



Requirements and acceptance of driver assistance  
systems with the focus on fuel consumption reduction  
in a cooperative environment

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# Reduction of fuel consumption through ecoADAS

Field of impact	Concepts / Studies	Known potential
<b>Navigation</b>	Fuel-optimized navigation (Ericson et.al.)	4% to 8% fuel savings
	Satellite navigation (TOMTOM/TNO)	16% reduced travel distance
<b>Traffic infrastructure</b>	Field-tests on synchronized traffic lights to avoid Stop-Go (AUDI Travolution)	21% less waiting time
<b>Driving behaviour</b>	Regular Eco Driver Coaching for commercial and private drivers (FORD)	20-25% fuel savings
	Driver self-evaluation on driving efficiency (FIAT eco:drive)	6-16% less fuel consumption

# The project eCoMove

- 33 partners from 10 countries:
  - Vehicle and supplier industry
  - map makers
  - Telecom
  - infrastructure operators
  - R&D labs & universities



- Starting date: 04/2010    Duration 36 Months
- Total budget:    22.6 M€    EC funding: 13.7 M€    (DG-INFISO)
- Coordinator:    ERTICO ITS Europe



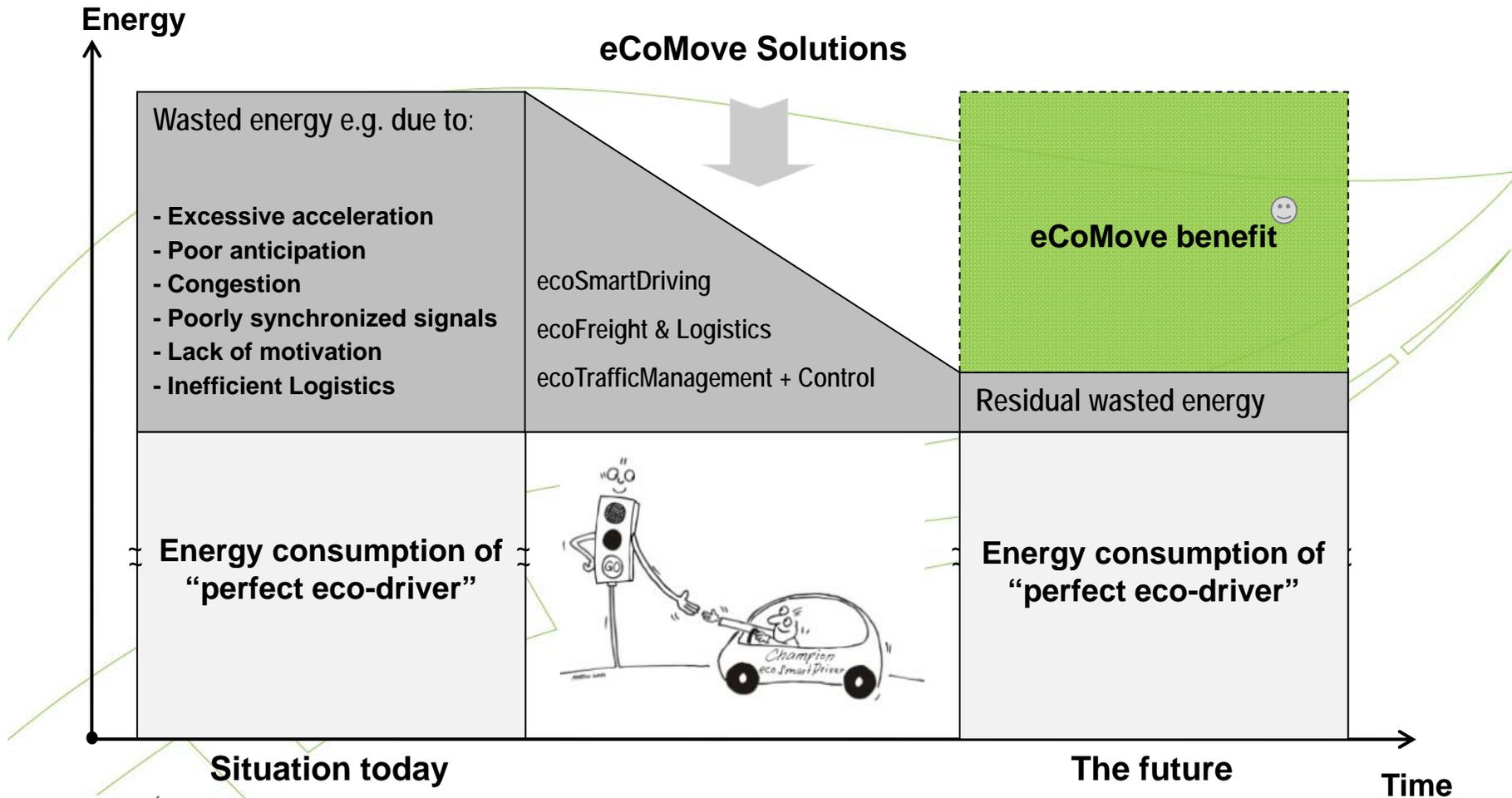
# Project goal

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.

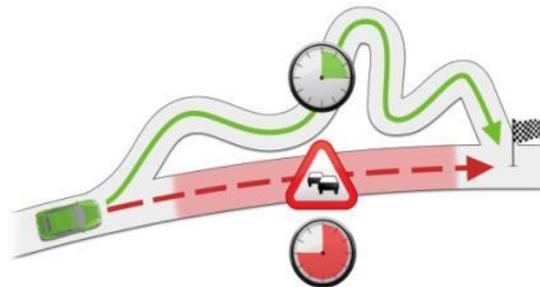
Target is to reduce up to 20% fuel consumption and therefore CO<sub>2</sub> emission

# Vision and motivation

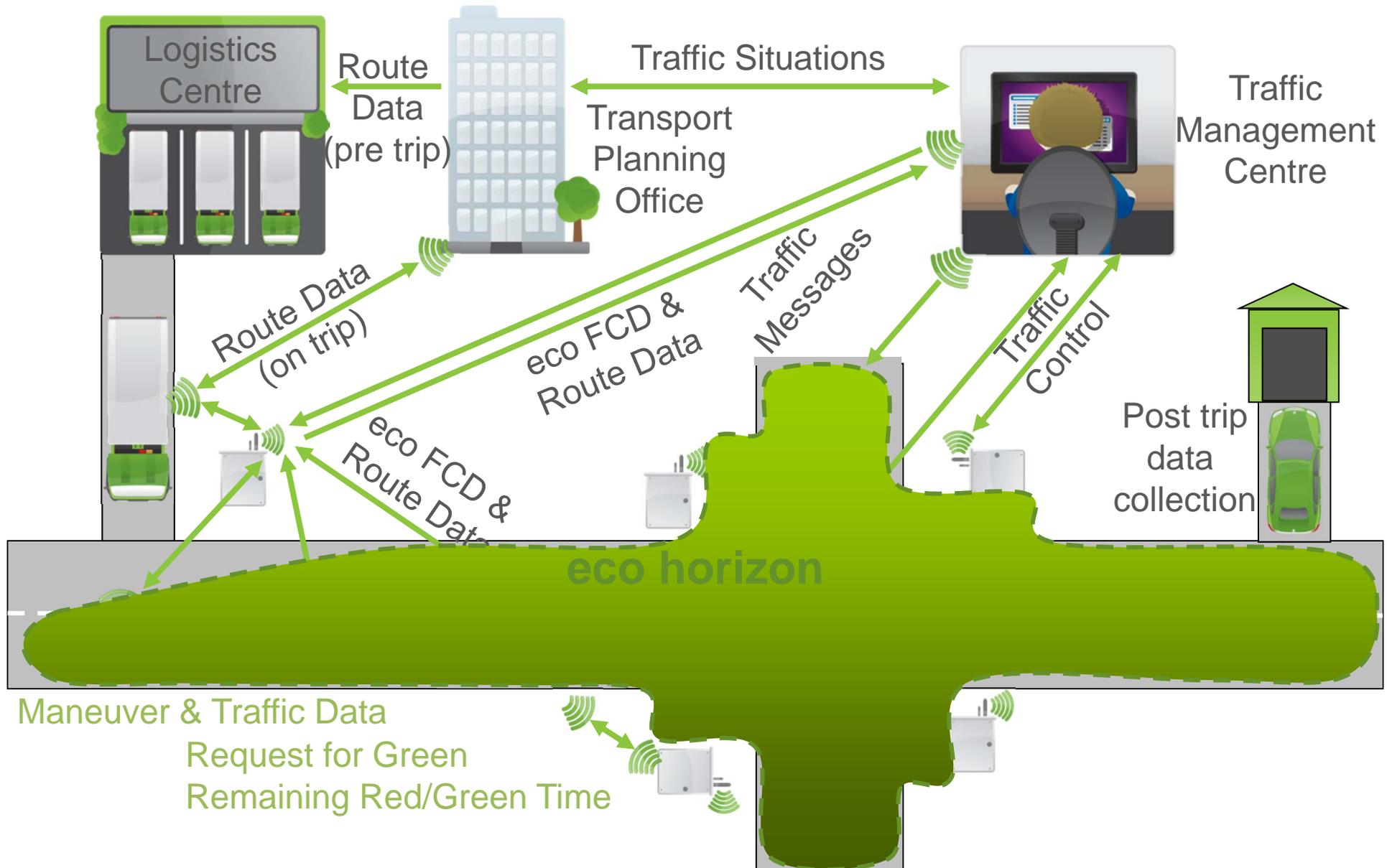


# Focus on existing inefficiencies

- Pre-trip inefficiencies
  - Vehicle condition
  - Trip planning
- On-trip inefficiencies
  - Primary driving tasks
    - Accelerating/decelerating
    - Gear changing
    - Idling
    - Keeping speed
    - Unnecessary stops
  - Secondary driving tasks
    - Inefficient routing (due to unexpected events)
  - Non-driving tasks
    - Vehicle condition & (electrical) energy consumers



# eCoMove System Concepts



# Main activities

- Develop eCoMove core technologies
  - V2V & V2I communication platform based on CVIS & SAFESPOT projects results
  - ecoMap (digital map database enhanced with eco-relevant attributes)
  - ecoModels to advise optimal driving and traffic control strategies
- Develop eCoMove applications
  - **ecoSmartDriving applications** for fuel-efficient driving behaviour
  - **eco Freight & Logistics applications** for green freight routing and fuel consumption-optimised logistics
  - **ecoTrafficManagement & Control applications** for energy-efficient traffic control & management measures
- Test and validate eCoMove system
  - In 5 field trials, 5 driving simulator studies and VISSIM simulation environment
  - User acceptance and cost-benefit analysis



# 2<sup>nd</sup> part: Study on perceived usefulness of ecoADAS

## Motivation:

1. Collect user needs on ecodriving assistant systems and carry out a pre-evaluation of applications to be designed within eCoMove
2. Uncover European differences
3. Identify potential challenges for the system development and market roll-out



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# Methodology

- Standardized online questionnaire
- High response numbers in short time covering 11 European countries with the support of European automobile clubs
- Possibility to visualize eCoMove applications and functionalities through sketches
- Evaluation of eCoMove applications through rating – pictures describing functionalities

Spain	615
Portugal	367
Norway	124
Finland	125
Belgium	303
France	675
Slovenia	145
Croatia	121
Austria	287
Switzerland	130
Germany	2915
<b>Total</b>	<b>5807</b>

Usefulness

System operation

Environmental impact

Willingness to pay



# Items

Factor	Questionnaire item
<div style="background-color: yellow; border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;">Usefulness</div>	<ul style="list-style-type: none"> <li>...restricts my freedom while driving</li> <li>...saves travel time</li> <li>...uses too much personal information</li> <li>...helps to improve my driving skills</li> <li>...would be useful for me</li> </ul>
<div style="background-color: purple; color: white; border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;">System operation</div>	<ul style="list-style-type: none"> <li>...requires technical knowledge to use it</li> <li>...makes trip planning easier</li> <li>...should be turned off if I want</li> <li>...makes driving less stressful</li> </ul>
<div style="background-color: green; color: white; border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;">Environmental impact</div>	<ul style="list-style-type: none"> <li>...improves traffic flow</li> <li>...helps me actively contribute to environmental protection</li> <li>...helps to save fuel</li> </ul>
<div style="background-color: lightblue; border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;">Willingness to pay</div>	<ul style="list-style-type: none"> <li>...is worth to pay for</li> </ul>

# “The average respondent”

- 42 years old, male, 16,000km yearly driving performance
- Medium sized car, 5 year old car with a portable navigation system



➔ All age and driving performance categories well represented - not true for gender aspects



# Pre-evaluation of eCoMove applications

## I: pre-trip

### ecoTripPlanning

- Route is calculated via TMC -> real time traffic information & pollution
- Recommend route can differ from fastest route – “detour” shown
- Driver is asked to act responsibly



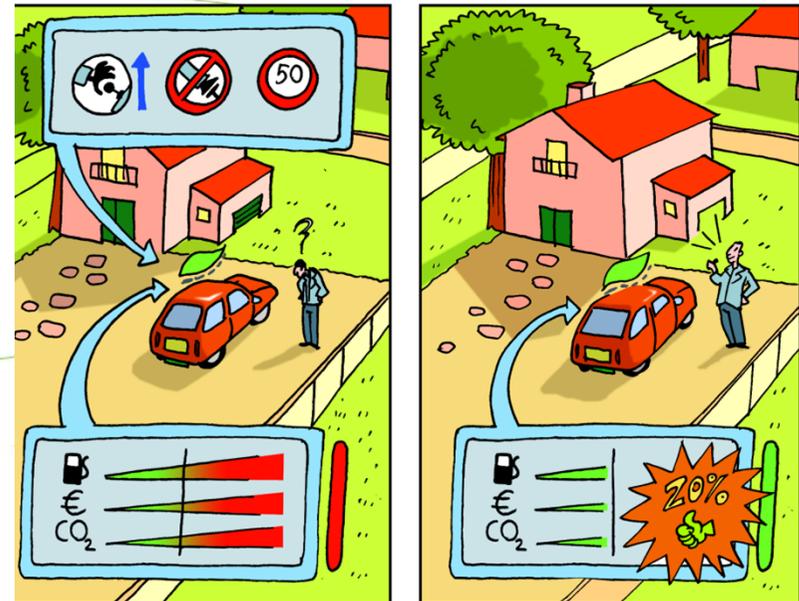


# Pre-evaluation eCoMove of applications

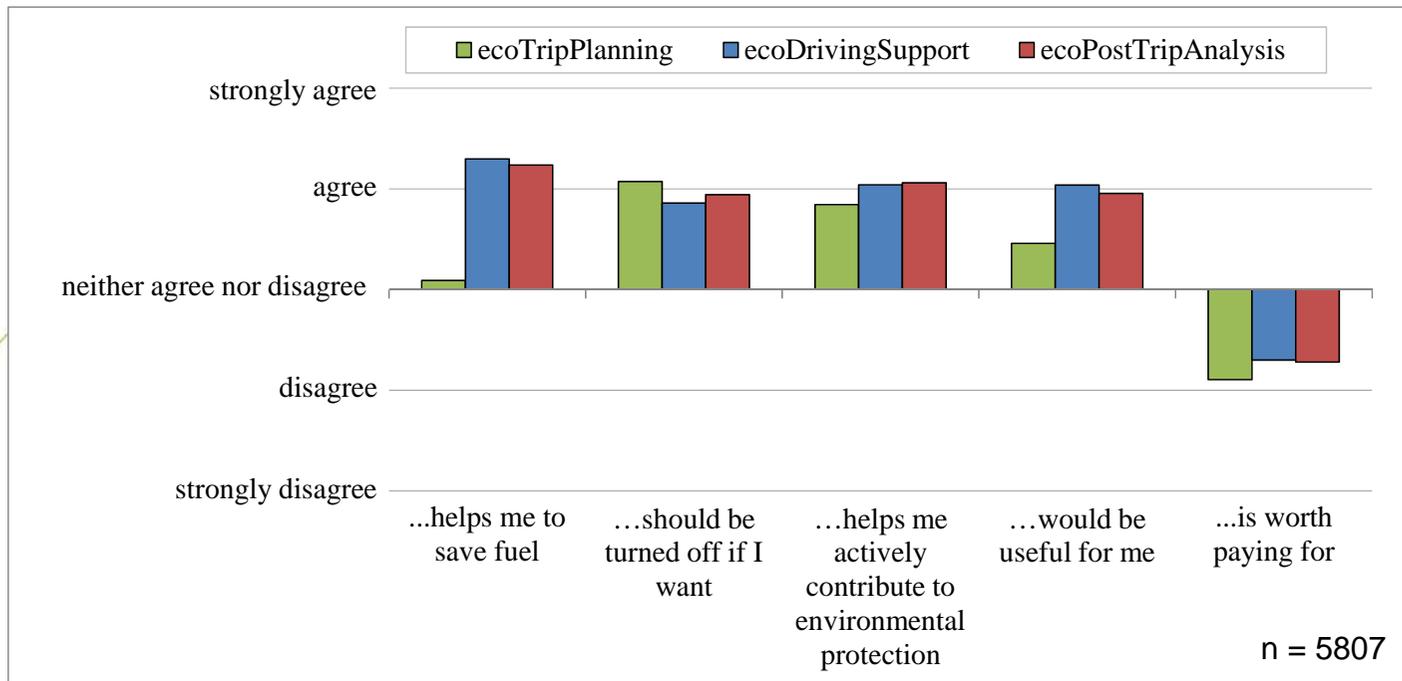
## III: post-trip

### ecoPostTripAnalysis

- Feedback on driver behaviour (acceleration, deceleration, speeding...)
- Demonstrating possible gains (fuel consumption, costs, CO<sub>2</sub> savings)



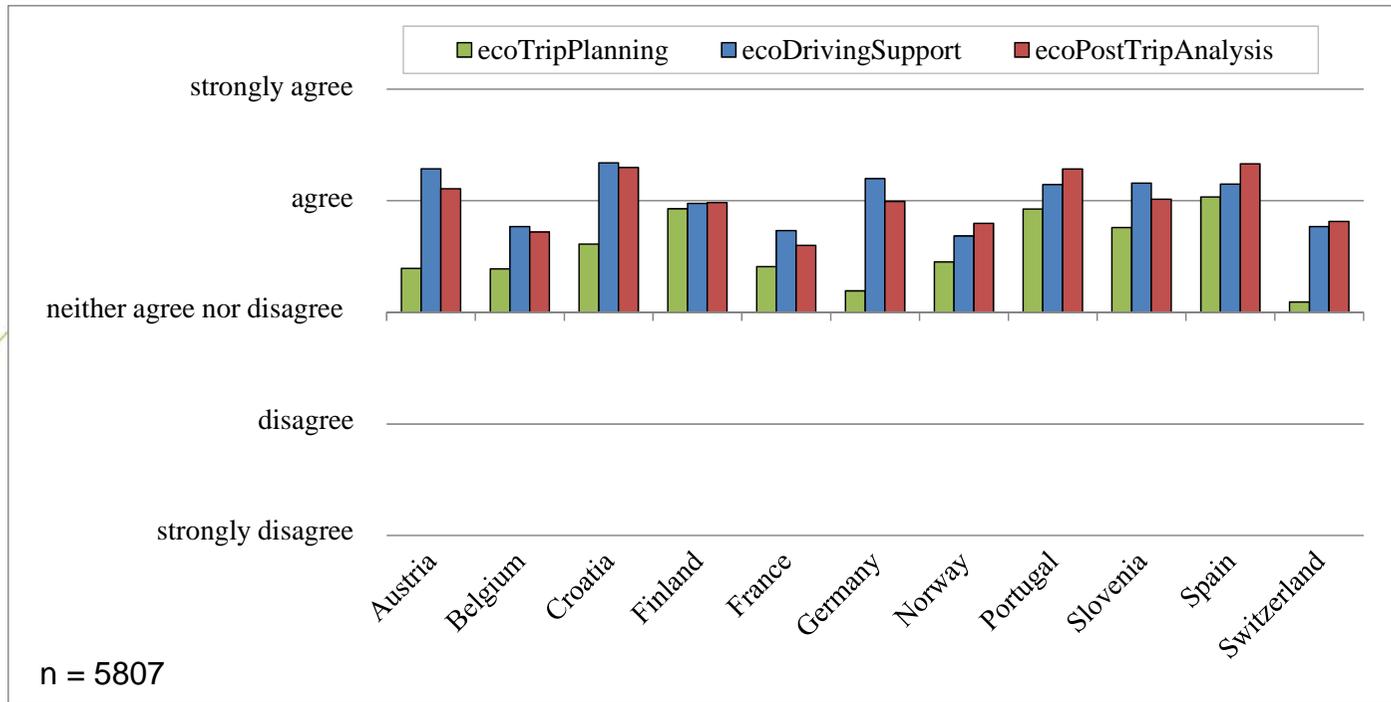
# Overall results



- Positive feedback on usefulness and environmental impact
- Highest interest in speed recommendations
- Limited acceptance for pre-trip application – no personal benefit
- Very low acceptance of paying for such applications



# Regional analysis - usefulness



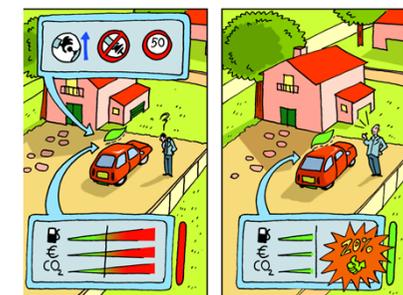
- ecoTripPlanning rated lower for all countries
- “Excited” countries: Austria, Croatia, Portugal, Slovenia, Spain
- “Cautious” countries: Belgium, France, Norway, Switzerland



# Regional analysis - willingness to pay



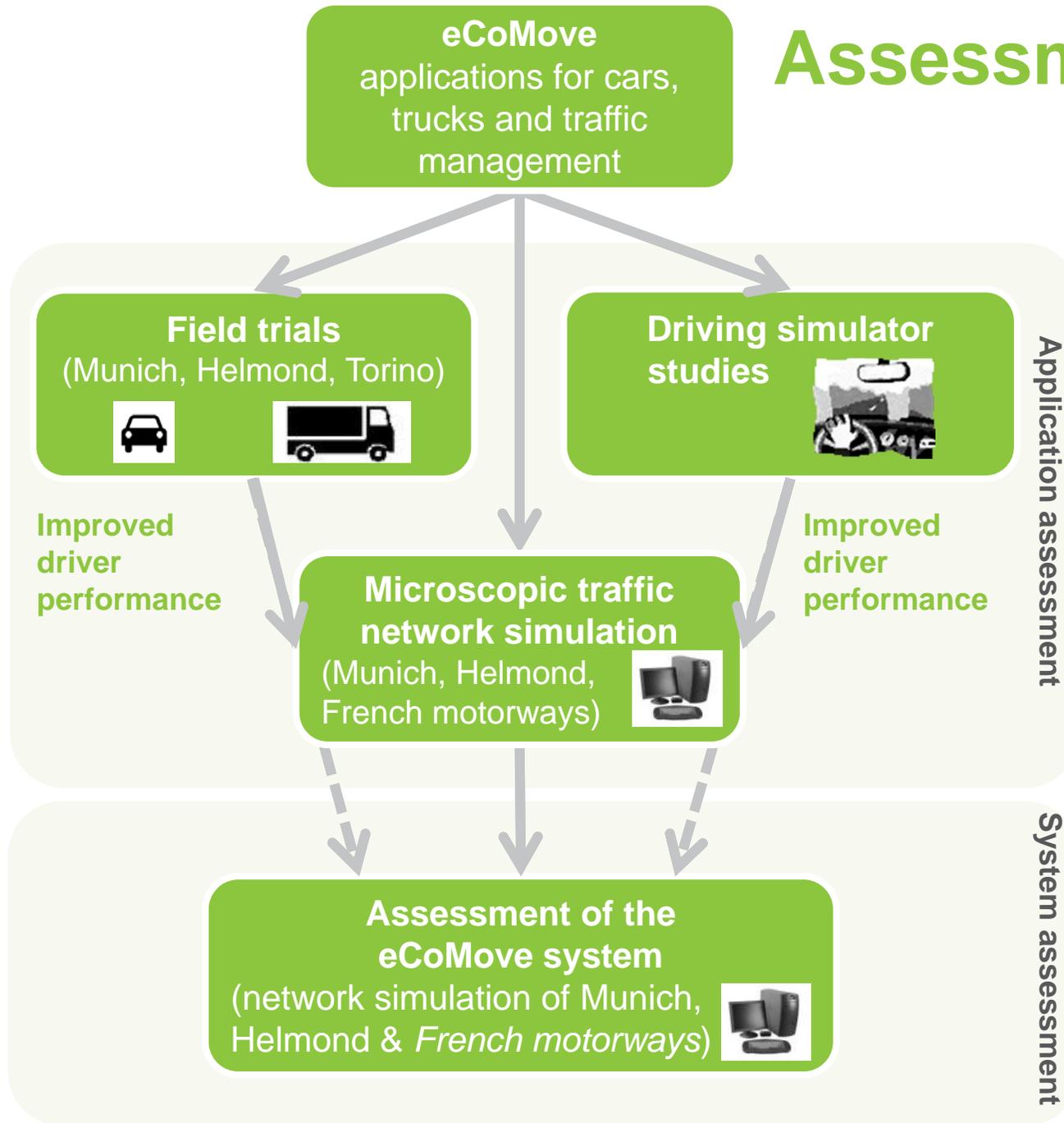
- Most controversial question
- Open minded countries: Portugal, Slovenia, Spain, Switzerland
- Refusing countries: Austria, Finland, France, Germany



# Summary and outlook

- Generally high interest in eCoMove applications
- High expectations of fuel savings -> conscious about saving potential in their driving and advanced traffic management solutions
- Less critical concerning privacy issues than expected
- More refusing to pay for the service than expected - Needed: acceptable payment models
- **Upcoming:** Test with test subjects in real test

# Assessment concept



Individual assessment of applications using different methods

Integration of findings from field trials and driving simulator studies into the traffic simulation model for subsequent system assessment

Assessment of the eCoMove system using traffic simulation models and emission models.

# Beyond eCoMove

... First cooperative systems close to market

- Transfer eCoMove solutions to electric vehicles
- Establish a deployment roadmap for Cooperative ITS for
  - political/regulatory framework
  - technology
  - prioritisation of applications/services
- FOT for cooperative sustainability solutions, demonstrate effectiveness and benefits of the proposed solutions (vs. safety, efficiency, etc.)
- Further research on Cooperative ITS applications & tools for deployment (e.g. new applications, business/organisational models)



# Thank you for your attention

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