



The project is funded by the European Commission's  
Directorate-General Environment



# EU Transport GHG: Routes to 2050?

Operational options and improved vehicle  
utilisation for all passenger transport modes

Bettina Kampman, CE Delft

Stakeholder meetings

2 July 2009, European Commission

Partners

[www.eutransportghg2050.eu](http://www.eutransportghg2050.eu)



# Overview of presentation

1. Introduction to the presentation
2. Operational options for road passenger transport
3. Operational options for rail transport
4. Operational options for aviation
5. Improved vehicle utilisation in passenger transport
6. Conclusions/discussion/questions

# Introduction to the presentation

- Based on:
  - Draft Paper 4 – Operational options for all modes
  - Authors: Bettina Kampman and Xander Rijkee, Alison Pridmore and Tom Hazeldine, Jan Hulskotte
  - Sections 5.3 and 5.4 of draft Paper 5
- Presentation is based on draft findings set out in the papers
- Scope:
  - Operational measures for GHG reduction, not yet policy measures
  - Short term and long term: potential carbon savings, costs, barriers to implementation, etc.
- Aim of subsequent discussion is to:
  - Agree what we know and do not know
  - Identify any omissions in our information/sources
  - Review the conclusions that are emerging

# Operational options for road passenger transport

- Fuel efficient driving
  - Ecodriving – a fuel efficient driving style
  - see next slide
- Tyre pressure monitoring
  - correct tyre pressure can improve fuel efficiency by up to 5%, and safety
  - will be obligatory for passenger cars (EU)
- Vehicle downsizing
  - buying smaller vehicles, or vehicles with less powerful engines
  - see later slides



# Fuel efficient driving – Ecodriving with passenger cars

## Short term:

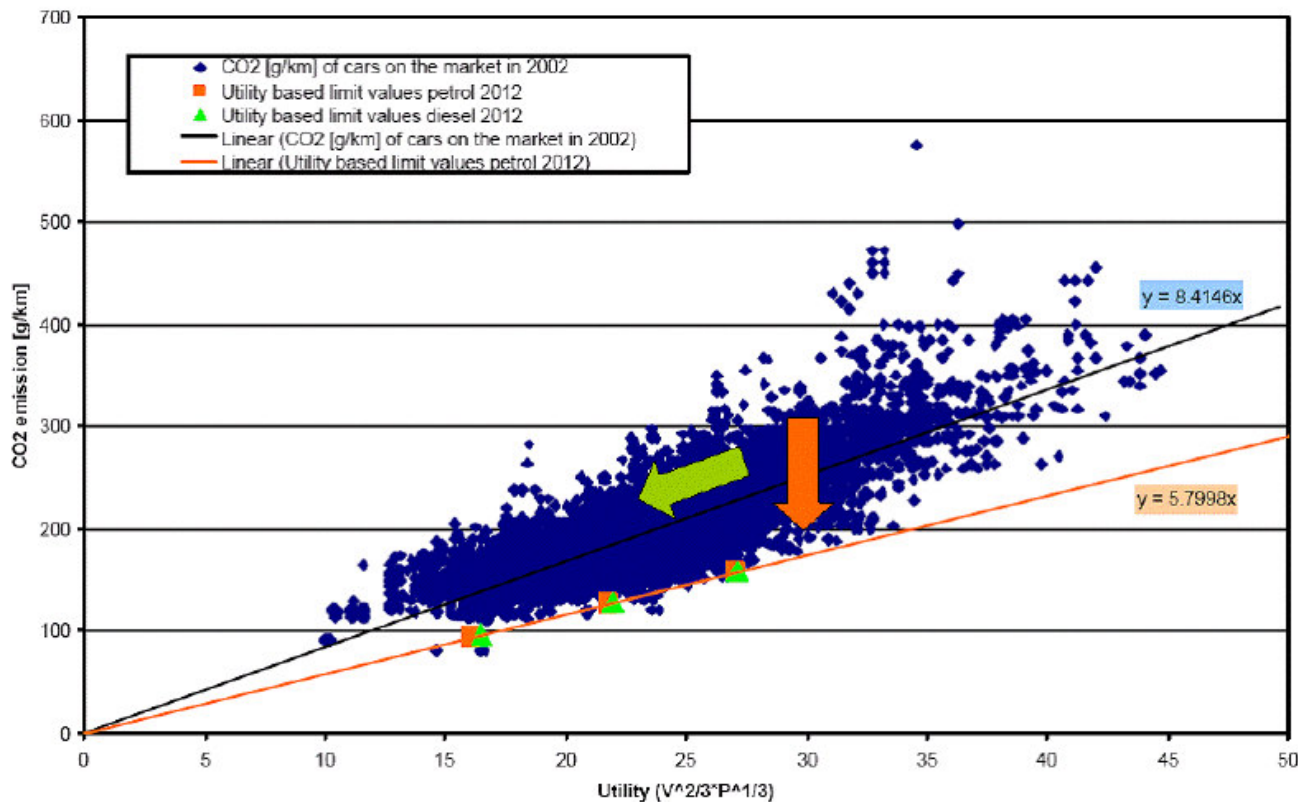
- Ecodriving training can be very effective: 5-25% fuel savings on average directly after the course, 3% savings over a year or more.
- About half of the savings due to maintaining tyre pressure, the rest is due to optimal gear change, better anticipation on the road ahead, etc.
- Very cost effective option: costs of training are low and benefits are high (fuel savings, reduction of accidents, lower maintenance costs).

## Long term potential is probably limited

- Tyre pressure monitoring systems will become mandatory in passenger cars (EU directive)
- An increasing part of eco-driving will probably be taken over by vehicle technology
  - start-stop systems, gear shift indicators, tyre pressure monitoring, etc.

# Vehicle downsizing (1)

- Variation between cars is significant
- Downsizing = **green arrow**; fuel efficient car choice: **orange arrow**



Source: Derived from Polk Marketing data

## Vehicle downsizing (2)

- Part of the variation is due to technological differences, but part is due to 'softer' consumer choices
  - Car size and weight, engine power, etc.
- Potential is large:
  - Moving down an engine size: -5% fuel consumption and GHG emissions
  - Choosing a smaller car: an SUV can emit 3 or 4 times as much CO<sub>2</sub>/km as an efficient small car
- Barrier: consumer preferences
- Long term:
  - Hybridisation can be expected to reduce the potential for smaller engine size
  - The effect of reduced weight may also reduce do to regenerative braking

# Operational options for rail transport

A large number of options was identified:

- Shorter trains when extra capacity is not required
- Energy efficient driving and train regulation
- Reduction in empty stock movements
- Intelligent engine control
- Better recording of fuel/power consumed and better energy monitoring
- Reduced traction maximum demand, reducing current (and thus losses) in the national grid
- Disconnecting electric vehicles from supply when stabled
- Reducing diesel engine idling
- Reducing energy demand for heating
- Control and Command signalling
- Train driver training



# Operational options for rail transport

- Limited data on potential and cost

<b>Savings Option</b>	<b>Timescale</b>
<b>Run shorter trains when extra capacity not required</b>	Short
<b>Energy efficient driving and train regulation</b>	Short to medium
<b>Reduction in empty stock movements</b>	Short
<b>Shutting down some engines on distributed power trains (intelligent engine control)<sup>6</sup></b>	Medium to long
<b>Better recording of diesel engine fuel / power consumed</b>	Short
<b>Reduced traction maximum demand (25kV &amp; 750V)</b>	Long/feasibility questionable
<b>Disconnect electric vehicles from supply when stabled</b>	Short to medium
<b>Reduced diesel engine idling</b>	Short
<b>Energy monitoring</b>	Short
<b>Reduced demand for heating</b>	Short to medium
<b>Train driver training</b>	Short

# Operational options for aviation

- Training of crew
- Air traffic management
  - Continuous Descent Approach
  - Open Airspace
  - Reduced vertical distance between airplanes
- Aircraft performance
  - Aircraft capacity
  - Reduced weight
  - Improved maintenance
- Airport Operations
  - Electricity at the gate
- And perhaps for the longer term:
  - Multi-Stage long distance travel
  - Air-to-air refuelling
  - Formation flying (V-formation)
  - Contrail Avoidance



# Potential of operational options for aviation

<b>Training of crews</b>	Cost and potential unknown, but will be prerequisite for effective use of operational measures
<b>Air traffic management</b>	<p>IPCC: 6-12% reduction potential</p> <ul style="list-style-type: none"> <li>• Continuous Descent Approach</li> <li>• Open Airspace: 5% reduction</li> <li>• Reduced vertical distance: 1.6 to 2.3% reduction</li> </ul>
<b>Aircraft performance</b>	<p>Reduced weight: about 0.5%</p> <p>Improved maintenance engine: up to 1%</p>
<b>Electricity at the gate</b>	<p>Up to 75-95% reduction while plane is at the gate (i.e. a small proportion of total energy use)</p> <p>Air carriers are not required to use electricity, and some choose not to as it costs time</p>
<p><b>Longer term options:</b></p> <p><b>Multi-Stage long distance travel</b></p> <p><b>Air-to-air refuelling</b></p> <p><b>Formation flying</b></p> <p><b>Contrail avoidance</b></p>	<p>Could only be implemented for longer distance travel, 10-25% reduction</p> <p>Feasibility unknown, potential seems considerable</p> <p>Up to 10% reduction, automatic flight control required</p> <p>Potential unknown</p>

# Improved vehicle utilisation in passenger transport

- Can improve fuel efficiency for passenger cars, aviation and public transport
- Aviation: 65-80% average
  - Probably little scope to improve, utilisation is crucial for airline profits
- Passenger cars: 40% (UK average)
  - With large variation between holiday/day trips and commuting/business travel
  - Decreasing over time, due to increased car ownership and increased use of cars for commuting
- Public transport: limited data available
  - Occupancy for rail can increase due to improved efficiency and congestion on roads.
  - Large variations between countries, connections and type of train
  - Some public transport inefficient but important for social reasons
- Measures to improve utilisation:
  - Revenue management – has been very effective for airlines
  - Car sharing and car clubs, pricing schemes, car free urban centres, ...

# Main conclusions

- Vehicle downsizing has very significant potential for passenger cars
  - Main barrier: consumer preferences
- Potential of ecodriving with passenger cars is high in the short term, but will reduce in the future
- Number of options and their potential seems to be quite high in non-road modes
  - in rail transport probably due to the relatively low share of fuel costs in the total
  - in aviation due to complexity of options or due to the high value of time
- Potential of measures that impact on operations of rail and aviation are high, but costs and cost effective potential are difficult to quantify in general terms
- Improved vehicle utilisation: significant scope especially for cars

# Questions for the discussion

- Are there any other operational options for road transport?
  - related to driving style?
  - related to vehicle or engine downsizing?
- Are there any other operational options for rail transport?
- Are there any other operational options for aviation?
  
- Do you agree with our data?
- Have we missed any important literature?
  
- What options have the highest potential for (future) GHG reduction?
- What are the key barriers to these options?