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

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• In-vehicle ITS applications
  – Navigation
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Several ITS applications have the potential to reduce CO₂ 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
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:

- or search the internet for “ITS4CV”
Measurement

• Trials usually without system (baseline) and with system (treatment):
  – Average distance travelled
  – Total fuel use
  – Fuel use per kilometre (proxy for CO₂ 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
A few of the contributing projects

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

- **Amitran** ([www.amitran.eu](http://www.amitran.eu)) – CO2 assessment methodology for ICT in transport
Eco-Navigation

- 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 CO₂ savings:
- Between 5% and 10% in urban/suburban areas
- Less for longer distance trips
Eco-Driving

- 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
Eco-Driving

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
Predictive Powertrain Control

- 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 CO₂ 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/CO₂
- Visual HMI: 10% improvement in fuel efficiency
Cooperative Adaptive Cruise Control (C-ACC)

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

Potential CO₂ savings:
• Tests on trucks in the euroFOT project found an average 2% fuel saving with C-ACC
Traffic Signal Control

- 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%.
Energy Efficient Intersection Services

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

Potential CO\textsubscript{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\textsubscript{2} efficiency (g/km) of 5% - 10% (at intersection level)
Intelligent truck parking & Delivery space booking

- 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)
Many benefits…. but:

Validation & impact assessment depends on:

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

• 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
Thank you!

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