eCoMove Project Overview

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ITS WC 2010, SS35 "Cooperative systems for efficient mobility", Busan, 28.10.2010

www.ecomove-project.eu
Project goal

To develop a **combination of cooperative systems and tools** using V2V and V2I communication to help:

- drivers sustainably eliminate unnecessary fuel consumption;
- fleet managers manage their vehicles more economically and promote eco-driving through feedback & incentives;
- road operators balance traffic flows in the most energy efficient way.

Target is to reduce by 20% fuel consumption and therefore CO₂ emission
Vision and motivation

Wasted energy due to:
- Inefficient deceleration
- Wrong gear & engine speed
- Excessive speed, acceleration
- Poor anticipation
- Congestion
- Poorly synchronised signals
- Choice of inefficient route
- Lack of know-how, motivation

eCoMove Solutions
- ecoSmartDriving
- ecoFreight & Logistics
- ecoTrafficManagement + Control

Residual wasted energy

Energy consumption of “perfect eco-driver”

Situation today

The future

Energy

Time
Status: what do we have today

Logistics Centre
Route Data (pre trip)

Transport Planning Office

Traffic Management Centre
Traffic Control

Traffic often jammed, mostly uncoordinated

Traffic management centers managing traffic lights

Logistic centers managing commercial transport

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Cooperative data exchange as enabler

- eco-driving support (cars and trucks)
  - Green Routing
    - Optimum route from static and dynamic factors
    - Map learning from experience
  - ecoSmart Driving Assistant
    - Generation of most efficient driving strategy
    - Dynamic driving advice via HMI
  - Post Trip Driving Analysis
    - Feedback on driving behaviour
    - Long-term coaching strategy
  - Freight Specific Measures
    - Eco logistics planning
    - Training and eco bonus scheme

- eco-traffic management and control
  - Adaptive Balancing and Control
    - Eco green wave
    - Balanced priority control
    - Eco route distribution
  - Eco Motorway Management
    - Prioritised ramp metering
    - Eco merging assistant
    - Speed and headway control
  - Eco Traveller Support
    - Fuel consumption and emission prediction
    - Eco strategy model

**LEGEND:**
- ecoFVD: eco Floating Vehicle Data
- ecoTSD: eco Traffic Situation Data
- V2V: Vehicle-to-Vehicle
- V2I: Vehicle-to-Infrastructure
eCoMove System Concepts

- Logistics Centre
- Transport Planning Office
- Traffic Situation
- Route Data (pre trip)
- Route Data (on trip)
- eco FCD & Route Data
- eco horizon
- Maneuver & Traffic Data
- Request for Green Remaining Red/Green Time
- Traffic Management Centre
- Post trip data collection

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Project Structure

SP1 - IP Coordination and Dissemination

Cooperative Mobility Systems and Services for Energy Efficiency

SP2 - Core Technology Integration

SP3 ecoSmart Driving

SP4 ecoFreight and Logistics

SP5 ecoTraffic Management and Control

SP6 - Validation and Evaluation

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Core Technologies (SP2)

- **eCoMove communication platform** will be adapted from the technology developed and validated in the CVIS and SAFESPOT projects, and for the first time be fully integrated to provide support for both V2V and V2I communication, meeting the expected communication requirements of the eCoMove cooperative applications.

- **eCoMove messages** will be defined for information exchange amongst vehicles (V2V), between vehicles and the traffic system (V2I) and between vehicles and data processing and provision services; these standard messages include an ecoFVD message to describe a vehicle’s progress, its fuel consumption and its destination, as well as an ecoTSD traffic situation data message sent from the traffic system to vehicles in the vicinity.
Core Technologies (SP2)

- eCoMove communication platform
- eCoMove messages
- An ecoMAP comprising a digital map database enhanced with additional attributes needed for eco-driving support, such as slope, historical speed profile and energy consumption data;

- A situational & strategic operational model analysing the current driving and surrounding traffic conditions, taking into account real area-wide energy use and specific energy “hot-spots”, to define traffic management and control strategies for the entire road network and support the eco-driver assistant.
ecoSmartDriving applications (SP3)

- *ecoTripPlanning (pre trip)* application to enable green routing.
- *ecoSmartDriving (on trip)* comprising three applications
  - *dynamic green routing*: integrating information from the traffic centre, ecoMaps, ecoCooperative-eHorizon, etc.
  - *ecoDriving support*: dynamic advice on how to drive with least fuel consumption
  - *ecoInformation*: information how to tune other vehicle functions to minimise fuel consumption
- *ecoPostTrip (post trip)* information derived will be used to optimise ecodriving strategies.
- *ecoMonitoring (eco floating car data)* relevant information will be distributed anonymously to the traffic control centre.
ecoFreight & Logistics (SP4)

- **in-vehicle truck ecoNavigation**, i.e. most efficient route for trucks.
- **ecoDriver Coaching System** for goods vehicle drivers:
  - **Pre-trip**: ecoDriving training system with virtual simulator where the driver experiences the eCoMove system and its use cases.
  - **On-trip**: real-time eco driving advice on in-vehicle display
  - **Post-trip**: fleet management backoffice to analyze trends, give feedback to the drivers, handle incentives

- **cooperative ecoFleet Planning & Routing** taking into account previous missions.
  - Find the best combination of vehicle, trailer, route, driver, system configuration based on pre mission information, Traffic Management data, Truck & driver models and Routing system
  - Feedback from previous missions to adapt optimize the planning & routing system
ecoTrafficManagement & Control (SP5)

- **ecoAdaptive Balancing and Control system** for traffic control, improving traffic network energy efficiency through a coordination of traffic lights.

- **ecoAdaptive Traveller Support** application to send to drivers information on traffic state, route recommendations and speed profile data needed by vehicles.

- **ecoMotorway Management** application combining energy-optimised speed and flow management measures with tools to improve metering and merging assistance at vehicle level. ecoFreight & Logistics
Validation & Evaluation (SP6)

- **Conduct** a study on European level on driver motivation and behavioural change
- **Validate** that technologies, applications and services developed in eCoMove meet the functional and non-functional requirements defined in the SPs for IP and application level, including specifically requirements for data privacy and protection
- **Demonstrate** that the eCoMove framework is valid, meaning it enables and supports the interaction of the eCoMove applications and services to meet the expectations of all stakeholders
- **Show** that technologies, applications and services meet the high level objectives of eCoMove and enable a more energy efficient land-based transport of passengers and goods
### eCoMove test sites (SP6)

<table>
<thead>
<tr>
<th>Test site</th>
<th>Applications &amp; services tested</th>
<th>Test scenarios</th>
<th>Geographical coverage of test site</th>
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</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Simulation environment: Test and demonstration of eCoMove systems</td>
<td>Controlled Integration Test Scenario (Verification test site)</td>
<td>1,2 km test track</td>
</tr>
<tr>
<td>Düsseldorf</td>
<td>ecoSmart Driving</td>
<td>Urban (Verification test site)</td>
<td>North western part of the Dusseldorf area</td>
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</tbody>
</table>
| Munich         | • ecoSmart Driving  
• ecoAdaptive Balancing and Control (ecoGreenWave, ecoBalanced Priority, ecoRouting) | Urban / Interurban (Verification test site)       | Munich city and Motorway network                |
| Helmond        | All eCoMove applications in a cooperative environment (apart from Motorway) | Urban (validation test site)                     | Helmond city                                    |
| French Motorways | eco Motorway management                                                 | Motorway (validation test site)                 | Different types of Motorway road network        |
International cooperation

• Main goals:
  – common understanding about impact assessment of ITS measures for reducing CO2 emission
  – input to standardisation

• eCoMove involved in the EU-METI Task Force
  – participation to a first TF meeting in Amsterdam (23.03.2010)
  – eCoMove responsible for "Validation methodology" to establish: validation framework of both traffic simulation and CO₂ emission model

• EU-US DoT RITA Cooperation
  eCoMove contribution in the frame of the Implementation Agreement.

• eCoMove partners involved in new EU project ECOSTAND coordinating EU input to both EU-METI and EU-US TF
eCoMove IP Milestones

11/2010: Use cases & requirements
02/2011: Architecture & system specification
09/2011: eCoMove communication platform
03/2012: Applications ready for integration
07/2012: Applications and test vehicles ready for evaluation
09/2012: ITS WC Vienna
Q1/2013: eCoMove final event
03/2013: Evaluation results
General figures

- Total budget: 22.5 M€
- EC funding: 13.7 M€ (DG-INFSO)
- Duration: 36 Months
- Starting date: 01/04/2010
- Coordinator: ERTICO – ITS Europe
- 10 Countries: Austria, Belgium, France, Germany, Italy, Norway, Sweden, Spain, the Netherlands, United Kingdom
### The Consortium

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<thead>
<tr>
<th>Sector</th>
<th>Partner name</th>
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<td>Vehicle manufacturer</td>
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<td>Automotive supplier</td>
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<td>Digital map supplier</td>
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<td>Communication system supplier</td>
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<td>Mobile and fixed network operator</td>
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<td>Traffic system supplier</td>
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<td>University or research institute</td>
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<td>System integrator</td>
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<td>Motorway operator</td>
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<td>Motoring association</td>
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<td>Eco-driving trainer</td>
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<td>ITS association</td>
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28 October 2010

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Thank you for your attention

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