atmosphere that absorbs and emits radiation within the th infrared range. This process is the fundamental cause of the greenho The primary greenhouse gases in Earth's atmosphere are water vapo dioxide, methane, nitrous oxide, and ozone.			
Gross Vehicle Weight (GVW)	The maximum weight of a vehicle inclusive of the vehicle, load, fuel, driver and accessories.		
Heavy Goods Vehicle (HGV)	Goods vehicles over 3.5 tonnes GVW.		
Joint Approvals Unit for Periodic Training (JAUPT)	Provides application and quality assurance of centres and courses delivering periodic training on behalf of the DVSA in Great Britain and the DVA in Northern Ireland.		
Key Performance Indicators (KPIs)	A measurable value that demonstrates how effectively a company is achieving key business objectives.		
Nitrogen Oxide (NOx)	A generic term for the mono-nitrogen oxides NO and NO_2 (nitric oxide and nitrogen dioxide).		
Particulate Matter (PM)	A complex mixture of extremely small particles and liquid droplets that get into the air.		
The Royal Society for the Prevention of Accidents (RoSPA)	A British charity that aims to save lives and prevent life-changing injuries which occur as a result of accidents.		
Safe and Fuel Efficient Driving (SAFED)	A training course designed to improve the safe and fuel efficient driving techniques of drivers.		
Small Medium Enterprises (SMEs)	A business or company that has fewer than 250 employees and has either (a) annual turnover not exceeding €50 million (approximately £40 million) or (b) an annual balance-sheet total not exceeding €43 million (approximately £34 million) and of whose capital or voting rights, 25 per cent or more is not owned by one enterprise, or jointly by several enterprises, that fall outside this definition of an SME.		
SMMT	An acronym for 'Society of Motor Manufacturers and Traders'.		
Trunking operation	Where HGVs transport goods along a regular route and where most of the journey time is spent using major roads (e.g. trunk roads).		
Trunk road	A major road, usually connecting two or more cities, ports, airports and other places, which is the recommended route for long-distance and freight traffic. Many trunk roads have segregated lanes in a dual carriageway, or are of motorway standard.		
Vehicle Telematics	A system that integrates telecommunications and informatics allowing the monitoring and therefore improvement of the efficiency of a transport operation. They are used to monitor the location, movements, status and behaviour of a vehicle and/or driver. They also provide the user with up-to-the-minute knowledge of their fleet activities in one centralised, web-based interface.		



Executive Summary

Scope and background to the study

Transport is estimated to account for approximately one-fifth of the UK's greenhouse gas (GHG) emissions. The UK government is committed to reducing GHG emission levels by 80% from 1990 levels, by 2050. Freight transport is vital to economic growth, but has significant environmental impacts. Road freight makes up around 17% of UK GHG emissions from surface transport. Reducing emissions from road freight is expected to be challenging - however, it will be very difficult to meet the 2050 goals without major reductions in GHG emissions from Heavy Goods Vehicles (HGVs).

The Department for Transport (DfT) has undertaken a Freight Carbon Review to identify the key barriers to decarbonising road freight and consider potential GHG abatement options. One of the areas identified for further research was eco-driving. Eco-driving, also known as efficient driving, greener driving or smarter driving, is a series of driving techniques and maintenance procedures to achieve greater vehicle fuel efficiency. In principle it can be adopted by all drivers in any type of vehicle and it is capable of delivering immediate fuel saving results. Performance monitoring incorporates technologies and telematics designed to influence driver behaviour in-cab, and also monitoring techniques within the operator companies to promote continuous eco-driving. The scope of this research on eco-driving covers both driver training and also driver performance monitoring.

Methodology

The approach used to undertake this piece of research comprised of three phases as follows:

1. Phase 1 - Literature review (the full list of documents is included in Appendix 1)

This included a comprehensive assessment of available research and cataloguing of existing material. This was done to gain insight and a better understanding of HGV driver training and monitoring. The project team reviewed 24 sources of information during the course of this phase.

2. Phase 2 - Stakeholder engagement

DfT stated that they wanted to expand their level of understanding of current eco-driving uptake rates and barriers amongst Small Medium Enterprises (SMEs) in particular. Stakeholder engagement was therefore conducted with 40 operators. These were made up of 19 small (<10 vehicles in fleet), 19 medium (10-100 vehicles in fleet) and 2 large (>100 vehicles in fleet) operators. In addition, 10 system providers and 12 driver training providers were consulted via tailored online surveys and in-depth telephone interviews.

The operators who participated in this study can be categorised under the following operational types; Long haul (16), Regional delivery (27), Municipal utility (2), Urban delivery (17) and Construction (28).

3. Phase 3 - Development of policy options

Once better insight and understanding of HGV eco-driving training and driver monitoring had been gained following Phases 1 and 2, a number of policy options were developed by the project team for consideration by DfT. These are presented in Section 5.3.

Key Messages

A number of key messages have been drawn from this study and these have been categorised under the following headings:

- 1. Measures available
- 2. Uptake under current policy
- 3. Barriers to greater uptake
- 4. General points

1. Measures available

There are two types of measure available to operators with regards to eco-driving that are included within the scope of this project. These are:

a) Driver monitoring systems

- Telematics¹ were found by this study to be the most prevalent type of driver monitoring system with 86% of survey respondents saying that they currently have them.
- Operators thought that system functions such as harsh braking / acceleration monitoring, and over speeding and green rev-band driving monitoring were most likely to help their drivers to be more fuel efficient / safe.
- There are three main ways of acquiring telematics systems:
 - they are incorporated by the vehicle manufacturer as part of the build process
 - they are a one-off purchase and retrofitted
 - they are fitted as part of a time-based subscription where a monthly fee is paid covering both the costs of the system and also line rental or "airtime".
- Respondents detailed that monthly subscription costs of the monitoring systems varied from £10 to £25 a month and that prices were dependent on the functionality included as part of these systems. Other costs attributable to driver monitoring systems could include:

1. Installation of system	2. Vehicle downtime to install system	3. Driver and manager system training
 Administration costs attached to analysing data/de-briefing drivers on where they could improve 	5. The option to have data analysis done by external party	 Minimum term contracts of system (1-3 years depending on supplier)

• Operators reported that the telematics packages offered to smaller operators tend to be less comprehensive and cannot be tailored to their specific needs. In addition, some smaller operators are not able to fully integrate these systems into their operations so do not receive the maximum benefits.

¹ Vehicle telematics are systems that integrate telecommunications and informatics allowing the monitoring and therefore improvement of the efficiency of a transport operation. They are used to monitor the location, movements, status and behaviour of a vehicle and/or driver. They also provide the user with up-to-the-minute knowledge of their fleet activities in one centralised, web-based interface.

b) <u>Eco-driving training</u>

- 89% of respondents stated that they used the Driver Certificate of Professional Competence (DCPC) to train their drivers in eco-driving techniques and that the most typical duration of an eco-driving course was a day.
- 52% of respondents said they refreshed eco-driving training every 2 years or whenever driver performance dropped (whichever was sooner).
- The average cost of an eco-driving course was around £50-£100 per driver for DCPC and £200 per driver (for a minimum of 2 drivers) for SAFED (Safe and Fuel Efficient Driving which is one of the best known courses). Costs directly attributable to driver training that need to be taken into consideration include:

 The cost of hiring an agency driver to	2. Cost of training two drivers at a time (in-	
cover the work of the driver being trained -	vehicle) for SAFED as opposed to 20 in a	
to avoid vehicle downtime	classroom with DCPC	
3. The trainer	4. Possible travel costs and accommodation	

 A number of the training providers consulted as part of this study felt that DCPC is good for industry. However, it was felt that there could be better monitoring of the quality and content of the modules being studied by drivers. Some survey respondents noted that in the past this has led to some drivers repeatedly sitting the same module to obtain the qualification. However, this trend is changing and operators are taking more of an active role in deciding which modules their drivers are doing and aligning these choices directly to the goals of the organisation.

2. Uptake under current policy

The number of operators found, through the survey, to have already made use of eco-driving techniques (whether driver training or performance monitoring) was found to be high (88% (35) of respondents). Furthermore, 89% (17 out of 19) of all small operators, 84% (16 out of 19) of all medium operators and 100% (2 out of 2) of all large operators surveyed, stated that they had undertaken eco-driving training or were using some form of driver monitoring (such as telematics).

At face value, these figures suggest that most small sized operators use eco-driving techniques. However, this may not be a true representation. The survey was sent to over 200 operators and it is possible that those who participated had an interest in the topic of ecodriving and so were more likely to be using eco-driving techniques and respond to the survey than those who did not. This conclusion is supported by feedback received from training providers and systems suppliers who suggested that:

- Small transport operations have a low uptake of eco-driving systems / training
- Uptake of eco-driving systems / training was only 20% for smaller operators
- Companies with less than 5 vehicles are not interested at all
- The five hauliers who did not make use of eco-driving techniques operated vehicles in the construction sector or the municipal utility sector. These sectors are not as well suited to maximising the benefits of eco-driving techniques due to the environments in which the vehicles operate. For instance a refuse collection vehicle will be constantly stopping and starting in busy, built up areas which is not an economical way of operating a vehicle, and tippers used in the construction industry may spend a significant amount of time off road with the engine in low gear being over-reved.

 Historically, RoSPA has reported that between 2007 and 2009, around 154,000 HGV drivers undertook some form of eco-training of which around 82,000 undertook SAFED training. They found that uptake was highest for large operators; and despite reasonably high levels of awareness for small and medium size operators, the level of use amongst smaller fleets was low. Although uptake of SAFED courses rose between 2007 and 2009, it was not sufficient to embed widespread uptake of eco-driving training across the industry².

3. Barriers to greater uptake

The primary barrier preventing more / quicker uptake of eco-driving is the 'financial' element, in terms of the cost of training and the cost of installing telematics to monitor driver behaviour. Margins in transport are low - typically 4%³ is a good return - and therefore there is little money available for investment in additional equipment or training even if the expected returns are attractive. Therefore if training or investing in telematics is not viewed as a necessity and budgeted for, and if there is no financial incentive for the business, it is unlikely that many smaller companies will spend money on eco-driving training.

•	Other barriers	preventing more	and / or quicker	uptake were fo	und to be as follows:
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For driver monitoring systems	For eco-driving training
- the upfront cost of the system	- the cost of the course
 monthly subscription costs 	- lack of availability
- a lack of evidence to suggest the benefits	- potential driver resistance to training
	- a lack of evidence to suggest the benefits

• It was proposed by a number of stakeholders participating in this study that the barriers to uptake of eco-driving techniques could be overcome by providing tax breaks to those undertaking driver training / monitoring, by subsidising training courses and by making eco-driving mandatory as part of the DCPC.

4. General points

- Eco-driving is a strategy that encourages drivers to use their vehicles in an ecological and economical way to increase fuel efficiency, improve road safety and lower carbon emissions.
- The National Center for Sustainable Transportation (2015) proposes that implementing ecodriving techniques can help to save fuel and reduce emissions to the tune of between 5-15%⁴, but only if the principles of driver management are followed to support the driver training concept. An investment in training needs to be supported with an investment in time and resource to continue to monitor driver performance and provide regular feedback to enable any positive benefits from driver training to be maintained and sustained over a long period of time.
- Feedback from stakeholders consulted as part of this study suggests that new technologies are being introduced all the time, not just in the form of telematics and their functionality but also to the vehicles themselves. The introduction of autonomous trucks over the next 10 years, will mean less reliance on drivers to be more efficient as a lot of the 'driving' of the vehicle will be carried out by the vehicle itself. This new vehicle technology will control steering, braking, speed, collision avoidance, and lane stability meaning the driver will have reduced ability to affect the fuel efficiency of the vehicle.

² Increasing the uptake of eco-driving training for drivers of large goods vehicles and passenger carrying vehicles, RoSPA, DfT, 2010

³ Logistics report 2016, FTA, 2016

⁴ Reducing the Carbon Footprint of Freight Movement through Eco-Driving Programs for Heavy-Duty Trucks, National Center for Sustainable Transportation, 2015

- The role of the driver will change but the need for them to be trained in eco-driving techniques may not. This is because in future, drivers may be required to operate trucks equipped with future technology as well as those without (this will be dependent on the vehicles in their fleet). It is likely that drivers will need to be present in 'driverless' vehicles as they will need to take over the controls if the technology fails. This will mean then that there will be a continued need for drivers to know how to drive the vehicle as efficiently as possible.
- Potential benefits of eco-driving include:

 Reduced use of and demand for non- renewable natural resources (petrol/diesel) through reduced fuel consumption 	 Reduced CO2 emissions and potentially other pollutants (through reduced fuel consumption)
 Improved vehicle safety, particularly where schemes involve moderation of vehicle speed, plus better observation and anticipation of the situation ahead 	 Reduced ambient noise levels (where advice about driving in the green band is adhered to)

Recommendations - Options for increasing uptake

The findings from this study have led to the creation of three policy options for consideration by DfT. These have been developed following comprehensive research and cataloguing of existing material and through consultation with relevant stakeholders consisting of fleet operators, system providers and driver training providers.

An assessment of each of these options is provided in the table below. The estimate of costeffectiveness has been based on conservative assumptions about the duration of the benefits associated with training. If the analysis was re-done, assuming that fuel saving benefits persisted for longer than a year, these measures would look more cost-effective.

Policy	Ease of implementation	Contribution to carbon reductions	Level of opposition from the freight industry	Cost Effectiveness
Reinvigoration of SAFED* training course	Medium / Hard	High	Medium	£113/tCO₂
Support for eco-driving as part of the DCPC**	Medium / Hard	Medium	Medium	£212/tCO ₂ - £254/tCO ₂
Instigate data campaign to show benefits and communications campaign to industry	Easy	Low / Medium	Low	£296/tCO ₂

*Safe and Fuel Efficient Driving

**Driver Certificate of Professional Competence



1. Introduction

1.1 Overview

Heavy goods vehicle (HGV) movements account for a significant portion of greenhouse gas (GHG), Nitrogen Oxide (NOx) and Particulate Matter (PM) emissions within the UK. It is imperative that as cleaner, greener and more sustainable technology becomes available, it is implemented by operators to reduce the environmental impact of road freight and HGV movements. In addition to this, companies should introduce forms of eco-driving training to improve fuel economy and reduce GHG emissions.

According to DfT (2016)⁵, at the end of 2015 there were 483,400 heavy goods vehicles over 3.5 tonnes gross vehicle weight licensed in Great Britain, of which 396,900 were taxed as 'goods vehicles' (the remaining vehicles are HGVs exempt from tax and those taxed as private HGVs). In typical commercial trucking operations, fuel is usually one of the largest expenses, accounting for about 30% of the total operating cost.

One strategy that can improve fuel efficiency and reduce emissions from HGV operations is ecodriving. Eco-driving is a term used to describe the energy efficient operation of vehicles and consists of a combination of safe, defensive and anticipatory driving techniques. Eco-driving encourages drivers to use their vehicles in an ecological and economical way to increase fuel efficiency, improve road safety and lower carbon emissions.

In principle these techniques can be adopted by all drivers in all types of vehicle and employed at any stage of the journey whether it is before the journey starts (when planning the route or maintaining the vehicle), during the journey itself (through the adoption of specific driving styles or minimising engine idling) or after the journey is completed (when reviewing trip data or providing feedback to drivers about their performance).

Evidence from Europe, Asia, and North America suggests that eco-driving can save fuel and reduce emissions in the range of 5% to 15%⁶. However, mechanisms for ensuring long-term engagement in eco-driving behaviour are needed in order to maintain fuel savings and emissions reduction benefits.

According to DfT, vehicle traffic has risen by almost 2% between 2015-2016⁷. This could potentially lead to an increased danger of collisions and increased pollution. Although the size of the HGV fleet in the UK has remained reasonably static, the number of vans and light commercial vehicles has grown strongly to over four million vehicles in 2016⁸. Much of this increase in light goods vehicles is associated with changes in retail patterns with a rise in internet shopping demanding next day deliveries. Although vans are outside the scope of this study it marks a change in certain supply chains and like HGVs the vast majority of vans run on diesel.

⁵ Domestic Road Freight Statistics, United Kingdom 2015, DfT, 2016

⁶ Reducing the Carbon Footprint of Freight Movement through Eco-Driving Programs for Heavy-Duty Trucks, National Center for Sustainable Transportation, 2015

⁷ Provisional Road Traffic Estimates, Great Britain, DfT, October 2015 - September 2016

⁸ <u>https://www.smmt.co.uk/2016/04/largest-ever-number-of-vans-recorded-on-british-roads-as-commercial-vehicle-show-2016-</u> opens/

It could be argued that there is a case for both government and / or industry to increase efforts to further stimulate the uptake of eco-driving training / driver monitoring systems due to these rising numbers of commercial vehicular traffic on UK roads.

Eco-driving training and monitoring can provide a number of benefits to a wide range of stakeholders. These benefits include:

For HGV Drivers

Drivers develop skills that promote their safety and that of their vehicle, load, and other road users⁹. Through fuel efficient driving, drivers raise their levels of professionalism and become more of an asset to their employer. Personal benefits include:

- Reduced stress levels and enhanced satisfaction of driving
- Increased confidence in vehicle control and driving performance

For Operators

By developing the skills of their HGV drivers through deploying with eco-driving techniques, employers benefit due to:

- Reduced fuel spend and increased MPG by up to 15 per cent¹⁰
- Increased productivity and vehicle utilisation
- Improved resale value of fleet
- Reduced running costs (particularly relating to maintenance and tyres)
- Potential reductions in insurance premiums

For Organisations and the Environment

Eco-driving contributes to:

- The development of a health and safety culture within an organisation
- Effective risk management
- Reducing fuel consumption, CO₂ and potentially other harmful vehicle emissions
- Reducing vehicle and personal injury accidents / incidents
- Opportunities for operators to demonstrate their commitment to the environment

1.2 Findings from literature review

The key findings of the literature review are presented in Table 1.1 below.

⁹ SAFED for HGVs, A guide to Safe and Fuel Efficient Driving for HGVs, Freight Best Practice, DfT, 2010

¹⁰ <u>http://www.energysavingtrust.org.uk/scotland/businesses-organisations/transport/fuelgood-driver-training</u>

Table 1.1: Key findings from the literature review

Document	Source	Comment
An assessment of the potential for demand-side fuel savings in the Heavy Goods Vehicle (HGV) sector, 2015	The Centre for Sustainable Road Freight ¹¹	'Driver training is widely acknowledged to be one of the most cost-effective means of reducing fuel consumption and GHG emissions in the road freight sector. Drivers undergoing training as part of the SAFED programme managed to improve the fuel efficiency of their driving by around 7% on average and that most companies have experienced a payback period of less than 2 years.'
		'There is, nevertheless, general agreement that driver training must be accompanied by monitoring, debriefing, publicity and incentive schemes to ensure that the 'eco- driving' practices are embedded after the training period.'
		'Monitoring employees' behaviour is key to maintaining improved performance. With the development of telematics, companies can now closely monitor the behaviour of their drivers against a series of criteria, such as speed, gear changes, braking profile and overall fuel efficiency.'
		SAFED sessions cost around £150-300 per session and most companies have experienced a payback period of less than 2 years.
Companies and drivers benefit from SAFED for HGVs, 2009	DfT ¹²	Fuel savings of between 2-12% can be achieved along with other benefits such as reduced driver stress and accidents.
Reducing the carbon footprint of freight movement through eco-	University of California ¹³	Mechanisms must be in place to continually reinforce or incentivise eco-driving behaviours to prevent drivers reverting back to old habits.
driving programs for Heavy-Duty Vehicles, 2015		Telematics which measure location, speed, acceleration, shifting, idling and mpg in real time are now common for heavy vehicle fleets. The adoption of this equipment by industry means that fuel efficiency performance of drivers can be monitored which means the impacts of eco-driving programmes can be measured under real-world conditions.
Eco-driving scoping study, 2011	AA research foundation ¹⁴	It seems likely that a 5% reduction in fuel consumption may be a reasonable estimate of the benefits that might be expected from the average eco-driving scheme over the medium term.
		Many eco-driving schemes achieve significant short-term reductions in fuel consumption. However, medium-term

¹¹ An assessment of the potential for demand-side fuel savings in the Heavy Goods Vehicle (HGV) sector, Dr P. Greening, Dr M. Piecyk, Dr A. Palmer, Prof A. McKinnon, CSRF, DfT, 2015 ¹² Companies and drivers benefit from SAFED for HGVs, Freight Best Practice, DfT, 2009

¹³ Reducing the Carbon Footprint of Freight Movement through Eco---Driving Programs for Heavy Duty Trucks, Center for Environmental Research and Technology, University of California, 2015 ¹⁴ Eco-driving scoping study, AA research foundation, Energy Efficiency and Conservation Authority, 2011

		reductions, where they have been measured, appear to be more modest. On average, medium-term reductions of around 5% can be achieved where there is no support beyond initial training increasing to 10% where there is continuous feedback (e.g. using in-cab technology). They also note that there is little evidence on long-term reductions (e.g. over 3 years) because relatively few schemes have been subject to on-going evaluation.
ECOWILL, ECOdriving – Widespread Implementation for	Ecodrive, Intelligent Energy European Commission ¹⁵	One of the key findings of the project is that it is difficult to market and sell eco-driving training unless it is free, whether to fleet or private drivers.
Learner Drivers and Licensed Drivers, final report, 2013		In order to be taught in driving schools, eco-driving has to be a mandatory part of the practical driving test. Eco- driving knowledge needs to be harmonised between instructors and examiners and guidance for a systematic implementation in teaching and testing is required (i.e. the ECOWILL Blueprint).
		Subsequently, the study suggests that all driving instructors in the country need to be educated, focusing both on eco-driving contents and didactical methods to convey specific content to learner drivers.
		The consortium experienced that eco-driving is not on the top priority list of important (political) stakeholders anymore. The majority of projects and activities aiming at reducing fuel consumption of driving deal with technical aspects and focus on improvements of vehicle efficiency. This means that the very important issue of driving behaviour and how to influence it by applying an efficient driving style is neglected.
		However, it is very important to continue taking the behavioural site of eco-driving into account. For example, you can drive the most efficient car in a very inefficient way, resulting in no fuel savings at all.
		ECOWILL prepared and implemented methods to establish long-term changes in driving behaviour, both for learner and licensed drivers. The ECOWILL consortium is convinced that eco-driving behaviour and the correct use of technologies and tools have to be a central issue on the political agenda, especially at European level.
Eco-efficient feedback technologies: Which eco- feedback types prefer drivers most?, 2011	Johannes Tulusan, Lito Soi, Johannes Paefgen, Marc Brogle, Thorsten Staake ¹⁶	If adopted collectively, eco-driving can lead to an average fuel consumption reduction of 5-15%, reduced greenhouse gas emissions, improved road safety and reduced accident rates thus consisting of a sustainable solution.

 ¹⁵ ECOWILL final report, Intelligent Energy Europe, Ecodrive.org, 2013
 ¹⁶ Eco-efficient feedback technologies: Which eco-feedback types prefer drivers most?, Johannes Tulusan, Lito Soi, Johannes Paefgen, Marc Brogle, Thorsten Staake, 2011

		Drivers managed to improve fuel consumption by an additional 7% [on top of 6% average after training] when driving with a prototype feedback device, providing clear and accurate advice in a screen without posing excessive workload on the driver.
ecoDriver – Supporting the driver in conserving energy and reducing emissions, 2016	Institute for Transport Studies, University of Leeds ¹⁷	Average reductions of 4.2% in CO ₂ emissions and fuel could be achieved through the use of eco-driving systems.
Final report on the fuel saving effectiveness of various driver feedback approaches, 2011	National Renewable Energy Laboratory (US) ¹⁸	There is a broad consensus from prior research that fuel savings of 10% are possible through modified driver behaviour (a finding also supported by this study).

¹⁷ ecoDriver – Supporting the driver in conserving energy and reducing emissions, Institute for Transport Studies, University of Leeds, 2016

²⁰¹⁶ ¹⁸ Final Report on the Fuel Saving Effectiveness of Various Driver Feedback Approaches, Jeffrey Gonder, Matthew Earleywine, and Witt Sparks, National Renewable Energy Laboratory, 2011



2. Measures available

This section explores what driver training courses and technologies are available and explains how they work and the topics they cover. In addition the benefits of eco-driving training and monitoring systems are provided along with the methods of delivering eco-driving training.

2.1 Technologies and behaviours

The scope of this research covers:

- 1. Driver training
- 2. Driver performance monitoring

1. Driver training

Driver training is one of a range of effective measures capable of reducing fuel consumption and greenhouse gas (GHG) emissions in the road freight sector¹⁹. There is a wide variety of training available meaning operators and drivers can choose a format that suits their own individual needs. Courses vary in terms of their duration, their focus (some purely focus on eco-driving, whilst others incorporate other aspects of safety), and the type of training supplier (large national companies, smaller regional companies or independent trainers).

Some of these courses put an emphasis on classroom education, looking at the theory behind ecodriving, while others will get drivers into a vehicle for assessment as soon as possible. Whichever way a course operates, the aim is the same: an increase in fuel economy means corresponding reductions in fuel spend.

While environmental concerns or Corporate Social Responsibility (CSR) may be part of the reason to send drivers on an eco-driving course, cost reductions will almost certainly be the primary decision-making factor for an operator. Fuel represents around 30% of an HGV operator's operating costs so it is important that every effort is made to reduce the amount of fuel used in order to remain competitive.

What does eco-driving training cover?

An effective eco-driving style will incorporate the following techniques:

- Defensive driving
- Selective use of gears keeping in green
- Utilisation of engine-braking/torque
- Use of cruise control
- Compliance with speed limits
- Enhanced hazard perception and awareness skills

¹⁹ An assessment of the potential for demand-side fuel savings in the Heavy Goods Vehicle (HGV) sector, Dr P. Greening, Dr M. Piecyk, Dr A. Palmer, Prof A. McKinnon, DfT, 2015

- Progressive use of accelerator and brakes
- No overloading of the vehicle
- Anti-idling

For further information on what defensive driving and fuel efficient driving techniques include please refer to Appendix 2.

Examples of eco-driving training courses

Driver training courses include the following:

- Driving test and periodic training (Driver CPC)
- Safe and Fuel Efficient Driving (SAFED)
- SAFED 'style' courses

Driver Certificate of Professional Competence (DCPC)

The Driver Certificate of Professional Competence (DCPC) is mandatory for all HGV drivers and comprises of four parts. These are:

- 1. Part 1: Theory
- 2. Part 2: Case Studies
- 3. Part 3: Driving Ability
- 4. Part 4: Practical demonstration

Parts 1 and 2 must be completed before parts 3 and 4 can be taken. A brief overview of each of these parts and how they relate to eco-driving training is presented below:

Part 1: Theory

The test is made up of 2 parts - multiple choice and hazard perception. The multiple-choice questions are made up of 100 questions and cover the following topics as shown in table 2.1.

Vehicle weights and dimensions	Incidents, accidents and emergencies	Essential documents
Drivers' hours and rest periods	Vehicle condition	Environmental issues
Braking systems	Leaving the vehicle	Other road users
The driver	Vehicle loading	Road and traffic signs
The road	Restricted view	

The hazard perception involves watching 19 videos, each shown from a driver's point of view. The driver is expected to spot the developing hazard in each film and take action (where needed) such as changing speed or direction.

Part 2: Case studies

The candidate is given seven case studies that are based on real-life situations and scenarios that a driver is likely to come across in their working lives. This may be, for example, driving in icy conditions, or being asked to carry out non-driving work when taking weekly rest. Drivers are asked between six to eight multiple-choice questions on each case study.

Part 3: Driving ability

This is an in-vehicle practical test which includes:

- Vehicle safety questions includes various vehicle safety questions on HGVs.
- Practical road driving the examiner looks at how the driver uses the vehicle controls, moves away at an angle, uphill and downhill, does a controlled stop, uses the mirrors, signals, shows awareness and anticipation of other road users' intentions, manages and controls vehicle speed, deals with hazards, and selects a safe place to stop. This is followed up with 10 minutes of independent driving which is designed to test the drivers ability to drive safely while making independent decisions.
- Off-road exercises this consists of an 'S' shaped reverse into a bay and demonstrating the uncoupling and recoupling procedure if taking a test with a trailer.

Part 4: Practical demonstration

In this test the driver needs to show that they can keep their vehicle safe and secure. They are asked about:

- Safe use of the vehicle and checks to make before driving
- Loading the vehicle safely and securely
- Checking for risks from criminal acts and trafficking
- Assessing emergencies and risks

The test is made up of five topics from the Driver CPC syllabus. The ones most relevant to ecodriving include:

Advanced training in rational driving based on safety regulations

I. To know the characteristics of the transmission system in order to make the best possible use of it.

E.g. Curves relating to torque, power, and specific consumption of an engine, area of optimum use of revolution counter, gearbox-ratio cover diagrams.

II. To know the technical characteristics and operation of the safety controls in order to control the vehicle, minimise wear and tear and prevent disfunctioning.

E.g. Specific features of hydraulic vacuum servobrake circuit, limits to the use of brakes and retarder, combined use of brakes and retarder, making better use of speed and gear ratio, making use of vehicle inertia, using ways of slowing down and braking on downhill stretches, action in the event of failure.

III. Ability to optimise fuel consumption.

E.g. Optimisation of fuel consumption by applying know-how as regards points 1.I and 1.II.

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IV. Ability to load the vehicle with due regard for safety rules and proper vehicle use.

E.g. use of gearbox ratios according to vehicle load and road profile, calculation of payload of vehicle or assembly, calculation of total volume, load distribution, consequences of overloading the axle, vehicle stability and centre of gravity, types of packaging and pallets.

Main categories of goods needing securing, clamping and securing techniques, use of securing straps, checking of securing devices, use of handling equipment, placing and removal of tarpaulins.

Staying qualified – Periodic training

Every five years the driver must undertake 35 hours of DCPC periodic training to keep driving professionally. The DCPC syllabus includes many skills and competencies which could be considered as part of an eco-driving scheme. Although there is a syllabus, drivers are free to choose from a large number of accredited courses. Therefore there is no guarantee that drivers will complete training with 'Eco-driving Considerations'. The modules are presented in Table 2.2:

Vehicle Systems (Transmission System)	Vehicle Systems (Safety Controls)	Loading/Unloading (LGV)
Legislation (including Drivers Hours, Rules and Regulations and the Working Time Directive)	Regulations for Carriage of Goods (LGV)	Health, Safety and Emergencies
Prevention of Criminality and Trafficking	Personal Health and Wellbeing	Physical/Mental Health and Wellbeing
First Aid	Professional Driver and Company Issues	Economic Environment for Carriage of Goods (LGV)
Safe and Fuel Efficient Driving		

Table 2.2. Driver of o periodic training module	Table 2.2: Driver CPC period	dic training module
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Safe and Fuel Efficient Driving (SAFED)

Safe and Fuel Efficient Driving (SAFED) for HGVs has been designed to improve the safe and fuel efficient driving techniques of HGV drivers.

The SAFED training programme has been developed specifically to enable both vehicle operators and training providers to implement driver training within the road freight industry. It provides training and development for existing HGV drivers through instruction relating to vehicle craft and road craft.

Ideally, training should be performed in a candidate's own (or usual) vehicle. If this is not possible, the training provider will arrange for a similar vehicle to be available when a course is booked. Some candidates will benefit from training in a laden vehicle, but this is not essential.

How does the training take place?

The candidate's driving is initially assessed by a qualified instructor. Training on best practice in safe and fuel efficient driving techniques is then given. The candidate's driving is then reassessed to record improvements in driving performance and actual fuel consumption.

The final grade allocated to each candidate depends on performance in safety check and theory test exercises as well as the number of faults recorded during the day's practical driving sessions.

Fundamentals of SAFED

Safe and Fuel Efficient Driving involves many separate components. Table 2.3 outlines the key factors to be addressed to both ensure safety and optimise fuel economy.

Drivers undergoing training as part of the SAFED programme have on average managed to improve the fuel efficiency of their driving by around 7%. However, driver training must be accompanied by monitoring, debriefing, publicity and incentive schemes to ensure that the 'eco-driving' practices are embedded after the training period. SAFED sessions cost from £150-300 per session and most companies have experienced a payback period of less than 2 years²⁰.

The SAFED longevity report²¹ suggested that SAFED driver training can be beneficial to a transport operator, but only if they follow principles of driver management to support the driver training concept. An investment in training needs to be supported with an investment in time and resource to continue monitoring driver performance and provide regular feedback to enable any positive benefits from driver training to be maintained and sustained for a greater period of time.

Typical benefits from undertaking SAFED driver training include:

- An improvement in fuel consumption
- A reduction in vehicle accidents and incidents
- A reduction in vehicle maintenance through less wear and tear
- A reduction in driver stress and fatigue through improved driving standards
- A better quality of working life for the driver; and
- An improvement in a company's environmental and safety performance and a provision of evidence for clients of their commitment to greener driving and Corporate Social Responsibility.

The SAFED demonstration programme that ran between 2003 and 2005 saved an estimated £10.5 million (2005 prices)²² and 14 million litres of fuel for the 6,375 drivers trained within this period²³.

²⁰ An assessment of the potential for demand-side fuel savings in the Heavy Goods Vehicle (HGV) sector, Dr P. Greening, Dr M. Piecyk, Dr A. Palmer, Prof A. McKinnon, DfT, 2015

²¹ Longevity of SAFED benefits study, AECOM, 2010

²² This figure has been calculated using the average MPG improvement figure of 10.01%. The figure assumes that the MPG is achievable and can be maintained for one whole year. By looking at the total number of drivers trained and based on average annual mileage, the fuel saving is £10,456,455 per year (from www.safed.org.uk/ financial savings.html)

²³ This figure has been calculated by looking at the fuel before and after SAFED training (www.safed.org.uk/ financial_savings.html)

Table 2.3: Fundamentals of SAFED

Adjustable Aerodynamics	Braking	Clutch Control
Correctly adjusted air deflectors will save fuel	Smooth and progressive braking will save fuel and reduce stress on the driver, vehicle and load	Double-declutching is not necessary on synchromesh gearboxes. It increases clutch wear and wastes fuel
Cruise Control	Exhaust Brake	Forward Planning
To maximise fuel economy, cruise control should be used whenever safe and appropriate	Use of the exhaust brake will contribute to smoother decreases in speed, increase the lifespan of brake linings and save fuel	By planning well ahead and keeping the vehicle moving, gear changes will be reduced and fuel will be saved. Forward planning also helps to improve road safety
Gear Selection	Hazards	Height of the Load
Keeping the engine speed within the green band and using the highest gear possible optimises fuel consumption	Use of information gained through observation gives more time to plan ahead and systematically avoid hazards	The height of a trailer or load should be kept to a minimum to reduce aerodynamic drag
Low Revs, Low Noise, Low Emissions Quiet operations produce less air pollution	Momentum Using the momentum of the vehicle will save fuel	Motorways and Dual Carriageways Use of constant speeds on motorways and dual
		of cruise control, leading to less gear changes
Overfilling of Fuel Tank	Plan Your Route	Positioning a Load
Overfilling the fuel tank allows fuel to leak through the breather	Effective route planning minimises the total amount of fuel used	The positioning of a load, particularly on a flat trailer, can influence fuel consumption
Skip Gears or Block	Speeding	Tyres
Changes The fewer the gear changes, the less the physical activity needed by the driver and the more fuel efficient the operation	Speeding is illegal, jeopardises road safety and reduces fuel efficiency	Correctly inflated tyres offer less resistance on the road, increase fuel economy, give greater stability and reduce the risk of accidents
Vehicle Technology	Weather Conditions	
Technology will only assist in fuel economy and safe and efficient operation if the driver is fully familiar with the	Diesel does not burn as efficiently in bad weather due to a poor fuel/air mix and adverse weather	

More recently, the SAFED driver training programme has been commercialised and handed over to the Driver and Vehicle Standards Agency (DVSA) for day-to-day management.

The Joint Approvals Unit for Periodic Training (JAUPT)²⁴ strive to ensure that drivers and their employers receive periodic training that is fit for purpose and has been approved by the DVSA or DVA, through their rigorous on-going quality assurance processes

Any training provider that wishes to deliver SAFED training as part of Driver CPC periodic training will need to have the training course approved and will also need to be approved as a training centre for the delivery of Driver CPC periodic training. JAUPT cross check with the SAFED Trainer Network list before the course is approved as a SAFED branded course. Only those on the SAFED Trainer Network list are registered to use the SAFED name.

Currently there are no opportunities to add names to the SAFED Trainer Network list.

Historically, SAFED driver training has received elements of subsidy from the DfT for various transport sectors. However, these subsidies have now expired as a result of full commercialisation of the programme via the DVSA.

SAFED style courses

There are many training providers that deliver eco-driving training. Although this training is not specifically called SAFED, it includes many of the fundamentals of SAFED and the defensive and fuel efficient driving techniques as detailed in Appendix 2.

How is eco-driving training delivered in practice?

Eco-driving training can be delivered in a range of formats as follows:

- In-vehicle
- Simulator
- CD ROM / Online
- Pamphlet

These are explained in more detail below.

In-vehicle training

The usual style of learning eco-driving for HGV drivers is through participation in a one or two day course in a specially-prepared lorry. Typically, the course consists of a test-drive prior to the training, which allows the driver to become familiar with the vehicle and trailer being used in the test and the trainer to analyse the driver's current driving style. Then the trainer works alongside the driver to develop a new driving style which incorporates eco-driving techniques. A second test-drive then follows and an analysis of the improvement is conducted. Simultaneously, the fuel consumption, speed and rate of gear change will generally be evaluated, this is usually done through the use of telematics or some equally effective monitoring equipment.

In a report for DfT (2011)²⁵ covering Category B license holders, in-vehicle training was viewed as a useful approach to teaching eco-driving due to its instructor-led hands on, practical and interactive method, particularly for less confident or experienced drivers.

Simulator training

²⁴ JAUPT provides application and quality assurance of centres and courses delivering periodic training on behalf of the DVSA in Great Britain and the DVA in Northern Ireland.

²⁵ Eco-driving: Factors that determine take-up of post-test training research TNS-BMRB report v5210046, DfT, May 2011

Training simulators offer several possibilities and software programmes for the training of ecodriving. The methods are simple and installation is flexible so a simulator can be very valuable for many different types of learning. Also, large fleet companies can use a simulator for educating drivers at a reasonable cost with the ability to vary the training inside the simulator. In addition, new recruits who might not have passed their driving test can become familiar with the vehicle controls and eco-driving techniques without actually going out on the road. This is particularly useful where there might not be spare vehicles available in which to conduct this training. It also ensures new drivers are using the correct driving style before they drive on company business.

The Institute of Transport Studies (I.T.S) at Leeds University has one of the most advanced simulators in a research environment and they have used this equipment to conduct a thorough investigation of the wider effects of eco-driving interfaces on driver performance. The study was undertaken to assess how well drivers learn to use the eco-driving interfaces (both visual and haptic (touching)), the extent to which eco-driving skills learnt in one scenario transfer to others, and whether individuals' use of the eco-driving feedback to drive in a fuel-efficient manner can distract them from the need to drive safely.

This study assessed driving performance metrics as well as user acceptance of the systems to inform design choices. It involved the creation of hills of variable gradient for the first time in the University of Leeds Driving Simulator. The results of this study are provided in Section 2.4 below.

Online / CD-ROM / Classroom

This method of delivering eco-driving training can take different forms including more theoretical approaches or more practical on-line simulation games.

ECOdrive is an example of an online course. It is a computer programme (driving simulator) that can be installed on most Personal Computers. By using a mouse, keyboard or a steering wheel it is possible to emulate a trip in the city, the country or on the motorway. The participant has the choice of selecting various options to tailor the experience so that the simulation is as similar as it can be to their own operation. Options include:

- Petrol or diesel fuel
- Manual or automatic transmission
- Long or short trips

Pamphlets

These short documents provide information on eco-driving techniques that can be given to the driver to be read at their leisure.

Response to specific driving interventions

Table 2.4 demonstrates overall views for each of the interventions in terms of:

- Effectiveness likely impact on driving habits and of sustainability
- Cost of intervention
- Engagement level of 'fun'
- Flexibility accessibility and ease of use
- Potential coverage size of reachable audience

Table 2.4: Response to specific driving interventions²⁶

	Effectiveness	Cost	Engagement	Flexibility	Potential Coverage
In Vehicle Training	***	*	***	*	*
Simulator Training	***	**	***	**	**
Online Training	**	***	**	***	***
Pamphlets	*	****	*	****	****

NB. * Rating denotes ranking of intervention (* = poor and **** = excellent)

The two most popular interventions (taken from the TNS-BMRB report²⁷) are in-vehicle training and pamphlets with eco-driving information. These sit in opposition to each other. In-vehicle training scores very highly on effectiveness and engagement and poorly on cost, flexibility and potential coverage. Conversely the pamphlet option scores highly on likely cost, flexibility and potential coverage and poorly on effectiveness and engagement.

In-vehicle training was viewed as a useful approach to teaching eco-driving due to its instructor-led hands on, practical and interactive method, particularly for less confident or experienced drivers. The advantage of in-vehicle training is that the experience and element of fun helps to embed the messages. A further benefit is the ability to demonstrate potential savings on fuel by calculating the miles per gallon saved after the techniques have been mastered. A disadvantage of this type of training is the amount of time and effort required from drivers to attend lessons. Furthermore, it is also the most expensive option due to the cost of having an instructor.

The benefits of pamphlets are that high coverage can be achieved on a small budget. In addition, a small pamphlet is viewed as being easily digestible and can be put in the cab as a visual reminder. Pamphlets are useful for drivers who are unwilling to attend or pay for formal eco-driving training. The major downside to pamphlets is that they can be easily disposed of, and there can be a significant gap between reading the information and translating it into action.

2. Driver performance monitoring

There are a number of driver performance monitoring solutions available which aim to reduce costs and improve fuel efficiency. These include:

- Telematics
- Key Performance Indicators (KPIs)
- Driver performance league tables
- CANBus solutions

Driver performance monitoring incorporates technologies designed to influence driver behaviour in the cab and also monitoring techniques within the operator companies to promote continuous ecodriving.

Due to the advent and widespread adoption of smartphones, several applications have been developed utilizing the phone's in-built functions, such as accelerometer and GPS, to provide drivers with real time feedback. Examples of such applications are: Truck Fuel Eco-driving (over 100,000 downloads), and GreenRoad Central Mobile (10,000 downloads).

²⁶Eco-driving: Factors that determine take-up of post-test training research TNS-BMRB report v5210046, DfT / DVSA, May 2011

²⁷Eco-driving: Factors that determine take-up of post-test training research TNS-BMRB report v5210046, DfT / DVSA, May 2011

Telematics

Vehicle telematics systems integrate telecommunications and informatics allowing the monitoring and therefore improvement of the efficiency of a transport operation. They are used to monitor the location, movements, status and behaviour of a vehicle and / or driver. They also provide the user with up-to-the-minute knowledge of their fleet activities in one centralised, web-based interface.

Telematics systems are becoming ever more popular and advanced in terms of features provided and parameters measured. However, the value of a telematics system is not in the fitting of it but is in the effective analysis of the data it produces.

Different levels of sophistication in terms of features and parameters measures are available. An overview of the systems providers who participated in this study and the features that their products offer is shown in Appendix 3.

Data Capture

While all telematics systems have the primary aim of recording data from the vehicle this can be captured in different ways. Data can be captured in the following ways:

- Connecting to the vehicle Controller Area Network (CANBus)²⁸
- Using GPS technology
- Using accelerometer technology

Further information on the ways in which telematics capture data and provide feedback to the driver can be found in Appendix 3.

Key Performance Indicators (KPIs)

There are a number of KPIs which are often recorded and monitored by operators in order to influence training needs and driver behaviour, these are:

- Green band driving*
- Engine idling
- Harsh breaking
- Harsh acceleration
- Over speeding

*Modern engines have been developed to produce maximum fuel efficiency at low engine revs. The green band represents the rev band where the engine produces the best fuel efficiency and drivers should aim to drive within this band as much as possible. Change down a full gear when the revs reach the bottom of the green band and change up a full gear when the revs reach the top of the green band.

²⁸ A **CAN bus** system connects all the modules working throughout the vehicle so that they can work together to run effectively and efficiently; for example, the engine reports the vehicle's speed to the transmission, which in turn must tell other modules when to shift gears. Connecting all these individual modules to each other became too complex, so a central networking system became necessary to efficiently run the vehicle. The Controller Area Network, or CAN bus, is one of these central networking protocols used in vehicles without a host computer.

Driver Performance League Tables

Driver League Table Reporting allows the operator to compare the driving performance by individual and groups of employees very quickly and easily. This enables the operator to effectively identify the best and worst performing parts of the business along with areas of improvement. As a result, underperforming drivers can be targeted with appropriate training, whilst the league tables can be used to support driver incentive and reward schemes to boost employee engagement²⁹.



Figure 2.1: Ctrack driver performance league table³⁰

2.2 Timescales

What's available now?

All of the training courses and driver monitoring systems detailed in section 2.1 above are available now. Although SAFED is no longer being funded by DfT there are still training providers delivering the course.

What will be available in the future?

New technologies are being introduced all the time, not just in the form of telematics and their functionality but also to the vehicles themselves. The introduction of autonomous trucks will mean less reliance on driver efficiency as much of the 'driving' of the vehicle will be carried out by the vehicle itself. This new vehicle technology will control steering, braking, speed, collision avoidance, and lane stability meaning the driver will have reduced ability to affect the fuel efficiency of the vehicle.

Volvo has already introduced the 'Volvo I-shift'³¹ which is a clutch control system designed to save fuel. I-Shift uses its built-in intelligence to quickly and automatically choose the right gear at all times. I-Shift can not only choose the best gear at the time, but also prepare for the upcoming topography. In addition to this Renault has also introduced 'Renault Truck T Optifuel'. In spring 2015, the independent certifying organisation TÜV Rheinland certified that the Renault Trucks T Optifuel consumed 10.9% less fuel than a standard T after drivers had completed an Optifuel training instruction programme.

²⁹ https://www.ctrack.co.uk/vehicle-tracking/driver-improvement-monitoring-systems.html

³⁰ https://www.ctrack.co.uk/vehicle-tracking/driver-improvement-monitoring-systems.html

³¹ http://www.volvotrucks.com/trucks/uk-market/en-gb/trucks/volvo-fh-series/key-features/Pages/i-shift.aspx</sup>

Stakeholder engagement as part of this study, with a number of system suppliers suggests that there could be increasing interest in the application of telematics combined with new air emissions / quality monitoring technology. From a roads authority perspective, this is an important differentiator to the engine technologies and regulations (which are standard emissions tests rather than what is experienced on the road). This applies in particular to areas that do not meet current NOx limits (and therefore may have restrictions around development). Engine-based measures can be seen as long term solutions (10+ years), and are dependent on gaining agreement with a wide range of industry stakeholders and hauliers replacing existing (and polluting) vehicles.

Do we expect many changes?

Role of the driver

As discussed above, the role of drivers will undoubtedly change, following the introduction of new technology such as autonomous trucks, but the need for eco-driving training will not. Input from AA Drivetech confirms that drivers will need to operate trucks with future technology as well as other trucks that are in the fleet until they become obsolete. This will be due to the cascading effect of technology into the used vehicle market.

Although training will still be required, the topics that this training covers will alter. It is expected that drivers will need to be present in 'driverless' vehicles and will need to take over the controls if the technology fails. So although drivers may perform more of an administrator role, they will still need to know how to drive the vehicle efficiently in the event that the technology breaks down.

Driver Certificate of Professional Competence (DCPC)

DCPC is a qualification for professional large goods vehicle drivers (e.g. vehicles over 3.5 tonnes). Legislation was introduced in September 2009 with the aim of improving and maintaining high standards of driving and road safety across Europe. The training is delivered over five year 'cycles'. According to DCPC periodic training requirements a driver must undergo 35 hours of periodic training every five years.

A number of the training providers consulted as part of this study felt that DCPC is good for industry. This form of training is currently part way through the 2nd cycle however, there were concerns that there could have been more systematic monitoring to ensure drivers undertook an appropriate mix of training modules during the 1st cycle³². This situation has improved greatly in DCPC's 2nd cycle due in part to the fact that operators are taking much more of an active role in deciding which modules their drivers should take. Companies are carefully considering how each of the modules can support the achievement of company goals and are ensuring that the outcome of DCPC is tailored to their own specific needs.

Other comments made by training providers via the online survey highlighted that there needs to be a refocusing across the industry of the environmental benefits of eco-driving courses and that guidance from DfT, stating which modules should be taken by drivers, would be beneficial. It was felt by some training providers that it should be mandatory for drivers to undertake a module on eco-driving.

2.3 Carbon Savings

There is considerable evidence to suggest that eco-driving techniques and driver performance monitoring and training can result in a reduction of carbon emissions from goods vehicle operation. The Eco-Driving Scoping Study conducted by AA Research Foundation details that "it seems likely

³² Cycles run for a period of five years

that a 5% reduction in fuel consumption may be a reasonable estimate of the benefits that might be expected from the average eco-driving scheme over the medium term³³."

A reduction in fuel consumption will also result in a corresponding reduction in carbon emissions. The ecoDriver Study co-ordinated by the Institute for Transport Studies at the University of Leeds involved 170 drivers and tested six different eco-driving systems. The results showed average reductions in CO_2 emissions and fuel consumption of 4.2%. Reductions were most noticeable when vehicles were operated on rural roads (6% savings). Further to this, embedded eco-driving systems (savings up to 6%) were more effective than nomadic systems e.g. Smartphone applications³⁴.

In addition to the fuel and carbon savings observed, the study also had positive impacts on speed, time headway, accelerations and braking which provide significant safety benefits.

Other examples of HGV eco-driving evaluation studies are provided in table 2.5.

Year	Country	Training method	Evaluation setting	No. of drivers	Fuel economy improvement
2005	U.K	Driving simulator	Driving simulator	>600	3.5% immediately after training
2007	U.S	Class	Closed Driving course	36	33.6% To 40.5% immediately after training
2009	Australia	Class	Prescribed real-world route	12	27.3% Immediately after training; 26.9% after 3 months
2010	European countries	Class followed by monthly feedback and regular refreshing class	Actual real- world routes	322	9.4% over an unknown period
2011	U.S	Individualized coaching and in- vehicle real-time feedback system	Actual real- world routes	695	13.7% after 2 months
2013	Japan	Class	No information available	~3,000	8.7% immediately after training
2014	U.S	Individualized coaching and in- vehicle real-time feedback system (plus financial incentives)	Actual real- world routes	46	2.6% (5.4% with financial incentives) for sleeper cabs and 5.2% (9.9% with financial incentives) for day cabs after 2 months

Table 2.5: Examples of HGV eco-driving evaluation studies³⁵

Table 2.6 shows the potential carbon saving which could be made on a number of road haulage movements from a 5% reduction in fuel consumption.

³³ Eco-driving scoping study, R.Luther and P.Baas, Energy Efficiency and Conservation Authority, AA research foundation, 2011

³⁴ ecoDriver – Supporting the driver in conserving energy and reducing emissions, ITS Europe - Partnership Activities, Ertico, 2016

³⁵ Reducing the Carbon Footprint of Freight Movement through Eco---Driving Programs for Heavy---Duty Trucks, National Center for Sustainable Transportation, 2015

Trip Distance (Miles)	Good Vehicle Type	HGV Miles per Gallon (MPG) ³⁶	Miles per Litre	Litres Burnt	Kg of CO₂e per litre ³⁷	CO₂e Emissions (KG)	Potential CO ₂ e savings (KG)
30	<7.5t Light Goods	<7.5t Light 13.6 2.99 10. Goods		10.03		27.60	1.38
e.g. Liverpool to	17-25t Rigid	9.5	2.09	14.35	2.68	38.46	1.92
Trafford Park	Articulated HGV	7.9	1.74	17.24		46.20	2.31
80 e.g. Southampton to London	<7.5t Light Goods	13.6	2.99	26.76		71.72	3.59
	17-25t Rigid	9.5	2.09	38.28	2.68	102.59	5.13
	Articulated HGV	7.9	1.74 45.98			123.23	6.16
420 e.g. Felixstowe to Glasgow	<7.5t Light Goods	13.6	2.99	140.47		375.2	18.76
	17-25t Rigid	9.5	2.09	200.96	2.68	538.57	26.93
	Articulated HGV	7.9	1.74	241.38		646.90	32.35

Table 2.6: Potential CO₂e Savings on Specific Goods Vehicle Trips

These estimates have been calculated using the following metrics:

- Assumed 5% fuel consumption reduction factor _
- FTA average miles per annum by goods vehicle type³⁸ -
- Defra GHG conversion factors, kg CO₂e per litre of fuel burnt _
- DfT Average MPG figures _

³⁶ https://www.gov.uk/government/uploads/system/...data/.../env0104.xls ³⁷ DEFRA GHG conversion factors 2016

³⁸ <u>http://www.fta.co.uk/policy_and_compliance/fuel_prices_and_economy/fuel_prices/fuel_fractions.html</u>

In Table 2.7, we have attempted to quantify the potential carbon savings on an annual basis.

Vehicle Type	Average Annual Mileage	Average MPG	Miles per Litre	Litres Burnt per Annum	CO2e Emissions per Litre (KG)	Total CO ₂ e Emissions (KG)	Potential tCO2e Savings
<7.5t Rigid	40,000	11.3	2.51	15,936	2.68	42,708	2.14
17-25t Rigid	60,000	9.8	2.18	27,523	2.68	73,762	3.69
44t artic	85,000	7.9	1.73	49,133	2.68	131,676	6.58

 Table 2.7: Potential Annual CO2e Savings

As shown in the table, there is potential for considerable CO_2e savings to be made from using ecodriving systems in heavy goods vehicles. When it is considered that at the end of 2015 there were 483,400 HGVs over 3.5 tonnes gross vehicle weight licensed in Great Britain³⁹, the combined carbon savings could make a notable contribution to UK emissions reductions targets.

A 2010 DfT consultation response by the Royal Society for the Prevention of Accidents (RoSPA) suggests that, at that time, around 12% of periodic training undertaken for DCPC was classified as eco-, or eco-safe, driving training. RoSPA estimated that at this rate of uptake a maximum of 60% would have taken an eco-driving course by the end of the five year DCPC periodic training cycle.⁴⁰

According to DfT statistics (2016)⁴¹, there are around 299,000 drivers. If 12% of these drivers undertake an eco-driving course per year then this represents approximately 36,000 drivers over the five year DCPC periodic training cycle. If a conservative figure of a 5% increase in these numbers was factored in then the total would be 37,800.

From these figures a simple calculation can be done to determine how much carbon a 5% increase in uptake of eco-driving training could save. This is as follows:

- A driver typically works for 220 days per year and would generally use £100 of fuel per day
- The cost of fuel is constantly fluctuating and many operators buy it in bulk quantities but if an average fuel price of £1 per litre (typical fuel cost without VAT October 2016) were taken then a driver would use 22,000 litres of fuel per year. This means the annual fuel cost per year, per driver would be £22,000
- 22,000 litres of fuel produces 58.9 tonnes of carbon (22,000 x 2.68 (DEFRA GHG conversion factors, KGs of CO₂e per litre of fuel burnt) / 1000)
- Recent studies have found that implementing eco-driving techniques can reduce fuel usage by anything from 2-12%⁴². Even at the low end of the scale a 2% reduction would still result in an annual carbon saving of 1.2 tonnes of carbon per driver per year
- When this reduction of 2% is applied to the 36,000 drivers currently doing an eco-driving course per year this results in a saving of over 43,000 tonnes
- A 5% increase in the uptake of eco-driving training would mean this saving would rise by around 2,000 tonnes of carbon a year

³⁹ Domestic Road Freight Statistics, United Kingdom 2015, DfT, 2016

⁴⁰ Increasing the uptake of eco-driving training for drivers of large goods vehicles and passenger carrying vehicles, RoSPA, DfT, 2010

⁴¹ Domestic Road Freight Statistics, United Kingdom 2015, DfT, 2016

⁴² Companies and drivers benefit from SAFED for HGVs, Freight Best Practice, DfT, 2009

2.4 Costs and wider benefits

What is the cost of eco-driving training and monitoring systems?

Feedback from the stakeholder engagement with the operators, training providers and system providers suggested that the cost of eco-driving training was:

- Between £50-£100 per driver per day for DCPC
- £200 per driver per day (minimum 2 drivers) for SAFED

And, for driver monitoring systems:

• Between £10-£25 per month for telematics system + installation costs

What are the wider benefits of eco-driving training and monitoring systems?

The AA eco-driving scoping study⁴³ highlights the following potential benefits of eco-driving training:

- Reduced use of and demand for non-renewable natural resources (petrol/diesel) through reduced fuel consumption
- Reduced CO2 emissions and other pollutants (through reduced fuel consumption)
- Improved vehicle safety, particularly where schemes involve moderation of driver speed, plus observation and anticipation of the situation ahead
- Reduced ambient noise levels (where advice about rpm is adhered to).

In addition the report also states that while evidence was not found as part of the AA study, other potential benefits for eco-driving cited in eco-driving literature include:

- Reduced vehicle running costs (tyre wear and tear, general vehicle maintenance)
- Reduced driver/passenger stress
- Improved traffic flow.

Stakeholder engagement conducted as part of this study revealed that the top three benefits provided by the online survey were as follows:

- 89% (34 of 38 respondents) reported an improvement in fuel consumption
- 76% (29 of 38 respondents) reported an increase in Miles Per Gallon
- 71% (27 of 38 respondents) reported a reduction in engine idling

All three stakeholder groups (operators, driver trainers / systems providers) were questioned on whether there were other costs involved other than upfront capital costs.

For driving training

Costs included:

- The cost of hiring an agency driver to cover the work of the driver being trained
- Cost of training 2 drivers at a time (in-vehicle) as opposed to 20 in a classroom

⁴³ Eco-driving scoping study, R.Luther and P.Baas, Energy Efficiency and Conservation Authority, AA research foundation, 2011

Possible travel costs and accommodation

For driver monitoring systems

Other costs included:

- Vehicle downtime to install system
- Drivers and manager system training
- Admin costs attached to analysing data / de-briefing drivers on where they could improve
- The option to have data analysis done by external party
- Minimum term contracts of system (1-3 years depending on supplier)

2.5 Type and size of operator and duty cycle

Type of Operation

As identified in section 2.3, eco-driving systems have been shown to be most effective when vehicles are required to change speed and corner frequently e.g. on rural roads or in urban environments. In this situation drivers are working harder and applying techniques more frequently and therefore the benefits realised are greater.

Goods vehicles operate most efficiently when on free flowing motorways as they are able to maintain a constant speed, particularly if equipped with cruise control as many modern vehicles are. As such, the benefits for an operator who has a large number of trunking operations would be less than for an operator who predominantly operates in urban environments.

Size of Operator

For smaller operators, the financial burden that is presented by investing in training for drivers is a key barrier, in the sense that it is a significant risk for smaller operators to invest in training their drivers if there is a possibility that they will then lose those trained drivers. Larger operators are more likely to take active steps to promote eco-driving to their drivers as they are unlikely to suffer the same level of financial burden in proportion to their overall business.

Operators consulted through this study have reported that the telematics packages which are offered to smaller operators tend to be less comprehensive and cannot be tailored to their own specific needs. In addition, smaller operators are not able to fully integrate these systems into their operations so do not receive the maximum benefits.

Our survey also found that larger operators are likely to have a range of freight movements e.g. trunking and urban deliveries. Large operators are experts at maximising their assets and their vehicles are less likely to be assigned to one particular route. As such, the addition of fleet-wide eco-driving solutions is more appealing.

Evidence obtained from the stakeholder engagement with the training providers and the operators suggested that the costs of eco-driving training can be lower for larger operators. As highlighted in section 2.4 above, normally the cost of 20 drivers in DCPC would be around £1,000 ($20 \times £50$) but larger operators can reduce this to around £350 (by hiring a trainer at a cost of around £350, and training 20 drivers all at once on their own premises). Smaller operators are not able to do this and in many cases their drivers have to travel to the training facility which can sometimes incur additional travel costs and overnight accommodation.
Evidence from the driver monitoring systems providers that participated in this study showed that the costs of the driver monitoring systems vary depending on the operator's individual requirements and fleet size. The systems could be offered at a reduced rate if a greater number of units were ordered.

Duty cycle

Stakeholder engagement with the operators found that all of the five hauliers who did not make use of eco-driving techniques operated vehicles in the construction sector or the municipal utility sector. These duty cycles are not particularly well suited to maximising the benefits of eco-driving techniques due to the environments in which the vehicles operate in. For instance, a refuse collection vehicle will be constantly stopping and starting in busy, built up areas which is not an economical mode of operation, and tippers used in the construction industry may spend a great deal of time off road which may mean the driver will be over-revving the engine in a low gear.

2.6 Cost effectiveness

Telematics which measure location, speed, acceleration, shifting, idling and mpg in real time are now common for heavy vehicle fleets. The adoption of this equipment by industry means that fuel efficiency performance of drivers can be monitored which means the impacts of eco-driving programmes can be measured under real-world conditions.

What is the payback period?

According to a report for the European Union (EU) the average pay back period for eco-driving training is 12-18 months⁴⁴. The report notes that "the payback time differs per SME, since it is depending on factors such as the price of the selected training, the realised fuel savings, the total mileage per year and the price of fuel used. Medium-sized companies may have shorter payback times than small companies due to them having larger fleets. Furthermore, the price of training differs and also depends on whether it is a theoretical or practical training. The latter is more expensive (with prices per person), but usually has more impact on the realised fuel savings."

The National Center for Sustainable Transportation (US) states: "When fuel prices are low the incentive is reduced and the payback period for investing in training and technologies is extended. The expected payback period ranges from 18 months to 5 years⁴⁵."

The results of the stakeholder engagement conducted through this study found that 80% of operators using eco-driving techniques said that the payback period was 1 year or less. Responses from the training providers concluded that the payback period varied and was dependent on the driving standards of the drivers before they undertook the eco-driving training.

⁴⁴ ECO-DRIVING Europe - building the frame for a European market for eco-driving, Raimund, W. and S. Fickl, In S. Attali, E. Métreau, M. Prône and K. Tillerson (Eds.), 2003

⁴⁵ Reducing the Carbon Footprint of Freight Movement through Eco-Driving Programs for Heavy-Duty Vehicles, University of California, 2015





3. Uptake under current policy

This section provides evidence of the current and historic levels of uptake of eco-driving training and monitoring systems and presents the evidence available on future levels of uptake in the absence of further policy action. In addition, it details the source of this analysis and makes an assessment of the reliability of this evidence. It also highlights the various industry led schemes that are available which are aimed at increasing the levels of uptake.

3.1 Current and historical levels of uptake

Historical levels of uptake

In 2010 RoSPA reported that between 2007 and 2009 around 154,000 large goods vehicle drivers (23% of operators) undertook some form of eco-driving training; around 82,000 of these drivers (7% of operators) undertook SAFED training. They found that uptake was highest for large operators; despite reasonably high levels of awareness for small and medium-size operators, the level of use amongst smaller fleets was low⁴⁶.

RoSPA noted that the rate of uptake of SAFED courses had increased from 7% of operators in 2007 to 9% by 2009. However, the rate of uptake, notably amongst smaller fleets, was not at a sufficient pace to embed widespread uptake of eco-driving training across the industry.

Once all drivers had undertaken their 35 hours of DCPC training, only around 12% a year had undertaken periodic training that was classified as eco, or eco-safe, training, which suggests a maximum of 60% would have taken an eco-driving course by the end of the five year period⁴⁷.

Current levels of uptake

There is no evidence available to determine the exact levels of uptake of eco-driving training for HGV drivers. As previously mentioned, figures from 2015⁴⁸ suggest that there are roughly 299,000 HGV drivers in the UK. If the figure of 12% detailed above is used as a guide then this indicates that around 36,000 drivers undertake an eco-driving course per year.

A recent Fleet News article (2016)⁴⁹ about the uptake of eco-driving courses for car fleets states: "The Energy Saving Trust (EST) saw 5,300 car and van fleet drivers complete its 'Eco-driving' course in 2015/16 (a 50% increase on 2013/2014), which is delivered by a portfolio of driver training companies. Despite the increase in organisations undertaking 'eco-driving' training courses, the focus on finance by companies and the apparent savings that can be accrued through efficient driving, there are still a number of barriers that exist preventing further uptake of driver training."

As part of the stakeholder engagement for this study, operators were asked whether their company made use of eco-driving techniques. This question was answered by all (40) of the participants with a high proportion, 88% (35) saying that they did. Furthermore:

• 89% (17 out of 19) of all small operators who participated in this study had undertaken ecodriving techniques or were using some form of driver monitoring (such as telematics)

 ⁴⁶ Increasing the uptake of eco-driving training for drivers of large goods vehicles and passenger carrying vehicles, RoSPA, DfT, 2010
 ⁴⁷ Increasing the uptake of eco-driving training for drivers of large goods vehicles and passenger carrying vehicles, RoSPA, DfT, 2010

⁴⁸ Domestic Road Freight Statistics, United Kingdom 2015, DfT, 2016

⁴⁹ http://www.fleetnews.co.uk/news/fleet-industry-news/2016/04/19/dft-calls-for-robust-data-for-training-return-on-investment-1

- 84% (16 out of 19) of all medium operators who participated in this study had undertaken eco-driving techniques or were using some form of driver monitoring (such as telematics)
- 100% (2 out of 2) of all large operators who participated in this study had undertaken ecodriving techniques or were using some form of driver monitoring (such as telematics)

These figures are striking as they suggest that most smaller operators use eco-driving techniques. It is important to note, however that this should not necessarily be percieved as a true representation of smaller operators due to the low number of hauliers involved. The survey was sent to 200 operators and it is likely that those who participated in the survey had an interest in eco-driving and so were more likely to be using eco-driving techniques than those who did not. This possible conclusion is supported by the feedback received from training providers and systems suppliers who suggested that:

- Small transport operations have a low uptake of eco-driving systems / training
- Uptake was only 20% for smaller operators
- Companies with less than 5 vehicles are not interested at all

12% of respondents said they did not make use of eco-driving techniques. Two of these could be classed as small and three could be classed as medium. All of these five operators operated vehicles in the construction sector and the municipal utility sector. These findings are interesting as they back up previous assumptions that the uptake of eco-driving is directly linked to the duty cycle of the operator.

Use of telematics

A large number of respondents (86%) said they were using telematics to monitor driver behaviour / performance. 26% of all small operators who answered the online survey said they did not use telematics. Of these, 60% operated just one vehicle (meaning they were owner drivers). This could have meant they thought they had no use for telematics as they were the only driver in the fleet and therefore, the amount of information they could gleam from such a system was limited.

3.2 Industry-led schemes

There are a number of industry led schemes available for fleet operators to consider joining which have been designed to improve their fuel economy and reduce vehicle emissions. These are as follows:

The Fleet Operator Recognition Scheme (FORS)

The Fleet Operator Recognition Scheme (FORS) is a voluntary accreditation scheme encompassing all aspects of safety, fuel efficiency, vehicle emissions and improved operations. FORS helps fleet operators to measure and monitor performance and alter their operations in order to demonstrate best practice. It is open to operators of vans, lorries, mini-buses, coaches and other vehicles, and to the organisations that award contracts to those operators.

FORS accreditation provides access to targeted training for both managers and drivers:

- Nine FORS Practitioner workshops covering safety, efficiency, environmental issues and performance management
- Safe Urban Driving access to driver CPC training
- Four driver e-learning modules covering safety, vulnerable road user safety, fuel efficient driving and Penalty Charge Notices (PCNs)

• Access to Chartered Institute of Logistics and Transport (CILT) Knowledge Centre

FORS mandates training for drivers designed to demonstrate their abilities in driving both safely and economically. The latest available FORS data (2015) shows a 4.3 per cent improvement in fuel usage compared with 2014⁵⁰.

Logistics Carbon Reduction Scheme (FTA)

The Logistics Carbon Reduction Scheme is a voluntary initiative to record, report and reduce carbon emissions. It allows the UK logistics sector to publicly report, its contribution towards national carbon reduction targets.

Scheme benefits

- It's free to join and is confidential
- It helps companies to record and report carbon emissions from freight
- It carries weight with the Government, sector trade associations and buyers of logistics services

How does it work?

Fuel usage and simple business activity data from members is recorded. This is aggregated to report a carbon footprint for the scheme each year.

Straightsol

The EU-funded Straightsol project is piloting new systems and solutions for improved city transport, with a focus on better, safer and more efficient parcel and freight delivery.

ECOWILL (ECOdriving – Widespread Implementation for Learner Drivers and Licensed Drivers) – Ecodrive.org (Car initiative)

The ECOWILL project, launched in May 2010, aimed at reducing carbon emission by up to 8Mt by 2015 by boosting the application of eco-driving in cars across Europe. To reach such an ambitious target the project rolled out short duration eco-driving training programs for licensed drivers in 13 European countries. At the same time, ECOWILL promoted the education of eco-driving for learner drivers.

It is important to note that although this is an initiative for cars the principles are still the same and the lessons learnt detailed below can be applied to the HGV sector also.

Impact after the end of the action⁵¹

One major outcome of ECOWILL is that a great many structures have been established and initiatives have begun which will continue after the end of the project period.

One example is that there are 700 ECOWILL trainers qualified who will keep on including ECOWILL contents in their driving lessons and are mostly highly motivated to promote ecodriving further. Many of the ECOWILL trainers will continue offering short-duration training to private drivers.

Another example is that in several countries eco-driving initiatives have been started which did not exist before the project, and these are expected to continue after the end of the project. In the countries in which eco-driving initiatives were already running at the beginning of the project,

 $^{^{\}rm 50}$ Based on data reported during 2014 and 2015 for a sample of 22,464 vehicles

⁵¹ ECOWILL final report, Intelligent Energy Europe, Ecodrive.org, 2013

partners managed to integrate ECOWILL know-how and findings into existing structures. In those countries, where very few eco-driving activities existed at the beginning of the project, the basis was laid for eco-driving to be on the agenda in the future. Overall, the successful amendment of the European directive on driving license standards will have major impact on driver education and driving testing in all 28 EU-countries.

Lessons learnt

The three main lessons learnt during the action were

1. ECOWILL short-duration training (SDT) is hard to sell at market price. One of the key findings of the project is that it is difficult to market and sell eco-driving training unless it is free, whether to fleet or private drivers. A huge amount of effort and enthusiasm went in to making thirteen diverse and impressive marketing campaigns, and the project met its overall training target, but no partners have yet found the sort of interest or reported gathering momentum that seems likely to see thousands of trainees transform into hundreds of thousands. Indeed several partners reported that they did not think any of their marketing activities were very successful. Even those partners that are relatively optimistic about future training plans estimate sales to only a few thousand drivers per year.

The difficulty in marketing and selling ECOWILL SDT is no reflection on the model of eco-driving training developed by the project. Indeed all thirteen partners report that trainer feedback on the format of the training was largely or entirely positive and feedback from drivers has also been overwhelmingly positive. More fundamentally it appears to be difficult to persuade large numbers of people to pay for stand-alone eco-driving training. This experience mirrors that of other organisations, including both the AA and the Institute of Advanced Motorists in the UK.

2. In order to be taught in driving schools, eco-driving has to be a mandatory part of the practical driving test. Eco-driving knowledge needs to be harmonised between instructors and examiners and guidance for a systematic implementation in teaching and testing is required.

Subsequently, all driving instructors in the country need to be educated, focusing both on ecodriving contents and didactical methods to convey specific content to learner drivers.

3. The consortium experienced that eco-driving is not on the top priority list of important (political) stakeholders. The majority of projects and activities aiming at reducing fuel consumption of driving deal with technical aspects and focus on improvements of vehicle efficiency. This means that the very important issue of driving behaviour and how to influence it by applying an efficient driving style is neglected.

However, it is very important to continue taking the behavioural site of eco-driving into account. For example, you can drive the most efficient car in a very inefficient way, resulting in no fuel savings at all.

ECOWILL prepared and implemented methods to establish long-term changes in driving behaviour, both for learner and licensed drivers. The ECOWILL consortium is convinced that eco-driving behaviour and the correct use of technologies and tools have to be a central issue on the political agenda, especially at European level.





4. Barriers to greater uptake

This section explores the key barriers preventing more and / or faster uptake of eco-driving techniques and makes an assessment of whether these barriers impact certain parts of the industry more than others. The evidence provided here has been drawn from both the literature review and the stakeholder engagement undertaken through this study.

4.1 Key barriers preventing more and/or quicker uptake

The eco-driving report conducted by TNS-BMRB for DfT / DVSA⁵² provided feedback from a number of Category B fleet operators about their opinions on the specific barriers impacting the uptake of post-test training. The top answers given were:

- Cost of any post-test driver training
- Feeling expert enough in driving skill and fuel efficient driving
- Doubts about sustainability of eco-driving practices learnt
- Lack of evidence

Cost of training / monitoring systems

For employers, the primary barrier was financial in terms of:

- The cost of training
- The cost to replace a driver when they are on training
- The possible loss of business by taking time out of the business
- The cost of installing telematics to monitor driver behaviour

TNS-BMRB's report highlighted that employers were unwilling to be out-of-pocket without evidence of reduced fuel consumption. There was an overwhelming sense that without financial incentives, employers were unlikely to view eco-driving training as a necessity.

While a lot of companies are aware of the benefits of adopting eco-driving techniques, many operators said they could not afford to incur unnecessary expenses. Therefore if training or investing in telematics is not viewed as a necessity and if there is no financial incentive for the business, it is unlikely those companies will spend money on eco-driving.

For smaller operators, the financial burden that is presented by investing in training for drivers is a key barrier, in the sense that it is a major risk for smaller operators to spend money training their drivers if there is a possibility that they will lose those trained drivers⁵³. Larger operators are more likely to take active steps to promote eco-driving to their drivers as they will not suffer the same level of financial burden.

⁵² Eco-driving: Factors that determine take-up of post-test training research, TNS-BMRB report, DfT / DVSA, 2011

⁵³ Reducing the Carbon Footprint of Freight Movement through Eco-Driving Programs for Heavy-Duty Vehicles, University of California, 2015

Feeling expert enough

The current standard driving test was referred to many times as being high quality and sufficient, especially compared to previous years and other countries. As such, very few drivers surveyed by TNS-BMRB felt they were lacking in driving expertise to consider taking any post-test intervention. As already mentioned, when probed further regarding eco-driving techniques, drivers believed they were already incorporating eco-driving techniques, such as accelerating slowly and maintaining correct tyre pressure and therefore did not require further training. This increasing uptake of eco-driving techniques impacted on their willingness to attend an eco-driving course as they felt they were already reducing fuel consumption as far as possible.

Doubt about sustainability

TNS-BMRB's report highlighted that there was a concern that many drivers would not maintain techniques after training, leading to a lack of sustainability. For the smaller companies with smaller fleets and without tracking equipment, it was virtually impossible to monitor sustainability of ecodriving techniques.

Lack of evidence

Proof that a reduction in fuel consumption or accidents was the direct result of eco-driving training rather than other mitigating factors, was considered by some employers to be very challenging.

Operators surveyed by TNS-BMRB considered there to be a lack of data to quantify the return on investment (costs and benefits) from undertaking eco-driving training or introducing telematics in the business.

Stakeholder engagement findings

Operators contacted during the stakeholder engagement phase of this study were asked what they thought the key barriers were preventing more and/or quicker uptake of monitoring systems and eco-driving training.

For monitoring systems, the top three answers were:

- 1. Upfront cost of system (15 respondents)
- 2. Monthly subscription cost (11 respondents)
- 3. Lack of evidence to suggest benefits / Installation cost (9 respondents each)

For eco-driving training, the top three answers were:

- 1. Cost of course (17 respondents)
- 2. Lack of availability (13 respondents)
- 3. Potential driver resistance to training (13 respondents)

Cost of system / course was top in both instances. This reinforces the findings from the eco-driving report conducted by TNS-BMRB for DfT / DVSA⁵⁴ outlined above.

In addition, of the five opertors who responded to the online survey who did not make use of driver monitoring systems or eco-driving training, all cited the following as key barriers preventing more and/or quicker uptake:

• Cost of system (upfront, monthly subscription or installation) and the cost of course

⁵⁴ Eco-driving: Factors that determine take-up of post-test training research, TNS-BMRB report, DfT / DVSA, 2011

• Not convinced of return on investment / lack of evidence to suggest benefits of course

When grouped together, all of this evidence suggests that uptake rates are primarily based on evidence of cost effectiveness.

4.2 Key barriers and certain parts of the industry

As discussed, the financial burden and risk attached to training drivers in eco-driving techniques is disproportionately large for smaller operators. Newly trained drivers could be perceived as being more employable and there is a worry that once drivers gain new skills they will leave their current employers and join new ones.

The extent to which eco-driving training is being undertaken across certain parts of the industry is variable. However, in general, the size of the company or firm has a much greater influence on the uptake of eco-driving than the industry in which a company operates⁵⁵. This is because larger firms are able to devote more resource towards eco-driving training and can utilise their own in-house driver training / trainer(s). Medium sized operators on the other hand do not have this luxury and instead might have a driver who trains other drivers for 20 days of the year and drives for the company the rest of the time. In most cases smaller operators do not have any infrastructure in place at all with regards to having their own in-house training provider.

The general consensus of the training providers who provided feedback for this study was that small companies do not see any benefits in the training. Small operators commented that there was not enough information available on the benefits and the return on investment of these eco-driving courses to convince them to send drivers on training courses. When this was coupled with the amount of time required to physically attend the course, operators were unable to justify the costs.

Drivers who work for smaller companies are less likely to have undertaken any eco-driving training because either the company does not pay for the training or they feel they do not gain anything from the suggested benefits.

⁵⁵ Increasing the uptake of eco-driving training for drivers of large goods vehicles and passenger carrying vehicles, RoSPA, DfT, 2010





5. Options for increasing uptake

This section provides evidence on the scope for government and / or industry interventions to increase action and outlines how the barriers outlined in earlier sections could be overcome. It also highlights new or recent industry led schemes that are of notable interest, assessing how far the evidence suggests these actions could increase uptake. In addition, recommendations are made on what government could do to incentivise further uptake and overcome the remaining barriers, and the potential level of carbon abatement for each action is calculated.

Finally, a cost-benefit ratio is estimated for each action along with the cost effectiveness (£/tCO2e) and evidence is provided on how packaging measures together would result in significant savings.

5.1 Scope for government and/or industry intervention

According to the New Zealand AA report,⁵⁶ many eco-driving schemes involve partnerships between government organisations, charities, private organisations and industry bodies. These relationships appear to be essential to ensure that the scheme is credible and likely to reach its target audience(s). Given the relationship between eco-driving and road safety, DfT could provide publicity and advertisements for eco-driving as part of its road safety initiatives. Additionally, organisations such as RoSPA and Brake could engage in promoting the benefits of eco-driving and encourage relevant stakeholders to engage in such activities⁵⁷.

A recent article by the road safety charity, Brake (2016)⁵⁸ stated: "Vehicle traffic has risen by almost 2% in the last year, meaning as well as the increased danger of crashes, we are seeing increased pollution. Much of this increase is being attributed to light goods vehicles, many running on diesel, which of course we have now learned is much more damaging to the environment than previously claimed."

Increasing numbers of vehicles

HGVs

The new HGV market in the UK grew by almost a fifth in the first quarter of 2016, according to figures released by the Society of Motor Manufacturers and Traders (SMMT)⁵⁹. Continued business confidence resulted in more than 10,000 new commercial vehicles over six tonnes being registered in the first three months of the year, a 19.2% increase compared to Q1 2015.

Growth was driven by increased demand for rigids, specifically those over 16 tonnes which saw a 48.1% rise, offsetting a small decline in 3-axle artic registrations. Tractors were the most popular body type for HGVs in the first three months of the year, accounting for 38% of the heavy goods vehicles that hit British roads in Q1.

HGV traffic has increased by 3.4% between 2015 and 2016 to 17.1 billion vehicle miles. For the last four years, HGV traffic has grown an average of 2.3% per year making it the second fastest growing traffic type in this period. However, HGV traffic remains below the peak of 18.2 billion vehicle miles observed in the year ending June 2008.

⁵⁶ Eco-driving scoping study, AA Research Foundation, Energy efficiency and Conservation Authority, 2011

⁵⁷ Increasing the uptake of eco-driving training for drivers of large goods vehicles and passenger carrying vehicles, RoSPA, DfT, 2010

⁵⁸ http://www.brake.org.uk/media-centre/1588-urgent-action-needed-as-progress-to-prevent-road-deaths-and-casualties-stalls

⁵⁹ http://www.smmt.co.uk/2016/05/strong-start-to-2016-for-heavy-truck-market-as-new-registrations-grow-by-a-fifth/

In addition, although as previously mentioned, vans are out of scope for this project, the number of vans on Britain's roads has hit an all-time high of 4 million. According to Motorparc data from the SMMT (SMMT April 2016)⁶⁰, a total of 4,007,331 vans are in use on UK roads, a 4.3% increase on the previous year.

In conclusion, it could be argued that both government and industry need to increase efforts to further stimulate the uptake of eco-driving training / driver monitoring systems due to the rising numbers of HGVs and vans on UK roads and associated impact on emissions.

5.2 Tackling the barriers to uptake

As highlighted in Section 4.1, the key barriers preventing more and/or quicker uptake of monitoring systems and eco-driving training are:

- Cost of any post-test driver training
- Complacency, with many drivers feeling expert enough in driving skill and fuel efficient driving and hence not requiring additional training
- Doubts about the sustainability of eco-driving practices learnt
- Lack of evidence of benefits

All of these barriers could be tackled - however, some are more difficult to address than others. An assessment of how each of these barriers could be overcome is provided below:

Cost of any post-test driver training

Findings from the literature review and stakeholder engagement show that the primary barrier to greater uptake was the cost of training / monitoring equipment. This includes the cost of replacing a driver when they are on training and possible loss of business by taking time out of the workplace. Operators said that without evidence of reduced fuel consumption they would be less likely to pay for eco-driving training / monitoring equipment.

There are four ways in which these barriers could be overcome. These are:

- 1. Subsidise driver training and / or monitoring equipment making it cost neutral to the operator.
- 2. Make the eco-driving training DCPC accredited
- 3. Make the training mandatory as part of the DCPC (i.e. 1 day every five years)
- 4. Increase the promotion of the benefits of eco-driving

Feeling expert enough in driving skill and fuel efficient driving

If operators were more aware of the benefits of eco-driving training and its associated cost, they may be more likely to encourage their drivers to attend an eco-driving course. Again increasing promotion of the benefits of eco-driving training may result in more and / or quicker uptake.

Doubt about sustainability of benefits

The SAFED longevity report conducted by AECOM⁶¹ found that an investment in training needs to be supported with an investment in time and resource, to continue to monitor driver performance

⁶⁰ http://www.smmt.co.uk/2016/04/largest-ever-number-of-vans-recorded-on-british-roads-as-commercial-vehicle-show-2016opens/

⁶¹ Longevity of SAFED benefits study, AECOM, 2010

and provide regular feedback. This will enable any positive benefits from driver training to be maintained and sustained for a greater period of time.

It is important that any eco-driving training course or promotional material includes clear guidance on how to monitor driver performance and provide feedback to the driver with or without the use of telematics. It is possible to manually record data such as MPG, fuel consumption, speed and start/finish location for instance in conjunction with a tachograph.

Lack of evidence of benefits

As mentioned above, findings from both the literature review and the stakeholder engagement undertaken as part of this study, revealed that operators felt there was a lack of data quantifying the return on investment from undertaking eco-driving training or introducing telematics in the business.

DfT could potentially overcome this barrier by instigating a data campaign to show the benefits of eco-driving training and communicate these to the wider industry. This is explained in greater detail in section 5.3 below.

5.3 Further possible government intervention

The findings from this study have led to the creation of the following policy options for consideration by DfT with:

- 1. Reinvigoration of SAFED training course
- 2. Encourage eco-driving as part of the DCPC
- 3. Instigate data campaign to show benefits and communications campaign to industry

Option 1 - Reinvigoration of SAFED training course

What does this involve?

The SAFED training course material should be re-evaluated to determine the extent to which it is still relevant and covers everything needed to ensure the potential for drivers to operate vehicles efficiently is maximised. Where course content is found to be lacking / insufficient, it should be brought up to date. For instance the inclusion of new vehicle technology such as automatic gearboxes and brake assist might be considered. DfT could look to work with HGV manufacturers in refreshing the course content.

The cost to the operator of sending a driver on a SAFED course is around £150-£300. This represents a large investment for smaller operators. Therefore subsidising the course for SMEs and making the revised SAFED training course DCPC accredited would alleviate the financial burden and increase the level of uptake. DfT might consider stipulating that in order to qualify for the subsidy, operators would need to show that the training is being undertaken alongside proper fleet and driver management.

The course itself could be delivered in a day, with a session in the classroom in the morning (3.5 hours) followed by in-vehicle training (3.5 hours) in the afternoon. It is recommended that the training be refreshed every five years to ensure any positive benefits achieved from driver training is maintained and sustained for a greater period of time. This also brings it in line with the DCPC periodic training requirements (i.e. a driver must undergo 35 hours of periodic training every 5 years).

Table 5.1 highlights a number of potential updates that could be included in a revised SAFED course.

Table 5.1: Potential updates to SAFED course

Update content and incorporate new vehicle technologies and monitoring systems

Review course content regularly and possibly involve vehicle manufacturers in these revisions

DfT subsidised training for small and medium sized operators

Stipulate that in order to qualify for funding training should be undertaken alongside proper fleet and driver management

Stipulate training should be refreshed at least every 5 years

Stipulate that operators are to report feedback and benefits achieved electronically into a central database

Review accreditation system for training providers

Benefits of this approach

- SAFED is well respected by the transport industry
- Drivers undertaking SAFED training improved fuel efficiency by around 2 12%
- Most companies experience a payback period of less than 2 years
- Subsidising the course and making it DCPC accredited should help to ensure a large uptake
- Other benefits of SAFED include a reduction in accidents, vehicle maintenance and driver stress and fatigue
- Vehicle technology is changing at a considerable rate as are the ways in which drivers interact with this technology. Refreshing the content of SAFED regularly will ensure it remains relevant, teaches drivers new things and keeps the operators / drivers interested
- Reviewing the existing accreditation system for training providers will ensure the quality of training delivered will be of a suitable standard
- The format of the SAFED course (in-class and in-vehicle training) has been proven to be the most effective method of learning

Rationale for this measure

Feedback provided by the training providers during the stakeholder engagement phase of this study suggested that industry still regards SAFED highly and there is a need for training of this nature. Respondents also expressed that if this was the only course that applied a government subsidy then it would be very popular and that if the subsidy made the training cost neutral then this could potentially work. The longevity of the funding would be critical to the success of this option as not all drivers would be doing their DCPC training at the same time (as they have five years to complete it) so funding it for a year, for example, would not be sufficient. Also the need to refresh the training to achieve sustained benefits would need to be factored in.

Concern was voiced over the way in which the training is rolled out however, as operators often perceive 'free' as being not worthwhile. There is also the danger that, without building in appropriate safeguards, having booked onto the course, drivers may not turn up, or cancel, safe in the knowledge that they would not be penalised for doing so.

In addition the training providers said that it would be important to raise awareness of the course and develop guidance documents detailing what the training covered and how it would be delivered in practice. As DCPC is mandatory, making the reinvigorated SAFED course DCPC accredited would mean that the potential is there to reach every HGV driver. JAUPT reported (2015)⁶² that: "New figures released week ending 11th September 2015 showed that almost 99% of lorry drivers stopped during roadside checks in the last year had completed their Driver Certificate of Competence (CPC) periodic training⁶³."

DfT could also request that in order to qualify for the subsidised training, operators would need to provide evidence that it was being done alongside proper fleet and driver management.

Option 2 - Encourage eco-driving as part of the DCPC

What does this involve?

The eco-driving DCPC module could be subsidised for SMEs by DfT and a menu of 'options' could also be created from which operators would select. A typical blended menu is presented in table 5.2. There are five options to choose (1 for each year of the periodic training). A different option could be selected every year. It is recommended that this is not mandated as one of the aims should be to encourage operators to willingly choose to undertake eco-driving, and some large operators already employ in-house eco-driving trainers.

The course material for this module should be re-evaluated to see if it is still relevant and covers everything needed to ensure the potential for drivers to operate vehicles efficiently is maximised. Where course content is found to be out of date, it should be revised (e.g., to ensure the inclusion of new vehicle technology). This content should be reviewed at regular intervals to make sure it keeps pace with the rate at which the technology is changing.

The cost to the operator to send a driver on a DCPC course is around £250 per module. This represents a substantial investment for smaller operators. Therefore subsidising the course for SMEs would alleviate the financial burden and increase the level of uptake. DfT might consider stipulating that in order to qualify for the subsidy, operators would need to show that the training is being undertaken alongside proper fleet and driver management.

⁶² https://www.jaupt.org.uk/news/2015/10/nearly-all-lorry-drivers-complete-cpc-training

⁶³ https://www.jaupt.org.uk/news/2015/10/nearly-all-lorry-drivers-complete-cpc-training

Table 5.2: Menu options for Driver CPC periodic training modules

Option 1 Health and Safety	Option 2 Vehicle	Option 3 Legislation / Regulation	Option 4 Operations	Option 5 Fleet fuel management
Health, Safety and Emergencies	Vehicle Systems (Safety Controls)	Legislation (including Drivers Hours, Rules and Regulations and the Working Time Directive)	Prevention of Criminality and Trafficking	Safe and fuel efficient driving
Physical/Mental Health and Wellbeing	Vehicle Systems (Transmission System)	Regulations for Carriage of Goods (LGV)	Professional Driver and Company Issues	
Personal Health and Wellbeing	Loading/Unloading (LGV)		Economic Environment for Carriage of Goods (LGV)	
First Aid				

The course itself could be delivered in a day, with the first hour of the course used to highlight any recent changes to the industry (such as changes to the national speed limits for HGVs), inform drivers about new training courses that might be of interest and reiterate the role / powers of the DVSA. It is recommended that the training is refreshed at least every five years to ensure any positive benefits achieved from driver training is maintained and sustained for a greater period of time. This also brings it in line with the DCPC periodic training requirements (i.e. a driver must undergo 35 hours of periodic training every 5 years).

In addition the Management CPC course could also incorporate a greater focus on fleet management training. Information and communication technology is currently included but not in great detail.

Finally DfT might consider reviewing the existing accreditation system for training providers to ensure that those delivering the training continue to be of a sufficient standard to maintain the quality of training provided.

Table 5.3 highlights a number of potential updates that could be included in a revised DCPC module.

Table 5.3: Potential changes as part of DCPC review

- 1. Update content and incorporate new vehicle technologies and monitoring systems
- 2. Review course content regularly and possibly involve vehicle manufacturers in these revisions
- 3. DfT to subsidise training for small and medium sized operators
- 4. Create blended menu of options that operators must select from
- 5. Stipulate that in order to qualify for funding training should be undertaken alongside proper fleet and driver management
- 6. Stipulate training should be refreshed at least every 5 years
- 7. Stipulate that operators are to report feedback and benefits achieved electronically into a central database
- 8. Review accreditation system for training providers

Benefits of this approach

- Although there is no specific evidence available on the effectiveness of the safe and fuel efficient driving DCPC module, eco-driving training has been reported to reduce CO₂ emissions and fuel consumption by an average of 2-12%
- Vehicle technology is changing at a considerable rate as are the ways in which drivers interact with this technology. Refreshing the content of this DCPC module regularly will ensure it remains relevant, teaches drivers new things and keeps the operators / drivers interested
- Subsidising the course would make it a feasible option for small and medium sized operators
- Having a blended menu allows operators to retain the flexibility they need to ensure the training their drivers receive can be tailored to the individual needs of the company
- Reviewing the existing accreditation system for training providers will ensure the quality of training delivered continues to be of a suitable standard
- DCPC is mandatory for drivers and if one of the five days is based on eco-driving this option is one way of educating the highest number of drivers in the techniques of eco-driving

Rationale for taking this approach

89% of respondents to the online survey undertaken through this study said they used DCPC to train their drivers in eco-driving techniques. In addition, 60% thought that making eco-driving mandatory as part of the DCPC would be a good way of overcoming the barriers to increasing the uptake of eco-driving training. This suggests that increasing the uptake of DCPC-accredited eco-driving training could be an effective way to address some of the barriers.

Would there be any resistance to this?

Encouraging, rather than mandating DCPC eco-driving training is likely to be well received by industry. DfT explored the mandating of eco-driving as part of the DCPC in 2010 and this was rejected by the FTA. The FTA recommended that although greater uptake of eco-driving training must be encouraged, the mandatory route proposed is unnecessary and could even become counter intuitive. We are also aware that some larger operators already employ in-house driver trainers, so mandating DCPC eco-driving modules could potentially duplicate existing industry efforts.

Option 3 - Instigate data campaign to show benefits and communications campaign to increase take-up amongst industry

What does this involve?

This would involve monitoring the effectiveness of eco-driving training by collecting fuel consumption data from operators before and after training has occurred. This would be input into an online benchmarking tool which is configured to allow other operators to view anonymised results. The benefit would be that it would provide independent evidence on the benefits of eco-driving to enable positive decision making.

The planning of this would comprise of the following two elements namely;

- 1. Data collection plan
- 2. Communications plan

The data collection plan

The data collection plan would set out the strategy for reaching HGV operators who are not currently undertaking eco-driving training and / or using driver monitoring systems and for developing of the tool.

The communications plan

The communications plan would set out the strategy for reaching HGV operators and drivers and encourage them to use and adopt eco-driving training and driver behaviour / performance monitoring systems.

Data collection strategy

- Evaluate existing data already available
- Determine stakeholder list to be contacted
- Collect new data from stakeholders and decide on the approach to be taken to collect this data (e.g. trials, face-to-face interviews, telephone interviews, questionnaires etc.)
- Create case studies to be used as part of communications strategy

Communications strategy

- Launch, raise awareness of and celebrate achievements of eco-driving techniques
- Encourage behaviour change by encouraging HGV drivers to adopt more fuel efficient, safer driving practices and promoting good practice
- Encourage organisations to take responsibility for road safety and manage road risk created by HGV driving activities

Data collection / Communications objectives

The data collection / communications objectives are to:

- Develop 10-20 case studies from SMEs highlighting benefits of eco-driving
- Provide evidence to operators that a reduction in fuel consumption or accidents was the direct result of eco-driving training rather than other mitigating factors
- Quantify the return on investment (costs and benefits) from undertaking eco-driving training or introducing telematics to the business
- Provide operators with information about what eco-driving is and what techniques they can use to drive more safely and efficiently

Communications plan

- Segment HGV driving market and prioritise target audiences
- Identify best communication channels to reach target audiences
- Define key messages for target audiences
- Set key timescales and communications milestones linked to key project milestones and specific audiences
- Position eco-driving as the definitive training course for HGV drivers (e.g. it could be offered in-house by approved driver trainers)
- Remind HGV drivers and operators of the importance of road safety and fuel efficient driving
- Reassure operators / drivers that safe and fuel efficient driving can be easily achieved and DCPC and SAFED (style) courses can support this
- Report back on the progress of eco-driving programme number of drivers trained, case studies showing behaviour change and benefits

Target audience

The HGV operator audiences have been split into three groups as follows:

- 1. Small operators (<10 vehicles in fleet)
- 2. Medium-sized operators (10-100 vehicles in fleet)
- 3. Large-sized operators (>100 vehicles in fleet)

The communication activity would initially raise the profile amongst the primary audience (groups 1 and 2 above) and then engage with the wider companies (group 3).

Table 5.4 presents a list of methods for reaching each of the target audiences.

|--|

	, 0		
		Audience	
Methods of communication	Group 1	Group 2	Group 3
	Small sized	Medium sized	Large sized
	operators	operators	operators
Staff newsletters	\checkmark	\checkmark	\checkmark
Team meetings	\checkmark	\checkmark	\checkmark
Intranet		\checkmark	\checkmark
Slide packs			\checkmark
Emails	\checkmark	\checkmark	\checkmark
Works notice boards		\checkmark	\checkmark
Internal training campaign		\checkmark	\checkmark
Mailing lists	\checkmark	\checkmark	\checkmark
Trade bodies	\checkmark	\checkmark	\checkmark
Word of mouth	\checkmark	\checkmark	\checkmark
Trade magazines / shows	\checkmark	\checkmark	\checkmark
Social media / App	\checkmark	\checkmark	\checkmark

Communications routes

There are a number of actions that would be needed to promote the eco-driving concept. This section discusses the various methods that DfT could use to develop awareness and promote the techniques. The marketing and communication strategy could be split into 2 stages:

Stage 1: Initiate

The first stage of any communication plan is to develop awareness of the concept. This requires a number of key actions to have been completed by DfT before any promotional activities commence. These activities include establishing a webpage and sending out newsletters to operators. Early communications should clearly state the objectives of the communications campaign, what it entails and its associated benefits.

Stage 2: Embed

Once initiated, the next aim of the communications plan should be to embed the concept with HGV operators by utilising various communications channels to embed the concept of eco-driving and continue the momentum built up during the initiate stage. Examples of these communications channels could include webpages, social media, newsletters, email, trade bodies, workshops and industry press / trade shows.

Benefits of this approach

- A communications campaign would mean high coverage could be achieved on a relatively small budget
- DfT could target specific segments of the HGV market and prioritise target audiences
- DfT could tailor the key messages it wants to convey to industry
- Provides the opportunity for DfT to interact with operators
- Data will be collected for use by DfT to use as appropriate

Rationale for taking this approach

The training providers who provided feedback for this study said that small companies did not see any benefits in undertaking eco-driving training. Small operators commented that there was insufficient information available on the benefits and the return on investment of these eco-driving courses to convince them to send drivers on training courses.

Of the five operators who responded to the online survey who did not make use of driver monitoring systems or eco-driving training, all commented that they were not convinced of the return on investment and that there was a lack of evidence to suggest the benefits.

When asked how the barriers to greater / quicker uptake of eco-driving techniques could be overcome, 50% of operators said they thought developing guidance documents to increase awareness of benefits would be a good method.

What were the results from the literature review?

The eco-driving report conducted by TNS-BMRB for DfT / DVSA⁶⁴ provided feedback from a number of fleet operators about the specific barriers impacting the take-up of post-test training. Lack of information available on the benefits and the return on investment of eco-driving courses was one of the top answers given.

The ECOWILL final report highlighted that "A huge amount of effort and enthusiasm went in to making thirteen diverse and impressive marketing campaigns, and the project met its overall training target, but no partners have yet found the sort of interest or reported gathering momentum that seems likely to see thousands of trainees transform into hundreds of thousands. Indeed several partners reported that they didn't think any of their marketing activities were very successful. Even

⁶⁴ Eco-driving: Factors that determine take-up of post-test training research, TNS-BMRB report, DfT / DVSA, 2011

those partners that are relatively optimistic about future training plans estimate sales of only a few thousand drivers per year.

The difficulty in marketing and selling ECOWILL SDT is no reflection on the model of eco-driving training developed by the project. Indeed all thirteen partners report that trainer feedback on the format of the training was largely or entirely positive and feedback from drivers has also been overwhelmingly positive. More fundamentally it appears to be difficult to persuade large numbers of people to pay for stand-alone eco-driving training. This experience mirrors that of other organisations, including both the AA and the Institute of Advanced Motorists in the UK⁶⁵."

5.4 Costs and benefits of the interventions

Tables 5.5, 5.6 and 5.7 highlight how much carbon abatement each of the proposed policy options could potentially achieve and presents their cost effectiveness in terms of \pounds/tCO_2e . For the purposes of this study, the benefits of eco-driving training have been estimated over a period of a year rather than a number of years. This is because there is a range of driver response to training which can mean certain drivers return to pre-training driving styles within weeks compared to those who adopt best practice for many years.

The following assumptions are used in the intervention analysis in this section.

Assumptions:	
Driver working days / year	220
Fuel cost / day (£)	£100
Cost / litre of fuel (£)	£1
Carbon emitted / litre of fuel (kg)	2.68
Reduction in fuel use achieved through:	
SAFED	6%
Driver CPC	2%
Communication Campaign	2%
Uptake of communication campaign	1%
Cost of facilitating a DCPC course	£250

⁶⁵ ECOWILL final report, Intelligent Energy Europe, Ecodrive.org, 2013

Option 1 - Reinvigoration of SAFED training course

Table 5.5: Reinvigoration of SAFED training course

Cost of training made up of:	Course (£200 / driver)
	Agency driver cover (£200 / day)
Total cost of training:	£400
Fuel cost / year:	£22,000 (based on £100 fuel per day x 220 days per year)
Save 6% fuel:	£1,320 (22,000/100*6)
22,000 litres burnt produces	58.96 tonnes of carbon per year (22,000*2.68/1000)
Saves	3.537 tonnes of carbon (6% of 58.96)
Therefore £400	buys 3.537 tons of carbon
Net benefit:	£1,320
Cost of course:	£400
BCR:	1:3.3
Cost effectiveness:	£113/tCO ₂

NB - All fuel costs include tax and therefore it is important to note that this reflects private cost effectiveness. In addition, the analysis does not apply any sensitivities such as lower or higher percentage fuel savings and does not take into consideration any decay in the efficiency of the training meaning there may be a degree of uncertainty in the final cost effectiveness results provided above.

Option 2 – Encourage eco-driving as part of the DCPC

Table 5.6: Encourage eco-driving as part of the DCPC

Cost of training made up of:	Course (£50 - £100 / driver*) Agency driver cover (£200 / day)
Total cost of training:	£250 - £300
Fuel cost / year:	£22,000 (based on £100 fuel per day x 220 days per year)
Save 2% fuel:	£440 (22,000/100*2)
22,000 litres burnt produces	58.96 tonnes of carbon per year (22,000*2.68/1000)
Saves	1.179 tonnes of carbon (2% of 58.96)
Therefore £250 - £300	buys 1.179 - tonnes of carbon
Net benefit:	£440
Cost of course:	£250 - £300
BCR:	1:1.76 – 1:1.47
Cost effectiveness:	£212/tCO ₂ - £254/tCO ₂

*Variable course cost factors in the cost of smaller operators having to travel to training course

NB - All fuel costs include tax and therefore it is important to note that this reflects private cost effectiveness. In addition, the analysis does not apply any sensitivities such as lower or higher percentage fuel savings and does not take into consideration any decay in the efficiency of the training meaning there may be a degree of uncertainty in the final cost effectiveness results provided above.

Option 3 - Instigate data campaign to show benefits and communications campaign to industry

Table 5.7: Instigate data campaign to show benefits and communications campaign to industry

Cost of campaign	£60,000/year
Individuals targeted	60,000
% uptake	1%
Cost/individual on advertising	£100
Total cost/individual	£350 (£250 DCPC + £100 advertising)
Fuel cost / year:	£22,000 (based on £100 fuel per day x 220 days per year)
Save 2% fuel:	£440 (22,000/100*2)
22,000 litres burnt produces	58,960kgs of carbon per year (22,000*2.68)
Saves	1,179kgs of carbon (2% of 58,960)
Therefore £350	buys 1.179 tonnes of carbon
Net benefit:	£440
Cost of course & advertising:	£350
BCR:	1:1.26
Cost effectiveness:	£296/tCO ₂

The findings from this study have led to the creation of three policy options that DfT could move forward with should they so wish. An assessment of each of these options is provided in table 5.8.

Table 3.6. Ease of implementation / Cost enectiveness table	Table 5.8	: Ease of	f implementation	/ Cost	effectiveness	table
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Policy	Ease of implementation	Contribution to carbon reductions	Level of opposition	Cost Effectiveness
Reinvigoration of SAFED training course	Medium / Hard	High	Medium	£113/tCO2
Support for eco- driving as part of the DCPC	Medium / Hard	Medium	Medium	£212/tCO₂ - £254/tCO₂
Instigate data campaign to show benefits and communications campaign to industry	Easy	Low / Medium	Low	£296/tCO ₂



Appendix 1 – Literature review - List of reviewed documents

Document name	Theme	Format	Source
2025 Every Car Connected: Forecasting the Growth and Opportunity	Uptake, Benefits, Costs, Future Technologies, Wider Benefits, Available Technology/Training	Report	GSMA Connected Living programme: Automotive (2012)
An assessment of the potential for demand-side fuel savings in the Heavy Goods Vehicle (HGV) sector	Benefits	Report	Centre for Sustainable Road Freight (2015)
Companies and Drivers Benefit from SAFED for HGVs, A Selection of Case Studies	Benefits, Wider Benefits, Training,	Report	Freight Best Practice, DfT (2010)
Domestic Road Freight Statistics, United Kingdom 2015	General Information	Report	DfT (2016)
ecoDriver – Supporting the driver in conserving energy and reducing emissions	General Information, Benefits	Report	University of Leeds (Institute for Transport Studies), Ertico (2016)
Eco-driving: Factors that determine take-up of post- test training research	General Information, Uptake	Report	DfT, DSA (2011)
Eco-Driving Scoping Study	Benefits, Wider Benefits, Available Technology/Training, Costs	Report	AA Research Foundation (New Zealand), Energy Efficiency and Conservation Authority (2011)
Eco-efficient feedback technologies: Which eco- feedback types prefer drivers most?	General Information, Benefits, Policy Options	Report	Institute of Technology Management, St. Gallen University (2011)
ECOWILL, ECOdriving – Widespread Implementation for Learner Drivers and Licensed Drivers, final report	General Information, Uptake, Policy Options	Report	EcoDrive, Intelligent Energy Europe, Ecodrive.org, European Commission, (2013)
Evaluation of Evidence- Based Practices in Online Learning A Meta-Analysis	Benefits	Report	US Department of Education (2010)

Document name	Theme	Format	Source
and Review of Online Learning Studies			
Fiat Eco-drive	Available Technology/Training	Website	Fiat (2016)
Final Report on the Fuel Saving Effectiveness of Various Driver Feedback Approaches	General Information, Available Technology/Training, Uptake, Benefits	Report	National Renewable Energy Laboratory (2011)
Gamification Driver Engagement Whitepaper	Available Technology/Training	Report	Microlise (2016)
Guidelines for Delivering Short Duration Eco-driving Training courses	Available Technology/Training, General Information	Report	Intelligent Energy Europe (2011)
Increasing the uptake of Eco- driving training for drivers of large goods vehicles and passenger carrying vehicles	Uptake	Report	RoSPA, DfT (2010)
Logistics Report 2016	General Information	Report	FTA (2016)
"Mitigating Driver Distraction with Smart Phone Connectivity"	Barriers	Presentation	SAE International (2011)
Online Driver Assessment, Training & Risk Mitigation Programme	Available Technology/Training	Website	UKGRS (2016)
Online Eco-driving and Manoeuvring System	Available Technology/Training	Website	Assured Vehicle Solutions
Overview of the UK Commercial Vehicle Industry	General Information	Report	Texaco, MotorTransport, Commercial Motor (2016)
Reducing the Carbon Footprint of Freight Movement through Eco- Driving Programs for Heavy- Duty Vehicles	General Information, Benefits, Policy Options, Costs, Uptake	Report	University of California (2015)
Save fuel with AA Eco Drive	Available Technology/Training	Website	AA (2016)
SAFED for HGVs, A Guide to Safe and Fuel Efficient Driving for HGVs	Benefits, Wider Benefits, Training	Report	Freight Best Practice, DfT (2010)
Scania DfT 20th November 2015	Uptake, Policy Options, Benefits	Presentation	DfT (2015)

Appendix 2 – Defensive and fuel efficient driving techniques

Defensive driving

Defensive driving helps drivers to keep away from problems on the road through detailed journ *yy* planning before travelling, and applying focus, observation and anticipation whilst on the road. A defensive driver does not just concentrate on his or her own actions, but also on the likely actions of other road users.

Defensive driving techniques include:

- Planning the journey a realistic amount of time should be allowed for the journey
- Looking fifteen seconds ahead and not just at the vehicle in front Anticipate risks, make fewer and smaller steering corrections and make better predictions of what is going to happen
- Staying alert and keeping the eyes moving Combining what is seen ahead and around the driver to identify hazards
- Giving enough decision and reaction time so that potential problems are recognised and the hazard drill can be applied safely – It is important to monitor and maintain a 'safety space' around the vehicle. For example, a two-second gap should be left at the front of the vehicle, driving in vehicles blind spots should be avoided and tailgaters at the rear should be allowed to pass
- Keeping a safe distance between the vehicle in front only a fool breaks the two-second rule
- Giving early, clear and effective signals
- Being patient and remembering that anyone can make a mistake
- Slowing down and holding back if a road user pulls out at a junction

Fuel efficient driving techniques

Fuel efficient driving techniques include:

- Driving smoothly and reading the road ahead so that the vehicle can keep moving as much as possible
- Accelerating gently and decelerating smoothly harsh acceleration and braking should be avoided
- Changing gear as soon as possible without labouring the engine
- Being proactive this includes having an awareness of the conditions and anticipating events before they happen
- Checking the vehicles mirrors prior to braking
- Only use the air conditioning if really needed
- Turning off electrical equipment, such as heated rear windscreen, demister blowers and headlights, when not needed
- Staying within speed limits driving at lower speed will improve fuel economy

Appendix 3 – Overview of systems suppliers and the functions their systems provide

		System Provider								
Vehicle and Driver Parameters	А	В	С	D	E	F	G	Н	I	J
Speed	1	1	1	-	1	1	1	1	1	1
Start/Finish Location and Time	1	1	1	1	1	1	1	1	1	1
Idling Time	1	1	1	1	1	1	1	1	1	1
MPG	1	-	1	-	-	1	1	1	1	1
Harsh Braking	1	1	1	1	-	-	1	1	1	1
Vehicle Route	1	1	1	1	1	1	1	1	1	1
Over revving	1	-	1	-	-	1	1	-	1	1
CO ₂ emissions	1	-	1	-	1	1	1	-	1	
Gear Changes	-	-	-	-	-	1	-	-		1
Maintenance schedule	1	-	1	1	-	-	1	1	1	1
Harsh Acceleration	1	1	1	1	-	-	1	1		1
Fuel Consumption	1	-	1	-	1	1	1	-	1	1
Lane changing	-	1	-	-	-	-	-	-		
Greenband Driving	-	-	1	-	-	1	1	-	1	
Cruise control usage	1	-	1	-	-	1	1	-	1	

Appendix 4 – Telematics data capture and driver feedback

Data Capture

While all telematics systems have the primary aim of recording data from the vehicle this can be captured in different ways. Data can be captured in the following ways:

- Connecting to the vehicle CANBus
- Using GPS technology
- Using accelerometer technology

All modern vehicles use a <u>CANBus</u> to transfer information between the various electronic vehicle systems. This communication network enables a wide range data including fuel consumption (MPG), revolutions per minute (RPM), odometer reading (ODO), throttle position, engine load/torque, fuel levels and engine temperature to be monitored. It is possible for telematics to connect directly into the CANBus system to allow this data to be recorded and subsequently analysed.

Ctrack's CANTouch (Figure 4A) is an example of a system that links directly to the vehicles CANBus.

Figure 4A: CANTouch system developed by Ctrack



CANTouch is manufactured in-house and enables fleet operators to extract CANBus data from vehicles without the risk of invalidating the manufacturer's warranties. The system clips over the CAN High and Low wires reading the following data through the insulation:

- Trip MPG
- Average MPG
- RPM
- Odometer reading

Telematic systems that do not connect to the CANBus instead use GPS data to monitor the vehicle. Figure 4B shows how telematics are integrated into a transport operation using GPS.





Driver Feedback

The use of driver feedback in relation to vehicle telematics is very important as without this the driver is not aware of their performance and is therefore unlikely to change their behaviour in order to make improvements.

There are two main types of driver feedback:

- Post trip feedback
- In-cab feedback

The vast majority of telematics systems provided by suppliers allow the driver to receive post trip feedback. This is normally achieved through the transport manager analysing the data provided by the telematics system and then reporting back to drivers at agree intervals (daily, weekly, monthly) to inform them of their performance and if any areas of their driving need improving. It is then up to the driver to take this feedback on board and improve their driving during the next shift.

However some systems allow drivers to automatically receive feedback after they have finished their trip. This reduces the administrative burden on the transport manager and means they can take a more strategic view and only provide direct feedback to particularly low scoring drivers.

The Telogis Coach system allows drivers to use their smartphone or tablet to check in daily, tracking their progress against company-wide benchmarks and other drivers. They can look up details for each event to understand what happened, to add a remark or have a discussion with their supervisor⁶⁶.

⁶⁶ <u>http://www.telogis.co.uk/solutions/mobile/coach</u>

Figure 4C: Telogis Coach

Jouay Salety Leaden	board	Day Week M	Month
* 1 🕘 Oscar Ackroyd	95	Wed, 2 Septen	nber
* 2 🧿 Gabriel Joss	93	Distance 124	mi
🞍 3 🕡 Tiana Roddick	87		
- 4 🎯 Hunter Aylmer	83	92	
* 5 🛞 Jonathan Button	75	Rank	
🞍 6 📵 Hamish Pinfold	72	1st	
🤞 7 🔞 Robert Watson	me 68		
8 📣 Aaron Dowling	64	Hard Brake	Ŧ
-	60		
🕈 9 🔞 Maya Morgan	63	Hard Acceleration	

Some (50%) telematics suppliers provide in-cab feedback systems with their products allowing a driver to identify the driving aspects that they personally need to improve while they are on a trip. This is sometimes known as the 'continuous feedback loop'. In-cab systems that provide instantaneous feedback can encourage the driver to adjust their driving style in real time. It also allows the driver to recognise aspects of his driving style that trigger the alerts and improve them as he / she drives.

Our research shows that visual display is the most common way of providing feedback.

However there are a number of systems that provide both a visual and sound alert. An example of a product that has both visual and audible warnings to the driver is the Driver Awareness Panel (DAP) developed by Squarell (Figure 2.4).

Figure 4D: Squarell – Driver Awareness Panel



The Squarell system also provides drivers with a summary of their past trip when the ignition is turned on (Figure 4E). This acts as a reminder for the driver of what aspects of eco-driving they should be concentrating on.

STAT

Figure 4E: Squarell – Summary of past trip when iginition is turned on

Another example of telematics that provides in-cab feedback is supplied by Greenroad and is shown in Figure 4F.

Figure 4F: Greenroad's dedicated in-cab feedback system (left) and Smartphone app version (right)



Suppliers that do not provide in-cab feedback systems often cite that visual or sound alerts are potentially distracting to the driver as they divert their attention from the road potentially leading to incidents.

Appendix 5 – Survey questions sets

Operators Survey

Eco-Driving for HGVs - Operators Survey
The Department for Transport (DfT) is exploring the extent to which eco-driving for HGVs, both training and monitoring, can reduce carbon emissions by 2032.
Eco-driving is a driving style that reduces fuel bills, cuts carbon emissions and lowers accident rates. It can be delivered to drivers through the use of driver training and driver performance monitoring (e.g. telematics).
This study forms part of the Department's wider Freight Carbon Review and will support the development of future policy options for carbon emissions reductions from freight by 2032.
To help us get a better understanding of what training / technology is available and what the associated uptake, costs and benefits of these products are we have created a short survey.
The survey is designed to take less than 10 minutes to complete.
Restart Next ->
Eco-Driving for HGVs - Operators Survey
What duty cycle do you operate vehicles in? (Please tick all that apply)
Long haul Regional delivery
Municipal delivery (e.g. waste collection)
Construction
← Back Restart Next →
Eco-Driving for HGVs - Operators Survey
Measures available
Does your organisation make use of eco-driving techniques?

Eco-driving is a driving style that reduces fuel bills, cuts carbon emissions and lowers accident rates. It can be delivered to drivers through the use of driver training and driver performance monitoring (e.g. telematics).
Eco-Driving for HGVs - Operators Survey
Measures available
Does your organisation make use of eco-driving techniques?
Eco-driving is a driving style that reduces fuel bills, cuts carbon emissions and lowers accident rates. It can be delivered to drivers through the use of driver training and driver performance monitoring (e.g. telematics).
What types of driver behaviour / performance monitoring do you use? (Please tick all that apply) Telematics Key performance Indicators (KPIs) Driver performance league tables CANBus Solutions Do not use driver behaviour / performance monitoring Other
← Back Restart Next →
Eco-Driving for HGVs - Operators Survey
How do these driver behaviour / performance monitoring systems help the driver to be more fuel efficient / safer? (Please tick all that apply) Post-trip feedback In-cab alerts Start stop assist / Engine idling Green rev-band driving monitoring Harsh braking / acceleration monitoring Over speeding Other
How much does the driver monitoring system cost?
← Back Restart Next →
Eco-Driving for HGVs - Operators Survey
What courses do you use to train your drivers in eco-driving techniques? (Please tick all that apply)
Safed for vans FuelGood driver training
RoSPA's eco-driving
Information booklet / handbook given to driver
Online training

- Do not send drivers on courses
 Other

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Eco-Drivir	ig for HGVS - Operators Survey
Barriers to uptake	
What are the key barriers preve systems? (Please tick all that ap	nting more and / or quicker uptake of driver behaviour / performance monitoring ¤(y)
Upfront cost of system Monthly subscription cost	
Installation cost	
Potential driver resistance to s	system
Suitability of system to your of Other	estment / Lack of evidence to suggest benefits peration
What are the key barriers preve	nting more and / or quicker uptake of eco-driving training? (Please tick all that
Cost of course	
Lack of availability Potential driver resistance to t	raining
Not convinced of return on inv	estment / Lack of evidence to suggest benefits rd driving test is good enough
Drivers will not maintain techr	iques after training
	← Back Restart Next →
Eco-Drivi	ng for HGVs - Operators Survey
Eco-Drivi In your opinion, do you think ther systems / training in the next 15 y	ng for HGVs - Operators Survey e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears?
Eco-Drivi	ng for HGVs - Operators Survey e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears?
Eco-Drivi	ng for HGVs - Operators Survey e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (Please tick all that apply)
Eco-Drivi	ng for HGVs - Operators Survey e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (<i>Please tick all that apply</i>)
Eco-Drivi	ng for HGVs - Operators Survey e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (<i>Please tick all that apply</i>) increase awareness of benefits PG target is reached
Eco-Drivi In your opinion, do you think ther systems / training in the next 15 y Yes No How can these barriers to uptake Subsidise training courses Subsidise monitoring equipment Develop guidance documents to Fuel duty incentives if agreed MI Tax incentives if driver training / Making eco-driving mandatory a Other	ng for HGVs - Operators Survey e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (<i>Please tick all that apply</i>) increase awareness of benefits PG target is reached monitoring conducted s part of DCPC
Eco-Drivi In your opinion, do you think ther systems / training in the next 15 y Yes No How can these barriers to uptake Subsidise training courses Subsidise monitoring equipment Develop guidance documents to Fuel duty incentives if agreed MI Tax incentives if driver training / Making eco-driving mandatory a Other	e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (<i>Please tick all that apply</i>) increase awareness of benefits ^{CG} target is reached monitoring conducted a part of DCPC
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Eco-Drivi In your opinion, do you think they yes Yes No How can these barriers to uptake Subsidise training courses Subsidise monitoring equipment Develop guidance documents to Fuel duty incentives if agreed Mil Tax incentives if driver training / Making eco-driving mandatory a Other Eco-Drivi	ng for HGVs - Operators Survey ewill be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (<i>Please tick all that apply</i>) increase awareness of benefits ^{PG} target is reached monitoring conducted s part of DCPC
Eco-Drivi In your opinion, do you think ther systems / training in the next 15 y Yes No How can these barriers to uptake Subsidise training courses Subsidise monitoring equipment Develop guidance documents to Fuel duty incentives if agreed MI Tax incentives if driver training / Making eco-driving mandatory a Other Eco-Drivi Making eco-driving mandatory a	a will be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (<i>Please tick all that apply</i>) increase awareness of benefits PG target is reached monitoring conducted a part of DCPC ► Back Restart Next → mg for HGVs - Operators Survey e technology / training courses you use?
Eco-Drivi In your opinion, do you think they systems / training in the next 15 y Yes No How can these barriers to uptake Subsidise training courses Subsidise monitoring equipment Develop guidance documents to Fuel duty incentives if agreed MI Tax incentives if driver training / Making eco-driving mandatory a Other Eco-Drivi Making eco-driving mandatory a Develop guidance documents to Eco-Drivi	e will be an increased uptake of eco-driving driver behaviour / performance monitoring ears? be overcome? (Please tick all that apply) increase awareness of benefits ^{CG} target is reached monitoring conducted a part of DCPC

Eco	-Driving for	HGVs - Ope	rators Surve	y
Benefits				
What benefits have yo Reduced fuel consu Reduced carbon em Reduced number of Reduced labour cos Reduced maintenan Reduced engine idli Reduced unauthoris Increased miles per Better fleet manage Mimproved customer Other	ou realised from making mption nission's vehicle incidents ts ice costs ng ied vehicle use gallon ment service	use of eco-driving techn	iques? (Please tick all that	t apply)
How often do you refr	esh your eco-driving tra	iining?		
🔘 0 - 2years	🔘 3- 5 years	0 6-8 Years	🔘 9 years +	Other
	← Ba	ck Restart Next -	>	

Eco-Driving for HGVs - Operators Survey

Please can you provide	the following details:
Full Name:	
Company Name:	
Would you be intereste	t in providing a case study for the Eco- Driving techniques you use in your company?
Please can you provide	the following details:
Telephone Number:	
Email address:	

Systems Providers Survey



Eco-Driving for HGVs - Systems Providers Survey From the options below, please indicate which features / characteristics your system incorporates? **Driver Behaviour and Vehicle Parameters** MPG Over Revving Harsh Braking / Acceleration Gear Changes Idling Time Drive Time Speed Distance Travelled Cornering Γ Fuel Consumption CO₂ Emissions Lane Changing Greenband Driving Cruise Control Usage Start Finish Location and Time Vehicle Route Maintenance Schedule Exhaust Brake Management Reports Web Based Reports and Maps Graphical Summary of Data Ability to Export Data to Excel Customisable Data Outputs Telematics Company to Manage the Data In Cab Dedicated Driver Feedback System Real - Time Information Availability Transport Manager Alerts Data History Storage (server) Data History Storage (vehicle) Driver League Tables / Driver Data Comparison **Training and Support** Customer Support Driver Behaviour Training/Seminars Manager/Driver Training (Train the trainer) From the options below, please tick what functions vour Other ← Back ^{(*}) Reset Next → Personal by

From the options be	elow, please indicate which featu	res / characteristics your sys	tem incorporates?
System Installation a	nd Setup		
CANBus Connectivity			
External System Connec	tivity		
Compatibility with 3rd Pa	rty Systems		
Installation by the Compa	ny's Technicians		
Installation by the Custon	ner's Technicians after		
Installation at Customer's	Depot		
Characteristics			
All Vehicle Types Compa	tibility		
All Fleet Sizes Compatib	lity		
System Recognises Unio Characteristics	ue Vehicle		
Driver ID Recognition			
Value / Benefits			
Reduced Fuel Consumpt	ion		
Reduced Incidents			
Reduced Maintenance C	osts		
Improved Driver Behavio	ur		
Better fleet management			
Reduced Carbon Emission	on's		
Reduced Unauthorised V	/ehicle Use		
Reduced Congestion			
Reduced Labour Costs			
Reduced Engine idling			
Eco-Driv	← Back া ⊃ Re ing for HGVs - S	ystems Provid	Researed by Enternation
ke			
What is the uptake	of these systems? (please explain	i below)	
Small operators			
Medium operators			
			and the second

What is the upta	ke of these systems? (please explain below)
Small operators	
Medium operators	
Large operators	
What are the key (Please tick all tha	r barriers to preventing more and / or quicker uptake of your systems / training? at apply)
Upfront cost	
Monthly subscrip	tion cost
Installation cost	
Maintenance cos	at and a second s
🔲 Lack of availabili	ty
Potential driver r	esistance to system
Not convinced of	freturn on investment / Lack of evidence to suggest benefits
Suitability of syst	em to your operation
Other	
Do these barrier	s impact certain parts of the industry more than others?
🔵 Yes	💭 No
In your opinion, (Please tick all the	what policies could be put in place to help overcome these barriers to uptake? at apply)
Subsidise monito	pring equipment
📃 Develop guidanc	e documents to increase awareness of benefits
Fuel duty incenti	ves if agreed MPG target is reached
Tax incentives if	driver training / monitoring conducted
🔲 Other	

Please explain, what cou	ld the government do to inc	entivise further uptake?	
In your opinion, do you t	hink there will be an increas	ed uptake of driver behav	iour / performance monitoring
	No		
	← Back 🧐 Re	eset Next →	Pownand by QUINER
Eco-Driving	for HGVs - Sv	ustams Drovid	lars Survey
Eco-Driving		Stellis Flovid	lers Survey
Costs			
00313			
Could you provide a <u>cap</u>	ital installation cost for the s	services below?	
Hardware Telematics unit			
Hardware installation			
Software configuration			
Software annual right to use			
Other (please specify)			
Could you provide an an	nual recurring cost for the s	ervice?	
Software annual right to use			
Customer support			
Other (please specify)			
Does this cost differ dep	ending on the size of operat	or?	
💭 Yes 👘	No No		
What is the payback per	od of these training courses	ir	
Half a year			
A year			
Conger			
	← Back う Re	iset Next →	Processed by STICLE
Eco-Driving	i for HGVs - S	vstems Provi	ders Survev

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Training Providers Survey



- Your own in-house course Information booklets / handbooks given to driver
- Other

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Eco-Driving for HGVs - Training Providers Survey

What does this trai	ning cover? (Please t	ick all that apply)		
Defensive driving	y techniques			
Selective use of	gears			
Utilisation of eng	ine-braking/torque			
Use of cruise cor	ntrol			
Compliance with	speed limits			
Enhanced hazar	d perception and aware	eness skills		
Progressive use	of accelerator and brai	(es		
Other				
What is the average	e duration of an eco-o	friving training cour	se?	
A couple of hours	🔵 Half a day	🔘 A Day	Longer	
		<i>2</i>		
	← Bao	k OReset Next	→	Reserved by

(e					
What is the upta	ake of these cou	Irse? (please explai	n below)		
Small operators-					
Medium operato	rs-				
Large operators-					
What are the ke (Please tick all th	ey barriers to pre	eventing more and /	or quicker uptake o	f eco-driving trainin	g?
Cost of cours	e				
Potential driv	er resistance to tr	raining			
Operators no	t convinced of ret	turn on investment /	lack of evidence to su	ggest benefits	
Not needed a Operators for	as operators belie	ve current standard	driving test is good en	ough	
Other		maintain techniques	anter training		
Do these barrie	rs impact certair	n parts of the indus	try more than others	;?	
🔵 Yes	No				
Develop guid Fuel duty inc Tax incentive Making eco-c Other	lance documents entives if agreed l is if driver training driving mandatory	to increase awarene MPG target is reach / monitoring conduc / as part of DCPC	es of benefits ed ted		
		← Back つ Rese	et Next→		evend by SINGIP
CO-Driv Are there any no that you know o Yes	ing for H ew or recent inde of that we should No	HGVs - Tra ustry led schemes d be drawing attent	that could increase in to?	viders Sur	Vey g training
What could gov	ernment do to ir	ncentivise further u	ptake? (please explai	in below)	
	. do vou think th	ere will be an incre	ased uptake of eco-o	driving driver trainin	ig in the next
n your opinion, 15 years?					

O No ← Back ⑦ Reset Next →

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O Yes



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Eco-Driving for HGVs - Training Providers Survey

Full Name:		
Company Name:		
Would you be inter company?	ested in providing a case study for the Eco- Driving techniques you use in you	ur
🧭 Yes	💭 No	
Please can you prov	ide the following details:	
Telephone Number		

About AECOM

AECOM (NYSE: ACM) is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries.

As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges.

From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM companies had revenue of approximately US\$19 billion during the 12 months ended June 30, 2015.

See how we deliver what others can only imagine at aecom.com and @AECOM.

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