EU Transport GHG: Routes to 2050?

Operational options and improved vehicle utilisation for all passenger transport modes

Bettina Kampman, CE Delft

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Partners

AEA CE Delft TNO ISIS milieu

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:

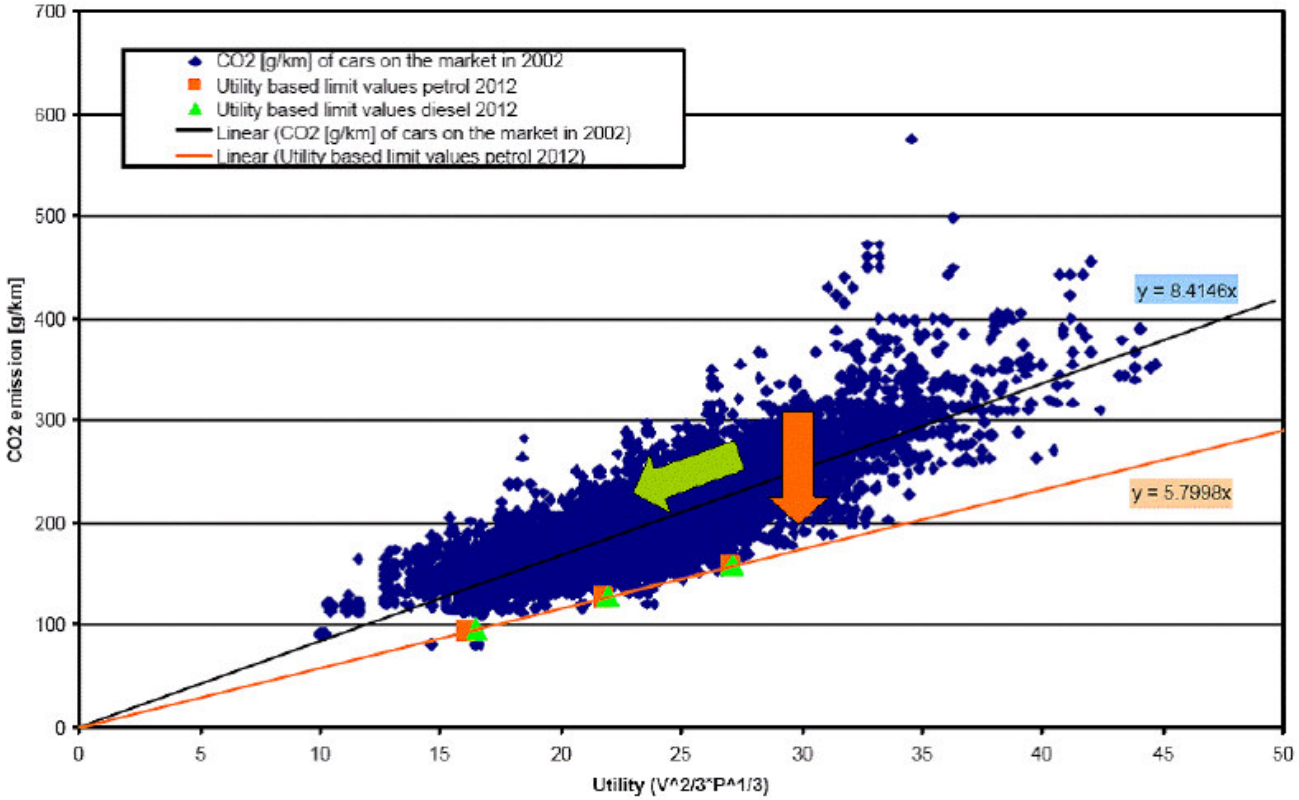
- Ecodriving training can be very effective: 5-25% fuel savings on average directly after the course, 3% savings aver a year or more.
- About half of the savings due to maintaining tyre pressure, the rest is due to optimal gear change, better anticipation on the road ahead, etc.
- Very cost effective 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_2/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

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

Training of crews	Cost and potential unknown, but will be prerequisite for effective use of operational measures
Air traffic management	IPCC: 6-12% reduction potential • Continuous Descent Approach • Open Airspace: 5% reduction • Reduced vertical distance: 1.6 to 2.3% reduction
Aircraft performance	Reduced weight: about 0.5% Improved maintenance engine: up to 1%
Electricity at the gate	Up to 75-95% reduction while plane is at the gate (i.e. a small proportion of total energy use) Air carriers are not required to use electricity, and some choose not to as it costs time
Longer term options:	
Multi-Stage long distance travel	Could only be implemented for longer distance travel, 10-25% reduction
Air-to-air refuelling	Feasibility unknown, potential seems considerable
Formation flying	Up to 10% reduction, automatic flight control required
Contrail avoidance	Potential unknown

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?