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Mexico International Freight Study Research into GHG Mitigation Measures in the Smaller Carrier Freight Sector

FINAL REPORT

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TSTES

itp integrated transport planning

Mexico International Freight Study
Research into GHG Mitigation Measures in the Small Carrier Freight Sector

Final Report
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Notice

EXECUTIVE SUMMARY

This document is the Final Report for this study, which was to review international case studies where mitigation measures have been put in place to reduce greenhouse gas (GHG) emissions in the smaller carrier freight sector.

Background

Mexico's greenhouse gas emissions have risen by over one third since 1990. The transport sector is a major contributor to Mexico's greenhouse gas emissions, and has had an increasing relative share of overall emissions in recent years, rising from 28% in 1990 to 33% in 2010.

The Mexican Government has pursued a number of interventions aimed at modernizing the federal trucking fleet and increasing operating efficiency in the sector. These measures have included a scrappage program, the Program for the Modernization of the Federal Motor Carrier fleet and the Clean Transportation Program.

These schemes have had some success in modernizing the fleet. However, take-up amongst the smaller fleet carriers has been lower than that of larger operators.

Study Objectives

The general objective of the study is defined in the terms of reference is to:

> "Research policies, programs and schemes to mitigate GHG emissions from the freight sector that are applied in other countries with a focus on owner-operators and small carriers, and suggestions of measures that could be implemented in Mexico"

To achieve this objective, the following specific tasks are identified:

- To make a comparative study of the policies, programs and instruments that apply or seek to apply in other countries, and whose purpose is to mitigate the GHG emissions from the trucking industry, in its equivalent to the classification of owner-operator and small cargo carriers.
- Based on the results of the comparative analysis, suggest those international instruments that could be implemented in Mexico for the trucking industry sector with particular reference to owner-operator and small carriers.

Small fleet sector characteristics

SCT data on freight fleets suggest that vehicles operated by owner-operators and small fleets (up to 30 vehicles) make up over sixty percent of the total number of freight vehicles on the road.

The small fleet and owner-operator freight sector has different characteristics to the large fleet sector and major haulage industry. The following characteristics can be identified:

- An average fleet age older than that of the large fleet sector.
- Typically serving shorter haul routes, with vehicles used less intensively than the larger operator fleets.
- Limited ability to finance the purchase of more modern vehicles.
- Lower levels of technology in relation to logistics management, and performance monitoring.

Developing measures which effectively target the smaller carrier sector will need to take into consideration the specific characteristics of this set of operators in order to be effective.

Stage I: Review of interesting case studies

The first phase of the study focused on identifying schemes which have been developed and implemented worldwide with a focus on reducing greenhouse gas emissions in the freight sector, and in particular those specifically focused on the smaller fleet operators.

There are typically three approaches to reducing emissions and improving fuel efficiency in the freight sector. These are to:

- Reduce energy intensity and CO_2 intensity of each transport unit through more efficient vehicle technology, the use of biofuels, a reduction of vehicle un-laden weight or modal shift to a less energy intensive form of transport (e.g. from road to rail);
- Reduce fleet mileage per ton transported, by for example the use of navigation systems; and
- Change driver behavior via training in eco-driving techniques and other measures

In total, twenty-nine schemes were identified, representing interventions adopted by international policy makers, and typically fitting into one or more of the three approaches identified above.

These schemes were assessed and 'ranked' according to the level of applicability and interest to this study, using a multi-criteria appraisal which scored against the following criteria:

- Specific focus on small-fleet freight operators.
- Applicability to the Mexico context.
- Scale of potential mitigation achievable by the scheme/success observed.
- Cost/Value for money of intervention.

Eight schemes were shortlisted for more detailed analysis and investigation.

Stage II: Analysis of interesting case studies

Phase II of the study involved a detailed examination of each of the selected case studies, including:

- Information gathering on all aspects of the initiative.
- The local conditions and freight market within which the initiative was implemented.
- The main reasons for implementing the initiative, and who was responsible.
- Any performance evaluation undertaken.
- Scheme promoter views on the success of the scheme and how it may be approved.

A summary table of the selected case studies and their key attributes and performance indicators is shown in the table overleaf.

Scheme	Intervention approach	Promoter	Scheme cost	Emissions reduction achieved	status
California Air Quality Attainment Programme Carl Moyer Proposition 1B Voucher Incentive Program (VIP)	Grant/subsidy for investment in low-carbon vehicle technologies	California Air Resources Board and the South Coast Air Quality District (SCAQMD)	Carl Moyer $26.6m available for 2012/13, total of 4-5 billion between 1998 and 2023	The clean-up of 8,000 to date is estimated to have achieved reductions of 7,000t/NOx per annum and 125t PM per annum	Ongoing
SmartWay Transport Partnership	Public-private partnership, with various strands of intervention including funding of low-carbon technology, R&D, international best practice guidance	US Environmental Protection Agency, Freight industry, Dealers, Shippers	EPA 2012 budget for SmartWay totaled $2.7m, $16.9 million received in Diesel Emission Reduction Act (DERA) funds for FY 2008 through FY 2010, also received $30 million in American Reinvestment and Recovery Act of 2009 funds	Since 2004 conception 23,600,000 tons CO2 reductions, 478,000 tons NOx reductions, 22,000 tons PM reductions, $6.5 billion dollars in fuel costs saved	Ongoing
Cambia tu Camion	Vehicle scrappage scheme	Ministry of Energy, Chamber of Commerce and industry		1.8m liters of fuel saved Estimated 754t CO_2/yr.	Pilot scheme completed
Columbia Scrappage Program	Vehicle scrappage scheme	Ministry of Transport	$600m in funds, of which $490m remain after 5 years of program. $15m allocated this year for scrappage of 600-700 vehicles. Looking to add additional $43m to achieve target of 2600 vehicles scrapped this year. Plan to disburse $150m per year for 2014, 2015, and 2016 to deplete budget.		Ongoing
Oregon State Energy Loan Program (SELP)	Preferential financing loans for clean technology investment	Oregon Department of Energy	848 loans made since inception totaling $574m, authority to issue up to $250m between 2009-11, scheme historically self-financing (private investment with state guarantee), but currently state required to commit $2m-$5m per annum to cover default		Ongoing
eCoMove	Intelligent Transport Systems research, promotion of eco-driving	European Commission	Total budget for 3 year program is $29m	Results of trail awaited but target of 20% emissions savings of participating fleets	Project approaching completion (Dec 2013)
UK Department for Transport Best Practice Guidance and Management Toolkits	Best practice guidance for eco-driving and fleet management	Department for Transport	Cost of program from 2004 to 2007 was $3m	2007 evaluation estimated 240,000 tons of CO2 saved since 2004, equating to $12 per ton CO_2 Cost savings attributed to scheme estimated at $125m	Scheme discontinued due to budget cuts

Stage III: Presentation of results

The main findings and lessons to be learned from the case studies were presented at a stakeholder workshop, and are outlined in this report. The following points can be highlighted in relation to how the shortlisted schemes may be applicable to the Mexican context:

California Air Quality Standards Attainment Program

The first point to note about California's various incentive programs is that they have been driven by, and justified on the basis of improving local air quality rather than reducing greenhouse gas emissions. Identifying and demonstrating the benefits to a local population can facilitate the gaining of support for a scheme or change of policy, and provide incentive to politicians/policy makers to implement the proposals. In the Mexican context, the awareness of air quality issues and the efforts which have been made to improve air quality in cities suggest that measures which have beneficial impacts in this area will be well received. Whilst the focus of the Nationally Appropriate Mitigation Actions (NAMAs) are not necessarily directly related to local air quality, quantification and costing of the potential benefits can only enhance the value of the proposed schemes.

Given the makeup and characteristics of the smaller operator fleet, the scale of reduction in local air pollutants from non-Euro or Euro I/II vehicles to Euro III/IV vehicles would be very significant, and indeed much greater in relative terms than the potential reduction in GHG emissions.

The second interesting aspect of the California program was the scale of different incentives available under different schemes, and how these incentives were tied to increasingly stringent conditions. The highest incentives were achievable by committing to investment in the cleanest of technology and contractual conditions relating to continued operation of the vehicle within the area. However, the variety of options increased the opportunity different market participants to access a scheme which was appropriate and relevant to their business. The conclusions which may be drawn from this are that a 'one-size-fits-all' scheme, for example a scrappage scheme, may not be best placed to encourage participation from across the freight sector, but that offering alternative schemes designed to appeal to freight operators of differing business characteristics may prove more successful in increasing market participation.

Finally, the use of regulation as a 'stick' to push operators into upgrading their vehicles can be effectively used in parallel to incentive schemes, although legal implications of such regulation must be established.

SmartWay

Although the upgrade to a SmartWay certified vehicle is only possible on a 2007 and onwards vehicle, the retrofitting of SmartWay approved vehicle technologies is possible on older vehicles. Aerodynamic measures such as mirrors and side skirts can be fitted to vehicles and trailers whilst the fitting of low-rolling resistance tires is possible on any vehicle.

Other limitations on vehicle upgrade need to be recognized, such as the prevention of upgrade to Euro V and VI vehicles due to the lack of availability of low-sulfur diesel.

Scrappage Schemes (Cambia tu Camion & Columbia Scrappage Scheme)

Mexico already has experience of the implementation of a scrappage scheme. However, the experiences of the schemes in Chile and Columbia are valuable in terms of identifying the factors critical to scheme success. The scale of the incentive is clearly very important in encouraging scheme take-up. The scrappage payment must exceed the market value of the old vehicle. The

Chilean scheme promoter believed that the scale of payment adopted there, amounting to around a third of the purchase cost of the new vehicle, was of the right order. However, to encourage greater take-up by smaller fleet owners, greater facilitation of credit to these operators would be required.

Other challenges to delivering an effective scrappage scheme were at the administrative level, ensuring vehicles were eligible and avoiding abuse of the scheme.

Oregon State Energy Loan Programme (SELP)

The key point demonstrated by the SELP scheme was the ability to assist those wishing to invest in cleaner technology with access to finance at preferential terms, and at low overall cost for the scheme. This was achieved by offering state guarantees on loans, which allowed the private sector to offer funds at lower than commercial rates. The costs to the scheme are only in meeting the guarantees in case of borrower default, which was minimal until the financial crisis.

In the small fleet freight sector, access to finance is a significant factor in excluding market participants from incentive schemes. Measures which increase access to finance or improve the terms of loans may offer significant improvement in incentive scheme uptake.

eCoMove

The use of technology presents an opportunity for all operators. However, there would be likely to be training requirements involved in equipping small fleet operators with the ability to make the best use of technological solutions. The best methods to encourage the uptake of training or the dissemination of information material may lie in less conventional methods. For example, the use of social media or incentivized training programs was discussed at the workshops to attract interest and raise awareness among the target audience.

Route planning for freight operators would need to recognize the restrictions placed on routing options and time restrictions. These limitations also reduce the route options available to freight, which make avoiding traffic more challenging.

DfT Best Practice Guidance

The important findings from the study are that effective dissemination requires careful identification of the person best placed to make use of the information.

The incentive for drivers to take training need to be identified and marketed. This may be through further certification, demonstrating higher training standards and a sense of value assigned to the ‘advanced driver’ qualification.

Effective scheme design

The critical factors which have been identified during the course of the study in relation to the development of a successful scheme are as follows:

The scheme needs to be of value to the particular target audience. Therefore a strong understanding of the operations and characteristics of the target market is essential.

The value to the operator can be derived from cost savings (efficiency improvements), the ability to increase revenues through wider tendering opportunities or increased competitiveness and/or a greater level of recognition/respect for the service that they deliver.

From the promoter perspective:

The scheme objectives should be clearly defined, with quantifiable goals. The scheme should focus on long-run behavioral change, or market transformation so as not to be derailed by transient market conditions.

Nationally Appropriate Mitigation Action (NAMA) design recommendations

A number of areas of consideration in relation to the development of new mitigation measures have been put forward based on the lessons learned from the case studies and the specific characteristics of the Mexican small carrier sector. These included:

- A scrappage scheme focusing on the replacement of old freight vehicles with *'nearly new'* vehicles, to facilitate a reduction in GHG and local air pollutants through newer vehicle technology, whilst keeping the cost of investment in new technology to a level which does not exclude smaller fleet carriers.
- Professionalization and improved organization of smaller carriers to allow them to benefit from improved operating efficiencies, economies of scale and potential to tender for work previously unfeasible.
- Improved HGV driver training program, including advanced driver training, with the potential for certification and with incentives for drivers and fleet operators to participate in the training.
- Stricter vehicle regulation to encourage operators to upgrade fleet technology as part of a 'carrot and stick' approach.
- Performance management tools to assist smaller operators in monitoring and managing operating costs, and for drivers to have greater awareness and consideration of eco-driving.

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1 INTRODUCTION

1.1 TSTES SA de CV in association with ITP is very pleased to be awarded the contract for this important study to look at ways to reduce the impact of freight movements on carbon dioxide-equivalent emissions in Mexico.

1.2 This Final Report collates the information collected during the whole study, covering both Phase I (long list of schemes) and Phase II (selected case studies).

1.3 The findings from the in-depth analysis have been used to inform recommendations on the main elements of successful schemes, and highlight the steps which may be taken to ensure increased take-up from the small fleet operator sector.

Study Objectives

1.4 The general objective of the study is defined in the terms of reference is to:

> "Research policies, programs and schemes to mitigate GHG emissions from the freight sector that are applied in other countries with a focus on owner-operators and small carriers, and suggestions of measures that could be implemented in Mexico."

1.5 To achieve this objective, the following specific tasks are identified:

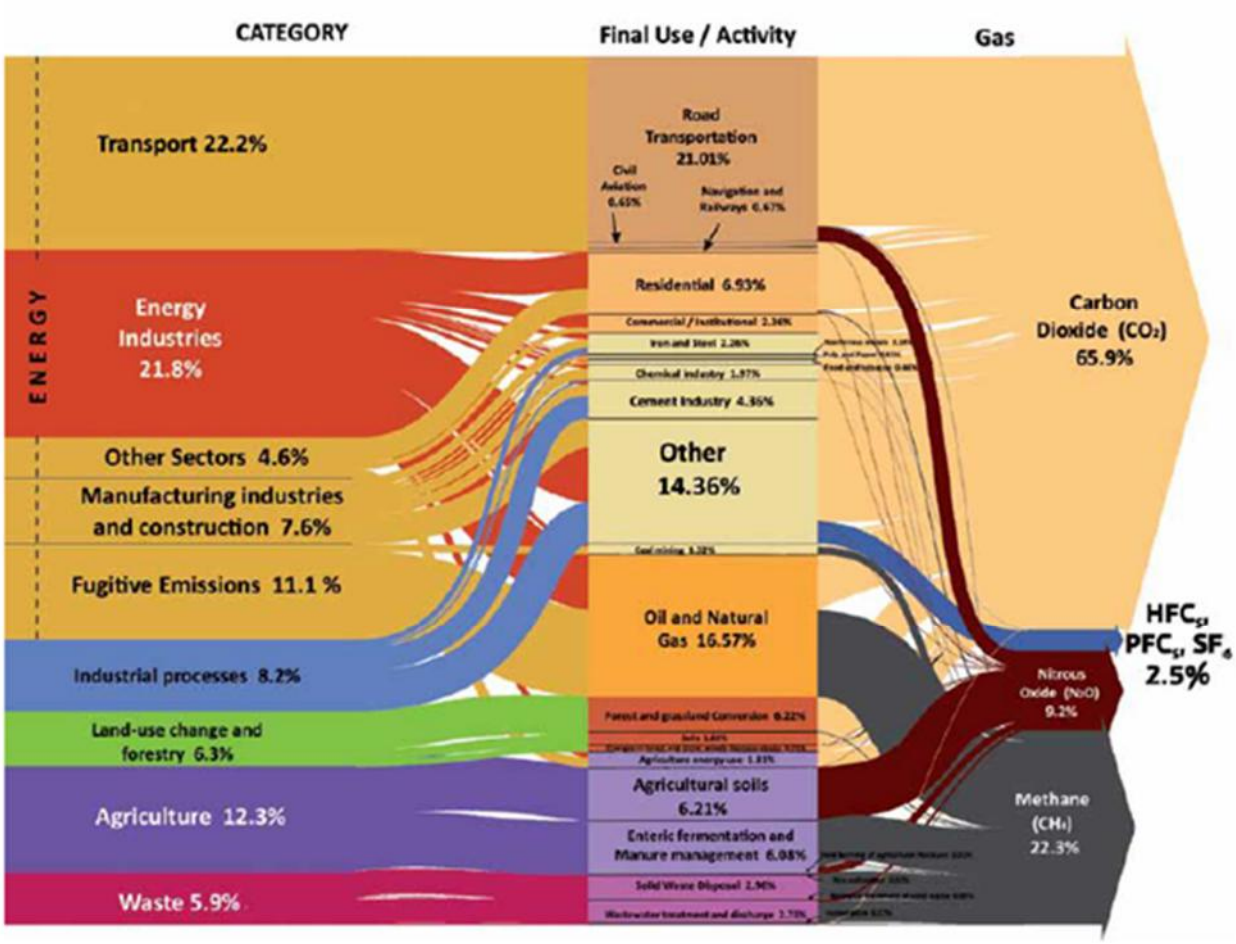
- To make a comparative study of the policies, programs and instruments that apply or seek to apply in other countries, and whose purpose is to mitigate the GHG emissions from the trucking industry, in its equivalent to the classification of owner-operator and small cargo carriers.
- Based on the results of the comparative analysis, suggest those international instruments that could be implemented in Mexico for the trucking industry sector with particular reference to owner-operator and small carriers.

Background

1.6 Mexico's 5th National Communication has recently been published. This document sets the backdrop for this study by providing an update on the Greenhouse Gas Emissions Inventory and projected emissions for the various sectors of Mexico's economy. It also sets out the National policies pursued in the mitigation of emissions across the sectors, and identifies achievements in the pursuit of these policies.

1.7 The Report highlights the increasing fraction which transport contributes to energy consumption and carbon dioxide-equivalent emissions. Transport's relative share of total energy consumption can be seen from Figure 1-1 below.

Figure 1-1: Energy consumption by sector, 5th National Communication



1.8 In 2010, Mexico's total emissions in units of carbon dioxide equivalent (CO_2e) climbed to 748 million tons, an increase of 33.4% over 1990.

1.9 Of these, 421.5 million tons were of final energy consumption (emissions minus energy and non-energy fugitive emissions, such as waste, agriculture, LULUCF, industrial processes). Transport's share of overall carbon dioxide-equivalent emissions increased from 28% in 1990 to 33% in 2010, as can be seen from the table below. Hence, not only have Mexico's overall CO_2e emissions increased markedly, but transport's relative share of these emissions has also increased by a significant proportion.

Table 1-1: CO_2 Emissions by Sector

Cuadro IV.6. Emisiones por sector (Gg de CO_2 eq.)

Sector	Emisiones		Contribución		TCMA*
	1990	2010	1990	2010	
	Gg de CO_2 eq.		%		%
1A Consumo de combustibles fósiles					
Consumo propio	37,228.8	47,431.9	11.7	9.4	1.2
Generación eléctrica	66,856.6	115,537.4	20.9	22.9	2.8
Manufactura e industria de la construcción	50,921.3	56,740.8	16.0	11.3	0.5
Transporte	89,149.3	166,412.0	27.9	33.0	3.2
Comercial	3,730.6	4,842.6	1.2	1.0	1.3
Residencial	19,672.7	21,460.1	6.2	4.3	0.4
Agropecuario	5,011.1	8,273.1	1.6	1.6	2.5
Subtotal	277,686.5	424,307.0	85.4	83.5	2.2
1B Emisiones fugitivas					
Minado y manejo del carbón	2,366.8	6,556.9	0.7	1.3	5.2
Industria del petróleo y gas	44,236.7	76,562.9	13.9	15.2	2.8
Subtotal	46,603.5	83,119.8	14.6	16.5	2.9
Total	319,173.8	503,817.6			2.3

* TCMA: Tasa de Crecimiento Media Anual.
Es posible que la suma total de las cantidades no sea de 100% debido al redondeo de las cifras.

Study Appreciation

1.10 In 2011 the Mexican Government, through the Ministry of Communications and Transport (SCT) and the Secretariat of Environment and Natural Resources (SEMARNAT), requested support from the German Government for the design of NAMAs, which gave rise to the "Mexican-German Program for NAMA ("ProNAMA") to run between 2011 and 2015. One goal of the program is to support the development of a Nationally Appropriate Mitigation Action (NAMA), covering the replacement of old vehicles and improve the efficient use of trucks operated by small carriers.

1.11 NAMAs are voluntary activities aimed at reducing the emissions of greenhouse gases (GHG) that are undertaken by developing countries under the "context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable way", and according to the level of development, economic growth and capabilities of each country.

1.12 The Special Climate Change Program 2009 - 2012 of the Mexican federal government has a special section for the transport sector. Its objective 2.2.4 cites "Encouraging vehicle renewal contributing to greater energy efficiency in the transport sector and reducing the GHG emissions trend compared to Business as Usual (BAU)".

Existing Programs

1.13 In this sense, there have been several lines of action in recent years to promote the modernization of federal trucking fleet and more efficient use of the fuel used in its operation, same as described below:

- The drive to promote the replacement and modernization of the federal motor carrier fleet through a scrappage scheme, operating under a decree which grants a tax incentive to vehicle assemblers and distributors, by reference to the value of the destroyed unit against the unit price to acquire new or newer unit.
- Strengthening the Program for the Modernization of the Federal Motor Carrier fleet, operated by Nacional Financiera (NAFIN).
- Clean Transportation Program; a voluntary program developed by SEMARNAT.

Vehicle Scrappage Scheme

1.14 The federal motor carrier's fleet consists of approximately 410 thousand motor vehicles, covering freight, passenger and tourism services, of which more than 190,000 are older than 15 years. The extended use of these older vehicles generates higher operating costs, fuel consumption, pollutant emissions, and increased road accidents (SCT, 2012).

1.15 The Federal Government, through the SCT, has implemented the vehicle scrappage scheme, which began in October 2003, with the aim of promoting the renewal of the vehicle fleet. The scheme consists of granting a fiscal stimulus to acquire a new or used unit up to six years old, which replaces a vehicle over 10 years old that has provided federal public service.

1.16 From 2004 to 2011, 24,746 vehicles have registered in the Scheme, of which 21,214 have been destroyed, thereby decreasing transport emissions by 2.24 Mt CO_2. This scheme was considered in Mexico's Special Climate Change Program (PECC).

Clean Transportation Program

1.17 SEMARNAT and the SCT coordinated the Clean Transportation Program with the objective that the federal motor cargo, passengers, tourism and private transport reduce fuel consumption, GHG emissions and transport operating costs by adopting strategies, technologies and best practices. The headline results of the scheme are presented in the table below.

Table 1-2: Results of the Clean Transportation Programme

Cuadro V.24. Resultados del Programa de Transporte Limpio

Concepto	2009	2010	2011
Número de empresas que reportaron operaciones	26	28	18
Número de vehículos evaluados	4,275	3,461	2,743
Emisiones de GEI (tCO_2/año)	760,091	709,741	395,814
Emisiones evitadas por uso de tecnologías y estrategias del programa (tCO_2/año)	234, 984	571,543	171,416

1.18 The measures implemented to reduce emissions in the freight fleet sector have demonstrated some success in terms of fleet modernization and the adoption of best practices to reduce fuel consumption and hence emissions. However, in general the take-up of these schemes has been limited to the major freight operators, who have the resources and ability to make best use of them.

1.19 There has been very limited take-up among the small fleet operators and owner-operators who make up a significant proportion of freight movements. A main objective of this study is to focus on the barriers which are preventing small-fleet operators from participating in the schemes and looking for examples in which emissions savings have been achieved for this group of operators in particular.

Small Fleet Freight Sector in Mexico

1.20 The "owner-operator" (defined as a person or entity that owns 1-5 truck units) and small carriers (those who own up to 30 units) form the focus of this study.

1.21 Various sources of information provide insight into the nature of the freight market and the role which these smaller operators play within the overall market. The table below shows the configuration of the on-road freight transport sector in Mexico.

Table 1-3: Freight market composition by operator size

Type of Company	Number of units	Number of companies	%	Number of vehicles	%
Owner-operator	1 - 5	103,787	83.0	191,387	29.1
Small Fleet	6 - 30	18,427	14.7	207,068	31.4
Medium Fleet	31 - 100	2,202	1.8	112,318	17.0
Large Fleet	Over 100	603	0.5	147,987	22.5
Total		125,019	100.0	658,760	100.0

Source: DGAF-SCT

1.22 The data suggests that vehicles operated by owner-operators and small fleets (up to 30 vehicles) make up over sixty percent of the total number of freight vehicles on the road.

1.23 The small fleet and owner-operator freight sector has different characteristics to the large fleet sector and major haulage industry. The following characteristics can be identified:

- An average fleet age older than that of the large fleet sector.
- Limited ability to finance the purchase of more modern vehicles.
- Lower levels of technology in relation to logistics management, and performance monitoring.
- Less efficient operation due to the nature of the freight markets served by smaller operators.

1.24 There are however some common characteristics between small and large scale operators which should not be overlooked:

- Operators are subject to the same road regulations and vehicle licensing standards.

- They have a common interest in implementing cost saving measures in order to increase financial performance.

Characteristics and issues faced by the small fleet sector

1.25 First hand interviews with small fleet freight operators have provided valuable insight into the issues and challenges faced by the small fleet freight sector.

Operator Characteristics

1.26 The interviews paint a picture of typical small fleet freight operators who have been in the business for many years, often being traditional family run businesses spanning a number of generations. They will involve the family in the business and typically will load and service the vehicles themselves.

Market for Services

1.27 Whereas the medium and large operators tend to operate on the long-haulage routes, there exists a demand for smaller distance movements, and it is this market for the short transfer of goods (often without invoice) which the owner-operator and small fleet sector typically serve.

Fleet

1.28 The fleets operated are typically older and less efficient vehicles. Even when considering fleet renewal, the operators are faced with the choice of purchasing imported trucks (pre 2005) for less than $400,000 pesos while national trucks of a similar year cost $600,000 pesos or more.

Challenges in participating in inventive schemes

1.29 Following on from the above, when faced with the possibility of participating in government led incentive schemes (e.g. the scrappage scheme), the smaller operator has challenges on a number of levels:

- Value of the incentive – typically the schemes are focused on encouraging the adoption of more efficient technologies; for example newer and more efficient vehicles. These would bring benefits in terms of fuel efficiency leading to cost savings for the operator. However, the cost savings will be smaller for those who typically operate on shorter haul routes, leading to a lower cost saving relative to the investment cost.
- Ability to make the required level of investment – small operators with old vehicles will still be faced with high required levels of investment, considering the value of their trucks (perhaps $100,000 pesos) compared to the $1,000,000+ pesos purchase cost of a new truck. The ability to finance investment due to access to credit may also significantly hamper the ability to participate in fleet renewal schemes, even if desired.
- Many of the small fleet operators could be considered to operate in the ‘informal sector’, or ‘grey economy’. The day to day nature of these operations may include the use of black market diesel (which may cost significantly less than pump prices), and a general lack of tax accountability. In these cases, the participation in official government schemes would require the move to greater accountability (fuel receipts etc.) which may be viewed uncomfortably by those operators not used to this level of scrutiny.

2 STUDY METHODOLOGY

2.1 This chapter presents a reminder of the study process. The terms of reference defines three stages to the study. These are:

- **Stage I:** Selection of interesting case studies and development of methodology for comparative analysis.
- **Stage II:** Descriptive analysis of the interesting case studies.
- **Stage III**: Reporting on the most appropriate actions.

2.2 This report represents the culmination of Stage III of the study, with the reporting of all of the information collected during the study including the long list and detailed analysis case studies and appropriate actions.

Stage I

Review of information on the interesting case studies

2.3 The preliminary report presented a long list of potentially relevant case studies. These were collected from a variety of sources including:

- National Governments and Transport Departments.
- International donor agencies such as the World Bank, Department for International Development (DfID) and Asian Development Bank.
- Freight operator bodies of individual operator promoted schemes.

2.4 Particular focus was given to policies and initiatives targeting the small fleet and owner-operator sector.

Methodology to select interesting case studies

2.5 A multi-criteria appraisal framework formed the basis of selection of the interesting case studies.

2.6 The criteria used in the case study selection were as follows:

- Nature of the initiative and applicability to the Mexican context.
- Specific focus on the small-fleet freight sector.
- Scale of emissions reduction achieved/achievable by the schemes.
- Cost of the intervention/value for money.

Stage II

Analysis of the interesting case studies

2.7 The Case Study Report provided a detailed examination of each of the selected case studies, including:

- Information gathering on all aspects of the initiative.
- The local conditions and freight market within which the initiative was implemented.
- The main reasons for implementing the initiative, and who was responsible.
- Any performance evaluation undertaken.

- Scheme promoter views on the success of the scheme and how it may be approved.

2.8 The following chapters each focus on an individual scheme, providing the above detail.

2.9 The final chapter aims to draw out the conclusions taken from the various case studies, with a view to promoting discussion on the identified elements of a successful scheme, and how these could be taken to the Mexican context.

Stage III

Presentation on Preliminary Results

2.10 Following submission of the Case Study Report, a presentation of the preliminary results and conclusions was made at a workshop involving the main stakeholders to the project, to promote discussion on the policy measures which show the greatest potential in the Mexican context.

Final Report

2.11 This Final Report is the product of the information collected during all earlier phases of the study, and incorporates the discussion and feedback collected from the workshop.

3 FREIGHT EMISSIONS REDUCTION MEASURES

3.1 The main element to Stage I of the study is the identification and compilation of a range of international case studies on measures adopted elsewhere and in particular those which have a specific focus on small-fleet freight operators.

Freight Emission Reduction Measures

3.2 There are typically three approaches to reducing emissions and improving fuel efficient in the freight sector. These are to:

- Reduce energy intensity and CO_2 intensity of each transport unit through more efficient vehicle technology, the use of biofuels, a reduction of vehicle un-laden weight or modal shift to a less energy intensive form of transport (e.g. from road to rail);
- Reduce fleet mileage per ton transported, by for example the use of navigation systems; and
- Change driver behavior via training in eco-driving techniques and other measures.

3.3 The majority of emissions reduction initiatives adopt measures which can be categorized into one or more of the above approaches. Each approach is considered in more detail below.

Reduce Energy Intensity of each Transport Unit per Ton Transported

3.4 This approach is focused on the transport unit i.e. the vehicle being used to transport goods, and ways to improve the vehicle efficiency. Fuel consumption and hence emissions levels can be reduced in a number of ways.

Fleet modernization

3.5 The purchase of new vehicles is a primary means of reducing fuel consumption and emissions levels, with the newer vehicles meeting more stringent emissions standards and incorporating the latest technology in efficient engines and powertrains.

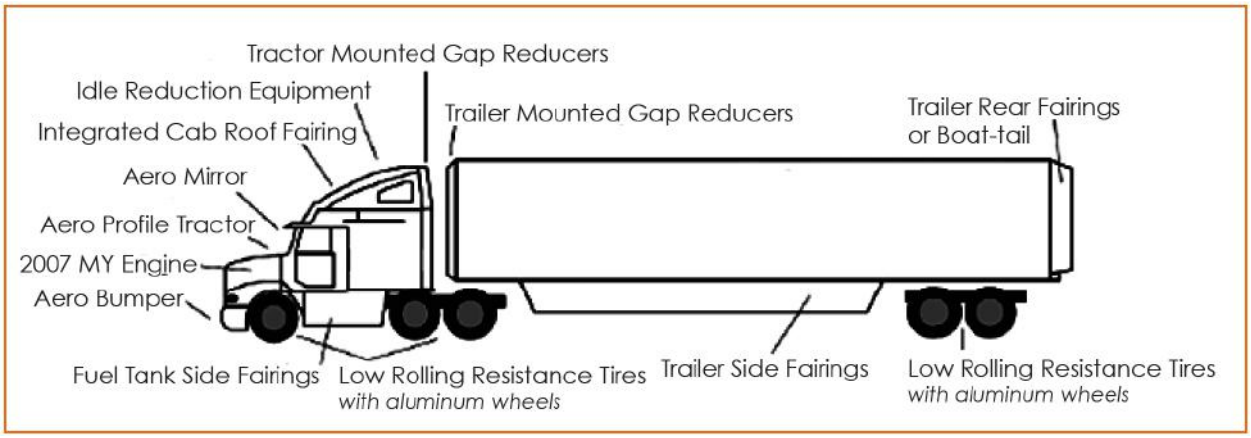
3.6 However, the purchase of new vehicles represents a significant expenditure for the fleet operator, with the most efficient vehicles often coming at greater cost. Higher fuel economy translates into operating cost savings, but these are realized over time and must be set against the upfront cost of the vehicle purchase. This puts larger fleet operators, with greater capital and access to credit, in a better position to be able to operate a more modern and efficient fleet. Smaller fleet operators face greater challenges in modernizing their fleet due to the high cost of vehicle purchase and limited access to the credit market.

Fuel saving technologies

3.7 Fleet modernization is not the only means of increasing vehicle efficiency. Existing vehicles can also be modified to increase efficiency through the retro-fitting of fuel saving technologies.

3.8 The figure below shows a variety of vehicle modifications which can lead to a reduction in fuel consumption, taken from the SmartWay Transport Partnership which has a certified list of vehicle types and retrofit equipment.

Figure 3-1: Vehicle fuel saving equipment and technology

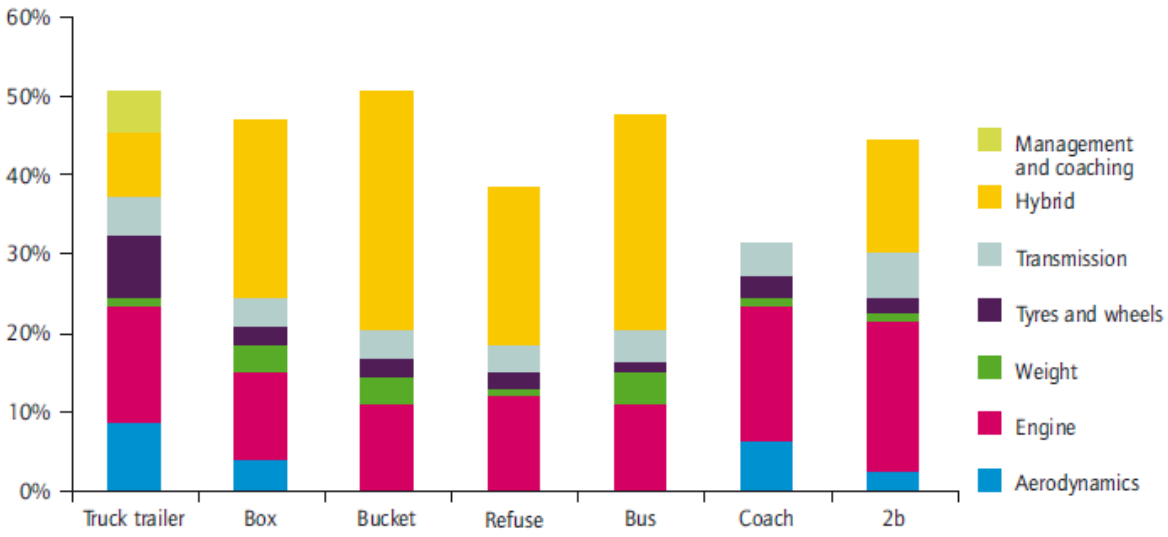


Source: SmartwayTM Equipment Standards, EPA,US (2008)

3.9 The International Energy Agency (IEA) Technology Roadmap sets out fuel efficiency targets and the means of achieving them through the adoption of energy saving measures across vehicle types. For heavy goods vehicles, savings of 30-50% are considered achievable by combining progressive engine, vehicle, drive-train and ITS technologies.

3.10 The contribution which different technological elements may play in reducing fuel consumption and hence emissions levels are shown in the table below for different vehicle types.

Figure 3-2: Relative contribution towards fuel economy improvement by Truck/Bus type and technology type for the United States



Source: NRC (2010)

3.11 For the Truck/trailer vehicle category, the contribution which different technological improvements bring are fairly evenly spread, with, hybrid technology, tires, engine and aerodynamics all able to make a meaningful contribution to improved efficiency. Fleet management improvements can also be seen to generate potential energy savings (covered in next section).

3.12 A more detailed breakdown of vehicle efficiency improvement measures, costs and availability is provided by the International Energy Agency Report on Fuel Efficiency[1].

Table 3-1: Truck Fuel Economy Improvement Technology Matrix

Category	Technology	Fuel improvement potential	Technology cost range (USD)	Market-ready
Engine	Variable valve actuation	1% to 2%	300 to 600	✓
Engine	Sequential turbo/downsizing	Up to 5%	NA	✓
Engine	Speed control (injection)	Up to 5%	NA	✓
Engine	Oil and water pump with variable speed	1% to 4%	NA	✓
Engine	Controllable air compressor	3.5%	~200	✓
Engine	Smart alternator, battery sensor electric accessory drive	2% to 10%	NA	✓
Engine	Start/stop automatic	5% to 10%	600 to 900	✓
Engine	Dual fuel systems	10% to 20%	~33 000	✓
Engine	Pneumatic booster: air hybrid	Up to 4%	800 to 1 000	
Engine	Turbocompound (mechanical/electric)	4%/7%	~3 000/8 000	✓
Engine	Bottoming cycles/waste heat recovery (*e.g.* organic Rankine)	1.5% to 10%	15 000 to 16 000	
Drive train	Eco roll freewheel function	1%	NA	✓
Drive train	Automated manual transmission	4% to 6%	4 500 to 6 000	✓
Drive train	Full hybrid	15% to 30% urban 4% to 10% long haul	30 000 to 33 000	✓
Drive train	Flywheel hybrid	15% to 22% urban 5% to 15% long haul	~4 500	
Drive train	Hydraulic hybrid	12% to 25% urban Avg 12% long haul	~13 000	
Vehicle	Low rolling resistance tyres	5%	300 to 500	✓
Vehicle	Aerodynamic fairings	0.5% to 5%	1 500 to 1 700	✓
Vehicle	Aerodynamic trailer/boat tail	12% to 15%	4 500 to 5 000	✓
Vehicle	Single wide tyres	5% to 10%	~1 700	✓
Vehicle	Light-weight materials	2% to 5%	~2 000 to 5 000	✓
Vehicle	Active aerodynamics	Up to 5%	~1 600	
ITS/ICT	Predictive cruise control	2% to 5%	~1 900	
ITS/ICT	Driver support system	5% to 10%	NA	✓
ITS/ICT	Acceleration control	Up to 6%	NA	✓
ITS/ICT	Vehicle platooning	Up to 20%	NA	

Notes: red = short-haul, medium freight trucks; green = long-haul, heavy-duty trucks; black = all truck types.
NA = not applicable.
Sources: IEA, 2010a; Hill *et al.*, 2011; Cooper *et al.*, 2009; Duleep, 2011; Law, K. *et al.*, 2011; NRC, 2010a.

3.13 The above efficiency improvements are based on percentage change compared to 2007 model-year units. Many of the above measures can be adopted collectively, although the overall savings may not necessarily be cumulative.

3.14 For the long-haul freight movements, efficiency improvements are realized through decreased rolling resistance and improved aerodynamics whilst hybrid technology, reduced idling benefit shorter distance freight movements due to the increased stop-start drive-cycles.

Alternative fuels

3.15 Diesel-engined vehicles are standard within the heavy goods vehicle sector, offering greater fuel economy than corresponding petrol engines. However, alternative fuel technologies are also becoming increasingly available, offering lower fuel consumption and generating less CO_2 emissions. These include biofuels, natural gas and electricity.

3.16 The cost of alternative fuelled vehicles is currently higher than the standard diesel-engined vehicles, although fuel efficiency savings can be realized over the life of the vehicle to offset the increased capital cost. However, the adoption of alternative fuels requires the necessary infrastructure to be present for fuelling.

Reduce Fleet Mileage per Ton Transported

3.17 Without making any changes to the vehicle or driving behavior, fuel savings can be realized though reducing the mileage travelled to transport the same amount of goods. This can be achieved in a number of ways, including better logistics management and the use of assistive technology.

Better logistics planning

3.18 Better logistics planning can significantly increase the efficiency of freight operations, reducing the vehicle kms and hence fuel consumed in the movement of goods. Measures include more efficient scheduling, and the minimization of empty running, using the most appropriate vehicle size for different loads. This may also extend to include the use of distribution center where loads may be combined, and where different vehicles can provide the long-haul from the final drop-off deliveries.

3.19 Improved management and logistics planning can often be achieved at a low initial investment cost. This is therefore an area in which potential gains are large in the small fleet sector, whereas the large haulage companies typically have advanced logistics planning tools in place already.

Sat-Nav

3.20 GPS Satellite Navigation can improve efficiency by ensuring that the most direct route is taken by the vehicle and to avoid unnecessary miles travelled in search of the delivery location. GPS also provides information on speeds and driving behavior which may be used as a tool to monitor and evaluate the efficiency of driving patterns.

Changing Driver Behavior

3.21 In-use fuel economy depends not only on vehicle technology but also on driver behavior and road conditions. Acceleration control, speed control, green zone indicators and

predictive cruise control can help the driver to keep the engine at best load points and prevent unnecessary acceleration and deceleration, saving 2% to 10% of fuel.[1]

Identified Case Studies

3.22 The following pages present case studies which were identified during Stage I of the study.

3.23 The case studies have been grouped according to the nature of the intervention based on the main forms of emissions reduction measures identified above.

3.24 A further category relating to 'Urban Freight Management' has been added, which covers measures to manage freight movements within urban areas to minimize the impact of freight movements in the urban area. These studies impact the emissions at both ends of the federal on-road transport of goods.

3.25 The list of identified case studies is as follows:

- Urban Consolidation Center (UCC), Bristol, UK.
- Green Freight Asia Network.
- Aerodynamics in UK Freight Delivery – DFT Best Practice.
- Alternative fuelling technology – NGV Bangkok.
- The Benefits of Operating Electric Vehicles in an Urban Environment – DFT Best Practice.
- Guangzhou Green Trucks Pilot Project, China.
- Driver Training Programs to Improve Vehicle Efficiency – SAFED for Vans & HGV's (Safe and Fuel Efficient Driving), DFT, UK.
- Efficient Operations for Small Fleets and Owner Drivers, DFT Best Practice.
- Small Fleet Performance Management Tool.
- Transport for London – London Freight Plan.
- Best Urban Freight Solutions – Enschede (The Netherlands).
- Carl Moyer on-road heavy-duty vehicle Voucher Incentive Program (California).
- Providing Loan Assistance for California Equipment (PLACE).
- Goods Movement Emission Reduction Program (California).
- Texas Emissions Reduction Plan (TERP).
- FedEx LNG trial, Texas, US.
- UPS CNG and LNG vehicles, North America.
- SmartWay Transport Partnership.
- eCOmove.
- Low Carbon Vehicle Procurement Programme (LCVPP), DFT/Cenex, UK.

[1] IEA Technology Roadmap, Fuel Economy of Road Vehicles, 2012

- EU eFreight Initiative.
- ODoE State Energy Loan Program (SELP).
- ODoE Business Energy Tax Credits.
- Cascade Sierra Solutions (CSS).
- 21st Century Truck Partnership.
- New Hampshire Climate Action Plan.
- Pennsylvania Climate Change Roadmap.
- Vehicle Scrappage Programme, Chile.

Reductions in vehicle mileage

Urban Consolidation Center (UCC), Bristol, UK

Topic	Comment
Scheme Description	• UCC was started in 2004 to minimize freight vehicle movements in the main Broadmead Shopping Area in a bid to improve air quality, reduce congestion and minimize vehicle conflicts in loading areas whilst ensuring the economic vitality of the area. It was recognized that the Broadmead received upwards of 100,000 delivery vehicles a year (serving over 300 retail units). with vehicles ranging from SGV to HGV's. • UCC was created 16km from City Center with average delivery time of 25mins. Deliveries are undertaken by a 7.5 ton vehicle and 18 ton vehicle and further, two electric vehicles. • Intended to serve medium sized businesses and the delivery of non-perishable goods.
Type of Measure	• Scheme is Voluntary; however retailers that are a part of the scheme have priority delivery windows with time restrictions being placed on those that are not. • Further restrictions on areas surrounding the city center will help enhance the attractiveness of the UCC and widen the area served by the center. • Designed in line with local air quality improvement measures in a bid to reduce emissions caused by larger vehicles and further reduce travel times for vehicles entering the city.
Promoter / Stakeholders	• Scheme implemented by Bristol City Council and initiated through a third party tender process resulting in the UCC being operated by DHL Logistics who are responsible for marketing the UCC and to engage interest. • Further key stake holders include local business partnerships and the main shopping centers in the city center.
	• 2007/8 operating costs for the centers were close to £450,000—US$720,000-- (with

Costs (including savings)	£285,000—US$460,000-- coming from BCC, funded by EU START action plan for greener freight delivery). • Initially, center was free for retailers to use however charges were implemented in 2011 due to funding being reduced. • DHL recover 40% of total cost through retailer contributions • Vehicle costs paid for by DHL.
Scheme success	• 2007 results showed a 77% reduction in delivery vehicle movements in the city center as a result of 64 retailers taking part in the scheme. • 20.3 tons of CO_2 saved in a 12 month period. • 12.9 tons of cardboard and plastic recycled. • Continued driver training resulting in improved vehicle driving techniques. • 100 per cent on time deliveries and zero lost or damaged stock. • Retailers noted improved working conditions and cost reduction. • Monthly monitoring of vehicle movements, emission reductions and retailer satisfaction. It should be noted that UCC's have been successfully developed across the world.
Applicability to Mexico situation	• Specifically focused on reducing impacts of freight delivery in city center location. May have applicability to Mexico City and other major cities. • Focusing on all sizes of delivery vehicles. • Offering viable options for delivery companies.

Reduction in energy intensity and improved freight consolidation

Green Freight Asia Network

Topic	Comment
Scheme Description	It has been identified that the global share of freight trucks operating in Asia will increase to 34% by 2050 with emissions set to rise also. Forming partnerships within private sector freight companies in Asia to identify ways to reduce emissions generated by freight travel and improve the impact of Freight travel on the environment.
Type of Measure	Establishing so called "Green Freight Centers" within the freight sector that: • Ensure the active participation of the private sector in the development of green freight policies and programs in Asia that are consistent with each other and with other global Green Freight programs. These efforts should cover road, rail, water and aviation, but an initial focus could be on-road freight. • Develop streamlined and consistent methods for fuel and CO2 measurement and reporting and a central database for data from freight carriers, national statistics, and other studies. • Enhance collaboration among shippers, carriers and logistics service providers to share best practice and jointly scale up Green Freight efforts.
Promoter / Stakeholders	• Clean Air Initiative Asia, DHL, IKEA, UPS.
Costs (including savings)	Not reported.
Scheme success	Not reported.
Applicability to Mexico situation	• Help identify best practice within freight sector for green initiative and to examine the means of creating frameworks for improved environmental impact monitoring.

Reduction in Energy Intensity - Vehicle Technologies

Aerodynamics in UK Freight Delivery – DFT Best Practice

Topic	Comment
Scheme Description	Guidelines on improving aerodynamics for freight vehicles to help saves costs on fuel and efficiency and further help to improve a vehicles impact on the environment by reducing emissions through better vehicle performance and management.
Type of Measure	A variety of vehicle improvements for existing and new fleet vehicles including: • Front round edging (minimizing drag from unwanted hard edges). • Front roof sloping and fairing (for better air flow over the vehicle). • Low drag mirrors. • Side skirting for HGV trailers. • Sheeting open loads. • Whilst the majority of vehicle improvements are aimed at larger goods vehicles, a case study by TNT showed that limiting vehicles to 60mph instead of 70mph had a fuel economy 30% better. • Further, TNT continue to employ aerodynamic modifications to their vehicles (mainly roof fairing) and investments have and are being made in the latest designs for small fleet vehicles from companies such as VW and Citron. TNT have also worked to develop better systems for loading and positioning within vans through driver education and have increased back loading across the UK business.
Promoter / Stakeholders	Department for Transport, TNT
Costs (including savings)	One case study showed that by sheeting its tipper trailers and making the tractor units more streamlined, fuel consumption was reduced by up to 14% depending on load weight. It was calculated that over a 5 year period, that could save the company up to £470,000 (US$750.000).

Scheme success	There have been a number of success stories discussed above, but overall, it is widely considered that improved aerodynamics creates fuel cost savings and improves vehicle efficiency whilst reducing CO2 emissions.
Applicability to Mexico situation	Vehicle technology best practice to improve fuel efficiency and environmental impacts of freight transport.

Reduction in Energy Intensity - Vehicle Technologies

Alternative fuelling technology – NGV Bangkok

Topic	Comment
Scheme Description	Promoting the opportunity for truck operators to convert vehicles to CNG through the provision of soft loans. Truck operators could receive 500,000 (US$15600) per vehicle but not exceeding three times their registered capital, to be repaid in three years with an interest rate of 4% for corporate loan and 5% for personal loan.
Type of Measure	Reducing carbon intensity through conversion of vehicles to more efficient fuelling technology .
Promoter / Stakeholders	PTT Plc. – Thailand's sole supplier of natural gas for vehicles (CNG). Operated via the Government Savings Bank for Agriculture and Agricultural Co-operatives.
Costs (including savings)	US$30m soft loan facility offered to registered members of the Land Transportation Association. Easing of loan criteria to allow personal guarantees instead of assets or property as collateral which increased accessibility to scheme for operators.
Scheme success	Target of 15,000 applicants for truck conversions.
Applicability to Mexico situation	The use of soft loans to finance vehicle modernization and efficiency enhancements offers useful insight. The success in increasing the accessibility to the scheme through the easing of loan conditions is also of relevance.

Reduction in Energy Intensity - Vehicle Technologies

The Benefits of Operating Electric Vehicles in an Urban Environment – DFT Best Practice

Topic	Comment
Scheme Description	Guidelines on and Review of employing electric delivery vehicles for urban areas looking at a major case study involving TNT in Scotland and their adoption of 100, 7.5 ton Electric Vehicles for inner city delivery drops.
Type of Measure	Study cites the many benefits associated with using EV vehicles for inner city drops more particularly: • No gear change (Perfect for stop start situations). • Ideal for multi drop scenarios (up to 100 miles). • Lower total CO_2 emissions overall. • Components 100% recyclable. • Quiet running vehicles.
Promoter / Stakeholders	DFT, TNT.
Costs (including savings)	Higher purchase/ Leasing cost than a diesel vehicle.
Scheme success	TNT predict savings of up to 1,200 tons of CO_2e per annum over 100 fleet vehicles and vehicle fuel cost (per vehicle) of £160 (US$250) per week.
Applicability to Mexico situation	End-of-chain delivery potentially in conjunction with city distribution centers.

Reduction in Energy Intensity and Driver Training

Pilot study into best practice for green freight and vehicle technologies

Guangzhou Green Trucks Pilot Project, China

Topic	Comment
Scheme Description	Development of a proof of concept for a truck program in Guangzhou Province, China ahead of 2010 Asia Games that aimed to • Enhance the fuel economy of the truck fleet (fuel costs & security). • Reduce Carbon Emissions (air pollution and other health impacts). • Create GHG Emission Savings. The scope of the project was focused on diesel trucks of varying classes accessing or passing through the city of Guangzhou and wider province with the prospect of developing a national program across China.
Type of Measure	The project was split into four components, each with their own output. These were: • Background Analysis Report – understanding and analyzing vehicle numbers, growth, operation and fuel use in Guangzhou. • Guangzhou Truck Sector Survey Report – 1040 truck drivers surveyed and 43 companies to fill gaps in numbers and determining fuel cost savings. Further, specifics were gathered on fleet vehicle sizes, age and replacements. Also operational details captured average speed, number of trips per company, maintenance programs, routes and driver training. • Smart Drivers for Trucking in China Course – Information on fuel efficiency, truck specs, loading, maintenance and inspections were made available to drivers and companies. • Technology Pilot Report – results from a technology pilot that tested tire weight, resistance reduction packages (including aluminum wheels and tire-pressure monitoring systems) and also aerodynamic packages (including cab fairing and trailer skirts) for all sizes of freight vehicles. This was intended to demonstrate that technologies being adapted in the US and Europe could also work in China.

Promoter / Stakeholders	The World Bank, Clean Air Initiative Asia, Australian AusAID.
Costs	There are investment costs associated with developing and implementing new technologies for more efficient and greener vehicles. For example tire equipment was tested on refuse x 2 refuse vehicles with investment costs of £6320 (US$10.000) with annual savings on fuel amounting to 2520 liters and CO2 reductions of 6.71 tons giving a payback period of 1.5 years given the longer life of the new aluminum rims.
Scheme success	The pilot scheme has shown that overall, fuel savings and efficiency can be increased as well as reducing a vehicles impact on the environment provided there are sound working partnerships in place between truck owner, companies and local/national government.
Applicability to Mexico situation	Consolidated approach to developing best practice through a variety of mechanisms and partnerships.

Changes in Driver Behavior

Driver Training Programs to Improve Vehicle Efficiency – SAFED for Vans & HGV's (Safe and Fuel Efficient Driving), DFT, UK

Topic	Comment
Scheme Description	Government funded (till 2012) driver awareness program designed to improve the safe and fuel efficient driving techniques of Van & HGV drivers. It provides training and development for existing Van & HGV drivers through instruction relating to vehicle craft and road craft such as improved driving standards (braking, clutch control, cruise control and gear selection, tires, aerodynamics) and further training on loading and positioning within trailers to minimize unladen weight and improve fuel efficiency.
Type of Measure	One day driver training program and assessment aimed at driver awareness on fuel efficiency and better driving/handling.
Promoter / Stakeholders	Department for Transport, Operators.
Costs (including savings)	Cost associated with training courses.
Scheme success	Major benefits associated with the SAFED scheme have been cite as: • Fuel reductions of at least 5% per fleet (Reduction in 1,000 liters of fuel due to improved .driving standards could save a company up to £700 (US$1100) if fuel was at 70p a liter). • 2.6 tons of CO_2e emissions saved. • Lower operating costs. • Improved profit margins. • Improved environmental performance. • Costs may be associated with course fees if government subsidy was unavailable.
Applicability to Mexico situation	A solid training program that could be adopted within Mexico to educate freight drivers.

Changes in Driver Behavior

Efficient Operations for Small Fleets and Owner Drivers, DFT Best Practice

Topic	Comment
Scheme Description	Guidelines for owner driver or small fleet owner (10 or less) on improving vehicle efficiency, reducing fuel and operating costs and reducing environmental impact of business).
Type of Measure	Best Practice guidelines including: • Better driving (improved braking, acceleration, clutch control). • Vehicle loading (maximizing loads and trips / back loading). • Using Sat-Nav and Route Planning Systems to optimize routes and deliveries. • Driver bonus schemes for reduction in fuel consumption and environmental impact. • Effective cost measuring.
Promoter / Stakeholders	Department for Transport, Operators.
Costs (including savings)	Some costs associated with vehicle improvements and driver awareness courses.
Scheme success	Case studies show fuel saving reductions of up to 15% per annum and further savings in general operating costs.
Applicability to Mexico situation	A solid training program that could be adopted within Mexico to educate freight drivers of small fleet and driver-owner companies.

Driver Training and Best Practice

Small Fleet Performance Management Tool

Topic	Comment
Scheme Description	Designed for small or medium sized fleet owners, this online or downloadable software program allows users to actively improve fuel consumption, reduce emissions and reduce operational costs.
Type of Measure	Developed by the DFT in 2006, This tool produces daily, weekly, monthly and annual reports for fleet/company owners that develop Key Performance Indicators (KPI) based on current operational conditions that help to create awareness and develop procedure for improvement. KPI's include, Miles Per Gallon of Fuel, Empty Running, CO_2 Reduction and Maintenance Schedules/Results. The software may also help to optimize a company's performance by offering solutions on route planning (developing optimal delivery routes) and improved loading. This can be combined with SAFED training programs (as discussed in a previous case study).
Promoter / Stakeholders	Department for Transport, Operators.
Costs (including savings)	Free to use.
Scheme success	A1 Paper Distribution saved (in one year) a total of 3,173 gallons of fuel over 7 vehicles (nearly £13,500 or US$21500)) as a result of better understanding of vehicle mileage, improved optimizing of delivery routes and drivers attending a variety of SAFED courses. Outputs and KSI's played an important role in the company's decision to upgrade an 18 ton vehicle to a 24 ton vehicle and help maximize loading.
Applicability to Mexico situation	A proven visual and informative tool that could help informs small fleet owners of potential cost and environmental savings.

Urban Freight Management

Transport for London – London Freight Plan

Transport for London

Topic	Comment
Scheme Description	In recognition of a 15% growth in freight traffic entering the center of London by 2025, 4 key projects were developed to help militate against the likely impacts of congestion, pollution and safety as a result of said increase. The plan recognizes the importance of partnership development (something which has been identified as crucial in Asian Green Freight development and further recognized as a current issue in Mexico City).
Type of Measure	Four key projects aimed at best addressing the issue of increased freight. Whilst one is predominantly focused on the construction industry, the three hold significance to Mexico and are: • **Freight Operator Recognition Scheme –** a membership scheme that will allow companies and fleet owners (small or large) to work toward recognized compliance standards (through training programs identified previously) and be awarded standard based on their achievements in best practice in areas such as fuel efficiency, alternative fuel, reductions in Co2 emissions and reduction in penalty charges a s a result if illegal loading/unloading. The scheme is used by clients/businesses when awarding, for example, supply contracts to freight companies. • **Delivery Plans** – a plan to reduce delivery trips (during peak periods) and increase availability and use of safe and legal loading facilities (and issue with Mexico City) through the use of consolidation centers and out of hour's delivery. Freight Operator Recognition Scheme membership is encouraged to help promote best practice and develop. • **Freight Information Portal –** A single interface that will allow all deliveries to be registered and monitored to improve journey planning, operational efficiency and driver behavior. It will help to recognize companies' commitment to best practice and enhance their profiles.
Promoter / Stakeholders	Transport for London, DFT.
Costs (including savings)	Costs associated with training.

Scheme success	Scheme is on-going, but analysis has indicated a 1.21m ton per year reduction of freight associated carbon. All London Boroughs have all their own fleet and contracted fleets signed up to the plan and it is hoped that by 2016 50% of freight vehicles accessing London will be signed up also.
Applicability to Mexico situation	A useful case study to follow that will help to improve and consolidate urban freight delivery in Mexican through a dedicated action plan.

Urban Freight Management

Best Urban Freight Solutions – Enschede (The Netherlands)

Topic	Comment
Scheme Description	Access restrictions to the city center for all freight vehicles (to reduce pollution and congestion) whilst maintaining the economic vitality of the area.
Type of Measure	Bollard system in place from 11am-7am leaving a 4-hour window for deliveries into the central area of the city. To promote more consolidated freight delivery and minimize congestion at loading bays, vehicles with more than 15 deliveries on the same day in the city center have an extension of 3 hours to deliver. Further, vehicles delivering food have no restrictions.
Promoter / Stakeholders	BESTUFS.NET The Municipality of Enschede.
Costs (including savings)	Costs associated with exemption passes for bollard system and installation of bollards.
Scheme success	Vehicles entering the city center have reduced by 40%. Outside of the delivery window, the city center is virtually car free (including non-freight traffic).
Applicability to Mexico situation	A means of considering more consolidated freight and offering delivery time restrictions.

Heavy-duty vehicle replacement

Carl Moyer On-Road Heavy-Duty Vehicle Voucher Incentive Program (California)

Topic	Comment
Scheme Description	The VIP is a streamlined approach to reduce emissions by replacing old, high-polluting vehicles with newer, lower-emission vehicles, or by installing a Verified Diesel Emission Control Strategy (VDECS). This program is limited to owners/operators with fleets of 10 or fewer vehicles that have been operating at least 75% in California during the previous twenty four (24) months. Exclusively for non-drayage fleets (10 or fewer trucks).
Type of Measure	The goal of this program is to reduce emissions from in-use heavy-duty trucks in small fleets by retrofitting Engine Model Years 1994 – 2006 or by replacing Engine Model Years 2002 and older with Model Years 2007 (or newer) emissions compliant models. The VIP will be implemented by AQMD through contractual agreements with Dealers, Dismantlers, and Retrofit Installers.
Promoter / Stakeholders	South Coast Air Quality Management District. California Air Resources Board (CARB).
Costs (including savings)	Maximum of $45K available per truck for replacements and $10K for retrofits. Total Funding under this Program: $10 Million.
Scheme success	
Applicability to Mexico situation	A proven program that could help small fleet owners replace old vehicles.

Heavy-duty vehicle replacement

Providing Loan Assistance for California Equipment (PLACE)

Topic	Comment
Scheme Description	ARB is developing innovative financing programs to provide fleet owners, particularly small business owners, easier access to loan opportunities. The ARB's loan programs may offer several options to increase financing accessibility, including loans, loan guarantees, and other mechanisms to assist industries affected by ARB regulations.
Type of Measure	To be eligible, the company must be a small business, meaning it has 100 or fewer employees, and $10 million or less in annual revenue, averaged over three years and must have their primary economic effect in California (most of the vehicle miles travelled must occur in California, most jobs in California, etc.) Applies to Fleets of 40 or fewer heavy-duty vehicles, as long as they meet the above requirements. • Applicable for the purchase of used and new tractors equipped with 2007 – 2009 model year engines certified to engine emission standards of 1.20 g/bhp-hr NOx and 0.01 g/bhp-hr PM or cleaner. • Fleet owners can combine Carl Moyer Program grant funding with loan guarantees to significantly lower the cost of a new truck purchase. Loans are available through the PLACE program in the form of loan guarantees issued through lenders to help truck owners that might not qualify for traditional loans • The borrower applies for a loan at a CalCAP lender participating in ARB's program. In addition, the borrower completes the lender's required loan application forms. • If the borrower qualifies, based on the lender's loan underwriting standards, loan documents are prepared and signed by the borrower and lender. • Lender disburses funds to the borrower

Promoter / Stakeholders	California Air Resources Board (CARB)
Costs (including savings)	The Providing Loan Assistance for California Equipment (PLACE) Program provides about $350 million for loan guarantees
Scheme success	Good
Applicability to Mexico situation	A proven program that could help small fleet owners replace old vehicles.

3.26

Heavy-Duty Vehicle Replacement

Goods Movement Emission Reduction Program (California)

Topic	Comment
Scheme Description	Goods Movement Emission Reduction Program (Program) is a program to quickly reduce air pollution emissions and health risk from freight movement along California's trade corridors. Local agencies apply to ARB for funding, and then those agencies offer financial incentives to owners of equipment used in freight movement to upgrade to cleaner technologies. Projects funded under this Program must achieve early or extra emission reductions not otherwise required by law or regulation.
Type of Measure	ARB awards grants to fund projects proposed by local agencies that are involved in freight movement or air quality improvements associated with goods movement activities. Examples of local agencies include air pollution control and air quality management districts (air districts), ports, and regional transportation agencies in the trade corridors. The local agencies are responsible for providing financial incentives to owners of equipment used in freight movement to upgrade to cleaner technologies, consistent with the Guidelines adopted by ARB. Bond funds flow via grant agreements from ARB to local agencies, then to equipment owners via contracts or other binding agreements with those local agencies. At both steps, there is competition based on the projected emission reductions and reductions per State dollar invested to ensure the most beneficial projects are funded. ARB may also award funds to any State agency (including ARB itself) for the purpose of administering a loan or loan guarantee program via an interagency agreement.
Promoter / Stakeholders	A partnership between the State Air Resources Board (ARB) and local agencies (like air districts and seaports) • Administrative Agency: California Environmental Protection Agency / Air Resources Board.

Costs (including savings)	ARB has awarded $571 million to 9 local agencies over multiple fiscal years.
Scheme success	Good.
Applicability to Mexico situation	A proven program that could help small fleet owners replace old vehicles.

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Heavy-Duty Vehicle Replacement

Texas Emissions Reduction Plan (TERP)

Topic	Comment
Scheme Description	The Texas Emissions Reduction Plan (TERP) program provides financial incentives to eligible individuals, businesses or local governments to reduce emissions from polluting vehicles and equipment. The TERP was established by the 77th Texas Legislature in 2001, It includes a number of voluntary financial incentive programs, as well as other assistance programs, to primarily help improve the air quality in Texas. The goals of the TERP develop multi-pollutant approaches to solving the state's environmental problems; and adequately fund research and development that will make the state a leader in new technologies that can solve its environmental problems while creating new business and industry in the state.
Type of Measure	Includes several sub-programs • Emissions Reduction Incentive Grants (ERIG) offers grants to upgrade or replace on-road vehicles and idle reduction infrastructure, on-vehicle electrification and idle reduction infrastructure. • Texas Clean Fleet Program (TCFP) offers grants to replace heavy-duty and light-duty on-road diesel vehicles with alternative fuel and hybrid vehicles. • Texas Natural Gas Vehicle Grant Program (TNGVGP) provides grants for the replacement and repower of heavy-duty and medium-duty diesel vehicles and engines with CNG and LNG heavy-duty and medium-duty vehicles and engines. • Rebate Grants (including small business) is a simplified first-come, first-serve grant program to upgrade or replace diesel heavy-duty vehicles and/or equipment. • ARRA Rebate Grants Program. The American Recovery and Reinvestment Act (ARRA).

	• Rebate Grants Program is a simplified first-come, first-serve grant program to upgrade or replace heavy-duty vehicles. On-road replacement vehicles may be powered by diesel, natural gas, or propane. • Heavy-Duty Motor Vehicle Purchase or Lease Incentive Program is a statewide program also administered by the TCEQ. Under this program, the TCEQ may reimburse a purchaser or lessee of a new on-road heavy-duty (over 10,000-lb.) vehicle for incremental costs of purchasing or leasing the vehicle in lieu of a higher-emitting diesel-powered vehicle. The vehicle being purchased or leased must be certified by the U.S. Environmental Protection Agency (EPA).
Promoter / Stakeholders	Texas Commission on Environmental Quality together with 41 specific Counties that have not attained their air quality standards.
Costs (including savings)	Average of about $130 million per fiscal year through 2008. Statewide 2% surcharge on the retail sale, lease or rental of new or used off-road heavy-duty equipment (agricultural exempted). Statewide 2% surcharge on the storage, use or other consumption of new or used off-road heavy-duty equipment (agricultural exempted). • Statewide 2.5% surcharge on every retail sale, lease, or use of every on-road diesel motor vehicle over 14,000 pounds. • Statewide 10% surcharge on the registration of a truck-tractors and/or semi-trailers. • Statewide $225 on the inspection required before registration of truck-tractors and/or semi-trailers.
Scheme success	Good.
Applicability to Mexico situation	A proven program that could help fleet owners replace old polluting vehicles.

Use of LNG in Long Haul Freight Delivery – Reductions in Energy Intensity

FedEx LNG Trial, Texas, USA

Topic	Comment
Scheme Description	Fed Ex USA began trialing in early 2012 two long haul HGV class 8 "tractors" on one of their major delivery routes (covering nearly 1000 miles per day) with the intent of placing them into full service in 2013. The LNG tractor beta test is part of a large scale sustainability initiative by FedEx Freight to integrate responsible environmental practices into daily operations. Further measures employed with the LNG test are improved aerodynamics on trailers and tractors.
Type of Measure	The trucks, believed to be the first LNG vehicles for FedEx in North America, have pre-production ISX12 G natural gas engines. The extensive yearlong testing of the vehicles has enabled FedEx to understand the day-day capabilities of running the vehicles on long haul routes indefinitely.
Promoter / Stakeholders	FedEx.
Costs (including savings)	The nature of the heavy duty trucking fleet makes it possible for operators to take advantage of retail LNG prices that were as low as $1.70 equivalent to a gallon of diesel (DGE) in April of 2012 compared to diesel, which is expected to average $3.91 per gallon over the next five years. The price differential makes the higher incremental costs of LNG heavy duties vehicles—which range from $40,000-$75,000 more than diesel-fueled trucks—attractive because of these fuel savings.
Scheme success	Good, with strong cost savings and environmental benefits.
Applicability to Mexico situation	A new concept in long distance haulage that could be adopted in Mexico given correct LNG provision is available and viable.

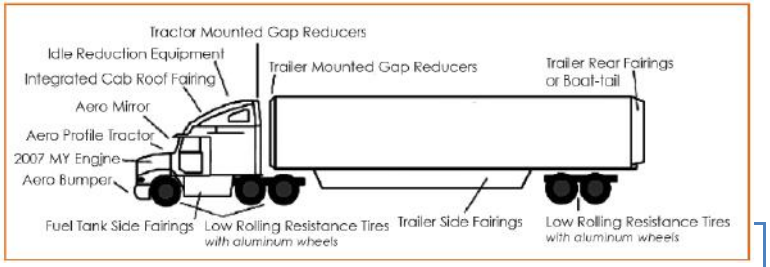
Use of LNG & CNG in Long Haul Freight Delivery – Reductions in Energy Intensity

UPS CNG and LNG Vehicles, North America

Topic	Comment
Scheme Description	In 2011, UPS purchased 48 new liquefied natural gas tractors (LNGs) for its "green fleet," which now totals more than 2,500 alternative-fuel, including electric, hybrid electric, compressed natural gas (CNG), liquefied natural gas, and propane-powered trucks. UPS was the first private delivery company to purchase LNGs when 11 were deployed in 2000. Of the 48 new LNGs, ten are deployed in Ontario, CA. and 38 LNGs are deployed in Las Vegas after completing the Clean Energy public LNG fueling station.
Type of Measure	The LNG system is manufactured by Westport HD Systems and the tractors will be made by Kenworth. The vehicles will replace older generation diesel vehicles. These LNGs are expected to produce 25 percent fewer greenhouse gas emissions compared to the older trucks and displace 95 percent of the fuel used by conventional diesel vehicles they replace.
Promoter / Stakeholders	UPS, Department of Energy's Clean Cities.
Costs (including savings)	LNG vehicles are more expensive than traditional diesel heavy-duty trucks, costing around 100 percent more than a conventional diesel vehicle. However, they also provide a 50 percent reduction in operating costs. LNG fuel is approximately $1.25 per diesel gallon equivalent, while diesel is hovering at $3 per gallon.
Scheme success	Good, with strong cost savings and environmental benefits.
Applicability to Mexico situation	A new concept in long distance haulage that could be adopted in Mexico given correct LNG provision is available and viable.

Vehicle technology Enhancements to Reduce Energy Intensity

SmartWay Transport Partnership



Topic	Comment
Scheme Description	Initiated by the US EPA in 2004, the SmartWay Transport Partnership brings together fleets, technology providers, and retailers to implement fuel savings and GHG reducing strategies.
Type of Measure	The program has focused on identifying and promoting products and practices that reduce conventional and climate change emissions, certifying vehicles and equipment such as tractors, trailers, idle reduction, and aerodynamic retrofit kits that meet SmartWay goals. The certification is not performance based; rather the SmartWay certified vehicles and equipment have a number of required features that are expected to enhance their environmental performance. SmartWay has also developed a draft heavy-duty vehicle GHG emission and fuel-efficiency test protocol to assist in the evaluation of technologies and vehicle designs including hybrid drivetrain technologies.
Promoter / Stakeholders	More than 1,200 partners accounting for about an estimated quarter of all goods moved in the United States (EPA 2008).
Costs (including savings)	Not known.
Scheme success	The program aims to reduce fuel consumption by 150 million barrels of oil per year and 33 to 66 million tons of CO2 as well as conventional pollutants.
Applicability to Mexico situation	An example of an effective partnership with industry which assists in the development and promotion of emissions saving measures.

Eco driving awareness, in vehicle technologies and reductions in fuel intensity

eCoMove, EU

Topic	Comment
Scheme Description	Policy makers in Europe, Japan and the US share the conviction that the application of information and communication technology (ICT) in the field of road transport, commonly referred to as Intelligent Transport Systems (ITS) can, as part of an integrated strategy, make a significant contribution to improving energy efficiency and reducing CO2 emissions. The transport sector represents 23% of global CO2 emissions, while road transport is responsible for around 75% of transport sector emissions and freight accounts for up to 30% to 40% of road sector emissions. This has grown by 45% between 1990 and 2007 and is expecting to keep on rising, despite cleaner engines. Information and communication technologies (ICT), such as the applications developed in eCoMove, specifically configured to target avoidable fuel consumption have the potential to achieve a cleaner and more energy-efficient mobility of goods and people. By applying the latest vehicle-to-infrastructure and vehicle-to-vehicle communication technologies, the project will create an integrated solution comprising eco-driving support and eco-traffic management to tackle the main sources of energy waste by passenger and goods vehicles.
Type of Measure	Most relevant to the freight sector is Sub Project 4. The objectives of this sub-project are to improve truck energy efficiency by introducing a learning driver coaching system and a planning & routing system that give all stakeholders the possibility and motivation to strive for optimal eco-behavior. This will be achieved with three applications. 1. Eco Driver Coaching Supporting the commercial vehicle drivers and fleet managers in the three following phases:

	• Pre-trip: eco driving training system with virtual simulator where the driver experiences the eCoMove system and its use cases in several driving situations. • On-trip: the driver receives real-time eco driving instructions on one's HMI based on the current state of the vehicle and its surrounding environment. • Post-trip: driving records are sent to a fleet management back-office to analyze trends, give feedback to the drivers on their driving style and reward good eco-drivers with incentives. 2. Eco Tour Planning Finding the most fuel efficient combination of vehicle, trailer, route, driver and system configuration based on mission information, traffic management data, truck and driver models and routing system. 3. Truck ecoNavigation Calculating the most fuel efficient route based on truck specific attributes, traffic patterns, eco maps and real-time traffic information.
Promoter / Stakeholders	European Committee, various truck manufacturers and operators.
Costs (including savings)	Fuel savings associated with better freight distribution planning.
Scheme success	Fuel is one of the major costs of transport companies. Eco-driving training has shown good potential (up to 10-15% reduction in fuel consumption) but its effects tend to wear off over time when professional drivers get back to their old habits.
Applicability to Mexico situation	Deployment of best practice in freight delivery through improved protocol.

Vehicle Financing scheme and reductions in energy intensity

Low Carbon Vehicle Procurement Programme (LCVPP), DFT/Cenex, UK

	Comment
Scheme Description	Cenex, the UK's Centre of Excellence for Low Carbon and Fuel Cell Technologies, is the Department for Transport's delivery partner for the Low Carbon Vehicle Procurement Programme (LCVPP). Announced in the May 2007 Energy White Paper, the program aims to accelerate the introduction of lower carbon technologies onto the UK vehicle market, with the ultimate objective of reducing overall carbon emissions from the vehicle fleet.
Type of Measure	The Low Carbon Vehicle Procurement Programme (LCVPP) is funded by the Department for Transport, to help public sector organizations procure hundreds of low carbon vehicles, in order to reduce CO2 emissions and develop the low carbon expertise of the UK. For Phase 1 of the program, £20 million (US$32M) is available to support the procurement of low carbon vehicles, starting with large panel vans and cars. 210 electric and hybrid vans have been ordered through the LCVPP program and are to enter operation during 2010. The program objectives are: • Quantify the benefits of low carbon vehicles. • Validate real world performance of low carbon vehicles. • Foster a culture change towards low carbon transport. • Achieve economies of scale for low carbon vehicle manufacturers.
Promoter / Stakeholders	DFT, Cenex, UK Private and Public Sector
Costs (including savings)	This initiative aims to help public sector bodies in England and Wales to procure and assess 500 Ashwoods Hybrid LCVs. The DfT provides a grant of £3,430 (US$5500) per vehicle, covering the entire extra cost of the Ashwoods system.

Scheme success	Conwy County Borough Council has invested in eight Ashwoods Hybrid Transit light commercial vehicles (LCVs), with the help of funding secured via the Department for Transport (DfT) Grant Funding program. Conway estimates the vehicles will deliver a CO2 reduction of up to 33% and fuel saving of 20%. With an average of 25,000 miles per year (68 miles per day) on a mixed drive cycle, this would result in an annual saving of £1,265 (US$2000) per vehicle, based on current fuel prices.
Applicability to Mexico situation	A government supported scheme that could be adopted in Mexico to offer access to hybrid vehicles for small fleet or driver/owners.

Reducing Mileage per Ton Through Improved Logistics Planning – Small Company Partnership

Successful Partnerships Case Study
(Currie European Transport Ltd and Jigsaw Solutions Ltd)

Topic	Comment
Scheme Description	Case Study presented in the DfT Freight Best Practice Guidance highlighting the effective partnership between two freight operators.
Type of Measure	The Partnership has offered the two firms the opportunity to enhance operations through: • Improving vehicle fill. • Reducing empty running. • Improved back-loading potential leading to enhanced fleet utilization. • Increasing customer satisfaction.
Promoter / Stakeholders	Currie European Transport Ltd and Jigsaw Solutions Ltd, with best practice guidance developed by the Department for Transport (DfT) and The Scottish Government.
Costs (including savings)	Management time in setting up and nurturing the partnerships.
Scheme success	The partnership has offered benefits to stakeholders including targeting an average 90% load fill which is far above average utilization, shared access to depots, and increased success in tendering for work. The Jigsaw partnership members (8 members) have applied jointly for financing and have been able to share IT infrastructure investments.

Applicability to Mexico situation	Partnering presents an opportunity for smaller fleet operators to improve efficiency, make savings on joint investment and widen their scope of operations. There may be potential to access funding jointly which would not be available individually.

Financing of Energy Efficient Investment in Freight Sector

ODoE State Energy Loan Program (SELP)

Topic	Comment
Scheme Description	The State Energy Loan Program (SELP) assists in promoting energy conservation and renewable energy resource development. The program offers low-interest loans for projects that: • Save energy. • Produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat. • Use recycled materials to create products. • Use alternative fuels.
Type of Measure	The loan program can be used as a means of funding the move to alternative fuel fleet vehicles. Loan amounts range from $20,000 to $20 million over a term of 5-20 years with interest rates determined according to the project application.
Promoter / Stakeholders	Oregon Department of Energy.
Costs (including savings)	Not Known.
Scheme success	
Applicability to Mexico situation	A mechanism for providing financing for energy saving measures which may be accessible to smaller fleet operators as well as large freight companies.

Financial Incentive Programme for Energy Efficient Investment

ODOE Business Energy Tax Credits

Topic	Comment
Scheme Description	The Oregon Department of Energy offers a Business Energy Tax Credit to Oregon businesses, trades, and rental property owners that invest in efficient truck technology projects. Applicants may receive a tax credit of up to 35 percent of the project costs. The credit must be filed over a period of five years, 10 percent in the first and second years and five percent for each remaining year. A tax credit may be received in one year if total projects costs are $20,000 or less. Efficient truck technology projects may include the purchase of idle reduction equipment, aerodynamic packages, single-wide tires, and automatic tire inflation.
Type of Measure	Incentive to invest in energy efficient vehicle technology.
Promoter / Stakeholders	Oregon Department of Energy.
Costs (including savings)	Not known.
Scheme success	
Applicability to Mexico situation	The effectiveness of such a scheme would be dependent on whether the tax incentive is sufficient to encourage the investment in efficient vehicle technology, and will depend on tax liabilities currently faced by small freight operators. Issues remain in the ability of smaller operators to gain access to the credit necessary to finance the investment.

Financing of Energy Saving Investment by Non-Profit Company

Cascade Sierra Solutions (CSS)

Topic	Comment
Scheme Description	Cascade Sierra Solutions is an Oregon based non-profit organization, providing comprehensive idle reduction solutions for commercial trucks and trailers nation-wide. Programs support all verifiable technologies that save fuel and reduce diesel emissions including options for upgrades, vehicle replacement and alternative fuel and hybrid vehicle technologies. Any fuel saving technology qualified as a U.S. Environmental Protection Agency's SmartWay Transport Carrier Strategy and approved by the CSS Technical Advisory Team is eligible for financing. Options for upgrades or vehicle replacement are available to registered truck owners. CSS combines available grants and tax incentives with a revolving loan fund to provide affordable leasing arrangements. Small Business Administration working capital loans and group insurance for truckers are also available. CSS operates showrooms along the I-5 corridor conveniently located near truck-stops and other locations accessible to truckers in Seattle, Portland, Coburg, Sacramento and Los Angeles.
Type of Measure	Financing and provision of fuel saving technologies to reduce energy intensity of vehicles.
Promoter / Stakeholders	Cascade Sierra Solutions, funding from EPA, California State Government and private lenders.
Costs (including savings)	Since its founding in 2006, CSS has received $44 million in federal grants and $35 million in state grants, the latter mostly from California. CSS has also been able to secure lines of credit from private sources as well on the order of $46 million.

Scheme success	As of end of 2009 CSS had a loan portfolio of $40 million but growth and demand for services was predicted to lead to an increase to $90 million by the end of 2010.
Applicability to Mexico situation	With access to credit for vehicle upgrade as one of the major barriers for smaller operators, this form of financing of fuel efficiency measures may offer a potential solution. The use of intermediary lenders who are able to provide better accessibility to fleet operators as distributors of grant funding may be explored.

Best Practice Partnership

21st Century Truck Partnership

Topic	Comment
Scheme Description	The 21st Century Truck Partnership is a cooperative research and development program formed by four federal agencies (Departments of Defense, Energy, Transportation and the Environmental Protection Agency) in a partnership with the truck industry and supporting industries in 2000. The goal was to advance technologies used in trucks and buses, yielding safer, cleaner and more efficient vehicles. In support of the general goal research was carried out in several areas of technology:
Type of Measure	In support of the general goal research was carried out in several areas of technology: • Integrated vehicle systems for commercial and military trucks and buses; • Engine combustion, exhaust after-treatment, fuels and advanced materials to achieve higher efficiency and lower emissions; • Heavy-duty hybrid propulsion systems; Reduction of parasitic losses to achieve significantly reduced energy consumption; • Technologies to improve truck safety; that result in the reduction of fatalities and injuries in truck-involved crashes; and Technologies that reduce energy consumption and exhaust emissions during idling.
Promoter / Stakeholders	Departments of Defense, Energy, Transportation and the Environmental Protection Agency, Fleet operators and supporting industries.
Costs (including savings)	Not known.

Scheme success	A review of the program in 2008 by the National Academy of Sciences found that many program goals had not been met because technologies were not implemented, not feasible from an engineering perspective and/or not adequately funded. Funding has proven difficult to sustain at the levels to meet the ambitious goals set out for the Partnership. The report recommended a clearer goal setting strategy, reviewed periodically and stated in measureable engineering terms. The review did conclude that the program had succeeded in bringing stakeholders to the table, facilitating communication and accelerating the pace of development, and ultimately recommended that funding continue and at levels that reflect the importance of reducing fuel consumption from heavy-duty vehicles.
Applicability to Mexico situation	A partnership approach to research and development of best practice, with lessons to learn about the factors which led to limited success in certain aspects of the initiative.

Emissions Reduction Programme

New Hampshire Climate Action Plan, USA

Topic	Comment
Scheme Description	A state wide targeted emissions reduction program focusing on a variety of sectors including freight and transport. It provides a solid set of reduction targets to reduce emissions to 20% 1990 levels by 2025.
Type of Measure	With regards to the transport sector, the targets focus primarily on overall emissions generated by all transport. However looking more closely at freight the main and most robust program is to reduce vehicle idling in freight vehicles by 100% in 2020. Legislation is to be passed that will establish an anti-idling program. Driver awareness training and outreach will be established and technologies made available for drivers to retrofit on vehicles. Fines will be introduced for drivers who do not comply with new legislation.
Promoter / Stakeholders	New Hampshire Climate Change Policy Task Force.
Costs (including savings)	Social costs associated with greenhouse gas emissions can be minimized and further costs savings can be created through improved vehicle operation.
Scheme success	On going.
Applicability to Mexico situation	A targeted scheme to actively reduce emissions through new and improved legislation. Possibility to adopt within local and regional government.

Emissions Reduction Programme

Pennsylvania Climate Change Road Map, USA

Topic	Comment
Scheme Description	A state wide targeted emissions reduction program focusing on a variety of sectors including freight and transport.
Type of Measure	The major transportation strategies to reduce emissions within road freight are seen as the following. • Establishment of a renewable fuel standard by 2025, with a requirement for fleet owners to reduce conventional fuel use by 25%. • The adoption of fuel efficiency standards for replacement tires to achieve higher fuel efficiency • Develop a pilot program for the use of Nitrogen inflated tires as it is proven that tire pressure can be maintained 2 to 3 times longer than air resulting in fuel efficiency gains and better traction. • Increase the use of Inter Modal freight by creating more terminals that allow efficient delivery to multiple locations. • Implementation of a state wide ban on vehicle idling and further expand location of electrification stations at key truck stops on freight routes to reduce the need for trucks idling when stopped.
Promoter / Stakeholders	Pennsylvania Environmental Council.

Costs (including savings)	Social costs associated with greenhouse gas emissions can be minimized and further costs savings can be created through improved vehicle operation.
Scheme success	On going.
Applicability to Mexico situation	A targeted scheme to actively reduce emissions through new and improved legislation. Possibility to adopt within local and regional government.

Reducing Vehicle Energy Intensity

Cambia tu Camión, Freight Vehicle Scrappage Scheme, Chile

<table>
<tr><th>Topic</th><th>Comment</th></tr>
<tr><td>Scheme Description</td><td>The ‘Cambia tu Camión’, or Change your Truck Scheme was introduced by the Chilean Government in 2009 with the aim of reducing freight vehicle emissions and boost economic growth.</td></tr>
<tr><td>Type of Measure</td><td>The program has been designed to encourage the scrapping and replacement of the oldest and most polluting trucks. Incentive payments of between 4,000,000 CLP ($7,200) and 12,000,000 CLP ($21,700) are offered towards new vehicles depending on truck size (see table below). Operators with vehicles over 25 years old could apply for the scheme.
<table>
<tr><th>Category</th><th>Size of truck</th><th>Incentive Amount</th></tr>
<tr><td>Light</td><td>Vehicle weighing less than 9 tonnes</td><td>CLP 4,000,000</td></tr>
<tr><td>Medium</td><td>Vehicle weighing more than or equal to 9 tonnes but less than 17 tonnes</td><td>CLP 8,000,000</td></tr>
<tr><td>Heavy</td><td>Vehicles weighing more than or equal to 17 tonnes</td><td>CLP 12,000,000</td></tr>
</table></td></tr>
<tr><td>Promoter / Stakeholders</td><td>The Government of Chile.</td></tr>
<tr><td>Costs (including savings)</td><td>A sum of 4 bn pesos was allocated, with the intention of taking 500 older vehicles off the roads between 2009 and 2010.</td></tr>
</table>

Scheme success	The scheme led to the removal of just under 5% of the pre-1984 trucks in the country, with an estimated reduction of over 100,000 tons CO_2.
Applicability to Mexico situation	The evaluation and findings from the Chilean study are a useful comparator to those of the Mexican scheme, and differences in experience and success can be reviewed and lessons learned.

4 SELECTION OF SHORTLISTED CASE STUDIES

4.1 An important task within Stage I of the project was to define a methodology to select a short list of case studies of most relevance to the study, and which could be taken forward for more detailed investigation.

4.2 A straightforward multi-criteria appraisal framework was proposed, which took these considerations and 'ranked' the various case studies according to their demonstrated performance or applicability under the different categories. Case studies were ranked under each of the criteria according to performance.

Selection Criteria

4.3 In selecting the most interesting studies, there were a number of relevant factors to be taken into consideration. These included:

- Specific focus on small-fleet freight operators.
- Applicability to the Mexico context.
- Scale of potential mitigation achievable by the scheme/success observed.
- Cost/Value for money of intervention.

4.4 A simple multi-criteria appraisal framework was proposed, which took these considerations and 'ranked' the various case studies according to their demonstrated performance or applicability under the different categories. This provided a means of straightforward comparison of the different studies, allowing the most relevant and useful to quickly be identified from among the selection.

Weighting of Criteria

4.5 Given the specific objectives of this project, case studies which have a particular focus on the small-fleet and owner-operator freight market greater importance was placed on those studies which were particularly relevant to this market and to the Mexican context. This was achieved by applying a weighting to the various objectives.

4.6 The weightings were applied as follows:

- Small Fleet Focus – 2.
- Applicability to Mexican Context – 1.5.
- Scale of Mitigation Achievable 1.5.
- Cost/Value for Money – 1.

Multi-Criteria Appraisal Results

4.7 The resulting appraisal results are shown below, with schemes ranked under each criteria, with the highest score of 3 (green) being given to schemes which fit well with the criteria and lowest scores of 0 (grey) or 1 (red) where the scheme demonstrates little relevance or low performance under the criteria. An overall scoring is given to each scheme reflecting criteria weighting.

Table 4-1: Potential case study 'long list' - appraisal results weighted by criteria

		Top Ranked Projects		Small Fleet Focus	Applicability to Mexican Context	Scale of Mitigation Achievable	Cost/Value for Money	
			Weighting Factor	2	1.5	1.5	1	Score
Reducing Energy Intensity	Fleet Modernisation	*	Carl Moyer on-road heavy-duty vehicle Voucher Incentive Program (California)	3	2	3	3	16.5
		*	Providing Loan Assistance for California Equipment (PLACE)	3	2	3	2	15.5
			Goods Movement Emission Reduction Program (California)	1	2	2	1	9.0
			Texas Emissions Reduction Plan (TERP)	1	2	2	2	10.0
	Aerodynamics	*	SmartWay Transport Partnership	2	2	3	2	13.5
	Alternative Fuel		Alternative fuelling technology – NGV Bangkok	1	1	2	1	7.5
			The Benefits of Operating Electric Vehicles in an Urban Environment – DFT Best Practice	0	0	2	1	4.0
			UPS CNG and LNG, North America	0	1	2	1	5.5
			Low Carbon Vehicle Procurement Programme (LCVPP), DFT/Cenex, UK	1	1	2	1	7.5
	Scrappage	*	Cambia tu Camión	1	3	3	1	12.0
Reducing Fleet Mileage per Tonne	GPS	*	eCoMove, EU	2	2	2	2	12.0
	Logistics Planning		Transport for London – London Freight Plan	1	0	2	2	7.0
			Best Urban Freight Solutions – Enschede (The Netherlands)	0	0	1	0	1.5
		*	Successful Partnerships Case Study	3	3	2	3	16.5
	Distribution Centres		Urban Consolidation Center (UCC), Bristol, UK	1	0	2	2	7.0
Driver Training and Management	Eco-Driving		Guangzhou Green Trucks Pilot Project, China	1	1	2	2	8.5
		*	Driver Training Programmes to Improve Vehicle Efficiency – SAFED for Vans & HGV's (Safe and Fuel Efficient Driving), DFT, UK	2	2	2	3	13.0
	Other Monitoring		eCoMove, EU	2	2	2	2	Repeat

Other	Vehicle Financing		Alternative fuelling technology – NGV Bangkok	1	1	2	1	Repeat
			Providing Loan Assistance for California Equipment (PLACE)	3	2	3	2	Repeat
			Texas Emissions Reduction Plan (TERP)	1	2	2	2	Repeat
		*	ODoE State Energy Loan Program (SELP)	3	2	2	2	14.0
			ODOE Business Energy Tax Credits	2	1	2	2	10.5
		*	Cascade Sierra Solutions (CSS)	3	2	3	2	15.5
	Small Fleet Focus	*	Efficient Operations for Small Fleets and Owner Drivers, DFT Best Practice	3	2	3	3	16.5
		*	Small Fleet Performance Management Tool	3	3	2	3	16.5
			Carl Moyer on-road heavy-duty vehicle Voucher Incentive Program (California)	3	2	3	3	Repeat
			Providing Loan Assistance for California Equipment (PLACE)	3	2	3	2	Repeat
	Best Practice Partnership		Green Freight Asia Network	1	2	2	3	11.0
			SmartWay Transport Partnership	2	2	3	2	Repeat
			eCoMove, EU	2	2	2	2	Repeat
			21st Century Truck Partnership	1	1	1		5.0
	Performance Mgt Toolkit		Small Fleet Performance Management Tool	3	3	2	3	Repeat
	Legislative Measures	*	New Hampshire Climate Action Plan, USA	1	2	3	3	12.5
		*	Pennsylvania Climate Change Road Map, USA	1	2	3	3	12.5

Selection Shortlisted of Case Studies

4.8 Resulting from the appraisal process, the following schemes were selected by the client as interesting Case Studies to progress to Stage II of the study.

- Carl Moyer on Road Heavy Duty Vehicle Voucher Incentive Programme (VIP), California[2].
- Providing Loan Assistance for California Equipment (PLACE)[2].
- SmartWay Transport Partnership.
- 'Cambia tu Camion' Chile Scrappage Scheme.
- ODoE State Energy Loan Programme.
- eCoMove.
- Efficient Operation for Small Fleets and Owner Drivers, DfT Best Practice[3].

[2] During further research, these were combined under the heading of California Air Quality Attainment Programme

[3] These were combined under the DfT Best Practice Guidance Programme heading

- Small Fleet Performance Management Tool.

4.9 An additional scrappage scheme was also added at the request of the client, that of Columbia. In total therefore, there were seven scheme programs which were taken forward for more detailed research.

Case Study summary

4.10 The following table presents case studies which were identified during Stage I of the study, showing how these fit in to the main forms of fleet emission reduction approaches.

4.11 The main feature of the intervention is noted in bold, whilst if the scheme also includes elements of a secondary approach, this is also flagged. The shortlisted case studies are highlighted for ease of reference, and demonstrating that these shortlisted studies effectively cover the range of potential approaches.

Table 4-2: Identified Case Studies categorized by form of intervention

Case Study	Page number in Preliminary Report	Reducing Vehicle Energy Intensity			Reducing Fleet Mileage per ton			Driver Training & Management		Others				
		Fleet modernization	Aerodynamics	Alternative Fuels	GPS Systems	Logistics Planning	Distribution centers	Eco-driving	Other monitoring	Vehicle Financing	Small Fleet Focus	Best practice partnership	Performance management toolkit	Legislative Measures
Urban Consolidation Center (UCC), Bristol, UK	**15**						**Y**							
Green Freight Asia Network	**17**											**Y**		
Aerodynamics in UK Freight Delivery – DFT Best Practice	**18**		**Y**											
Alternative fuelling technology – NGV Bangkok	**20**			**Y**						**Y**				
The Benefits of Operating Electric Vehicles in an Urban Environment – DFT Best Practice	**21**			**Y**										
Guangzhou Green Trucks Pilot Project, China	**22**		**Y**	Y		Y		**Y**	Y					

Case Study	Page number in Preliminary Report	Reducing Vehicle Energy Intensity			Reducing Fleet Mileage per ton			Driver Training & Management		Others				
		Fleet modernization	Aerodynamics	Alternative Fuels	GPS Systems	Logistics Planning	Distribution centers	Eco-driving	Other monitoring	Vehicle Financing	Small Fleet Focus	Best practice partnership	Performance management toolkit	Legislative Measures
Driver Training Programs to Improve Vehicle Efficiency – SAFED for Vans & HGV's (Safe and Fuel Efficient Driving), DFT, UK	**24**							**Y**						
Efficient Operations for Small Fleets and Owner Drivers, DFT Best Practice	**25**		Y		Y	Y		Y	Y		**Y**			
Small Fleet Performance Management Tool	**26**					Y		Y	Y		**Y**		**Y**	
Transport for London – London Freight Plan	**27**					**Y**		Y	Y			Y		
Best Urban Freight Solutions – Enschede (The Netherlands)	**29**					**Y**								
Carl Moyer on-road heavy-duty vehicle Voucher Incentive Program (California)	**30**	**Y**								Y	**Y**			
Providing Loan Assistance for California Equipment (PLACE)	**31**	**Y**								**Y**	**Y**			
Goods Movement Emission Reduction Program (California)	**33**	**Y**								Y				
Texas Emissions Reduction Plan (TERP)	**35**	**Y**		Y						**Y**				

Case Study	Page number in Preliminary Report	Reducing Vehicle Energy Intensity			Reducing Fleet Mileage per ton			Driver Training & Management		Others				
		Fleet modernization	Aerodynamics	Alternative Fuels	GPS Systems	Logistics Planning	Distribution centers	Eco-driving	Other monitoring	Vehicle Financing	Small Fleet Focus	Best practice partnership	Performance management toolkit	Legislative Measures
FedEx LNG, Texas, US	**37**	Y	Y	Y										
UPS CNG and LNG, North America	**38**	Y		**Y**										
SmartWay Transport Partnership	**39**		**Y**									**Y**		
eCoMove, EU	**40**		Y		**Y**			Y	**Y**			**Y**		
Low Carbon Vehicle Procurement Programme (LCVPP), DFT/Cenex, UK	**42**	Y		**Y**						Y				
Successful Partnerships Case Study	**44**					**Y**						Y		
ODoE State Energy Loan Program (SELP)	**46**	Y								**Y**	Y			
ODOE Business Energy Tax Credits	**47**	Y								**Y**				
Cascade Sierra Solutions (CSS)	**48**	Y	Y							**Y**	Y			
21st Century Truck Partnership	**50**	Y	Y	Y								**Y**		
New Hampshire Climate Action Plan, USA	**52**	**Y**	Y					Y				Y		**Y**

Case Study	Page number in Preliminary Report	Reducing Vehicle Energy Intensity			Reducing Fleet Mileage per ton			Driver Training & Management		Others				
		Fleet modernization	Aerodynamics	Alternative Fuels	GPS Systems	Logistics Planning	Distribution centers	Eco-driving	Other monitoring	Vehicle Financing	Small Fleet Focus	Best practice partnership	Performance management toolkit	Legislative Measures
Pennsylvania Climate Change Road Map, USA	**53**	**Y**	Y					Y						**Y**
Cambia tu Camión, Freight Vehicle Scrappage Scheme, Chile	**55**	Y								Y				

4.12 The following chapters focus on the shortlisted schemes in turn, providing greater detail on the scheme objectives, how the scheme is intended to deliver emissions savings and on the perceived success in achieving those objectives.

5 CALIFORNIA'S AIR QUALITY STANDARDS ATTAINMENT PROGRAM

Background

5.1 California's concern for achieving and maintaining acceptable air quality has led to multiplicity of programs administered at the state and local levels covering all types of fixed, and mobile emissions sources. Amongst these, some of the most successful programs have targeted on-road vehicles since vehicle emissions form an important part of the overall emissions inventory. In September 2000, the Air Resources Board (ARB) adopted the Diesel Risk Reduction Plan to reduce the risks associated with diesel particulate matter (PM) and achieve a goal of 75 percent PM reduction by 2010 and 85 percent by 2020.

5.2 At the local level, the South Coast Air Quality Management District's (SCAQMD) engagement with heavy duty on-road emissions started over 13 years ago with an Air Toxic Monitoring Program (MATES II) which clearly identified Diesel Particulate Emissions as the source of over 70% of the South Coast Air Basin Basinwide Cancer Risks of ~1400 in one million. MATES II was one of the most comprehensive air toxics programs ever conducted in an urban environment, and certainly much more comprehensive than a similar study (MATES-I) conducted by the District over a decade previously.

5.3 For heavy-duty vehicles, the implementation of tight emissions regulations for new vehicles was not sufficient to achieve these goals due, in part, to the extended operating life of these vehicles and the number of out-of-state vehicles that operate within the air quality management district and additional measures had to be taken to accelerate the process of "cleaning-up" the heavy duty fleet.

5.4 This air quality problem was considered unacceptable to the California Air Resources Board and the SCAQMD requiring actions to be taken. The problem was compounded by the fact that over 45% of all seaborne goods transported into the US come through port facilities[4] within the SCAQMD and much of the emissions sources are within these Federally administrated entities and thus not under the control of the AQMD such as Marine, Locomotives and Planes. Thus the SCAQMD were obliged to take actions above and beyond those included in the state and federal emissions regulations in order to improve their local air quality.

5.5 Amongst these programs, there are three main components that focus on in-use heavy duty goods vehicles. These are:

- The Carl Moyer Memorial Air Quality Standards Attainment Program.
- The Proposition 1B: Goods Movement Emission Reduction Program.
- Vehicle Voucher Incentive Program (VIP).

5.6 To achieve the needed air quality improvement they put in place several programs to accelerate the introduction of cleaner vehicles, reduce the age of the fleet and introduce alternative fuels. The initial focus for Natural Gas vehicles was for Refuse trucks, taxis and buses. Natural Gas, even though it had similar production emissions standards to diesel, emitted far less particulates. To achieve their air quality goals they additionally needed to

[4] http://www.mobility21.com/old/images/graphics/11DC/GoodsMovementBrochure_LR.pdf

lower the emissions from all owner-operator and small-fleet vehicles. The large number of these vehicles, which were typically older than the heavy duty vehicles in-use with the larger fleets, and often subjected to inferior maintenance made these vehicles a critical component to achieving acceptable air quality standards.

5.7 Cleaning up vehicle emissions from owner-operator and small-fleet vehicles is further complicated by the fact that (i) many are not subject to credit or do not have good credit ratings; (ii) and are disperse; needing a one-by-one approach.

5.8 So, the ARB and SCAQMD decided to use a carrot-and-stick approach by defining future regulations that would limit access to the ports and rail yards to those vehicles with cleaner emissions and implementing different incentive programs to help the small fleet update their vehicles to meet these future requirements.

Scheme Objectives

5.9 The gain that they wanted to achieve was (i) to get cleaner vehicles into the in-use fleet earlier than could be achieved by regulation only and (ii) allow the owner-operator and small fleet to comply with these future regulations. It was felt that without the incentive programs many owner-operators and small fleets would not have been able to update their vehicles (as required by regulation) and would have had to drop-out of this market.

The Regulations

5.10 To cover these vehicles that move freight into and out of the ports and rail yards, ARB instigated various "Drayage[5]" programs.

5.11 The current regulations are as follows[6]:

- Owners of class 7 and class 8 drayage trucks[7] that are prior to 2007 model year (MY) must have upgraded or replaced their engines to meet 2007 engine emissions standards by 12/31/2013.

5.12 Several compliance options exist, but not all options ensure that drayage trucks will be able to operate for the long term.

Short-term solutions

5.13 The operator can install a "level 3 verified diesel emission control strategy" on their vehicle which will make it compliant until 12/31/2013. However he will again be required to modernize to a 2007+ MY engine by 12/31/2013. Additionally he will not be allowed to enter the ports of Los Angeles and Long Beach which require a 2007 or newer MY engine.

Long-term solutions

5.14 To ensure that the Drayage Truck can continue to operate for the long-term, the operator has to replace the engine or truck with:

- A newer 2007-09 MY engine (compliant until 12/31/2022); or

[5] A drayage truck is a vehicle that transports marine or rail cargos. This includes trucks hauling empty containers and bare chassis.

[6] http://www.arb.ca.gov/msprog/onroad/porttruck/porttruck.htm

[7] Trucks that have a manufacturer gross vehicle weight rating (GVWR) of 26,001pounds or over

- A newer 2010+ MY engine (fully compliant).

5.15 In the future, ARB proposes tightening the NOx standard (beyond the 2010 certification levels) and promote hybrid trucks.

The Incentives

5.16 There are a number of different elements of this program:

Carl Moyer Program

5.17 The Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program) provides grant funding for cleaner-than-required engines and equipment. Grants are administered by local air districts. ARB works collaboratively with the districts and other stakeholders to set guidelines and ensure the program reduces pollution and provides cleaner air for Californians. The Carl Moyer Program achieves reductions in emissions of key pollutants which are necessary for California to meet its clean air commitments under regulatory requirements. Eligible projects include cleaner on-road, off-road, marine, locomotive, lawn & garden, light duty passenger vehicles being scrapped and agricultural equipment.

5.18 The Carl Moyer Program does not pay for compliance with a regulation - instead, it provides competitive grants for the incremental cost of cleaner-than-required engines, vehicles, and equipment. The program focuses on cleaning the air by replacing older heavy-duty diesels with electric, alternative-fuel, or cleaner diesel technologies.

Carl Moyer scheme costs

5.19 The program is expensive, accounting for 4 – 5 billion dollars through to 2023, costs which are borne by all vehicle owners following a "polluter pays" principle, but has been considered to be very successful in improving air quality in California.

5.20 Since 1998, the Carl Moyer Program has provided funding to encourage the owners of diesel engines to go beyond regulatory requirements by retrofitting, repowering, or replacing their engines with newer and cleaner ones. While regulations continue to be the primary means to reduce air pollution emissions, the Carl Moyer program plays a complementary role to California's regulatory program reducing NOx and PM by funding emission reductions that are surplus, i.e., early and/or in excess of what is required by regulation. This is the fifteenth year of the Carl Moyer Program and $26.6 million is available for FY 2012-13 project awards within the South Coast AQMD's 4-county jurisdiction.

5.21 Not all eligible vehicles however take advantage of this program, so to widen its reach it can be combined with a loan guarantee program and with direct loans to the vehicle owner typically for 60 months financing of the new replacement truck.

Goods Movement Emission Reduction Program (Proposition 1B)

5.22 The Proposition 1B – Goods Movement Emission Reduction Program approved in 2006 provides funding for projects that reduce emissions from goods movement operations. The Prop. 1B Program provides US$1 billion from bonds to reduce diesel air pollution from goods movement operations and achieve the earliest possible health risk reduction in nearby communities. The projects funded by the Prop. 1B Program must achieve "early or extra emission reductions" that are not required by a law or regulation.

5.23 The Prop. 1B Program which is entering its fourth year, offers a financial incentive to owners/operators of eligible equipment involved in goods movement operations to upgrade their equipment, install a retrofit device, install electrical infrastructure at a truck stop or distribution facility, or implement other projects that will reduce diesel air pollutant emissions. The types of goods movement equipment targeted by the Prop. 1B program include: heavy-duty diesel trucks (replacement, retrofit or repower), truck stop or distribution center electrification infrastructure, locomotives, ships at berth (e.g. shore power), commercial harbor craft, and cargo handling equipment at ports or rail yard facilities.

Voucher Incentive Programme (VIP)

5.24 The VIP is a streamlined approach to reduce emissions by replacing old, high-polluting vehicles with newer, lower-emission vehicles, or by installing a retrofit device. This program is limited to owners/operators with fleets of 10 or fewer vehicles that have been operating at least 75% in California during the previous twenty four (24) months. The goal of this program is to reduce emissions from in-use heavy-duty trucks in small fleets by retrofitting Engine Model Years 1996 – 2006 or by replacing Engine Model Years 2002 and older with Model Years 2007 (or newer) emissions compliant models.

5.25 The VIP is implemented by SCAQMD through contractual agreements with Dealers, Dismantlers, and Retrofit Installers. The Dealers/Retrofit Installers will apply to the SCAQMD for the vouchers on behalf of the applicant. If approved, the voucher amount will be deducted from the total purchase price of the truck or retrofit device by the Dealer or Retrofit Installer, respectively.

5.26 Applicants interested in replacing their truck must purchase their replacement truck through an SCAQMD-approved VIP Participating Dealership that has completed the required training for the VIP. Similarly, applicants interested in retrofitting their truck must purchase their retrofit device through an SCAQMD-approved VIP Participating Retrofit Installer who has completed the required training for the VIP.

5.27 Note that due to CARB's On-Road Truck & Bus Regulation, retrofit funding is limited exclusively to Class 6 Trucks (GVWR: 19,501 – 26,000 lbs.). Drayage vehicles are not eligible for the VIP program.

Mobile Source Air Pollution Reduction Review Committee (MSRC)

5.28 In September 1990, California signed into law legislation that authorized $4 per vehicle surcharge on annual registration fees. This money collected by the Department of Motor Vehicles would be distributed to the SCAQMD and used to fund the implementation of programs to reduce air pollution from motor vehicles pursuant to air quality plans and provisions of the California Clean Air Act. Thirty percent of these funds would be deposited by the SCAQMD in a "Discretionary Fund" to be used to implement or monitor programs to reduce motor vehicle air pollution and the Mobile Source Air Pollution Reduction Review Committee (MSRC) was created to develop a Work Program for evaluating programs and to recommend which programs and/or projects would be funded.

How they operate

5.29 Between them these programs offer the small vehicle fleet owner (or owner-driver) various options that have replaced over 5,000 HD vehicles in the SCAQMD and probably 15,000

state-wide. Vehicle owners can receive incentives for meeting early the emissions standards contained in future regulations and for using alternative fuels (CNG and LNG) that have lower emissions than required to meet the regulations.

5.30 As a general rule, the earlier the vehicle replacement or retrofit is performed, the larger the incentives. When the regulation comes into force, the incentives disappear completely since these programs are paying only for emissions reductions over and above those provided by the regulation.

The largest grants have the strictest conditions attached (Proposition 1B)

5.31 In the first year of Proposition 1B, a grant of US$50,000 was given to replace a Class 8 HD truck. This amount increased to US$60,000 in the second year and then went back to US$50,000 in the third year. Additionally in the third year, class 6 trucks became eligible with a grant of US$35,000. These amounts represent approximately 70 percent of the cost of a new replacement truck. If the replacement Class 8 truck is fuelled by LNG an additional grant of US$50,000 can be made available, covering the complete cost of the new vehicle.

5.32 Additionally ARB used some of the bond funds to offer loans and loan guarantees to operators with marginal credit.

5.33 To obtain these grants, the operator has to sign a five year contract with the SCAQMD that commits to operate 75% of the time within California, and for Drayage vehicles a minimum number of entrances into the ports. Additionally his old vehicle has to be scrapped by one of the authorized scrappage centers.

The Voucher Incentive Program.

5.34 The Voucher Incentive Program (VIP) is handled by vehicle dealers and involves far less paperwork for the fleet owner. Under this program the replaced vehicle still as to be scrapped (as above) but there is no contract. The maximum grant amount for a Class 8 is US$35,000. Under this program, the dealer submits the paperwork which SCAQMD reviews and authorizes. SCAQMD conducts random audits to ensure compliance.

<u>The MSRC buy-down Program.</u>

5.35 The easiest of the programs is the MSRC buy-down program which offers lower grant amounts (US$15,000-20,000) but does not include the obligations of a contract or that the old vehicle be scrapped. This is particularly popular with operators that are looking to increase the size of their fleets.

5.36 It additionally allows the replacement vehicle to be new-used; that is one of 2007 or 2010 model year that has less than 500,000 miles on the clock. This option is particularly interesting for small fleets without much liquidity that are looking to expand.

Critical Assessment

5.37 All interviewees agreed that the success of their programs is due to:

- The amount of the grant (up to 80% of the cost of the new vehicle and even higher if the replacement vehicles in LNG or electric).
- The future regulation that will inhibit the vehicle owner's ability to conduct his business if he does not update his vehicles.

5.38 This gives the owner of the older vehicle three options: update now with support from grants, financing and loan guarantees; update later with him bearing the full cost of the change; not update and lose the ability to carry goods to and from the ports and rail yards. Naturally, this makes the first option highly attractive.

Originally ARB had proposed a maximum grant of US$35,000 for a Class 8 truck and they are convinced that the program would not have worked with that amount. They believe that the tipping-point is when the grant covers at least 70% of the cost of a new replacement vehicle.

5.39 They all insisted that you additionally need the future regulation – that vehicles will have to meet in some future year – and a declining grant availability as the date of implementation nears, to add urgency to the program.

You also need strong outreach in the initial stages for the program to be widely known. The SCAQMD hires an external contractor to conduct the outreach with workshops in the ports, translators for the foreign (principally Korean and Mexican) owners, public workshops and printed material.

Background information on MATES:

MATES - Multiple Air Toxics Exposure Study

See: http://www.aqmd.gov/aqmd/interfaces/interface_mates.htm

MATES I
The first Multiple Air Toxics Exposure Study was conducted in 1986-87 and the findings published in June 1987.

MATES II
At its October 10, 1997 meeting, the SCAQMD Governing Board directed staff to conduct a major air toxic evaluation program, referred to as MATES II (Multiple Air Toxics Exposure Study) to quantify the current magnitude of population exposure risk from existing sources of selected air toxic contaminants. This program was more comprehensive than a similar study conducted over a decade ago in MATES I, in that more sites were sampled, more toxic compounds were analyzed, and other elements such as micro scale modeling were also incorporated into the study. The AQMD conducted this study in three parts addressing; (1) Air Toxic Monitoring; (2) Air Toxic Emissions Inventory Enhancements; and (3) Air Toxic Modeling and Risk Assessment. Further information is found in the MATES II Final Report.

MATES III
As part of the 2003-04 Environmental Justice Work plan, the AQMD conducted a Multiple Air Toxics Exposure Study beginning in 2004. A Technical Advisory Group was formed and met periodically to provide technical review and input to staff during this study. These meetings were open to the public. Results are available in the MATES III Final Report.

MATES IV
The AQMD is planning to conduct the next Multiple Air Toxics Exposure Study (MATES IV) beginning in the summer of 2012.

6 SMARTWAY TRANSPORT PARTNERSHIP

Background

6.1 Launched in 2004, the innovative SmartWay Transport partnership is a public-private collaboration between the US Environmental Protection Agency and the freight industry to improve the environmental performance of freight operations in the country. The voluntary program is free for businesses to join, and in return they have access to market-based incentives to reduce their environmental impact through a reduction in GHG emissions and business costs.

Driving factors

6.2 Factors that drove the introduction of the initiative were the escalating environmental costs of freight shipments in the US, with the freight industry producing 350 million metric tons of carbon dioxide per year[8]. The development of the program focuses on reducing:

- Fuel consumption from trucks and rail delivering freight
- Operating costs associated with the delivery of freight.
- Emissions of carbon dioxide, a greenhouse gas.
- NOx emissions and particulate matter, and air toxics that adversely affect air quality and contribute to health problems, especially in densely populated urban areas[9].

Part of wider initiative

6.3 The SmartWay program focusses on five work streams, one of which is of 'international interest', in this area the program provides best practice advice for other countries looking to adopt elements of the SmartWay program and how to develop an effective public-private, market-based partnership.

Policy context

6.4 The SmartWay program supports national and state led clear fuel initiatives which look to advance strategies to reduce diesel emissions by working with fleet operators through the National Clean Diesel Campaign (also promoted by EPA).

Scheme Promoters/Stakeholders

Promoters

6.5 The US Environmental Protection Agency (EPA) and the freight industry.

Other organizations involved in implementation

6.6 The initiative was developed jointly with charter partners represented by industry stakeholders, environmental groups, American Trucking Associations and Business for Social Responsibility.

[8] http://www.epa.gov/smartway/basic-info/faq-general.htm

[9] http://www.epa.gov/smartway/basic-info/faq-general.htm

Other Stakeholders

6.7 60% of SmartWay's carrier partners are medium and small sized fleets with 100 or fewer trucks. 25% of SmartWay carrier partners are owner-operators, or fleets that operate 20 or fewer trucks. A breakdown of partners and affiliates involved with the program is shown in the table below:

Table 6-1: SmartWay partners and Affiliates

Partner Type	# of Partners	Affiliate Type	# of Affiliates
Logistics	471	Dealership	69
Multi-modal	12	Leasing Co.	26
Rail Carrier	18	Non Profit	89
Shipper	251	Other	4
Truck Carrier	2,387	State Trucking Assoc.	34
		Truck Stop	4
Total	**3,139**	**Total**	**227**

Scheme objectives

Stated objective

6.8 SmartWay aims to accelerate the availability, adoption and market penetration of advanced fuel efficient technologies and operational practices in the freight supply chain, while helping companies save fuel, lower costs and reduce adverse environmental impacts. EPA helps SmartWay Partners move more goods, more miles with lower emissions and less energy. It has 5 work streams:

- SmartWay Transport Partnership – Freight carriers commit to the program and track operations and energy consumption to benchmark performance.
- Finance Programme – A competitive grant program that makes investing in fuel-saving equipment easier for freight carriers.
- Technology Programme - A testing, verification, and designation program to help freight companies identify equipment, technologies and strategies that save fuel and lower emissions.
- SmartWay Vehicles - A program that ranks light-duty cars and small trucks and identifies superior environmental performers with the SmartWay logo.
- SmartWay International Interests – Develop guidance and resources for countries seeking to develop freight sustainability programs modeled after SmartWay.

Target market

6.9 Freight industry including:

- Large and small (owner-occupied) trucking companies,
- Rail carriers,
- Logistics companies,
- Commercial manufacturers,
- Shippers,
- Truck Carriers,
- Logistics Partners,
- Truck Stop/Plaza Partners,
- Retailers, and
- Other federal and state agencies.

Criteria for success

6.10 When freight organizations join the SmartWay program they agree to track their current and future fuel consumption to monitor improvements in the fleet. SmartWay envisages that by meeting their standards and equipment specifications they can help reduce fuel consumption by 10 to 20 per cent for 2007 long-haul tractors and trailers. Certification is not performance based; rather the SmartWay certified vehicles and equipment have a number of required features that are expected to enhance their environmental performance.

Cost of project

6.11 Over the period of the scheme, SmartWay's funding has come from a variety of sources:

- EPA's SmartWay program received $2.42 million in financial year (FY) 2011, had 11 full-time equivalents, and contracted for 10 Partner Account Managers. The Partner Account Managers are staffed through contracts with Senior Service America, Inc.
- EPA's FY 2012 budget for the SmartWay program totaled $2.7 million.
- EPA's SmartWay program also received $16.9 million in Diesel Emission Reduction Act (DERA) funds for FY 2008 through FY 2010.
- The SmartWay program also received $30 million in American Reinvestment and Recovery Act of 2009 funds.
- EPA awarded 12 grants to 9 grantees for SmartWay projects with these funds. The grants were for loan guarantees, loans, subsidies, and leases to retrofit, repower, or replace equipment to reduce emissions.
- The SmartWay program did not receive any DERA funds for FY 2011 and FY 2012, according to the Office of Transportation and Air Quality (OTAQ).

Scheme effectiveness

Evaluation material

6.12 As part of the project, SmartWay has a verification program designed to quantify emissions reductions and fuel savings from various available technologies, such as tractor and trailer aerodynamics, auxiliary power units, and wide-based tires. As a result, companies can

compare the fuel efficiency and environmental performance of various technologies and make more informed purchases.

Feedback from stakeholders

6.13 With a large number of operators having participated in the SmartWay partnership, there is no shortage of case studies of adopters. Below are some examples of the feedback received:

Marc Althen, President, Penske Logistics

> "We are constantly working to optimize our fleet as it relates to responsible sustainable practices, which includes the reduction of fuel consumption and lowering emissions. The SmartWay program has provided us with the necessary strategies to accomplish this."

Kevin J.Igli, SVP and Chief EHS Officer

> "We're serious about our responsibility to the environment, which is why we joined the SmartWay Transport Partnership. The framework it provides has enabled us to evaluate, measure and reduce the environmental impact of our transportation operations in a more comprehensive and strategic way. Specifically, SmartWay has helped us reduce fuel usage and greenhouse gas emissions, and improve our operational efficiency."

Daniel Marshall, Owner D&J 'XPress LLC,

> "As a small motor carrier business owner, I know first-hand how fuel costs affect my bottom line. So I look for what works for me. That's why I am a SmartWay partner, and a member of NASTC and OOIDA. SmartWay & these associations help small trucking companies like me save fuel and money. It also helps me - a guy with 3 trucks -market myself to customers looking for greener trucking companies. Like any small business owner, I have to wear a lot of different hats - from sales to operations to finance. So I appreciate how SmartWay saves me time and money with free business help including online calculators, performance tracking tools, and technical and financial assistance. With the price of diesel going up, up, up, the only way I can raise salaries is to use less fuel, and attract more business. SmartWay helps me do just that. Thanks, SmartWay!"

Quantified impacts

6.14 Some of the noteworthy achievements of the SmartWay Scheme, in terms of its success from inception in 2004 to the present day are as follows:

- Over 2,900 partners.
- $6.5 billion dollars in fuel costs saved.
- Saved 55 million barrels of oil -- equivalent of taking over 3 million cars off the road.
- 23,600,000 tons CO_2 reductions.
- 478,000 tons NOx reductions.
- 22,000 tons PM reductions.

6.15 Representatives from environmental, retail, and trucking associations consider EPA's SmartWay program an effective program for reducing fuel costs and reducing the environmental impact of freight movement.

6.16 According to a survey conducted by American Shipper, SmartWay ranked first among all the choices of supply chain sustainability programs

Lessons Learned

6.17 Based on interviews with SmartWay's partners they said that:

- They are generally great advocates of the organization, its purpose, and the tools it offers and feel that being associated with this organization helps them measure their footprint and accomplish their sustainability goals.
- Shipper partners see value in how it validates practices many were already implementing as well as driving many towards some level of consistency which does not exist in the current regulatory environment.
- Carrier partners appreciate the information provided on new technologies that are being tested.
- A few specifically noted how being involved has caused them to critically examine their operations as they collect information for the calculator tools.
- Other participants appreciated the level of service from the individuals in the SmartWay organization and perceived these individuals to really understand issues the industry is facing.

What part of the approach did not go to plan?

6.18 When analyzing the effectiveness of the program the monitoring and evaluation could be improved. EPA relies on self-reported industry data for meeting reduction targets. The Office of Transport and Air Quality performs some checks of data provided by industry and EPA also has 10 Partner Account Managers under contract who review data provided by the partners. Yet, there is no direct verification by EPA of data submitted by SmartWay participants which could be a potential weakness of the program for measuring validity of the statistics.

What were the main challenges?

6.19 When engaging with mid-sized and smaller carriers barriers experienced were[10]:

- The lack of resources or a lack of understanding.
- The lack of time to spend collecting data and completing paperwork for the tools.
- The perceived costs to invest in new technologies being too high.
- Not being sure what the value would be from the partnership.
- Some misconceptions where certain types of equipment or technology may not have been cost-beneficial.

Are there areas in which the approach would be changed based on scheme experience?

6.20 Areas which the approach would be changed based on scheme experience include:

- Could develop more direct methods of reporting of CO_2e reduction.

[10] Ellram & Golicic, (2011) "Environmentally Sustainable Transportation Study"

- Focus on increasing the participation of mid-sized and smaller carriers as the program grows.
- SmartWay Partnership could better inform the industry about its organization.
- The SmartWay Partnership provide case studies to companies to educate them on the costs and benefits of becoming a SmartWay partner.
- Companies could be educated about innovative practices and technologies that can be implemented with little to no investment which can achieve a quick return.

7 'CAMBIA TU CAMION' CHILE SCRAPPAGE SCHEME

Background

7.1 In Chile, 33.5% of the country's total energy consumption is from the transport sector; and of this 82.8%[11] is consumed by on-road transport of which approximately half is for highway trucks. This, combined with the fact that diesel fuel is an imported energy source, highlights the country's interest in efficiency measures in this sector.

7.2 The "Change your truck" program was administered by the Chilean Energy Efficiency Agency which is a public-private foundation, non-profit organization that seeks to promote, strengthen and consolidate the efficient use of energy in the country. The AChEE grew out of work done by the National Energy Efficiency Program, created in early 2005 with the goal of establishing a permanent political society to the efficient use of energy resources, and address issues of energy efficiency in all sectors including Transport.

Scheme promoters

7.3 The Ministry of Energy holds 50 percent of the foundation and provides most of its annual budget. The remaining 50 percent is split amongst the Chambers of Commerce, Industry, Construction etc., representing the private sector.

Scheme overview

7.4 In 2009, work was initiated on a pilot fleet renewal program with the objective of replacing trucks over 20 years old with new units. Technical assistance was received from the US EPA SmartWay program.

7.5 The Pilot consisted of two phases; in phase one 180 vehicles were scrapped and substituted and in phase two a further 154. Plans to extend this program were postponed by the need to divert funds for reconstruction after the 2010 devastating magnitude 8.8 earthquake.

7.6 Under the program, three categories of truck were included with different payment amounts for each as shown below.

Table 7-1: Fleet renewal payments

GVW (ton)	Payment (USD)
3.86 - 9	8,000
9 - 17	16,000
Over 17	24,000

7.7 It was considered that these payments represented on average between 1.2 and 2 times the resale value of the old truck and approximately one-third of the purchase price on a new replacement unit.

7.8 The conditions for an operator to be accepted into the program included:

[11] From the 2010 National Energy Balance

- The truck to be scrapped had to be over 20 years old and in good working condition.
- All its papers had to be in order, including the annual safety and emissions verification and with no overdue fines or payments.
- The owner had selected a vehicle distributor (supplier) and replacement vehicle.
- The owner had to have a pre-approved credit with one of the two Commercial Banks that operated products for this program that would be used to finance the purchase of the new unit.

7.9 An authorized recycler was used to handle and certify the vehicle scrappage and the payment was made, not to the vehicle owner, but directly to the selected supplier.

Scheme challenges

7.10 The main administrative complexity of this program involved managing the arrears of documentation or partial fulfillment of some activities; for example, the delivery of the vehicles to the test to help verify that the old truck was in operable condition with complete documentation etc.

7.11 The main reasons why some applicants did qualify for the program was their lack of access to credit. This particularly affected the small operators which have a family business characteristic and often unreported, or informal, income, which negatively affects their credit assessment. No specific window was setup to financing or loan guarantee programs that could be available through Fogape (Guarantee Fund for Small Businesses) or Fogain Fund (investment guarantees) which support and increase access to credit for businesses this program type.

7.12 Claudio Gavilán considered that the payment amount per vehicle was probably about right (one third of the new vehicle price) but that stronger financing and loan guarantee support would be needed to scale-up the program to a larger number of vehicles, particularly since it is the smaller fleets and over-operators that typically have the oldest vehicles. Very little demand was seen in the 3.86-9 ton category and a future program could focus specifically on the heavier two groups (9-17 ton and over 17 tons).

Scheme evaluation

7.13 One interesting aspect of this pilot program was the significant amount of work performed to establish the emissions and fuel consumption baseline of the old vehicles and the mitigation achieved by the scrappage program.

7.14 A total of 93 tests were run, distributed amongst the three categories of vehicles and three test cycles:

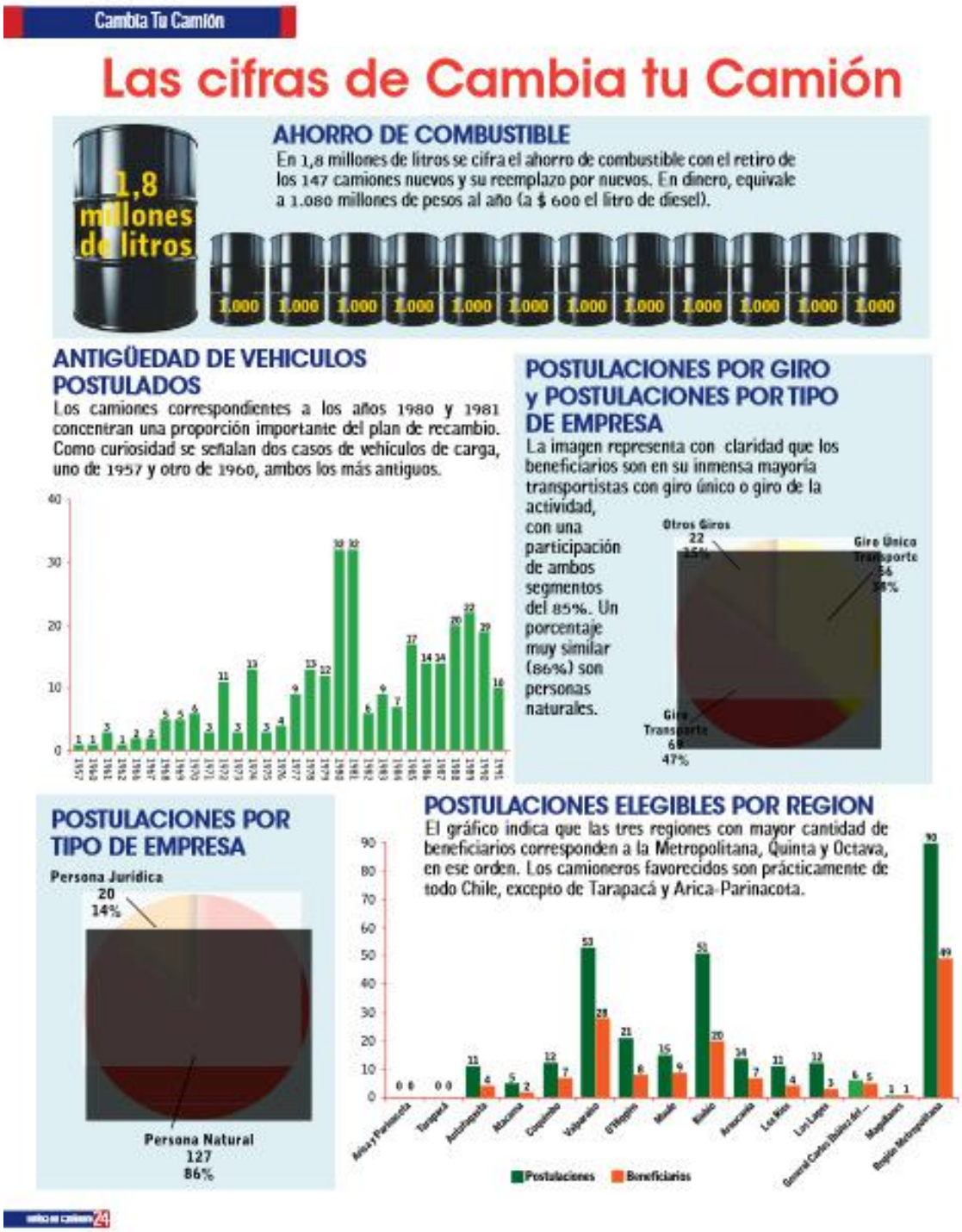
- A road-route driven by the vehicle's operator using the old (to be scrapped) vehicle.
- The same route driven by the same operator using the new replacement vehicle.
- A repeat of the previous test after having received training in Eco-driving techniques.

7.15 The results from these tests showed that on average a 19% fuel saving was achieved due to the vehicle substitution and an additional 8-12% fuel saving was shown after the Eco-driving course. It is to be expected that some of this Eco-driving benefit may be lost over time if drivers revert to their old habits.

7.16 For local criteria pollutants (CO, NOx, and PM), mitigation of between 82 – 87%[12] were achieved due to the updated vehicle technology since the new trucks were certified to EURO III standards, and the effect of the Eco-driving course was an additional 3 percent.

7.17 It is interesting to note that these vehicles are operated on average 30,800 kms/yr and that fuel costs account for 26% of their income.

Figure 7-1: Summary of Cambia tu Camion statistics



[12] The largest reduction was in the case of PM emissions.

Critical Assessment

7.18 This pilot program provides an invaluable technical assessment of the advantages that can be achieved through a vehicle scrappage program; however the re-assignation of funds due to the 2010 earthquake did not allow it to lead into a follow-up, larger program.

7.19 The administration of the pilot was complex, due to the imposed level of control – particularly of the paperwork. The program administrator (Claudio Gavilán) believes that this would also be necessary in a large scale program to avoid the operators gaming the system.

7.20 The grant amount (of about twice the value of the scrapped vehicle and one third of the new vehicle price) was considered sufficient to promote the program. However it is not known if that would be sufficient for a more extensive program. Whilst the pilot program did not include financing and loan guarantee support to small fleets and owner-operators it was felt that this would be needed to scale-up the program to a larger number of vehicles.

8 PROGRAMA DE REPOSICIÓN DE VEHÍCULOS DE CARGA DEL GOBIERNO NACIONAL (COLUMBIA SCRAPPAGE PROGRAMME)

Scheme overview

8.1 The 'Programa de Reposición de Vehículos de Carga', Columbia's 'one to one' scrappage scheme was instituted in 2004 with the objective of the renewal and replacement of the goods vehicle fleet. The idea was to have newer vehicles that would be safer, cleaner and more efficient to allow a better movement of freight in the country. At that time, the program only allowed the sale of a new vehicle when accompanied by the scrappage of one over 25 years old.

Scheme objectives

8.2 The scheme objective was to retire a total of up to 60,000 old trucks and highway tractors, reduce the age of the transport fleet and avoid an over-population of vehicles.

Challenges and observations

8.3 As the program started, old trucks began to appreciate, to have a much higher value than their true value, and at the same time the scrappage system was found to be bureaucratically onerous causing considerable delay in the purchase of new trucks. It was a complex process, particularly since the old vehicle fleet was atomized among a large number of owner-operators. To circumvent this, the government created a policy mechanism to regulate the entry of vehicles. The policy mechanism allowed the purchaser of a new vehicle to post a policy for the value of a scrapped vehicle; – the policy would be redeemed when he presented the certificate of scrappage with all papers in order.

8.4 The amount paid for the total physical scrappage of each public service vehicle and the cancellation of its registration (at current prices) is US$35,000 for Highway Tractors with three axles, US$17,500 for single axle trucks with a GVW of up to 10,500 kg and US$25,000 for Highway Tractors with two axles, and rigid trucks with three or four axles. If the vehicle owner scraps, but conserves the vehicle's registration (i.e. replaces the scrapped vehicle with a new one) the incentives are, by law, paid at 50%. However Fenalco explained that in practice there are ways round this, and most scrapped vehicles get paid at 100%.

8.5 The policy process was designed to support the process of scrapping. What was sought at that time was to give a penalty to new vehicles that entered the market if after three months they could not find a vehicle to scrap. The objective of the policy process was not to raise money. However in practice most purchasers took this as an additional tax, and did not bother to go through the process of scrapping. Instead of renovating the parc, this caused an increase in the population of trucks. The scrapping process continued, but not at the same rate as new vehicles entering the fleet.

8.6 Thus the policy process, which was created to regulate the increase in the size of the fleet, resulted in a means of raising money, into government coffers. That money went into the general budget of the nation, and like for any project the Treasury, acknowledged that the program was operating and assigned a budget item for the coming year based on historical usage. This caused a delay in the funding process with less funds being made available to support the scrappage program than those being raised via the policies.

8.7 According to data from Asecarga the scrappage policy has to date raised about US$600 million, of which US$490 million remain. This year the program has approximately US$15 million available which will fund the scrappage of around 600 or 700 trucks of the estimated 10,000 to 15,000 trucks that are over 25 years old. Since 2008 a total of 5,989 vehicles have been scrapped.

Future plans for the scheme

8.8 Currently the Ministry of Transport is looking to increase the funds assigned to the scrappage program to allow 2,600 vehicles to be processed this year. Additionally, this year there will be a transfer of US$43 million. In the years 2014, 2015 and 2016 they plan to use about US$150 million from this fund each year, which will consume all these funds in 2017.

8.9 Additionally they are looking to increase the transparency of the scrappage process, which does not have a high degree of credibility amongst the vehicle owners, and simplify the administrative process. The demand to privatize the process has not yet been accepted by the government. The vehicle distributors are demanding that new vehicle sales be freed from the additional “tax” imposed by the policy, whilst the fleet owners--who are also demanding that new vehicle sales be freed from the additional “tax”- insist that the overall size of the fleet should be fixed to regulate the increase of supply in freight services.

8.10 Other incentives are being investigated. According to the Vice-minister of Transport, Felipe Targa Rodríguez "The idea is to get an exemption for those who have not paid the unified vehicle tax for several years, for trucks over 20 or 25 years of service, to offer them an incentive to scrap and we are also studying the possibility of reducing the VAT on the sale of vehicles, provided that the purchaser demonstrates the scrappage of an old truck, which would directly incentivize the sale of new commercial vehicles".

8.11 What is clear is that Colombia needs to make its freight transport more competitive particularly in light of the Free Trade Agreement with the USA.

9 ODOE STATE ENERGY LOAN PROGRAMME (SELP)

Background

9.1 The Oregon Department of Energy was created in 1975. The agency's primary program goals include encouraging the investment in energy efficiency and renewable energy sources through loans such as the SELP program and grants.

9.2 The department also works to provide assistance to households, businesses, schools, tribes and government agencies with technical advice, information and financial incentives to use renewable energy sources.

Driving factor / Need

9.3 The driving factor of the initiative is to encourage more businesses to take up sustainable practices which conserve energy. Transport savings are encouraged through upgrading or purchasing vehicles to improve fuel efficiency and reduce CO_2 emissions. The state believed that people need support to make these changes and the provision of a low-interest loan would encourage this.

Part of wider initiative

9.4 The initiative forms part of the Oregon's Department for Energy Business Energy Incentives alongside transportation tax credits, biomass tax credits, conservation tax credits and renewable energy development grants. ODOE strategic goals are to:

- Meet a significant portion of Oregon´s incremental energy needs with conservation and renewable resources.
- Reduce carbon dioxide emissions from burning fossil fuels.
- Prepare the state and counties within 50 miles of an operating commercial nuclear power plant for nuclear emergencies.
- Reach key clean-up milestones at the Hanford Nuclear Reservation.

Policy context

9.5 The project supports national and state led clear fuel initiatives which look to advance strategies to reduce diesel emissions by working with fleet operators through the National Clean Diesel Campaign (also promoted by EPA).

Scheme Promoters/Stakeholders

Primary Promoter

9.6 Oregon Department of Energy

Other organizations involved in implementation / stakeholders

9.7 The initiative is wholly implemented by Oregon's Department of Energy.

Scheme objectives

Stated objective

9.8 The purpose of the Energy Loan Program is to promote energy conservation and renewable energy resource development. The program offers low-interest loans for projects that:

- Save energy.
- Produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat.
- Use recycled materials to create products.
- Use alternative fuels.

Target market

9.9 The Energy Loan Program can loan to individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, tribes, and non-profits. Projects must be primarily in Oregon.

Scheme timelines

Planning stages

9.10 In 1979, the legislature created the Small Scale Energy Loan Program (SELP). In 1980, voters approved an amendment to the Oregon Constitution authorizing sale of general obligation bonds to finance small scale, local energy projects. SELP made its first loan in 1981.

Implementation

9.11 The program was designed to be self-supporting. While the sale of bonds provides loan funds, borrowers pay the costs of administering the program through loan repayments. The SELP staff includes loan officers, accountants and an energy analyst.

9.12 Loan amounts range from $20,000 to $20 million for people to take advantage of. Loans above $100,000 must be presented for approval to the Loan Advisory Committee. As part of this they submit reviews of projected revenues and expenditures to the state. The projections must show the programs future capability to meet all outstanding loan payments. Approval processes can take 4-8 weeks or longer, depending on complexity of the application. Loan terms range from 5-20 years.

9.13 SELP issues three types of bonds:

- Governmental Purpose, for energy projects in publicly owned and operated facilities.
- Private Activity, for projects that use renewable resources to produce energy or for energy projects for non-profit organizations.
- Federally Taxable, for energy-saving projects in homes and businesses.

Scheme duration

9.14 The scheme has been running for 32 years, and cash flow projections from the 2010 biennial report projected SELP would have sufficient funds to meet its semi-annual bond payments and pay administrative expenses in the next five to seven years without additional infusion of cash. However, reports from the 2012 State Debt Policy Advisory Committee suggest that the default of an $18 million dollar loan mean that the project is no longer self-sustaining and will require start assistance.

Cost of project

Funding from government

9.15 Previously the scheme has been fully self-sustaining as energy bonds are sold to finance secured loans for the development of small scale projects and are then re-paid to the state. With the defaulting of loans the government will now require state funding from the treasury to make amends for the losses for up to $20 million.

9.16 For the 2009-11 biennium, SELP has authority to issue up to $250 million in general obligation bonds. As of December 31, 2010, SELP had issued $87 million and had $163 million of legislatively approved bond issuance authority remaining for the biennium ending June 30, 2011.

9.17 SELP is on schedule to issue approximately $27 million in March 2011 to fund new energy conservation and renewable energy projects[13].

9.18 SELP has made 848 loans over the years totaling $574 million. Currently, 227 loans are outstanding for $206 million[14].

9.19 A full loan breakdown can be found in the SELP Audit Report 2011[15].

Scheme effectiveness

Notable achievements

9.20 As of December 31, 2010, SELP has financed 828 projects totaling an aggregate of $540 million upon final disbursement. These projects save or produce substantial energy savings each year.

9.21 In addition to loans made, SELP has counseled many potential borrowers regarding energy project design or financing plan improvements.

9.22 Between January 1, 2009 and December 31, 2010, SELP made 33 loans totaling $96.3 million, of which $71.1 million has been disbursed.

Quantified impacts

9.23 Only the indicate costs of the project found (see section 5). No record of the CO_2 / environmental impact as a result of the loans except through case studies.

Continuation of scheme or re-launch planned

9.24 No plans to discontinue the project, committee meeting still continuing (last ones in January and March 2013) to discuss the project and the businesses who are making repayment to ensure that they stay on track.

[13] Oregon Department of Energy (2010) SELP Biennial Report 76th Legislative Assembly, available at http://www.oregon.gov/energy/docs/reports/legislature/2011/selp_biennial_report_2010.pdf

[14] State of Oregon Debt Advisory Committee (2012) Report of the State Debt Policy Advisory Committee' available at: http://www.oregon.gov/treasury/Divisions/DebtManagement/LocalGov/Pages/MDAC.aspx#reports

[15] Enterprise Fund of the State of Oregon (2012) "Department of Energy Small Scale Loan Programme for the Fiscal Years 2010 and 2011" available at: http://www.oregon.gov/energy/LOANS/docs/Audit_Report_2012-SOS.pdf

Lessons Learned

What part of the scheme/approach was particularly successful?

- The project was originally self-sustaining.
- Financed 828 projects totaling an aggregate of $540 million.
- Improvements made by local businesses to improve the energy efficiency of their operations

What part of the approach did not go to plan?

9.25 During 1981 – 2008 investment and expansion of investing in renewable energy was at a high. However, in the loan then became used by some businesses as a tool for making more speculative loans. For example "borrowers were allowed to use cash they got from the department's controversial Business Energy Tax Credit, or BETC, program to qualify for SELP loans"[16]. When combined with the recession this led to numerous businesses defaulting on their loan repayments creating problems for the state energy department for these losses.

What were the main challenges?

9.26 Although the program has historically been self-sustaining, the state will be required to commit $2 million to $5 million a year from the general fund over four years (or up to $20 million) to compensate companies defaulting on loans.

Are there areas in which the approach would be changed based on scheme experience?

9.27 As a result of the defaulting loans the department has adopted a more rigorous approach to originating loans and ensuring that they are pursued to collect full payment. The SELP loan is no longer used for construction loans of any kind. The Commission recommended that the Legislator and the Governor limit the bonding of authorizations to a minimum and provided for those with the highest priority of state capital projects. The Commission also recommended that tighter monitoring programs are introduced to ensure that future loan commitments are assured.

16 Oregon Live (2012) "Oregon taxpayers must bail out state fund that made bad loans for renewable-energy projects", available at: http://www.oregonlive.com/business/index.ssf/2012/01/oregon_taxpayers_must_bail_out.html

10 ECOMOVE

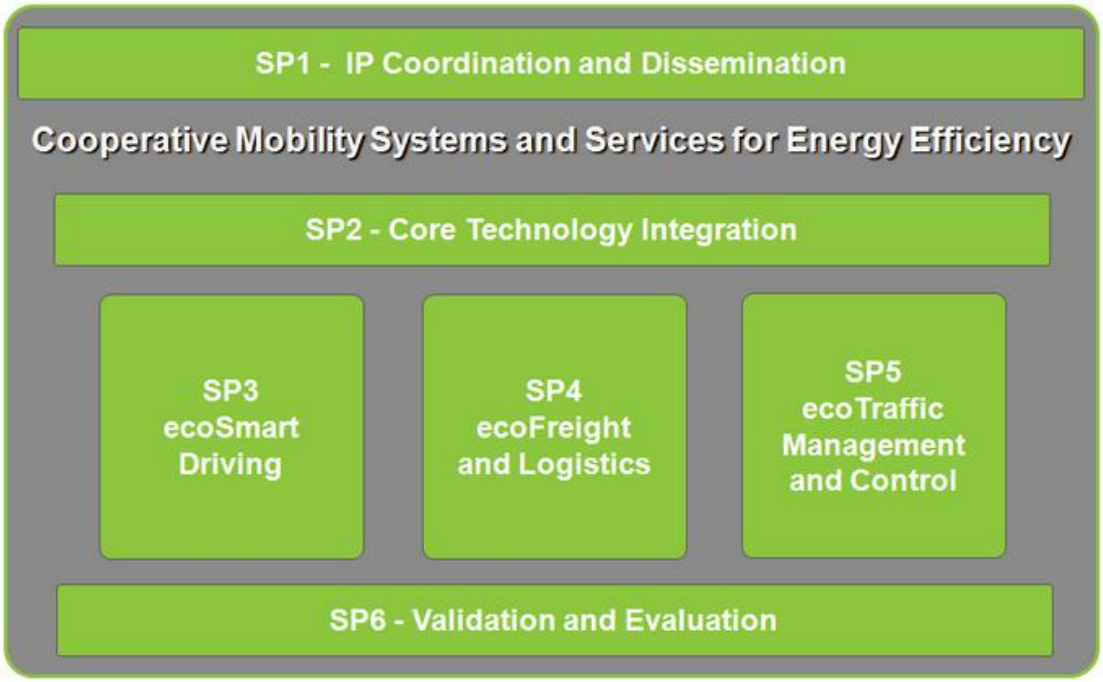
10.1 Commencing in April 2010, the eCoMove project has just reached the three year mark of its planned 36 month duration (which is being extended by 7 months).

10.2 Policy makers in Europe, Japan and the US share the conviction that the application of information and communication technology (ICT) in the field of road transport, commonly referred to as Intelligent Transport Systems (ITS) can, as part of an integrated strategy, make a significant contribution to improving energy efficiency and reducing CO_2 emissions.

The eCoMove concept is that of the "perfect eco-driver" travelling through the perfectly "eco-managed" road network, i.e. a combination of cooperative applications for ecodriving and eco-traffic management can – for any given trip by a particular driver in a particular vehicle – help to approach the theoretical least possible fuel consumption (and thus CO_2 emissions), all without compromising the quality of people's and goods mobility.

Scheme overview

10.3 Information and communication technologies (ICT), such as the applications developed in eCoMove, specifically configured to target avoidable fuel consumption have the potential to achieve a cleaner and more energy-efficient mobility of goods and people. By applying the latest vehicle-to-infrastructure and vehicle-to-vehicle communication technologies, the project will create an integrated solution comprising eco-driving support and eco-traffic management to tackle the main sources of energy waste by passenger and goods vehicles. The scheme is divided into subprojects (SP), as shown in the following program structure diagram.



10.4 Most relevant to the freight sector is Sub Project 4, the ecoFreight and Logistics sector.

Objectives of SP4

10.5 Fuel is identified by the program as one of the major costs of transport companies. Eco-driving training has shown good potential (up to 10-15% reduction in fuel consumption) but its effects tend to wear off over time when professional drivers get back to their old habits.

10.6 The objectives of the freight sub-project are to improve truck energy efficiency by introducing a learning driver coaching system and a planning & routing system that give all stakeholders the possibility and motivation to strive for optimal eco-behavior. This will be achieved with three applications:

- ecoDriver Coaching supporting the commercial vehicle drivers and fleet managers in the three following phases:
  - Pre-trip: eco driving training system with virtual simulator where the driver experiences the eCoMove system and its use cases in several driving situations.
  - On-trip: the driver receives real-time eco driving instructions on one's HMI based on the current state of the vehicle and its surrounding environment.
  - Post-trip: driving records are sent to a fleet management back office to analyze trends, give feedback to the drivers on their driving style and reward good eco-drivers with incentives.
- ecoTour Planning
  - Finding the most fuel efficient combination of vehicle, trailer, route, driver and system configuration based on mission information, traffic management data, truck and driver models and routing system.
- Truck ecoNavigation
  - Calculating the most fuel efficient route based on truck specific attributes, traffic patterns, eco maps and real-time traffic information.

Promoter, funding and Scheme partners

10.7 The eCoMove scheme is promoted and funded by the European Commission under the 7th Framework Programme of Research and Technological Development.

10.8 The total budget for the project is Euro 22.5m (USD$29m). Of this with, European Commission project funding stands at Euro 13.7m (USD$17.5m).

10.9 The project has 33 partners from 10 different countries, with the following range of stakeholders included in the consortium:

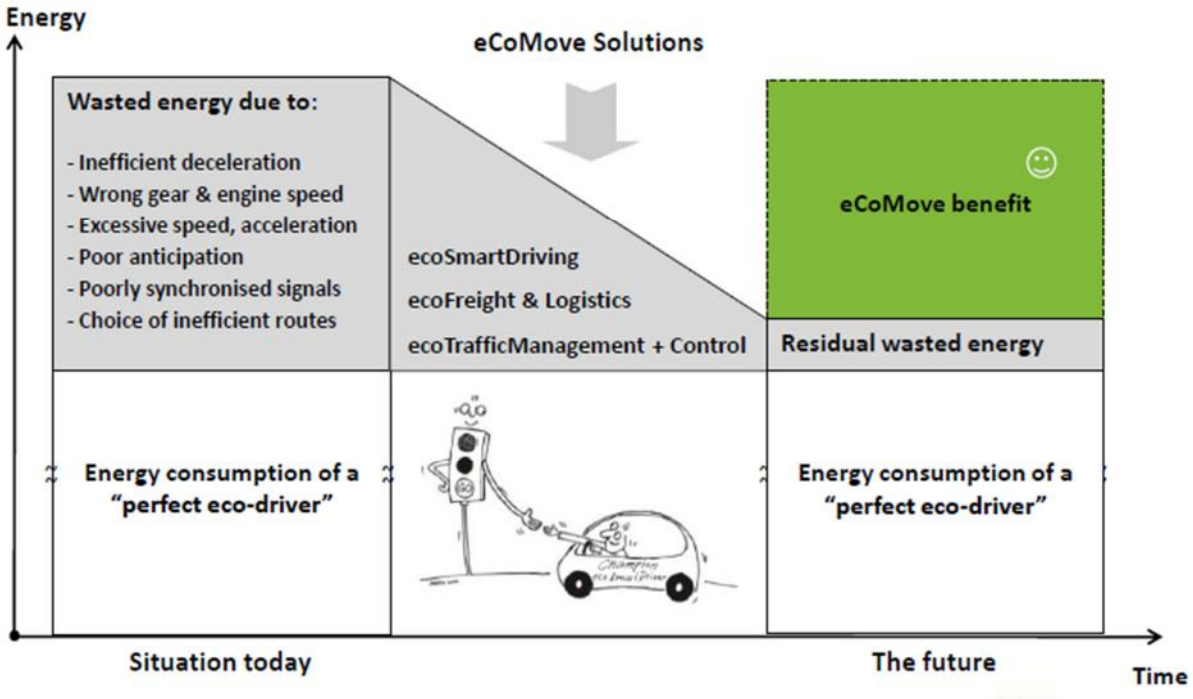
- Vehicle and supplier industry
- Map makers
- Telecoms
- Infrastructure Operators
- R&D labs and universities

Target

10.10 The eCoMove applications are intended to bring major improvements to road transport energy use by using the latest vehicle-to-infrastructure communication technologies:

- A dynamic **ecoSmartDriving "virtual coach"** that provides advice to adapt driving behavior for minimum fuel use, but also personalized recommendations based on driving record for eco-driving optimization;
- Dynamic **eco-pre-Trip Planning** and **on trip Green Routing tools** to select the lowest energy route;
- An **ecoDriver Coaching System** that combines dynamic eco-driving support with training and incentive systems for commercial vehicle drivers;
- An **ecoFleet Planning & Routing application** combining eco-driving support and logistics planning for commercial vehicles with energy-efficient traffic control measures, e.g. selective priority for trucks;
- An **ecoAdaptive Balancing & Control system** that applies local energy-optimized strategies for traffic control, e.g. traffic lights coordination based on a map of energy "hot-spots";
- **ecoMotorway Management measures** combining eco-support of individual vehicles with energy-optimized traffic management on the interurban network.

10.11 When combined, these mainly independent but interacting applications can potentially deliver up to 20% overall fuel savings and CO_2 emissions reduction. The project target is to achieve a reduction in fuel consumption and hence CO_2 emissions of 20%.



Source: ITS world Congress (2011) Presentation, Stephan Trommer

Evaluation

10.12 An important aspect of the eCoMove project is the ability to validate and evaluate the success and

Performance indicators

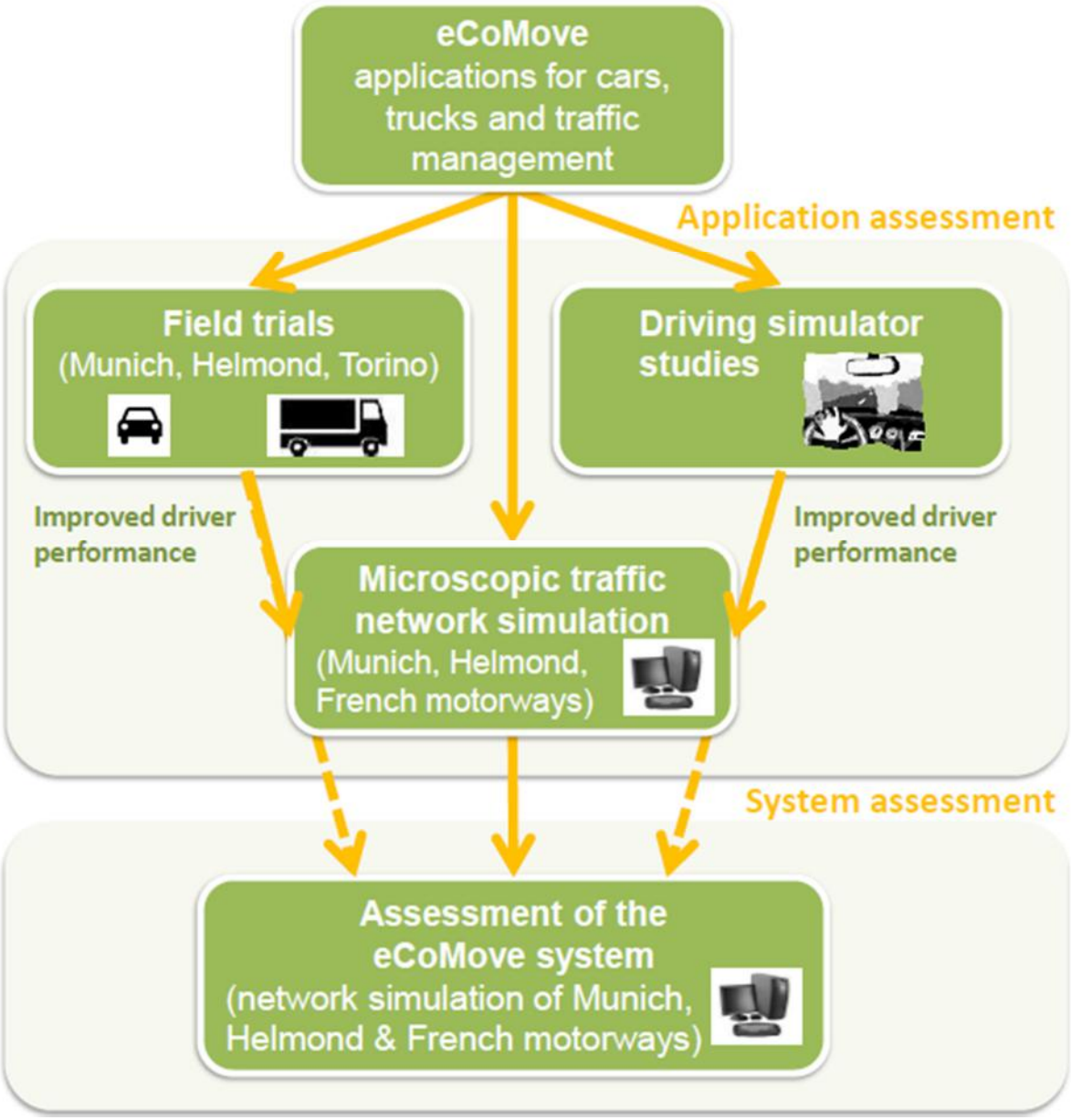
10.13 The following performance indicators have been identified for scheme evaluation:

- Environment
  - Fuel consumption, CO_2 emissions (in total, per trip or per vehicle per km or tkm), other emissions (CO, NOX).
- Mobility
  - Total/individual travel times, delays, number of stops, network speed, level of service.
- Safety
  - Times to collision, time headways, variations in speed, # hard braking events, speeding, distraction and workload.
- Compliance
  - Following advice: on vehicle condition and on strategically, tactically and operational driving.
- Driver performance
  - Gear changes, acceleration & deceleration performance, speed, idling.
- User acceptance
  - System on/off, usefulness, ease of use, satisfaction with the system.

The assessment of the scheme: Evaluation and Reporting

10.14 Trials have been underway to determine the impact which the eCoMove system has had on participants in terms of CO_2 reduction.

10.15 The assessment will be carried out using the following process:



10.16 Based on the above approach, the assessment will then be carried out at a number of levels to assess not only the impact of individual interventions but the combined effect of the implementation of the eCoMove system.

Related evidence in anticipation of eCoMove evaluation results.

10.17 With the results of the eCoMove evaluation not yet available, we reference the information which has informed the eCoMove project. Their review of evidence and research suggested that emissions savings may be of the following order:

- ecoRoute Advice
  - 4% CO_2/Fuel
- ecoGreen Wave
  - <-5% CO_2/Fuel for coordination
  - -9% CO_2/Fuel with platooning

- ecoApproach Advice
  - o -7% CO_2/Fuel
- ecoBalanced Priority
  - o -13% CO_2/Fuel priority vehicles
  - o -11% CO_2/Fuel overall
  - o -6% CO_2/Fuel FCD-network strata.
- ecoRamp Metering
  - o -14%/-3% CO_2/Fuel virtual stop line
  - o -27%/-3% CO_2/Fuel truck priority
- Eco S&H Management
  - o -3% CO_2/Fuel(EU)
- eco Tolling
- ecoDriver Coaching/Assistance
  - o -15% CO_2/Fuel
- Trip Departure Planning
  - o -2% CO_2/Fuel

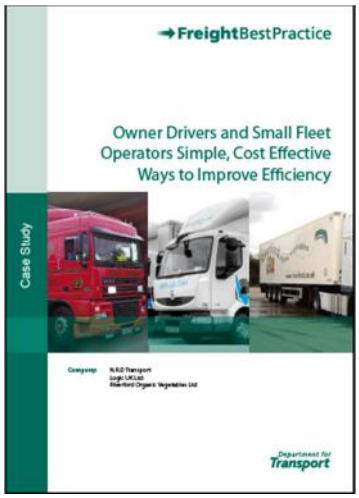
10.18 The evaluation process is due to be completed in November 2013.

11 EFFICIENT OPERATION FOR SMALL FLEETS AND OWNER DRIVERS, DFT BEST PRACTICE AND SMALL FLEET PERFORMANCE MANAGEMENT TOOL

Scheme overview

11.1 The Freight Best Practice (FBP) program commenced in 2004, as an evolution to the Transport Energy Best Practice Program.

11.2 The Program offered a suite of guidance documents for the freight industry including material specifically targeted at owner driver or small fleet owner (10 or less) on improving vehicle efficiency, reducing fuel and operating costs and reducing environmental impact of business).



11.3 The promoted measures including:

- Better driving (improved braking, acceleration, clutch control).
- Vehicle loading (maximizing loads and trips / back loading).
- Using Sat-Nav and Route Planning Systems to optimize routes and deliveries.
- Driver bonus schemes for reduction in fuel consumption and environmental impact.
- Effective cost measuring.

11.4 The full range of guidance documents were categorized under the headings of; Saving Fuel; Developing Skills; Equipment & Systems; Operational Efficiency; Performance Management and Public Sector. The individual documents are listed on the following page.

Objectives

11.5 The Freight Best Practice program was aimed at improving the operational efficiency and reducing the environmental impact of the freight industry in England. This was expected to result in reduced CO_2e emissions and contribute to reducing congestion and improving local air quality and also safety.

11.6 Transport accounts for 18-22% of the UKs CO_2e footprint and of this, goods vehicles account for around 5% of emissions.

11.7 The aim of the scheme was therefore to work with the freight industry and provide the necessary information to operators to allow them to make efficiency savings and thereby to reduce their emissions levels. Jonathan James, Director of the Freight Best Practice Programme commented in 2008 that:

> "The changing attitude in the road freight industry, combined with the obvious pressures on profitability, means that information freely available from Freight Best Practice on how to operate fleets more efficiently can only be a good thing and is highly respected by the industry", said James. "Information is power, without the right information there are often fleets that are operating in ways that could easily be improved but are not taking the opportunity to improve simply because of the lack of knowledge."

Saving Fuel

Fuel Management Guide
The definitive guide to improving the fuel performance of your fleet.

Fuel Saving Devices
This guide contains practical tips and advice on how to trial and choose fuel saving products.

Pocket Guide
Fuel Saving Tips
This handy pocket guide offers simple ways to reduce fuel consumption.

Save It! DVD
Two 25 minute programmes for truck operators and drivers – 'The Road to Fuel Efficiency' and 'Champions of Fuel', offering practical tips and advice on fuel saving and efficient driving.

Developing Skills

Drive It! DVD
A 25 minute driver focussed DVD informing and educating about operational efficiency.

Pocket Guide
Safed Driving Tips
This pocket guide provides essential safe driving tips.

SAFED for HGVs: A Guide to Safe and Fuel Efficient Driving for HGVs
This guide outlines the elements of the Safe and Fuel Efficient Driving scheme for HGVs.

SAFED for Vans: A Guide to Safe and Fuel Efficient Driving for Vans
This guide outlines the elements of the Safe and Fuel Efficient Driving scheme for vans.

Case Study **Companies and Drivers Benefit from SAFED for HGVs: A Selection of Case Studies**
Describes the experiences of those who have taken part in the SAFED scheme.

Case Study **Proactive Driver Performance Management**
Shows how Thorntons implemented an effective driver performance programme.

Equipment & Systems

Buyers' Guide to Refrigerated Transport Equipment
This guide explores the different refrigerated transport systems available.

Computerised Vehicle Routing and Scheduling for Efficient Logistics
This guide describes the different types of CVRS systems available to logistics companies.

Quick Guide to Computerised Vehicle Routing and Scheduling
This quick guide highlights the latest CVRS products and developments.

Information Technology for Efficient Road Freight Operations
Provides an overview of the available and relevant IT systems for road freight operations.

Telematics for Efficient Road Freight Operations
Provides information on the components of telematics systems and their implementation.

Aerodynamics for Efficient Road Freight Operations
This guide offers practical information on aerodynamically effective styling for trucks.

Equipment & Systems

Quick Guide to Truck Aerodynamics
An introduction to aerodynamic styling.

Truck Specification for Best Operational Efficiency
A step-by-step guide to the process of correctly specifying a 'fit for purpose' vehicle.

Case Study **Focus on Double Decks**
Shows how double deck trailers helped Focus DIY to improve operational efficiency.

Case Study **IT Systems at Marshalls Pave the Way for Operational Efficiency**
Shows how implementation of a fuel management system and modernisation of vehicles and equipment has improved operational efficiency.

Case Study **Making the Swap to Demountables**
This guide describes the benefits that can be experienced from using demountables.

Case Study **Reducing Costs and Improving Efficiency with Articulated Tippers**
This Case Study reveals the benefits enjoyed by Lafarge Aggregates and K & J Plant from changing from Rigid to Articulated Tipper vehicles.

Case Study **Save Fuel with Lower Rolling Resistance Tyres**
This case study shows how lower rolling resistance tyres can reduce fuel consumption.

Case Study **Smoothing the Flow at TNT Express and Somerfield using Truck Aerodynamic Styling**
Shows how aerodynamic solutions have saved money for TNT Express and Somerfield.

Case Study **Testing Time for Trucks**
This report describes trials that tested the effects of differing variables on fuel consumption.

Operational Efficiency

Transport Operators' Pack
This Resource pack provides practical advice and tools to enable operators to implement and run an efficient fleet.

Make Back-loading Work for You
This guide shows how back-loading can improve your fleet efficiency.

Preventative Maintenance for Efficient Road Freight Operations
Offers practical advice on how to implement an appropriate preventative maintenance plan.

Working Together to Improve Operational Efficiency of RDCs
This guide shows how RDC operators and their partners can improve operational efficiency.

Case Study **Consolidate and Save**
A case study on the Tankshare scheme showing the benefits of groupage operations.

Case Study **Expert Advice Helps Cut Fleet Costs**
Shows how Denholm Industrial Services devised a site-specific efficiency improvement plan.

Case Study **London Construction Consolidation Centre**
Describes the benefits experienced in construction through the use of the LCCC consolidation service.

Case Study **Home Delivery: Meeting the Needs of Customers and the Environment**
Describes how Royal Mail Group Plc addressed the problem of failed deliveries.

Case Study **Jaguar Sprints Forward**
Shows how Jaguar introduced a streamlined and re-engineered logistics system.

Case Study **Keeping Profit on Track with Wheel Alignment**
Shows how Kidds Transport and CRL Distribution devised wheel alignment programmes.

Case Study **Operational Efficiency Brings Savings for Yearsley**
Shows how a focus on operational efficiency has dramatically improved Yearsley's performance.

Case Study **Profit Through Partnership**
This case study highlights how partnerships can win and manage large contracts.

Case Study **Reducing the Environmental Impact of Distribution**
How Transco reduced costs, mileage and CO_2 emissions with alternative fuels, stepframe trailers and improved vehicle routing.

Case Study **Road to Rail: Open Access Intermodal Gateway to the UK**
Shows how TDG European Chemicals use a road to rail service for its BP contract.

Performance Management

Fleet Performance Management Tool incorporating CO_2 Calculator
Helps fleet operators improve their operational efficiency through using KPIs and recording performance.

Introduction to Job Costing for Freight Operators
Helps to understand the true cost of your operation down to individual vehicles in the fleet.

In Fleet Trials of Fuel Saving Interventions for Trucks
Shows how to establish the potential performance of fuel saving devices in your fleet.

Key Performance Indicators for the Next Day Parcel Delivery Sector
Highlights the relevant KPIs for the next-day parcel delivery sector.

Key Performance Indicators for Non-Food Distribution
Measurement of KPIs and analysis of benchmarking in this sector.

Key Performance Indicators for the Food Supply Chain
Measurement of KPIs and analysis of benchmarking in this sector.

Key Performance Indicators for the Pallet Sector
This guide helps pallet networks identify real opportunities to maximise transport efficiency.

Key Performance Indicators for the Builders' Merchants Sector
KPI survey and results identifying potential efficiency improvements for this sector.

Performance Management for Efficient Road Freight Operations
Explains the process of measuring performance to maximise operational efficiency.

Case Study **Small Fleet Performance Management Tool Helps A1 Paper Improve Efficiency**
Shows how A1 Paper made good use of the small fleet performance management tool.

Public Sector

Efficient Public Sector Fleet Operations
Helps fleet managers in the public sector to improve operational fleet efficiency.

Freight Quality Partnerships Case Studies
Provides examples of existing Freight Quality Partnerships (FQPs).

Freight Quality Partnership Guide
Provides guidance on how to set up and run an effective Freight Quality Partnership (FQP).

Local Authority Freight Management Guide
Helps to produce deliverable freight strategies and action plans for local authorities.

Planning for Freight on Inland Waterways
This guide provides practical advice and examples of how good planning can help support and encourage the use of waterways for freight transportation.

Source: Suite of Freight Best Practice Guidance Documents http://www.freightbestpractice.org.uk/

Scheme duration

11.8 The funding for FBP was withdrawn as a result of the Comprehensive Spending Review in 2010 and the scheme ceased along with associated schemes such as the Freight Facilities Grant which encouraged modal shift from road to rail or water. It is understood that the withdrawal of the scheme was mainly due to political changes on the change of Government and not necessarily a reflection of the success or otherwise of the scheme. The program continues to receive funding from the Welsh Government, but this is now limited to maintaining the website (http://freightbestpractice.org.uk) where the information is available and providing literature, pocket guides and the CD based tools free of charge to the Welsh freight industry.

Scheme Evaluation

11.9 In an independent impact assessment commissioned by the Department for Transport in 2007, the Freight Best Practice program was found to be directly responsible for achieving the following:

- Helping transport operators using the guidance to save an average £20,500 (USD$32k) per year.
- This represented an overall industry saving of £83m (US$132M) over the two year period 2005 to 2007.
- Circa 240,000 tons of CO_2 have been saved over this period.

11.10 Based on the cost of the scheme, it was estimated that the **cost per ton of CO_2 saved was £8** (USD$12), or £30 per ton of CO_2e. The £2m (USD$3m) cost of the scheme was found to be far outweighed by the cost savings attributed to the scheme of £83m (USD$125m). [18]

11.11 Overall 24% of fleets are aware of FBP in 2007, compared to 13% in 2003. Of those aware of FBP, 36% had gone on to use at least one aspect of the program (9% of all fleets, compared to 5% in 2003). The following table summarizes key factors associated with awareness and use.

Table 11-1: Awareness and use of DfT Freight Best Practice Program amongst operators (2007)

		Aware	Use
Size	Single vehicle	20%	6%
	2-14 vehicles	24%	9%
	15+ vehicles	49%	24%
Job role	Transport manager	37%	13%
	Non-transport manager	22%	8%

[18] Lawson, Michealis & Waldron, 2007, Freight Best Practice Programme Impact Assessment: Final Report, Data build, London

Improvements to the scheme

11.12 The 2007 evaluation report made certain recommendations following the findings and analysis of the 1200+ telephone interviews with both user and non-user operators.

11.13 Noting that overall 9% of fleets are using FBP, with a further 15% aware of it but not using it, there was more which could be done to increase usage. Analysis showed that half of large fleets were aware of FBP and half of these were using it. Whilst much lower proportion of medium and small size fleets were aware of FBP let alone using it. It was recommended that the program think about the type of organization it should target to:

- Continue increasing awareness of FBP among large fleets.
- Increase the conversion rate from awareness to use.
- Increase awareness and use among smaller fleets.
- Target transport managers.
- Increase use and awareness amongst own account operators.

11.14 It was recommended that the program focus on the opportunities which it can make the most difference, with the most fertile potential areas identified as:

- Continue increasing awareness of FBP amongst large fleets – the conversion rate from awareness to use is much higher among large fleets than other size fleets. Therefore, the more fleets that are aware of the program, the more users there will be. The larger fleets have the ability to save a greater amount of fuel per fleet than smaller fleets. The program therefore could target a small number of fleets that can achieve a higher proportion of savings.
- Increase the conversion rate from awareness to use – there was found to be a fairly high proportion of fleets that were aware of FBP but not using it. The challenge with these is to show them the benefits they would get from using FBP; this would include making sure that fleets see the relevance of the program to their business and that they can see examples of how other fleets have benefited from the program. This was considered to be particularly important among the 25% of large fleets that are aware of, but not using, FBP.
- Target transport managers – transport managers within fleets are much more likely to use FBP and to take action than non-specialists. It was therefore considered to be a priority for FBP to target these before other managers.

In terms of relevance to this study, it is notable that the pursuit of increased awareness amongst smaller operators is not one of the recommendations, with the authors seeing evidence of the low take-up amongst the smaller fleets.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 This report has set out and reviewed the range of different approaches and interventions adopted internationally and presented a more in-depth analysis of selected case studies of interest in the Mexico context, with further research into the nature and operational detail of each scheme, the evaluation material available and feedback and insight from scheme promoters where possible.

The Selected Case Studies

12.2 The selected case studies represented a range of different types of intervention, and between them covered the three main ways of reducing freight emissions; namely:

- Reducing vehicle energy intensity per ton transported.
- Reducing fleet mileage per ton.
- Driver training and management.

12.3 The means of targeting efficiency improvement varied, and certain schemes incorporated a number of different elements to achieve this objective. The table below summarizes the main approaches adopted by each scheme, and the emissions reduction methods promoted.

Table 12-1: Key Features and Emissions Reduction Approach of the Selected Case Studies

	Main form of Intervention			Reducing Vehicle Energy Intensity			Reducing Fleet Mileage per tonne		Driver Training & Management	
Case Study	Vehicle Financing Grants/Loans	Best Practice Guidance	Legislative Measures	Fleet modernisation	Aerodynamics	Alternative Fuels	GPS Systems	Logistics Planning	Eco-driving	Other monitoring
Efficient Operations for Small Fleets and Owner Drivers, DFT Best Practice										
Small Fleet Performance Management Tool										
Carl Moyer on-road heavy-duty vehicle Voucher Incentive Program (California)										
Providing Loan Assistance for California Equipment (PLACE)										
SmartWay Transport Partnership										
eCoMove, EU										
ODoE State Energy Loan Program (SELP)										
Cambia tu Camión, Freight Vehicle Scrappage Scheme, Chile										

12.4 A summary table highlighting the key information and indicators relating to each of the schemes is shown in the table below.

Table 12-2: Summary of Case Study Characteristics and Performance Indicators

Scheme	Intervention approach	Promoter	Scheme cost	Emissions reduction achieved	status
Carl Moyer Proposition 1B Voucher Incentive Program (VIP)	Grant/subsidy for investment in low-carbon vehicle technologies	California Air Resources Board and the South Coast Air Quality District (SCAQMD)	Carl Moyer $26.6m available for 2012/13, total of 4-5 billion between 1998 and 2023	The clean-up of 8,000 to date is estimated to have achieved reductions of 7,000t/NOx per annum and 125t PM per annum	Ongoing
SmartWay Transport Partnership	Public-private partnership, with various strands of intervention including funding of low-carbon technology, R&D, international best practice guidance	US Environmental Protection Agency, Freight industry, Dealers, Shippers	EPA 2012 budget for SmartWay totaled $2.7m, $16.9 million received in Diesel Emission Reduction Act (DERA) funds for FY 2008 through FY 2010, also received $30 million in American Reinvestment and Recovery Act of 2009 funds	Since 2004 conception 23,600,000 tons CO2 reductions, 478,000 tons NOx reductions, 22,000 tons PM reductions, $6.5 billion dollars in fuel costs saved	Ongoing
Cambia tu Camion	Vehicle scrappage scheme	Ministry of Energy, Chamber of Commerce and industry		1.8m liters of fuel saved Estimated 754t CO_2/yr.	Pilot scheme completed
Columbia Scrappage Program	Vehicle scrappage scheme	Ministry of Transport	$600m in funds, of which $490m remain after 5 years of program. $15m allocated this year for scrappage of 600-700 vehicles. Looking to add additional $43m to achieve target of 2600 vehicles scrapped this year. Plan to disburse $150m per year for 2014, 2015, 2016 to deplete budget.		Ongoing
Oregon State Energy Loan Program (SELP)	Preferential financing loans for clean technology investment	Oregon Department of Energy	848 loans made since inception totaling $574m, authority to issue up to $250m between 2009-11, scheme historically self-financing (private investment with state guarantee), but currently state required to commit $2m-$5m per annum to cover default		Ongoing
eCoMove	Intelligent Transport Systems research, promotion of eco-driving	European Commission	Total budget for 3 year program is $29m	Results of trail awaited but target of 20% emissions savings of participating fleets	Project approaching completion (Dec 2013)
UK Department for Transport Best Practice Guidance and Management Toolkits	Best practice guidance for eco-driving and fleet management	Department for Transport	Cost of program from 2004 to 2007 was $3m	2007 evaluation estimated 240,000 tons of CO2 saved since 2004, equating to $12 per ton CO_2 Cost savings attributed to scheme estimated at $125m	Scheme discontinued due to budget cuts

12.5 This chapter reviews the main points arising from the selected case studies in terms of factors for success and the insight provided by scheme promoters in terms of ways they may do things differently.

12.6 Firstly, we consider the factors which were identified by the promoters or evaluation material to be critical to the success or otherwise of the schemes.

Implementation of Incentive programs

12.7 The California Schemes, ODoE scheme and the Chilean Freight vehicle scrappage scheme all feature financial incentives which assist operators in the move to a more efficient vehicle fleet. The SmartWay Transport Partnership also features a finance program which offers grants to assist operators in investment in fuel-saving equipment.

12.8 We can identify the following key factors in the effectiveness and ultimate success of the schemes:

- Level of the financial incentive in comparison to the cost of the required operator investment.
- Conditions related to the incentive i.e. loan terms, other contractual agreements.

12.9 The feedback from the scheme promoters suggested that following:

- The grant amount must clearly be in excess of the value of the scrapped vehicle for any participation to be expected.
- The tipping point for effective scheme uptake came when the grant covered about 70% of the cost of a new replacement vehicle.

12.10 From the schemes adopting financial incentives as the mechanism for encouraging investment, the following points can also be drawn from the way in which these schemes have been effectively implemented:

- Different levels of incentives can be offered which relate to the level of commitment which the operator is willing to give to the emission reduction scheme, and the conditions which will be met. This may for example relate to the type of low emissions vehicle which will be purchased e.g. higher grants for LNG or full electric vehicles, or to contractual agreement to operate on a particular route or in a certain area for a set period of time.

The 'carrot and stick'

12.11 A main theme emerging from research into the effectiveness of incentive programs is the way that the incentives offered by the scheme work in combination with pressure placed on operators to move to more efficient operating practices. The incentive provides the **'carrot'** to encourage investment, but the effectiveness and impact of the incentive is often supported by a **'stick'** in the form of punishment for operators who do not choose to increase their operating efficiency.

12.12 The following can be identified as means of applying the 'stick' to provide penalties to operators for not adopting more sustainable practices.

Regulation

12.13 Vehicle usage regulations are a particularly effective tool in ensuring the move towards more efficient vehicles. The State of California implemented stricter vehicle regulations than those in effect in other states, on the basis that local air pollution levels were reaching unacceptably high levels.

12.14 Vehicle usage regulations can take the form of age based restrictions or engine technology compliance with emissions standards.

Contractual

12.15 Another form of 'stick' may come in the form of exclusion from tendering opportunities for operators who do not meet certain fleet of operating standards. Encouraging major procurers of fleet services (e.g. ports, large retailers, public agencies) to place pressure on operators through the tendering process can be an effective in sharing the 'heat' which may be experienced by legislators when trying to bring in stricter vehicle regulatory standards.

Scale of potential efficiency improvements and GHG emissions savings

12.16 Further evaluation material reviewed as part of the case study evaluation has provided some data on the scale of efficiency improvements possible, and the carbon savings which may be achievable. Cost savings for operators should also not be overlooked as demonstrable efficiency savings to fleets provides a strong and effective commercial message to encourage scheme uptake.

- The impact of the DfT Freight Best Practice guidance was estimated to save users £20,500 (USD$32k) per year
- The cost per ton of CO_2 saved was estimated to be in the order of £8 or US$12 (2007)
- SmartWay estimates that fuel efficiency savings achievable by applying the system can be in the order of 30% or more, which can be relayed directly to GHG emissions savings.

12.17 In addition to the efficiency and GHG savings, the potential impact on local air pollution of an upgraded fleet can see very significant results, particularly in high pollution areas and where fleet technology is low. The difference in emissions of local air pollutants with advances in technology is many times greater than that of carbon emission savings.

Potential Funding sources

12.18 Government funding has provided the main source of investment into the schemes reviewed. However, potential additional funding sources have also been identified through the analysis. These include:

- Vehicle surcharge on annual registration fees, fuel taxes or highway tolls to fund the implementation of emissions reduction programs.
- Attracting private investment to support the financing of vehicle upgrade or replacement loans is possible, particularly where government bonds or guarantees are used to underwrite an element of default risk. An example is the ODoE scheme which was at one point totally self-funding though the issue of energy bonds to private investors.

Dissemination of information

12.19 From discussions with the scheme promoters and review of the evaluation documentation, the following points can be raised:

The awareness of the California programs was effectively raised through engagement with, and promotion through the freight vehicle dealers. These dealers provided the means of contact and dissemination to freight operators

Engaging with the small fleet sector

12.20 The difficulty of engaging with the small fleet sector is a common theme experienced within the various schemes.

12.21 In some cases, the scheme objectives took precedence over the desire for inclusivity of all sectors. Therefore, whilst incentives were open to all, the small fleet sector was given no specific preferential treatment, with the market mechanisms leading to an increase in market share for the larger operators who were better placed to make the required efficiency improvements.

12.22 This was equally applicable to the dissemination of best practice guidance, in which the lower level of awareness amongst smaller operators was not met with an increased focus on getting the message to this sub-sector, but rather to focus on the larger operators and fleet-managers on the basis these represented more fertile areas for achieving successful increase in scheme take-up.

Applicability of the case studies within the Mexican context

12.23 The different case studies have brought a range of different approaches and experiences which can be learned from in the development of a NAMA applicable to Mexico, and to the small-fleet sector. We would highlight the following particular points of note from each scheme, and how they might be applied in the Mexican context:

California Air Quality Standards Attainment Program

12.24 The first point to note about California's various incentive programs is that they have been driven by, and justified on the basis of improving local air quality rather than reducing greenhouse gas emissions. Identifying and demonstrating the benefits to a local population can facilitate the gaining of support for a scheme or change of policy, and provide incentive to politicians/policy makers to implement the proposals. In the Mexican context, the awareness of air quality issues and the efforts which have been made to improve air quality in cities suggest that measures which have beneficial impacts in this area will be well received. Whilst the focus of the NAMAs are not necessarily directly related to local air quality, quantification and costing of the potential benefits can only enhance the value of the proposed schemes.

12.25 Given the makeup and characteristics of the smaller operator fleet, the scale of reduction in local air pollutants from non-Euro or Euro I/II vehicles to Euro III/IV vehicles would be very significant, and indeed much greater in relative terms than the potential reduction in GHG emissions,

12.26 The second interesting aspect of the California program was the scale of different incentives available under different schemes, and how these incentives were tied to

increasingly stringent conditions. The highest incentives were achievable by committing to investment in the cleanest of technology and contractual conditions relating to continued operation of the vehicle within the area. However, the variety of options increased the opportunity different market participants to access a scheme which was appropriate and relevant to their business. The conclusions which may be drawn from this are that a 'one-size-fits-all' scheme, for example a scrappage scheme, may not be best placed to encourage participation from across the freight sector, but that offering alternative schemes designed to appeal to freight operators of differing business characteristics may prove more successful in increasing market participation.

12.27 Finally, the use of regulation as a 'stick' to push operators into upgrading their vehicles can be effectively used in parallel to incentive schemes, although legal implications of such regulation must be established.

SmartWay

12.28 Although the upgrade to a SmartWay certified vehicle is only possible on a 2007 an onwards vehicle, the retrofitting of SmartWay approved vehicle technologies is possible on older vehicles. Aerodynamic measures such as mirrors and side skirts can be fitted to vehicles and trailers whilst the fitting of low-rolling resistance tires is possible on any vehicle.

12.29 Other limitations on vehicle upgrade need to be recognized, such as the prevention of upgrade to Euro 5 and 6 vehicles due to the lack of availability of low-sulfur diesel.

Scrappage Schemes (Cambia tu Camion & Columbia Scrappage Scheme)

12.30 Mexico already has experience of the implementation of a scrappage scheme. However, the experiences of the schemes in Chile and Columbia are valuable in terms of identifying the factors critical to scheme success. The scale of the incentive is clearly very important in encouraging scheme take-up. The scrappage payment must exceed the market value of the old vehicle. The Chilean scheme promoter believed that the scale of payment adopted there, amounting to around a third of the purchase cost of the new vehicle, was of the right order. However, to encourage greater take-up by smaller fleet owners, greater facilitation of credit to these operators would be required.

12.31 Other challenges to delivering an effective scrappage scheme were at the administrative level, ensuring vehicles were eligible and avoiding abuse of the scheme.

Oregon State Energy Loan Programme (SELP)

12.32 The key point demonstrated by the SELP scheme was the ability to assist those wishing to invest in cleaner technology with access to finance at preferential terms, and at low overall cost for the scheme. This was achieved by offering state guarantees on loans, which allowed the private sector to offer funds at lower than commercial rates. The costs to the scheme are only in meeting the guarantees in case of borrower default, which was minimal until the financial crisis.

12.33 In the small fleet freight sector, access to finance is a significant factor in excluding market participants from incentive schemes. Measures which increase access to finance or improve the terms of loans may offer significant improvement in incentive scheme uptake.

eCoMove

12.34 The use of technology presents an opportunity for all operators. However, there would be likely to be training requirements involved in equipping small fleet operators with the ability to make best use of technological solutions. The best methods to encourage the uptake of training or the dissemination of information material may lie in less conventional methods. For example, the use of social media or incentivized training programs was discussed at the workshops to attract interest and raising awareness among the target audience.

12.35 Route planning for freight operators would need to recognize the restrictions placed on routing options and time restrictions. These limitations also reduce the route options available to freight, which make avoiding traffic more challenging.

DfT Best Practice Guidance

12.36 The important findings from the study are that effective dissemination requires careful identification of the person best placed to make use of the information.

12.37 The incentive for drivers to take training need to be identified and marketed. This may be through further certification, demonstrating higher training standards and a sense of value assigned to the 'advanced driver' qualification.

Important considerations in NAMA development

12.38 An effective NAMA must meet twin objectives in providing value for the operator and the goals of the promoter. Therefore, the obvious starting point in NAMA design must be to identify the goals of the promoter and to have a strong understanding of how any proposed intervention may be of value to the target audience.

Identification of value for operators

12.39 From the operator perspective, we can identify the following motivating factors which may provide opportunity for developing a scheme which offers value to the operator:

- Commercial performance, i.e. profit, which is driven by
  - Revenue.
  - Costs.
- Ease and efficiency of doing business (i.e. minimizing the stress and work required to deliver the service offered).
- Respect and recognition for the service provided.

12.40 The above motivating factors may be considered as relatively straightforward. However, it is important to recognize that different types of operator face differing conditions and have differing challenges in relation to the above. Small fleet and owner-operators are faced with different relative costs and have different operational challenges to those of large fleet operators. Hence, to design a scheme which is to appeal to smaller operators, these differences need to be reflected in the scheme design.

Revenues

12.41 The haulage undertaken by the smaller operators are typically the more informal 'ad hoc' deliveries rather than larger, regular contracts. This offers challenges and opportunities. Achieving certain standards in terms of vehicle technology or eco-efficiency as under the

certified SmartWay program is likely to be of less value in terms of recognition to the clients who make up the informal commissions, and hence achieving certification is consequently of less value to the operator.

12.42 However, a scheme which enables the smaller operator some means of competing and tendering for the larger, more regular commissions would allow an opening of new tendering opportunities and the potential for more lucrative stable contracts.

Costs

12.43 The operating costs faced by smaller operators, whilst including similar elements such as fuel, tires and maintenance, will differ in terms of relativity. This is important to understand when considering the potential benefits of a scheme which aims to reduce the cost of operations.

12.44 Smaller operators typically serve the market for shorter haul trips, with evidence that the older fleet utilized by the smaller operators exhibiting much lower annual mileage than that of the newer vehicles of the larger operators. As such, the impact of more efficient vehicles in terms of fuel cost savings is much lower for the smaller operator than for the larger fleets in intensive usage on the long haul routes.

Given a fixed price of investment in new vehicles, the scheme will be of more benefit to those serving longer routes.

Respect and recognition for services provided

12.45 The motivation to earn recognition should be recognized as a potential source of value, and not overlooked in the development of a scheme. Large firms are motivated to meet and exceed environmental efficiency standards, which can be used as a marketing advantage. Smaller operators are unlikely to achieve the same benefits at a corporate level. However, given the pivotal role that individuals play in the small fleets and as owner-drivers, respect and recognition for the individual is likely to be a more fruitful area of focus.

12.46 Training programs which are able to offer certification for drivers and for other personnel engaged in small fleet operations, can give the opportunity for a respected achievement for those who participate. At an individual level, this may offer improved employment opportunities and a ‘badge of honor’ in addition to the improved performance and efficiency enjoyed by the business.

Promoter goals

12.47 The goals of the NAMA are well defined in terms of objectives and the target participants. However, the following should be kept in mind in developing a scheme:

- The scheme should focus on long run behavioral change or market transformation to ensure that objectives are not derailed by transient market conditions.
- Targets should be set which are well defined and measureable.

Opportunities for New NAMAs

12.48 This final section draws on the lessons taken from the case studies and on the analysis and issues presented above to identify areas of opportunity which a future NAMA may focus on to, or which may be included within existing schemes to effectively target smaller fleet operators.

12.49 The proposals are focused on providing a scheme which is of value to smaller fleet operators in particular, and cover the following areas:

- SmartWay type vehicle efficiency improvements and certification.
- Scrappage scheme.
- Professionalization of operations.
- Training and best practice.
- Regulation.

Scrappage Scheme

12.50 Smaller operators have less incentive to invest in brand new vehicles due to the cost compared to the potential cost savings that such a vehicle can offer. Programs which encouraged the replacement of old vehicles with *newer* vehicles would provide efficiency benefits, but with lower investment costs for the operator and potentially lower scrappage scheme costs for the promoter. Carbon emission reductions would still be achievable jump in vehicle technology from the old fleets to the newer vehicles, whilst local air pollutant reductions achievable by moving to a Euro standard vehicle could be very significant.

12.51 Consider a scheme in which operators of the oldest vehicles, for example trucks over 20 years old, were able to receive scrappage grants for these vehicles for the purchase of a newer truck of say 8 years or younger.

12.52 The tables below set out the cost and technical data for the vehicles of different ages, for 2 axle trucks and for highway tractors.

Table 12-3: Vehicle characteristics, 3 Axle Truck

	20 year + truck*	5-8 year truck (Euro 2)^	New (Euro 4)"
Market value	140,000 pesos	255,500 pesos	1,070,000 pesos
Fuel consumption	238g/km	193g/km	188g/km
CO_2 emissions	746g/km	606g/km	591g/km
NOx emissions	11.1g/km	7.0g/km	3.3g/km

* 1993 Kenworth Volteo (Cummins motor) 3 axle, 20 tons

^ 2005 International Chassis-Cabina (Navistar motor)

" Kenworth 3 axle

Table 12-4: Vehicle characteristics, Highway Tractor

	20 year + Highway Tractor*	5-8 year tractor (Euro 2)^	New highway tractor (Euro 4)
Market value	235,000 pesos	445,000 pesos	1,470,000 pesos
Fuel consumption/km	224g/km	184g/km	187g/km
CO_2 emissions/km	703g/km	578g/km	557g/km
NOx emissions/km	10.5g/km	6.6g/km	3.2g/km

* 1993 Kenworth T800

^ 2005 Kenworth T800

“ Kenworth highway tractor

12.53 The current Mexican scrappage program operates based on the following incentives:

- 15% of the value of the new unit:
  - Up to a maximum of MN$69,000 (+16% VAT) for a 2 axle truck.
  - Up to a maximum of MN$103,000 (+16% VAT) for a 3 axle truck.
  - Up to a maximum of MN$161,000 (+16% VAT) for a Highway Tractor.

Table 12-5: ‘Nearly new’ scrappage scheme worked example

Vehicle	Value (pesos)	New vehicle cost (pesos)	Scrappage allowance (pesos)	Cost of change (pesos)
3-axle truck	140,000	1,070,000 (new)	119,480 (15%)	950,520
	140,000	255,500 (8yr)	38,325 (15%)	217,175
	140,000	255,500 (8yr)	119,480 (max allowance)	136,020
	140,000	255,500 (8yr)	Double the commercial value of the scrapped vehicle	Zero
Highway tractor	235,000	1,470,000 (new)	186,760 (15%)	1,283,240
	235,000	445,000 (8yr)	66,750 (15%)	378,250
	235,000	445,000 (8yr)	186,760 (max allowance)	258,240
	235,000	445,000 (8yr)	Double the commercial value of the scrapped vehicle	Zero

12.54 For an operator with a 20 year old 3-axle truck worth approximately 140,000 pesos, scrapping the vehicle to purchase a new 3-axle truck would cost 950,000 pesos after the scrappage allowance. If the same scrappage terms (15%) applied to the purchase of used vehicles meeting certain standards, the operator could purchase an 8 year old Euro 2 truck at a cost of 217,000 pesos after scrappage allowance. If the highest value of scrappage allowance (103k+vat) was offered, the cost to upgrade would fall to 136,000 pesos, with the scrappage amounting to 47% of the 8 year old vehicle cost. It is important to highlight that in all cases, the scrapage payment is less than the market value of the old truck unless this is in sub-normally bad conditions.

12.55 A similar story emerges for the highway tractors, with the cost of replacing a 20 year old vehicle with a newer vehicle falling to 258,000 pesos assuming the maximum scrappage allowance (161k+ vat, or 42% of the 8 year old tractor) compared to an investment of 1,283,000 for a new vehicle after scrappage allowance. In this case as well, the scrapage payment is less than the market value of the old truck unless this is in sub-normally bad conditions, so the option is probably not attractive to the vehicles owner.

12.56 If, on the other hand the payment for scrapage were double the commercial value of the old vehicle, the owner could update to an 8 year old truck almost cost-free.

12.57 Taking the scrappage example one stage further, the potential impact of the 'nearly new' scrappage program in terms of emissions savings to expenditure can be estimated. The following table presents the cost and estimated carbon emissions saving for every 100 vehicles scrapped, assuming that scrappage allowance is double the commercial value of the old vehicle.

Table 12-6: 'Nearly new' scrappage scheme cost and potential impact

Vehicle	3-axle truck	Highway tractor
Scrappage cost (per 100 vehicles)	23.9m pesos ($1.8 M)	37.36m pesos ($2.8 M)
Annual CO_2 emissions saving*	420 tons CO_2	375 tons CO_2

* assuming 30,000km/annum

12.58 The scale of the estimated CO_2 savings is higher than those estimated for Cambia tu Camion which are in the region of 750t CO_2 per year following the scrapping of600-700 vehicles.

Vehicle efficiency Improvements

12.59 The scale of cost savings which the smaller operator could benefit from as a result of investing in vehicle efficiency enhancements are likely to be lower than that of the longer haul operators. Therefore, the incentive to take part in a certification scheme which requires significant investment in these technologies will not appeal as much to our target market.

12.60 The investment in SmartWay type certified vehicle improvements could lead to specific benefits for the complying operators. For example:

- Reduction in highway tolls for certified vehicles.
- The ability to tender for particular public service contracts.
- The easing of vehicle restrictions on certain routes or at certain times for compliant vehicles.

12.61 In order to achieve this, there would need to be a certifying body with the ability to give certification, either to SmartWay standards or to standards set for Mexico.

12.62 The value of this in relation to smaller operators would depend on the potential ability of owner-drivers to retrofit or upgrade their fleet to achieve certification and also the value which they would then derive from the benefits – for example, what proportion of a smaller fleet's run kms are on toll ways? Hence, a focus on benefits which are likely to be enjoyed by smaller operators to a similar degree or greater than larger operators should be the focus of the policy.

Organization and professionalization of smaller operators

12.63 A case study identified in the original long list of schemes highlighted the potential of smaller operators teaming up for mutual benefit This was presented as a case study of two UK operators forming an alliance in order to tender for larger contracts than they otherwise could service, and to benefit from the economies of scale that larger operators enjoy including more efficient fleet usage, reduced empty running and greater opportunity for winning contracts.

12.64 There is potential for a scheme which encourages the professionalization of the smaller operators. Incentivisation might commonly be achieved through tax breaks, but it is not clear that this would be effective in the smaller fleet operating environment. Instead, there may be the opportunity for improved access to credit in the form of preferential loans, or access to particular contracts upon meeting the required criteria.

12.65 For example this may be through the formation of small companies who could then operate routes for larger retailers of companies such as Chrysler, as in US where they use smaller minority owned operators as part of corporate social responsibility.

Driver training and certification

12.66 The existing HGV driver training programmes are poorly funded and of low capacity. A strong focus on improving driver training, with certification extending beyond simply receiving a driving permit, has the potential to lead to significant improvements in driving efficiency, with further safety benefits also achieved.

12.67 However, to encourage drivers to take advanced training, there needs to be an incentive. Again, the motivating factors for smaller operators needs to be carefully considered to design a scheme which will effectively capture the target market. Financial incentives to take training courses may be one means of encouraging existing HGV drivers to take the time to participate in further training.

Regulation

12.68 New vehicle regulations such as minimum emissions standards will have little impact on the older fleets of the smaller operators other than by 'trickle-down' over time. However,

wider roadworthiness testing and safety regulations can be adopted to remove the most polluting vehicles from the fleet.

12.69 Testing centers which are equipped to test dynamic emissions levels could provide the mechanism to identify and regulate the worst offenders.

12.70 Regulatory measures should be seen as one element of the 'carrot and stick' approach, to encourage investment in less polluting technologies through incentives and assistance to those who are willing to participate, with the backdrop of tightening vehicle regulations which will make updating of the vehicle fleet a requirement in the longer term.

Monitoring and evaluation

12.71 Management and monitoring tools which are designed to assist smaller operators with their day-to-day operations can offer both cost reduction and reduce the burden of operations. The challenge of keeping on top of performance monitoring is enhanced for smaller entities, particularly for owner-drivers who are responsible for all roles in day-to-day operations.

12.72 Examples of such management tools can be found in the DfT suite of best practice with the spreadsheet based 'Small Fleet Performance Management Tool', providing a straightforward way of collecting and analyzing operating data, allowing the monitoring of performance.

12.73 However, critical to the success of this form of assistance is the effective dissemination of the tools, and also ensuring that operators are equipped to understand and to use the tools at their disposal. The DfT Best Practice evaluation study highlighted the difficulty in raising awareness and encouraging the adoption of such tools amongst smaller fleet operators.

12.74 Other methods of basic performance monitoring may be delivered through on-board vehicle technology which monitors driving patterns to encourage eco-driving and/or assists in route planning. Again, the challenge would be effectively distributing the technology to the target market and equipping the operators to effectively make use of these tools.

Summary

12.75 The above proposals highlight fertile areas for further investigation in the development of effective NAMAs. A range of different types of intervention are identified, which may a form standalone scheme or adopted as part of a wider set of interventions.

12.76 It has already been stressed above, but an effective intervention must deliver value for the target audience. The specific characteristics of the smaller fleet operators must be kept strongly in mind, to ensure that the measures are both of value to the operators and also that they have the means of participating, recognizing the constraints relating to access to finance and the potential aversion to formalizing their operations. The scrappage example presented above highlights a way in which an existing scheme can be modified to make it more attractive to the smaller fleet operators, and the potential emissions saving which are achievable.

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