The Role of Road Transport in a Green Transport System

Professor Alan McKinnon

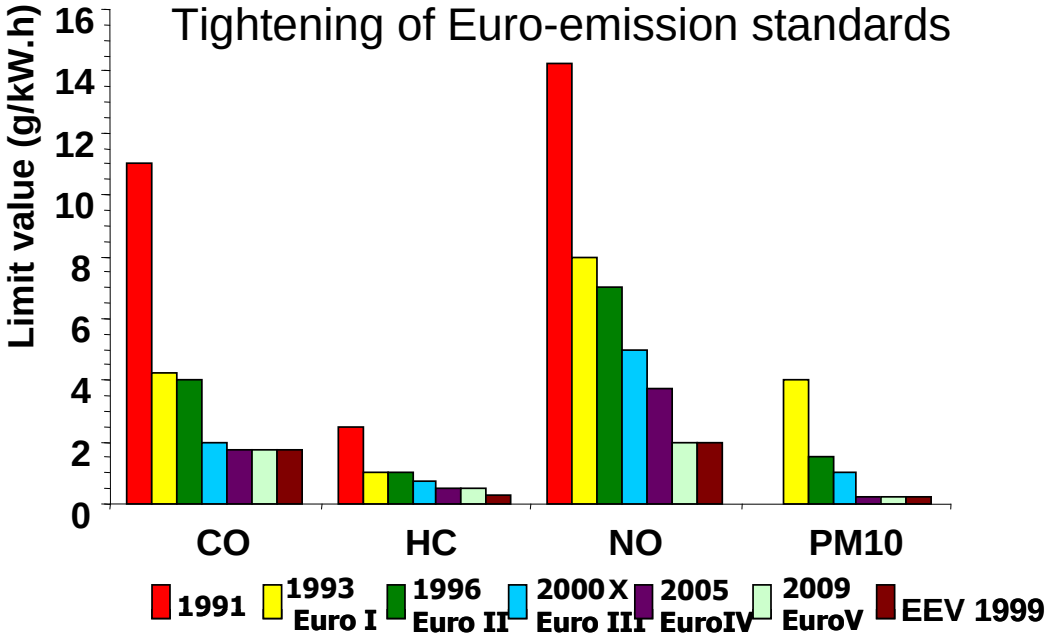
Kühne Logistics University
Hamburg

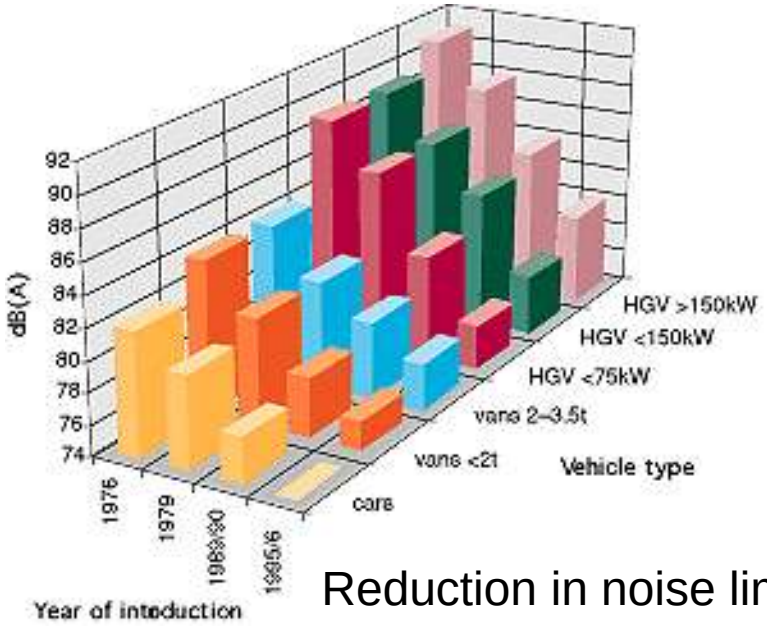
2nd IRU / EU Road Transport Conference

Brussels

29th February 2012

Greening of Trucks

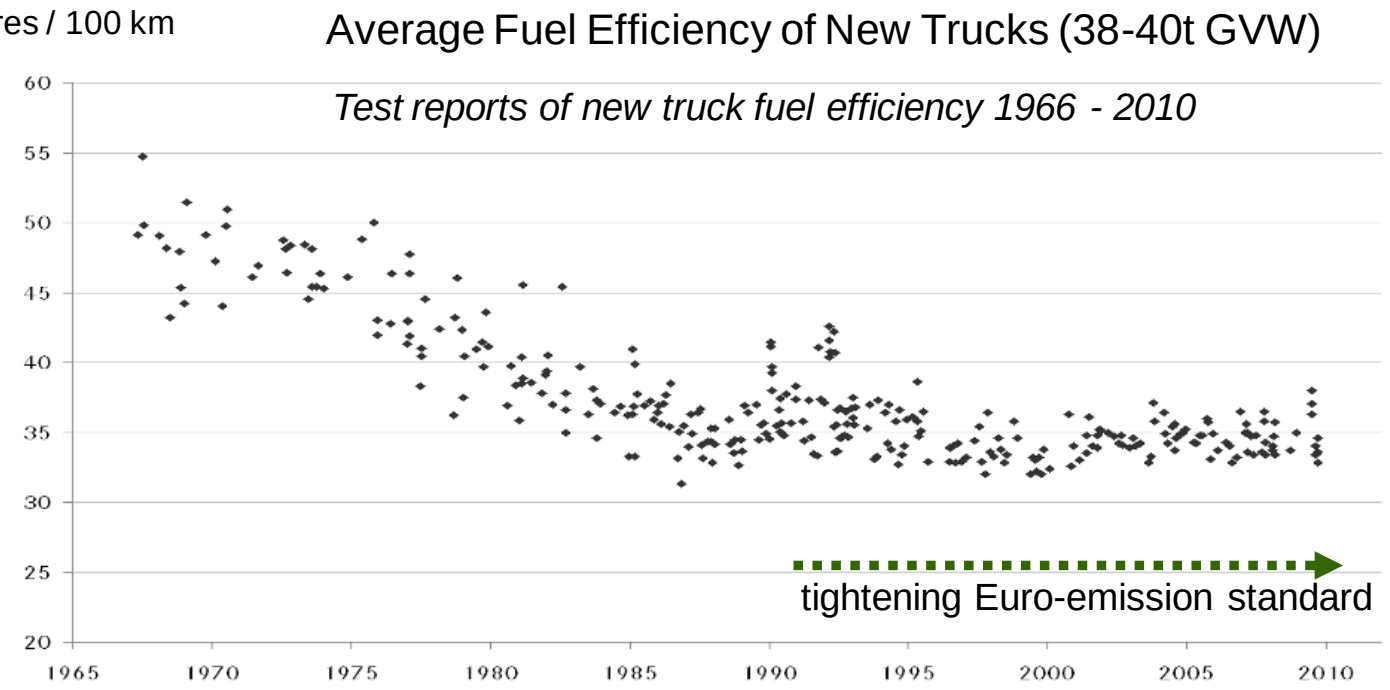




Reduction in noise limits in new vehicles

UK accident involvement rate for trucks per 100 million vehicle-km

1998-2008: 52 → 31 (down 40%)



Source "Lastautomnibus" Test report 1966-2005, (all Brands) – quoted in Mercedes presentation (2011)

Euro 6: Initial 3% fuel and CO_2 penalty – eroding to 0% in 3 years (Ricardo)

Trucks at the end of the1960s

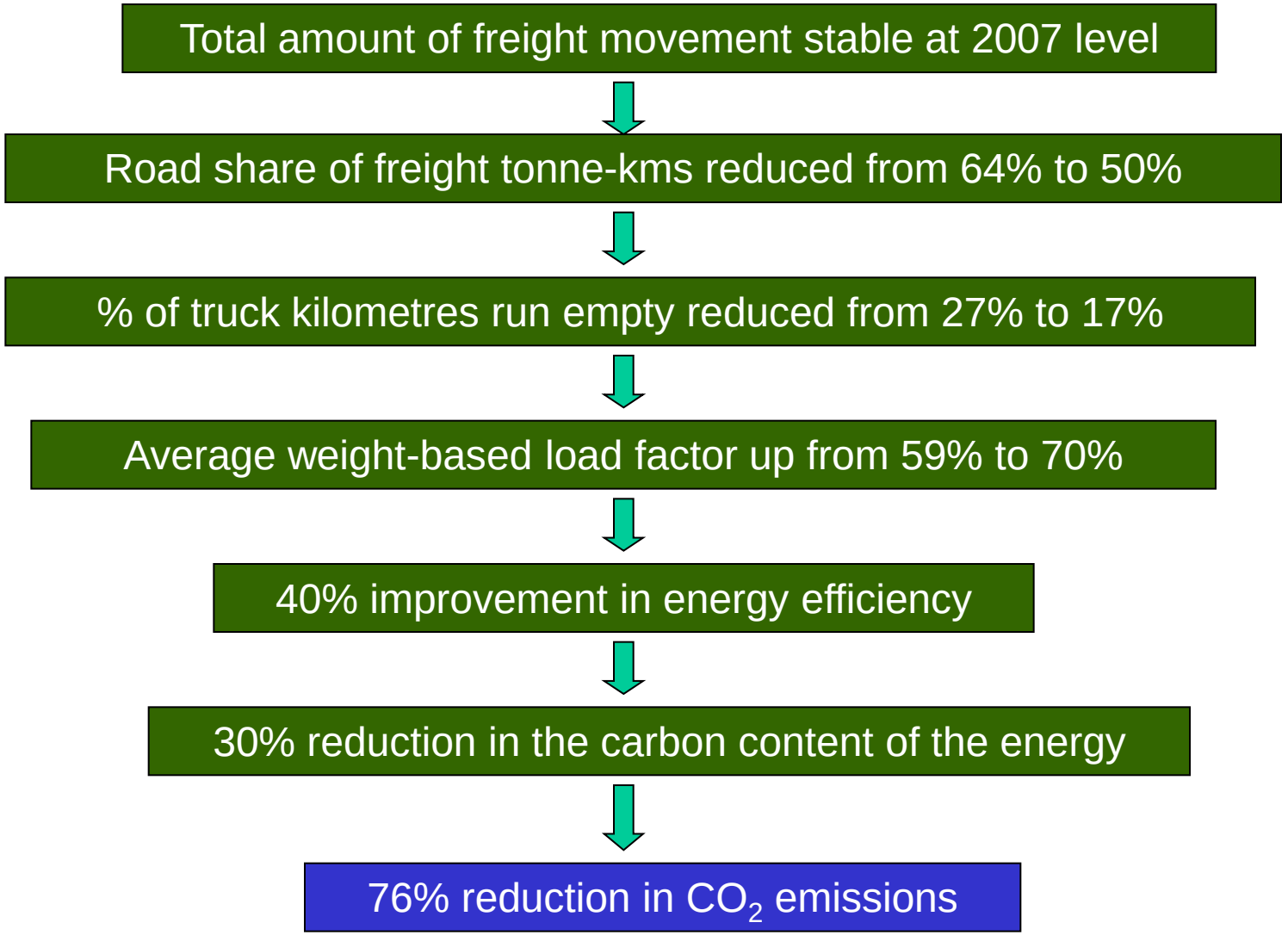
- **148-181 g CO_2/tkm[2)]**
- Fuel: 45-55 l/100 km
- Payload: 20t
- Load factor: 40%
- Average speed: 45km/h

Trucks today[1)]

- **50-60 g CO_2/tkm**
- Fuel: 30-33 l/100 km
- Payload: 25t
- Load factor 60%
- Average speed: 70 km/h

Source: Mercedes Benz / VDA

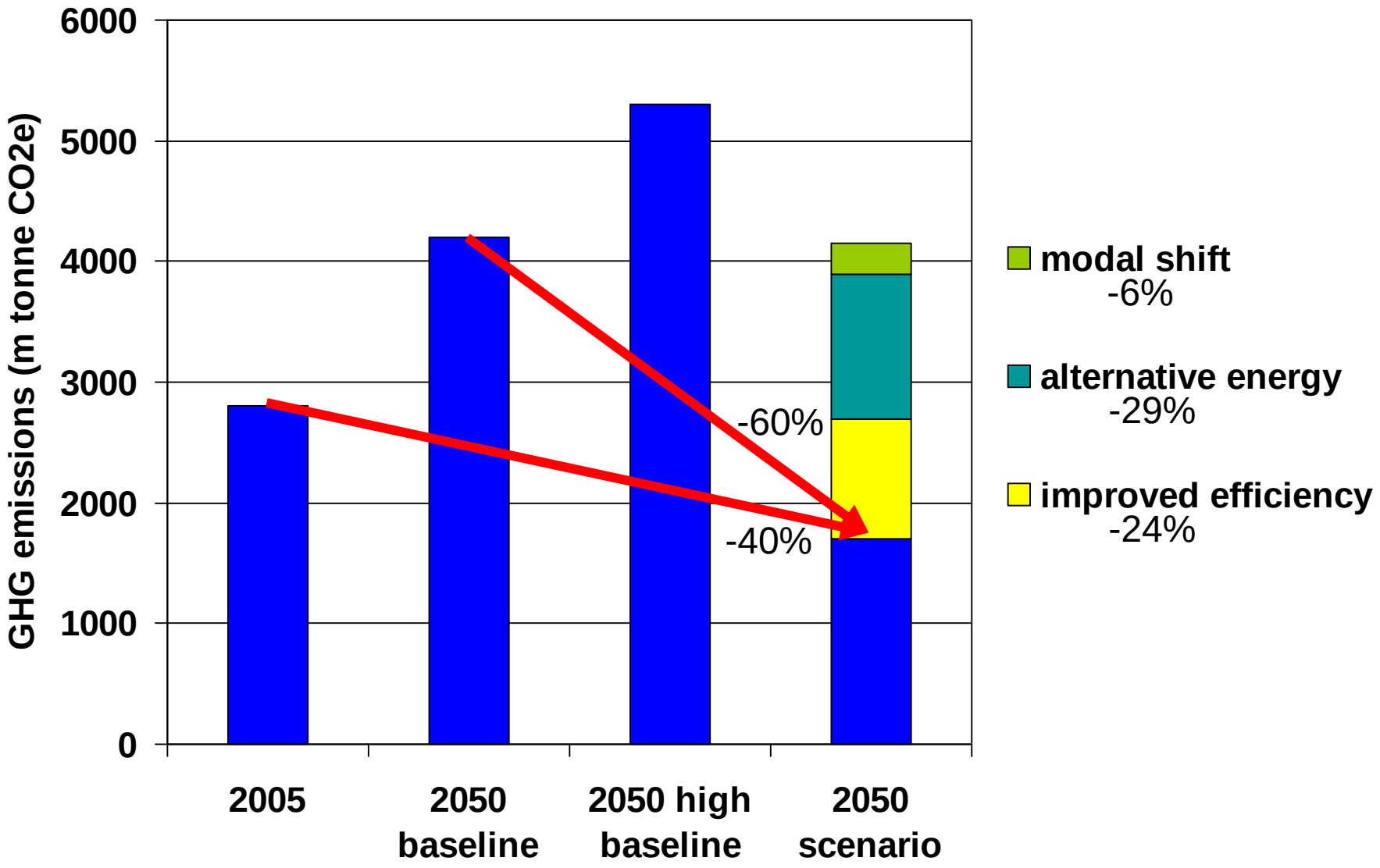
Decarbonisation Scenario for UK Road Freight in 2050



Source: McKinnon and Piecyk, 2009

International Energy Agency Projections 2005-2050

Trucking

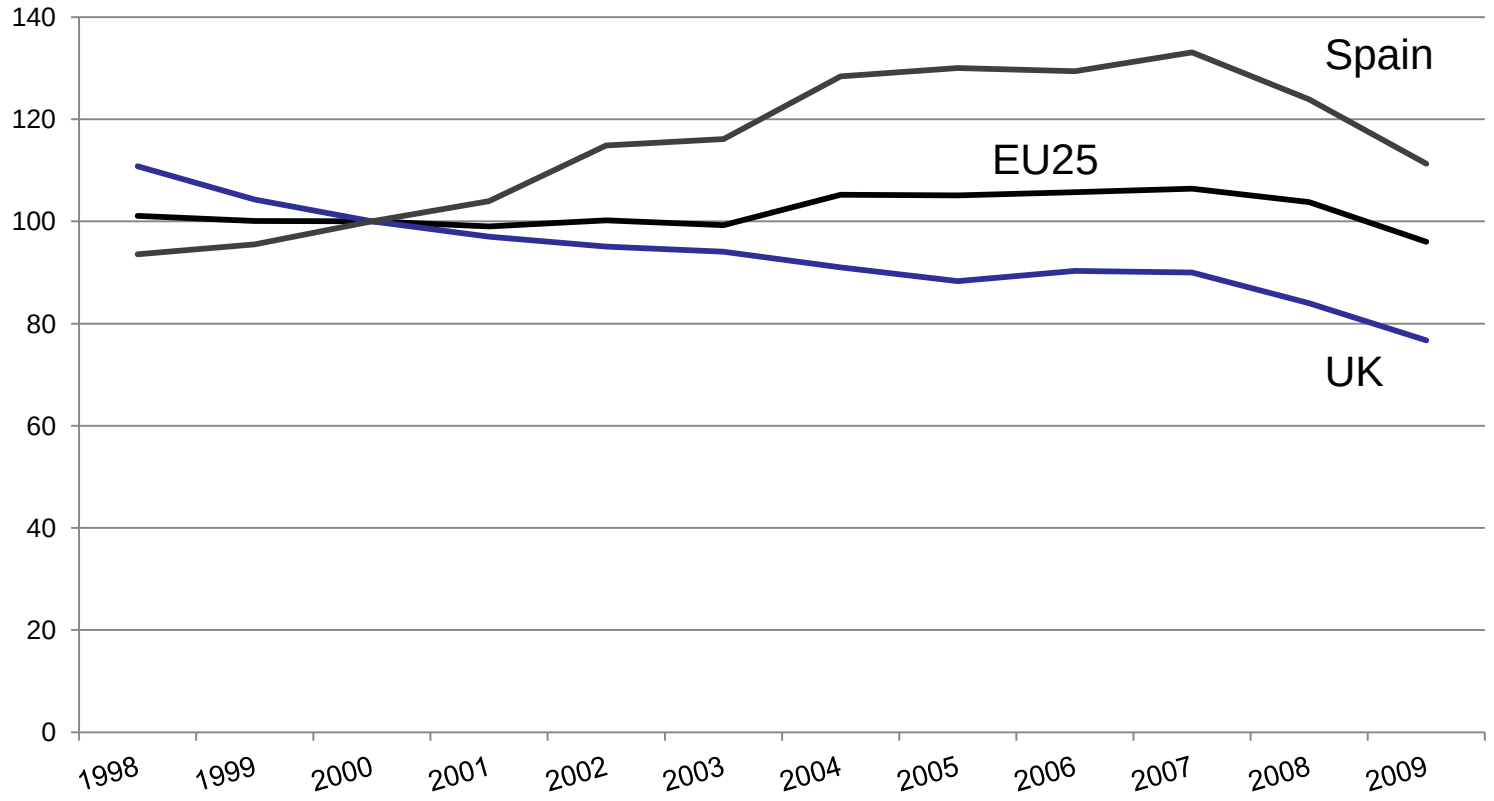


Source: IEA, 2009

'Blue map shift scenario'

Trend in Freight Transport Intensity

Ratio of Tonne-kms to GDP

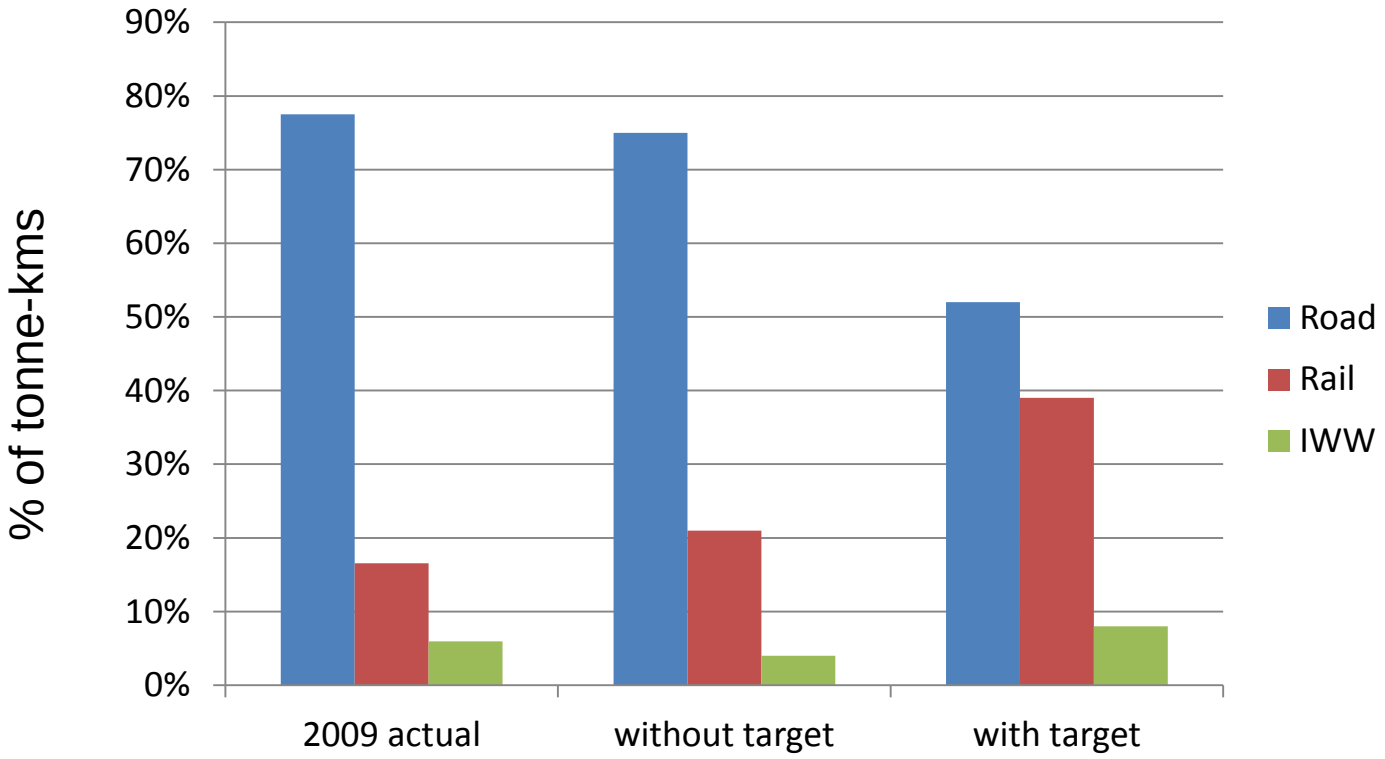


Source: Eurostat

Modal Split for Inland Freight Transport in 2009 and 2030

With target: EC White Paper target for 30% of freight tonnes moving over 300km to move by rail or inland waterway

Without target: Business-as-Usual projection of modal split



Source: Tavasszy and van Meijeren (2011) – based on Trans-Tools analysis

Reflections on the 300km target

Policy interventions required to achieve it ?

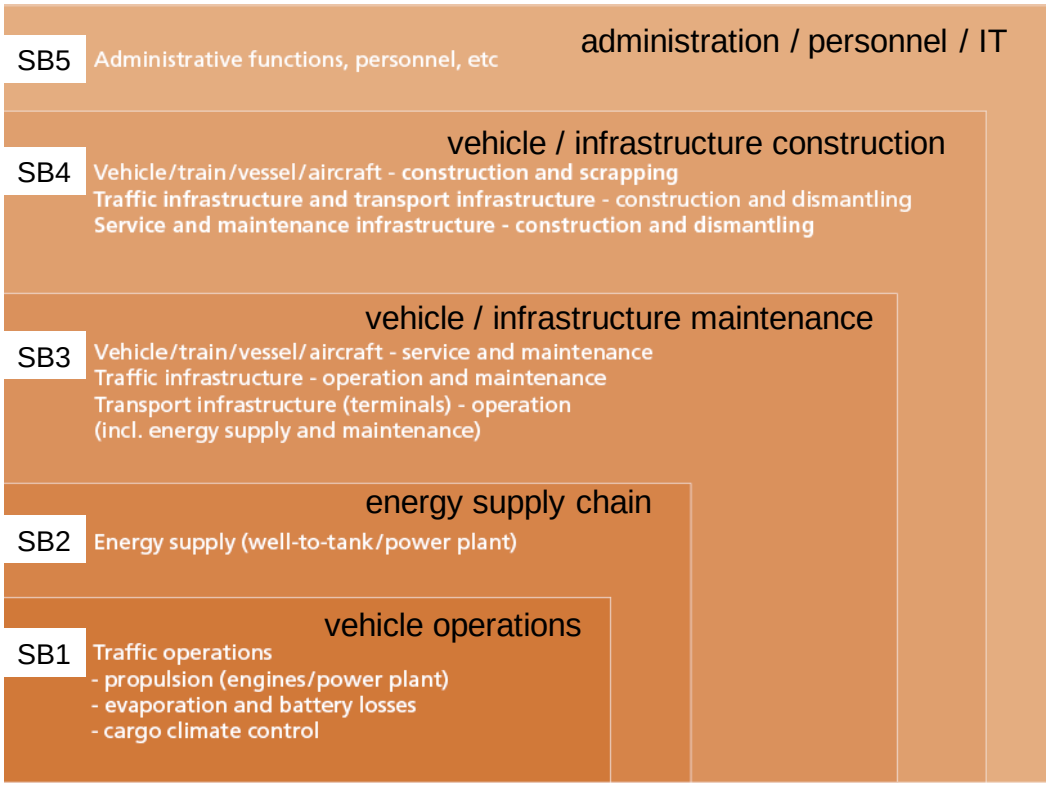
Need for a 60% long-haul c tariff increase to induce it? (Tavasszy and ven Meijeren)

Differential rates of ‘greening’ and ‘decarbonisation’ by modes over next 20-40 years

Energy efficiency improvements on trucking will make it harder for rail to compete

Additional rail and IWW capacity required to meet target

Net carbon benefits based on holistic / SB5 calculation



Source: NTM

AEA

A world leading energy and climate change consultancy

Reduction and Testing of Greenhouse Gas (GHG) Emissions from Heavy Duty Vehicles – Lot 1: Strategy

Final Report to the European Commission - DG Climate Action
Ref: DG ENV/ 070307/2009/548572/SER/C3

RICARDO

Restricted Commercial
ED48504
Issue Number 4
Date 22/02/2011

FABER MAUNSELL | AECOM

Reducing Greenhouse Gas Emissions from Heavy-Duty Vehicles

The Role of the European Commission Policy Instrument Recommendations

Client: European Commission
March 2008

NEA | Newcastle University

TIAX

European Union Greenhouse Gas Reduction Potential for Heavy-Duty Vehicles

Report

Prepared for:
The International Council on Clean Transportation
One Post Street, Suite 2700
San Francisco, CA 94104

Date: December 23, 2011

Prepared by:
Karen Law
Michael D. Jackson
Michael Chan
TIAX LLC
20813 Stevens Creek Blvd., Suite 250
Cupertino, California 95014
Tel 408.517.1500
Fax 408.517.1551

TIAX Reference No. D5625

Low Carbon Technologies for HGVs

Presenting the winners of the LowCVP Technology Challenge 2010

LowCVP
low carbon vehicle partnership

21ST CENTURY TRUCK PARTNERSHIP

21CTP-0003
December 2006

Roadmap and Technical White Papers

...safely and cost-effectively move larger volumes of freight and greater numbers of passengers

...dramatically reducing dependency on foreign oil

Energy Efficiency and Renewable Energy

21st Century Truck Partnership

Automotive

The truck industry's green challenge

Headwind or competitive edge?

Microsoft Excel non-commercial use - Decarbonisation Prediction Model Ver 1 7

Freight Transport Association
Delivering safe, efficient, sustainable logistics

Decarbonisation Model - Main Menu

HERIOT WATT UNIVERSITY

This tool can model current and future CO_2 emissions from a company's freight transport operation. These emissions can be reduced by the application of a range of technologies and management practices. A total of 36 carbon-reducing measures have been identified on the basis of previous research and company experience. By modelling the effects of these measures individually and in various combinations, the tool allows you to conduct what-if analyses and thus help you to develop a 'decarbonisation strategy' for freight transport.

The first step is to click the 'Input Data' button. This opens a table in which you should insert information about your current vehicle fleet. You can specify the fleet in various ways. At the most aggregated level, you can treat it as a single entity and enter only one row of values. If your fleet comprises one type of vehicle undertaking very similar delivery operations this might be a sensible option. If, however, you operate a mixed fleet engaged in different types of distribution, it would be advisable to differentiate the various classes of vehicle and / or distribution operation assigning each a different row in the table. If you operate a small fleet, you may even wish to enter data for individual vehicles, each getting a separate row. Clicking on each cell opens a window providing advice on the information required.

Having specified your vehicle fleet and indicated the anticipated change in total vehicle-kms between now and 2013 and 2015, you can proceed to the 'Select Measures' screen by clicking the appropriate button. This lists the 36 carbon-reducing measures under three general headings:

1. Measures which reduce energy consumption (relative to distance travelled)
2. Measures which reduce the carbon content of the energy used
3. Measures which reduce the distance travelled by road vehicles

As some measures can reduce both fuel use and vehicle-kms they appear under both headings.

Clicking on the measure opens a window containing background information and a default value indicating the % reduction in energy consumption, carbon content or distance travelled that you might expect to achieve from applying this intervention. It is possible to alter this default value by moving the slider within the pre-defined range. You can also indicate to what % of your vehicle fleet the measure is currently applied and will be applied in 2013 and 2015. Separate estimates are required for each of the categories of vehicle / distribution operation that you specified earlier. In the case of several of the measures that reduce distance travelled, there will be an adverse effect on fuel efficiency. This is indicated in red and a default value has been inserted to allow for this offsetting effect. Again you can substitute an alternative value for the default figure.

Once you have decided on a suitable range of carbon-saving measures for your fleet and indicated the % uptakes for today, 2013 and 2015, you can get the results presented in either tabular or graphical form by clicking on the appropriate button. The table is divided into three sections. The first shows the baseline position, estimating the current level of CO_2 emissions for each category of vehicle / distribution operation and the total for the fleet as a whole. There are also baseline projections of the change in this carbon footprint by 2013 and 2015 assuming that no carbon-saving measures are applied. The second section forecasts the level of CO_2 emissions in 2013 after the specified carbon-saving measures have been applied. Clicking on the 'vehicle type' cells opens a window containing a summary of the selected measures and level of adoption. An indication is given of the predicted changes in carbon emissions in 2013 relative both to the current level and the baseline projections for 2013. The third section provides the same output for 2015. All these

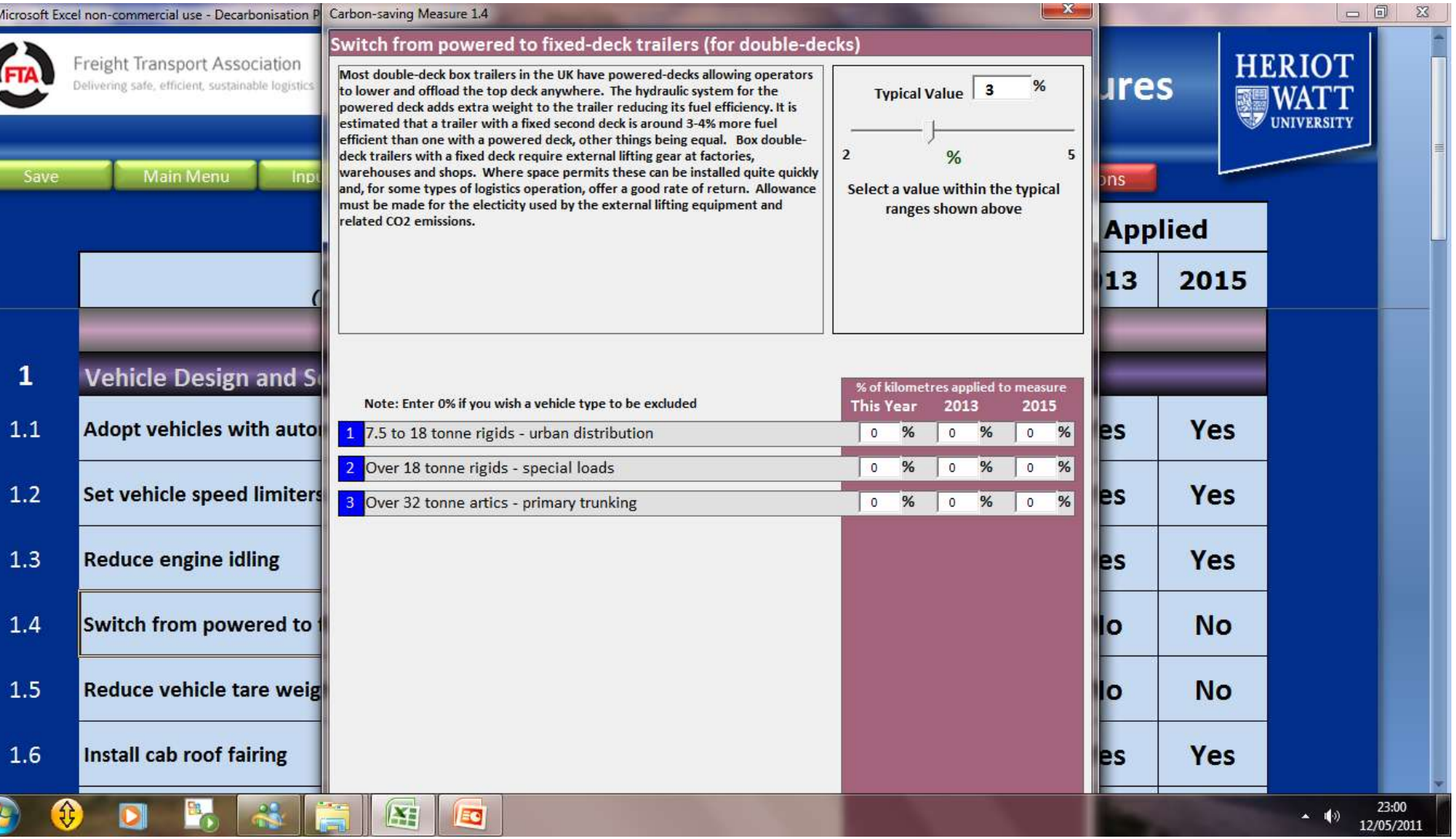
Input Data

Select Measures

Display Results in Tabular Form

Display Results in Graphical Form

Close Model



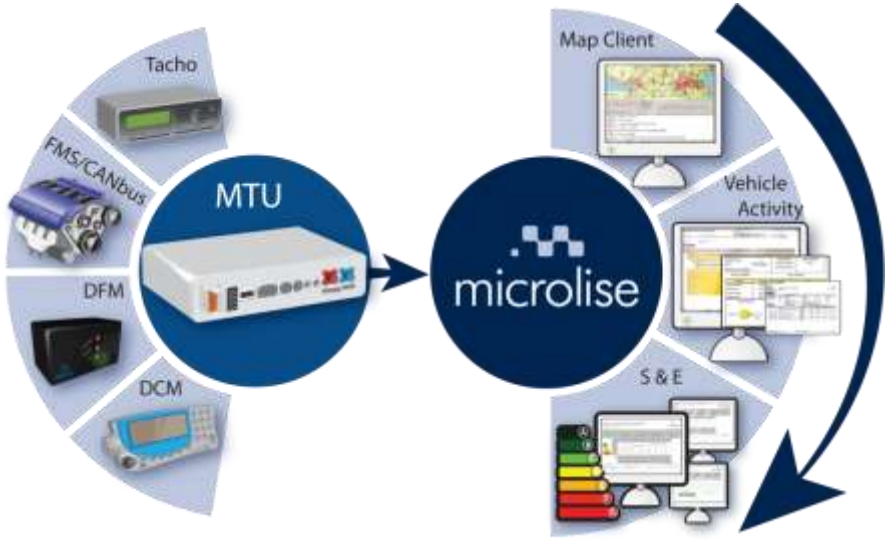
38 carbon-reduction measures – cutting vehicle-kms
increasing fuel efficiency
reducing carbon content of energy used

Estimating Typical Fuel Savings in Road Freight Innovations

Teardrop trailer

Claims: 0 – 12% fuel saving per vehicle-km

Depends on the nature of the delivery , commodity type, driving style etc.



Vehicle telematics

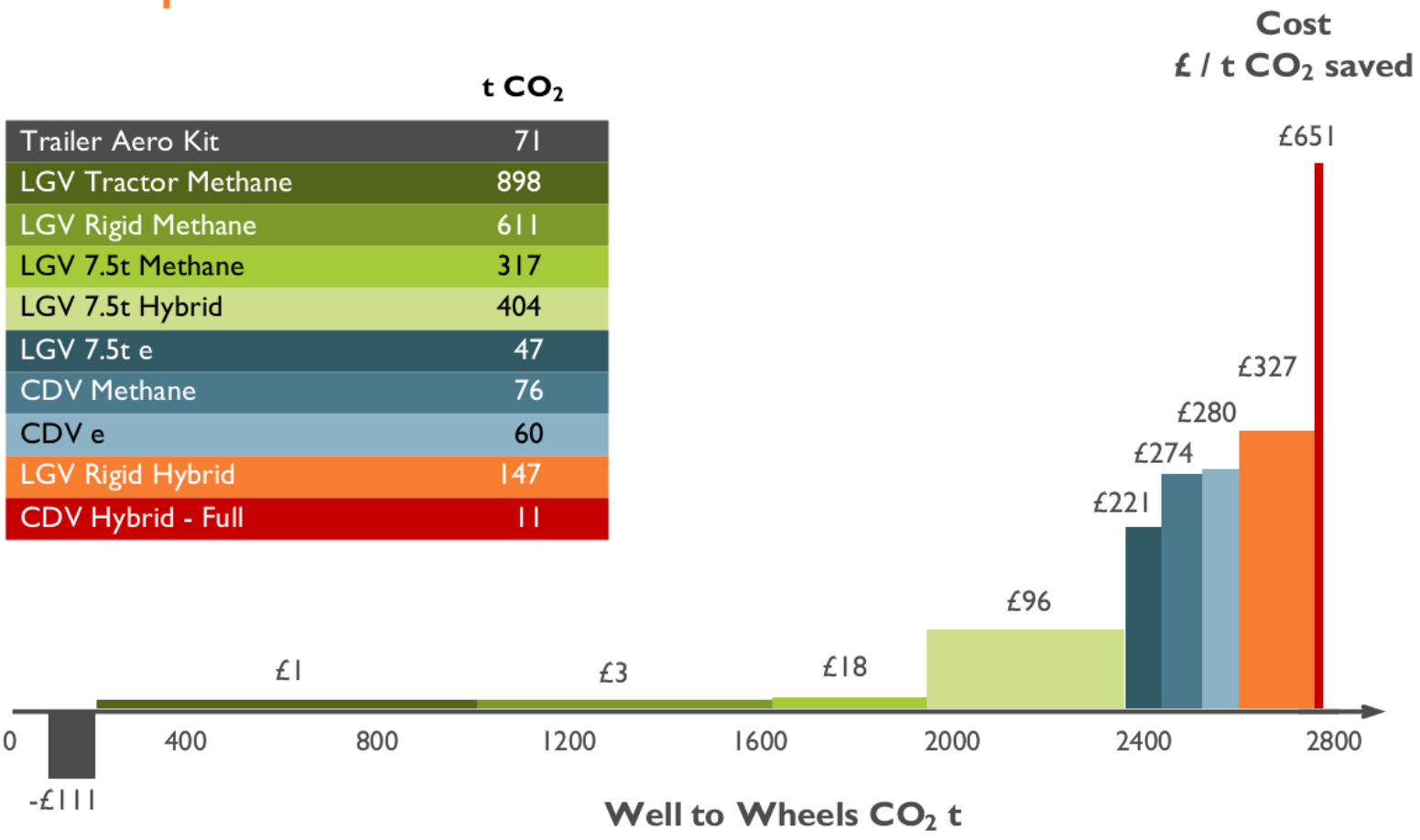
Claims: 5 – 17% fuel efficiency improvements

Depends on the nature of the delivery operation and baseline conditions

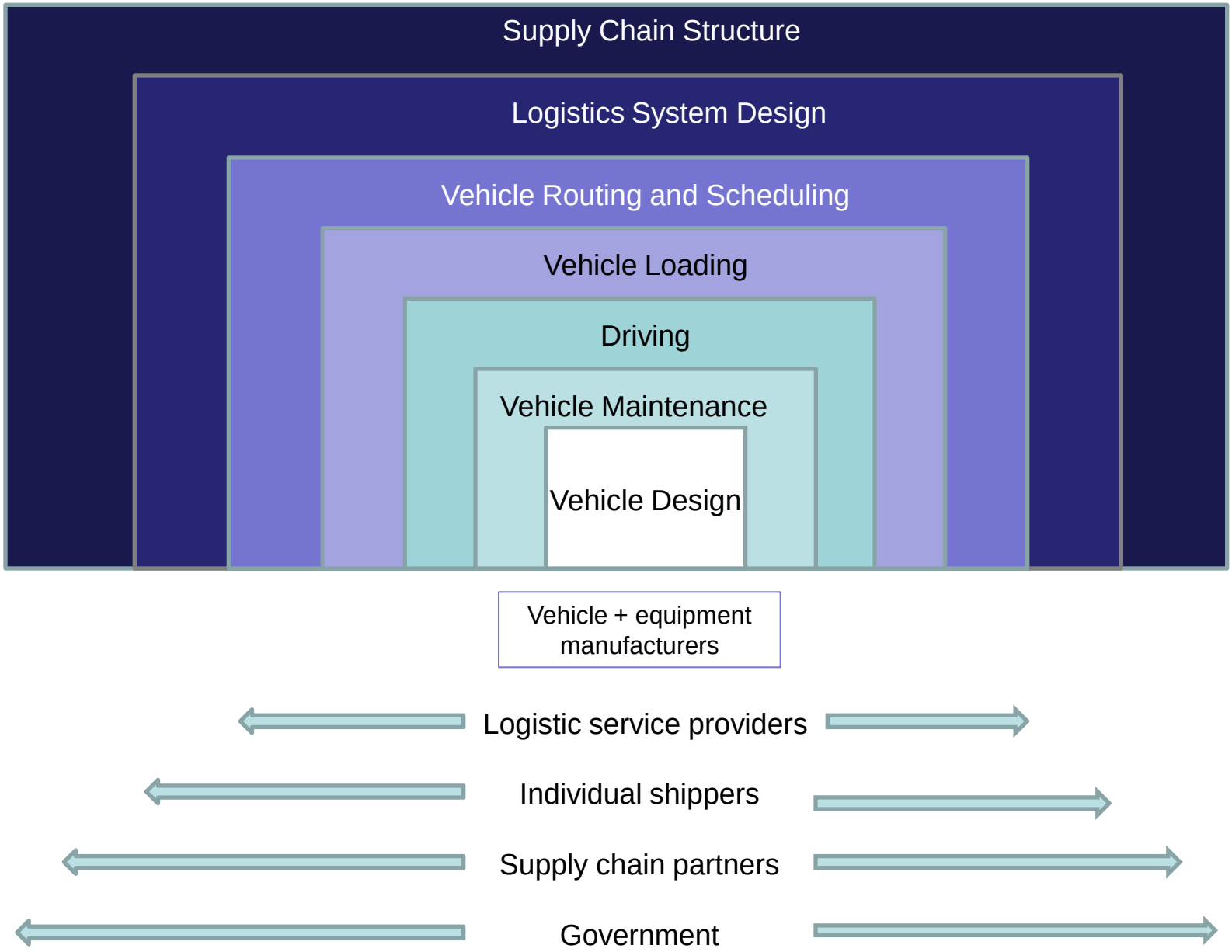
Marginal Abatement Cost Curve for Road Freight Interventions

UK Royal Mail

Transport MACC



Scope of the Intervention



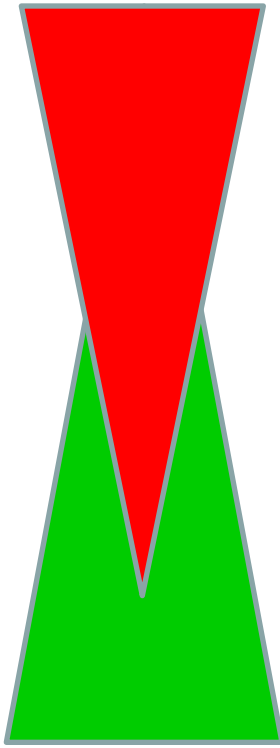
Levels of Logistical Decision-making

STRATEGIC: numbers, locations and capacity of factories and warehouses
'corporate infrastructure'

COMMERCIAL: trading links to suppliers, customers and sub-contractors
'supply chain configuration'

OPERATIONAL: timing of production and distribution operations
'scheduling of freight flows'

FUNCTIONAL: day-to-day running of the logistics function
'transport management'

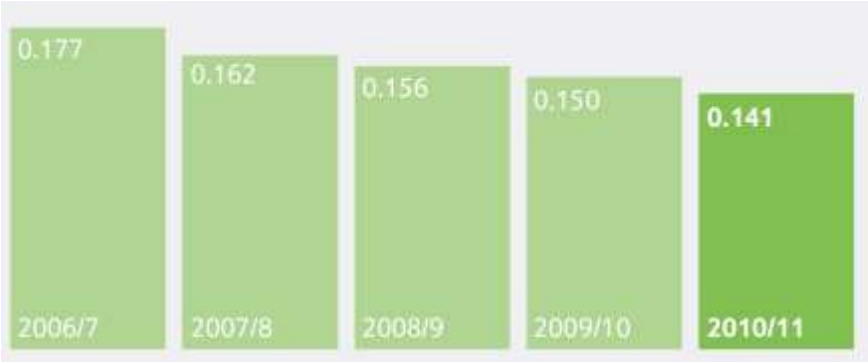


Green measures implemented at lower levels offset by effects of higher level strategic decisions

TESCO

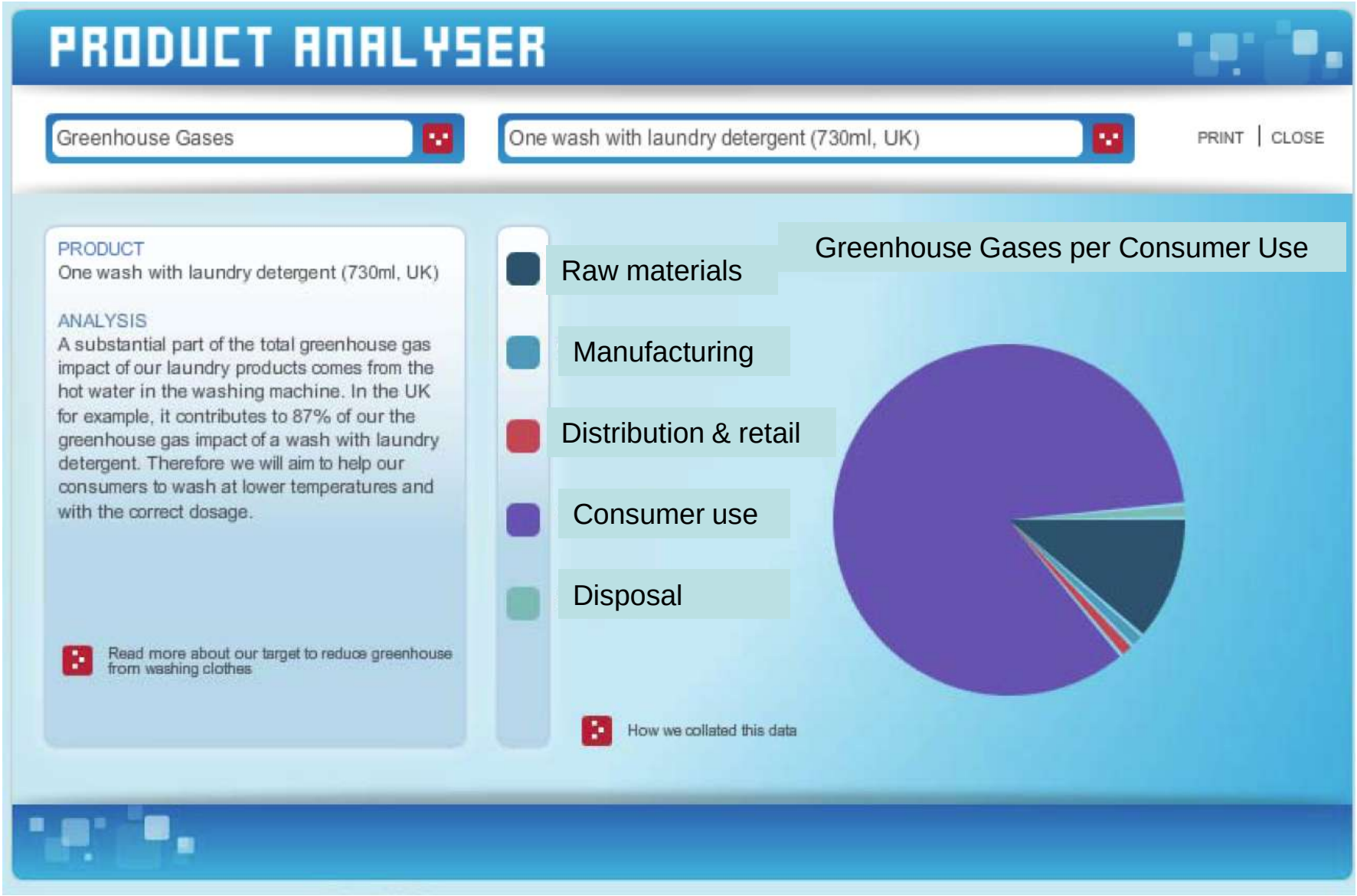
Target: 50% reduction in CO2 emissions per case delivered between 2006 and 2012

Carbon footprint per case of goods delivered $kgCO_{2e}$ / case



Life Cycle Assessment of the Environmental Impact of Unilever Products

One wash with laundry detergent



Source: http://www.sustainable-living.unilever.com/the-plan/

Classification of ‘Greening’ Options

Inexpensive, cost-effective, short payback, tried and tested, uncontroversial

- Eco-driving with telematic monitoring and support
- Aerodynamic profiling - 360 degree perspective
- Dissemination of best-practice / industry initiatives
- Rescheduling deliveries to off-peak periods

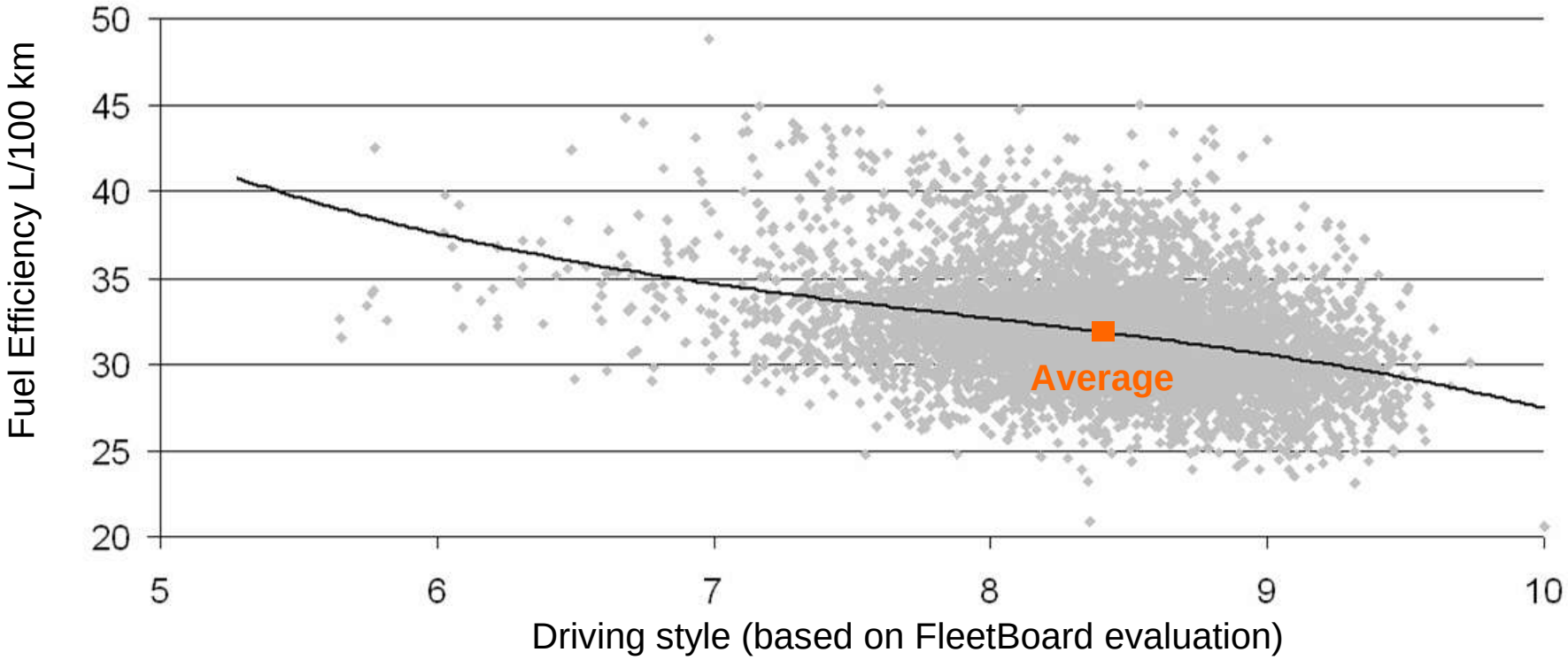
More expensive, more difficult, more complex, longer-term and /or more controversial

- Improving vehicle powertrain efficiency
- Increasing maximum vehicle weights and dimensions
- System optimisation – software applications + process re-engineering
- Collaborative initiatives: vertical + horizontal
- Switching to alternative fuels / power sources
- Imposition of fuel economy standards for new vehicles

Very expensive, very controversial and potentially counter-productive

- Relaxing the JIT / lean principles
- Returning to more decentralised logistics
- Re-introduction of quantitative licensing

Variability in Driver Fuel Performance



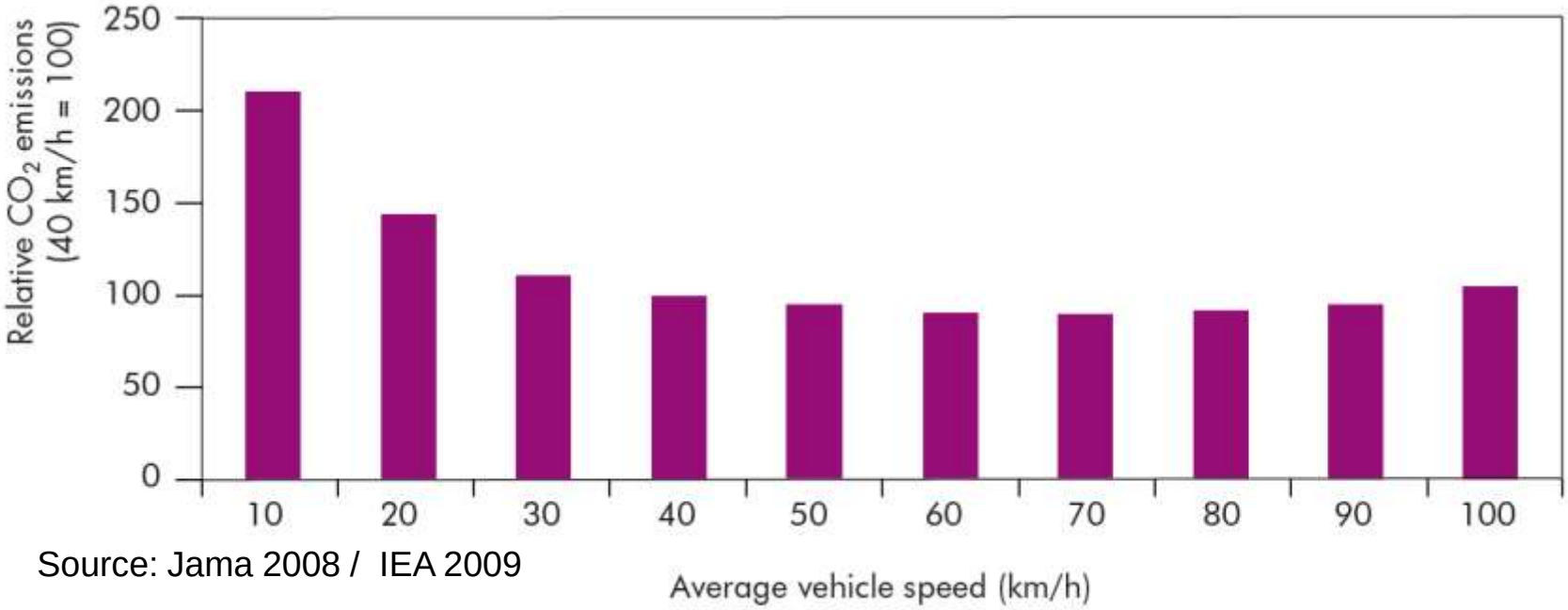
If 90% of HGV drivers were eco-driving trained, and continued to practise eco-driving techniques, we could save up to 3MtCO_2 and £300m in costs to the industry over a 5 yr period

UKDfT 2010

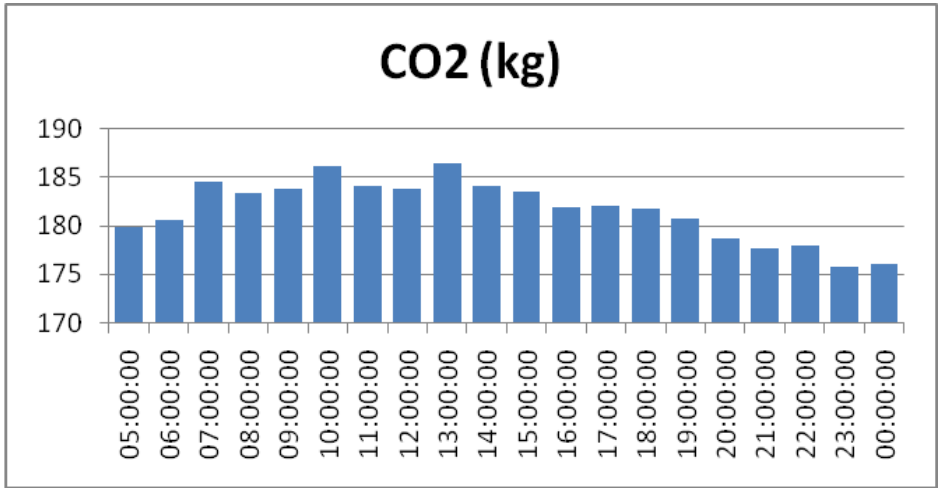
Safe and Fuel Efficient Driving (SAFED) Programme 8000 drivers 7% fuel saving

Use of telematic monitoring / coaching to embed eco-driving practices

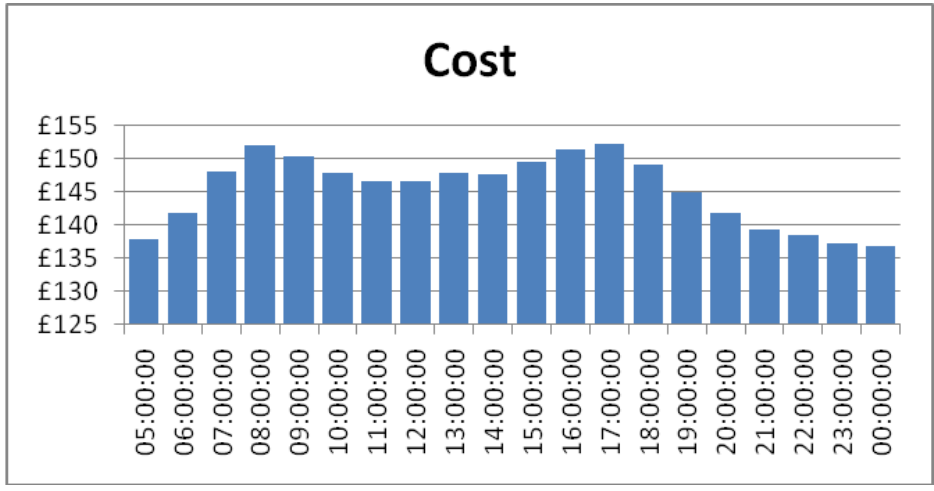
Effect of Truck Speed and Delivery Rescheduling on CO_2 Emissions



Source: Jama 2008 / IEA 2009

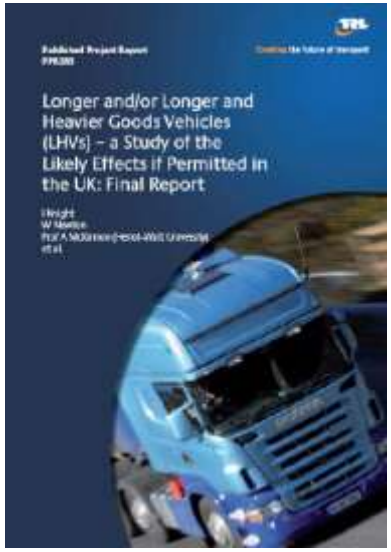


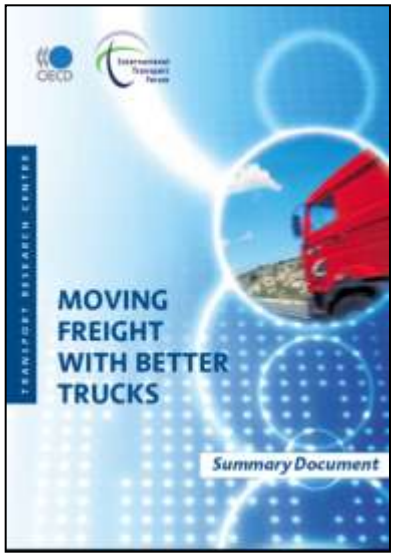
trip departure time



trip departure time

The Maximum Size and Weight Issue





Advice and Encouragement

Estimated CO_2 savings: 240,000 tonnes

Cost per tonne of CO_2 saved: £8

SmartWay℠

US SmartWay Programme

Industry-led initiatives:

Green Freight Europe

UK Logistics Carbon Reduction Scheme

Conclusions

- Road freight sector already achieved huge reduction in externalities per tonne-km
- Rate of tonne-km growth exceeding rate of externality reduction
- Little prospect of significant tonne-km : GDP decoupling at EU level
- Potential exists to maintain this trend of environmental improvement per tonne-km
- Broad array of mutually re-inforcing technological and behavioural options
- As incremental benefits from advances in vehicle technology reduce, main environmental gains will accrue from operational / logistical improvements
- Still significant ‘low hanging fruit’ to be harvested
- Need more sophisticated and objective analysis of modal split targets

Contact details

Kühne Logistics University – The KLU
Wissenschaftliche Hochschule für Logistik und Unternehmensführung
Brooktorkai 20
20457 Hamburg

Tel.: +49 40 328707-271
Fax: +49 40 328707-109

E-Mail: alan.mckinnon@the-klu.org
Website: www.the-klu.org