Potential of Intelligent Transport Systems to reduce greenhouse gas emissions in road freight transport

Andrew Winder
Project Manager, Clean Mobility
ERTICO, Brussels

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Background

Several ITS applications have the potential to reduce CO_2 emissions of vehicles:

- encouraging results from studies & deployments
- but no real benchmarking

A desk study by ERTICO in 2016 looked at **real, simulated and modelled results for heavy commercial vehicles** (trucks and buses)

- comparison of results of key projects/trials
- followed a similar 2015 study for passenger cars
- Both studies in conjunction with ACEA

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ACEA

2016 ERTICO study scope

Background and scope

Currently available ITS applications which reduce emissions in goods vehicles (and buses) by:

- optimising routing
- making driving smoother
- more efficient parking and deliveries
- more efficient traffic signals

Report available at:

- http://erticonetwork.com/reducing-co2-emissions-heavy-commercial-vehicles/
- or search the internet for “ITS4CV”

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Measurement

- Trials usually without system (baseline) and with system (treatment):
  - Average distance travelled
  - Total fuel use
  - Fuel use per kilometre (proxy for CO_2 emissions)

Data from: On-road trials of ITS applications
Studies using driving simulators
Traffic/emissions modelling

Some projects also included an impact assessment:

- Potential impact of system in real-life situations
- Can include future-casting, scaling up, scenarios

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A few of the contributing projects

- **eCoMove** (http://ecomove-project.eu) – Cooperative mobility systems and services for energy efficiency
- **FREILOT** - Urban Freight Energy Efficiency Pilot
- **ecoDriver** (http://ecodriver-project.eu) - Supporting the driver in conserving energy and reducing emissions
- **Compass4D** (www.compass4d.eu) - Cooperative Mobility Pilot on Safety and Sustainability Services for Deployment
- **CO-GISTICS** (www.cogistics.eu) - COoperative loGISTICS for sustainable mobility of goods
- **OptiTruck** (www.optitruck.eu) - Optimal fuel consumption with Predictive Power Train Control and calibration for intelligent trucks
- **Amitran** (www.amitran.eu) – CO2 assessment methodology for ICT in transport

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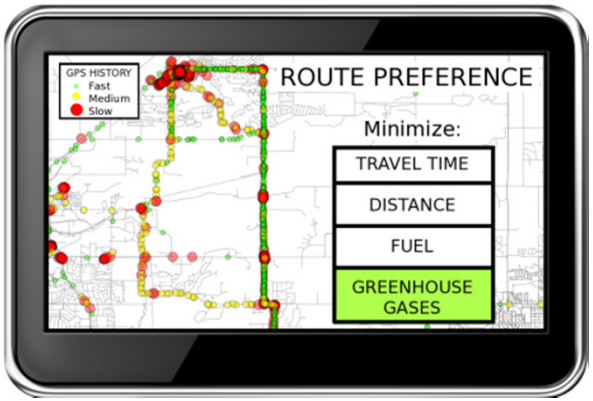
Eco-Navigation

In-vehicle ITS applications

- Dynamic navigation integrates maps with up-to-date traffic information (e.g. RDS-TMC information)
- Eco-navigation includes information such as estimated fuel consumption and proposes most fuel efficient route

Potential CO_2 savings:

- Between 5% and 10% in urban/suburban areas
- Less for longer distance trips



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Eco-Driving

In-vehicle ITS applications

- Systems designed to influence driver's behaviour: use of gears, engine braking, anticipation, etc.
- Recognise driving behaviour and provide on-trip advice and post-trip feedback/feed-forward

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Eco-Driving

In-vehicle ITS applications

Potential CO_2 savings:

- HGVs: average 10% reduction (mixed roads); Range 0-25% (ecoDriver, 2016)
- Up to 25% CO_2 reduction at junctions, traffic lights, bends, etc.
- Little or no CO_2 benefit in congested situations and limited benefit on motorways
- Scania Driver Support system provides real-time coaching in HGVs with tips and feedback via a visual HMI: 10% improvement in fuel efficiency

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Predictive Powertrain Control

In-vehicle ITS applications

- Uses vehicle, infrastructure and topographic data to anticipate a fuel saving driving style
- Focus on the topography, using slope data ahead of the vehicle to generate a predictive speed profile to optimise control of the powertrain

Potential CO_2 savings:

- Applications on the market from OEMs like Scania (Active Prediction), Daimler (Predictive Powertrain Control) and Volvo (I-See), and an average saving of 5% of fuel/CO_2
- Visual HMI: 10% improvement in fuel efficiency

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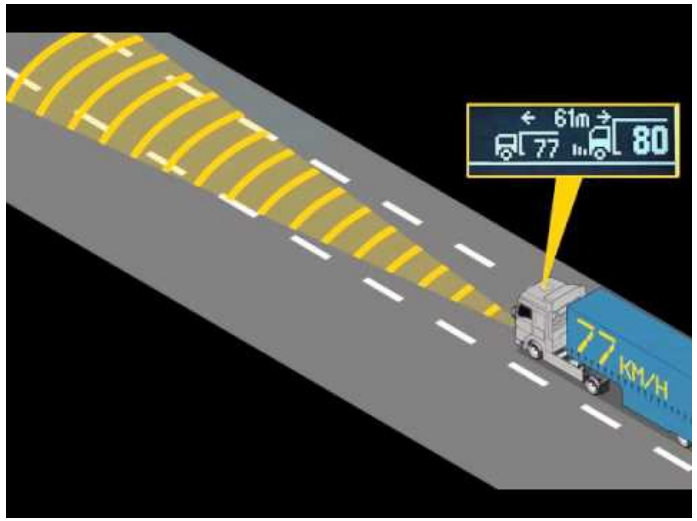
Cooperative Adaptive Cruise Control (C-ACC)

In-vehicle ITS applications

- Enhancement to ACC systems that can optimise a vehicle's speed profile by adding communication with other vehicles and/or infrastructure

Potential CO_2 savings:

- Tests on trucks in the euroFOT project found an average 2% fuel saving with C-ACC



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Traffic Signal Control

Infrastructure-based and cooperative ITS applications

- Coordination of traffic signals in a network by the use of timing plans (varying by time of day) loaded on a central computer
- Green waves for vehicles with recommended speed

Potential CO_2 savings:

- 3% to 7% feasible
- Success of green waves depend on traffic patterns
- Measured impact of selective truck priority in FREILOT project in from test sites in Helmond and Lyon found fuel consumption / CO_2 emissions were reduced by 8 to 13%.

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Energy Efficient Intersection Services

Infrastructure-based and cooperative ITS applications

- EEIS: Traffic lights which extend green phase to selected vehicles (Compass4D project).

Potential CO_2 savings:

- Measurements in Helmond and Bordeaux showed that the system (which included an in-cab GLOSA service) led to an improvement in HGV CO_2 efficiency (g/km) of 5% - 10% (at intersection level)

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Intelligent truck parking & Delivery space booking

Infrastructure-based and cooperative ITS applications

- On-trip reservation system for loading spaces in cities and truck parking on motorways

Potential CO_2 savings:

- Around 20% reduction for delivery vehicles (at the location where they are delivering)
- Very difficult to quantify (percentage CO_2 reduction is only for the part where the delivery takes place)

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Many benefits…. but:

Conclusions

Validation & impact assessment depends on:

- road network characteristics
- traffic load
- local topography
- penetration rate of the applications / systems
- driver behaviour

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Proposed actions

Conclusions

- Explore and build consensus on how to measure combined effects of several ITS solutions together
- Work towards defining a common Impact Assessment methodology to assess in a comparable way solutions for reducing emissions
- Session at ITS World Congress, Copenhagen to share knowledge and discuss required steps:
  - session SIS38, Tuesday 18 September
  - will work towards ERTICO Clean Mobility Roadmap target to achieve consensus on evidence of environmental benefits of different ITS applications by 2020

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Thank you!

Andrew Winder
Project Manager, Clean Mobility
a.winder@mail.ertico.com
ERTICO website: ertico.com
ERTICO Newsroom: erticonetwork.com