ecoDriver project overview

Supporting the driver in conserving energy and reducing emissions

2 March 2012

Co-financed by

ecoDriver

www.ecodriver-project.eu

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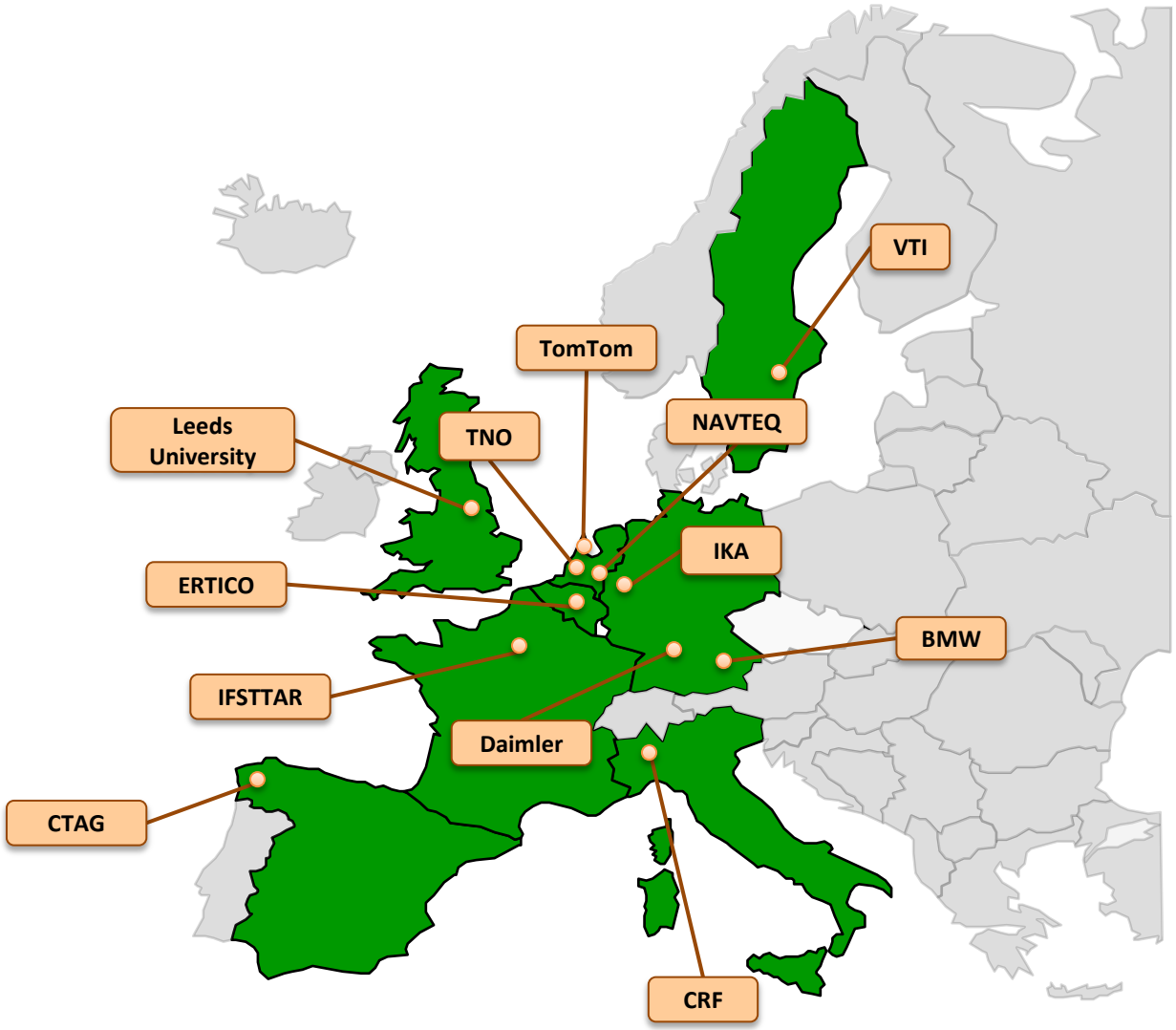
Project at a Glance

- **Budget: 14.5 M€**
  - Funding: 10.7 M€
  - Co-funding: DG INFSO, 7th Framework Programme (FP7-ICT-2011-7)
- **Duration: 48 months**
  - Dates: October 2011 – September 2015
- **Coordinator: University of Leeds**
  - Contact: Oliver Carsten, o.m.j.carsten@its.leeds.ac.uk
- **Website:** www.ecodriver-project.eu

Consortium


VTI
TomTom
Leeds University
TNO
NAVTEQ
IKA
ERTICO
BMW
IFSTTAR
Daimler
CTAG
CRF

Consortium

12 Partners from 8 different countries:

R&D	**University of Leeds (coordinator)**	**United Kingdom**
	CTAG - Centro Tecnológico de Automoción de Galicia	Spain
	IFSTTAR - IFSTTAR - Institut français des sciences et technologies des transports, de l'aménagement et des réseaux	France
	IKA – Rheinisch-Westfaelische Technische Hochschule Aachen	Germany
	TNO - Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek	Netherlands
	VTI – Statens Vag – Och Transportforskningsinstitut	Sweden
ITS association	ERTICO ITS – Europe	Belgium
Vehicle manufacturers	BMW Forschung und Technik	Germany
	CRF - Centro Ricerche FIAT	Italy
	Daimler AG	Germany
Service providers	NAVTEQ	Netherlands
	TomTom	Netherlands

Motivation & Challenges

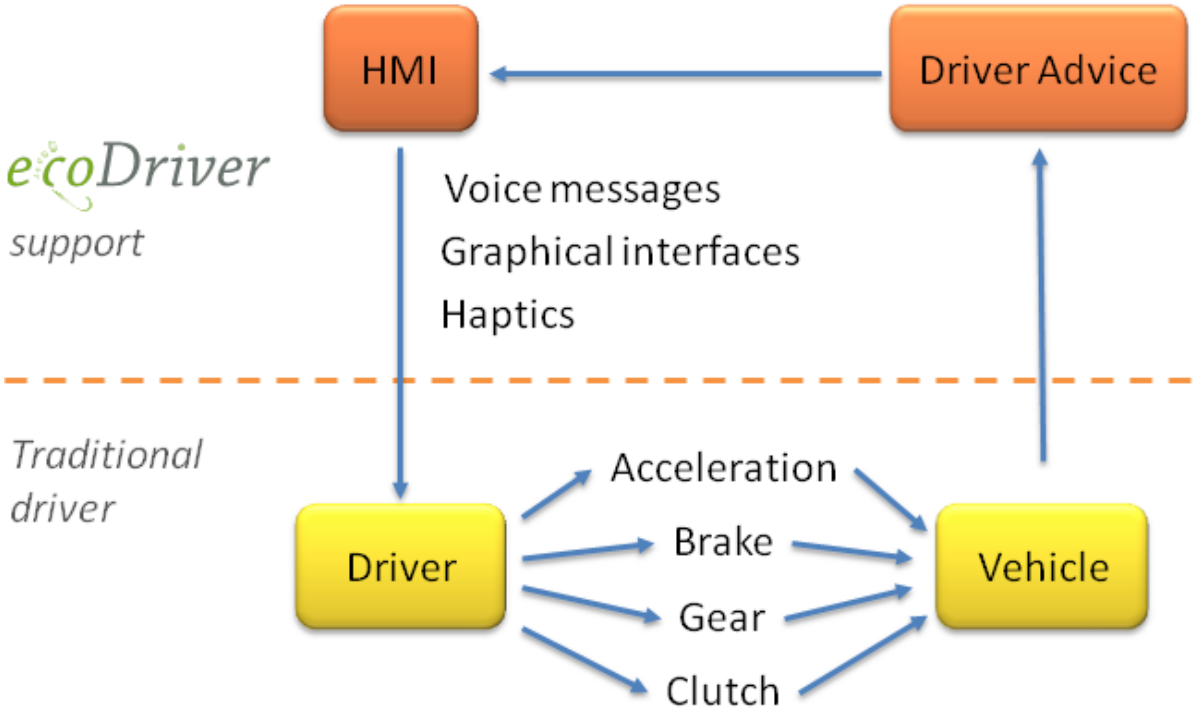
- **Motivation**
  - Need to reduce CO_2 emissions and fuel consumption
  - Climate change mitigation policies
- **Challenges**
  - Consider the human element in eco-driving
  - Optimise the driver-powertrain-environment feedback loop
  - Find the most energy-efficient driving style
    - For individual and collective transport
    - Nomadic or built-in navigation systems
    - Current and future vehicles
    - Hybrid and plug-in electric vehicles
    - Experiences in lab and in real world
  - Propose eco-driving solutions to improve energy efficiency by 20%

Objectives

- **ecoDriver aims to:**
  - Deliver to the driver the most effective feedback and advice on “green” driving
  - Maximise system effectiveness by adapting human-machine interfaces to:
    - driving style (e.g. relaxed *vs* sportive)
    - traffic condition (e.g. fluid *vs* heavy traffic)
    - powertrain (conventional, hybrid, electrical)
    - vehicle type (passenger cars, vans, trucks, buses)
  - Compare the effectiveness of nomadic with built-in navigation systems
  - Maintain or enhance driver safety
  - Scale up results and carry out a social cost benefit analysis
  - Explore how eco-driving related CO_2 emissions reductions might be affected by future technological, political and lifestyle scenarios

Objectives

- **Optimising the driver-powertrain-environment feedback loop**



Objectives

- **Expected results:**
  - Scenarios will be developed to assess the implications for the future effectiveness of green driving support
  - The target of ecoDriver is to deliver a 20% improvement in energy efficiency by autonomous means alone, which opens up the possibility of greater than 20% savings in combination with cooperative systems

Target: 20% reduction of CO_2 emissions and fuel consumption by encouraging "green" driving behaviour

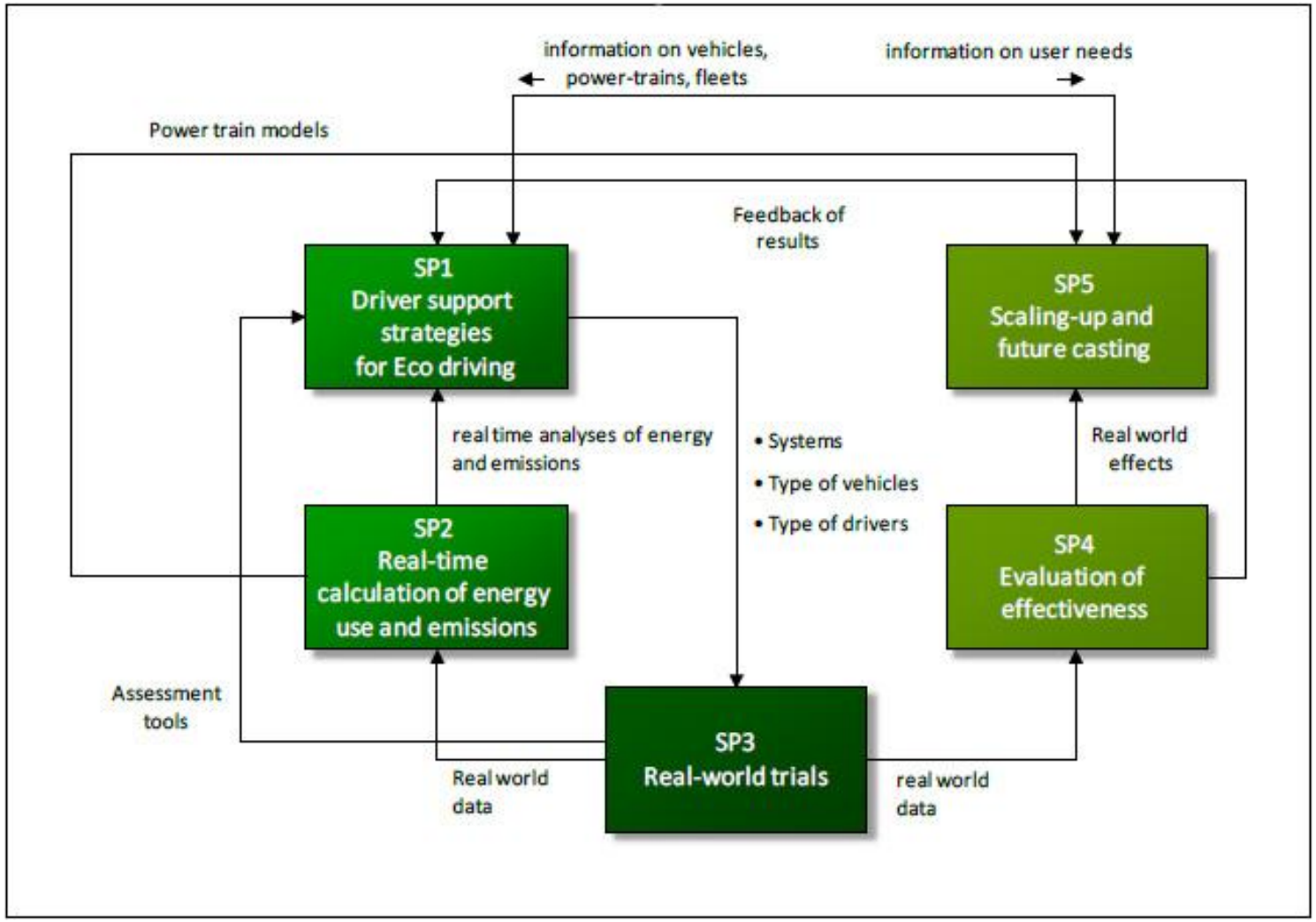
Innovative aspects

- **Main innovative aspects:**
  - Optimisation of feedback for both nomadic and built-in navigation systems and compare the effectiveness of each
  - Tailoring feedback to driving style and vehicle and traffic conditions
  - Minimising any side-effects of eco-driving support in terms of drivers distraction and safety
  - Post-drive feedback and tutoring for eco-driving
  - Use of real-time fuel use calculators to ensure the most accurate feedback

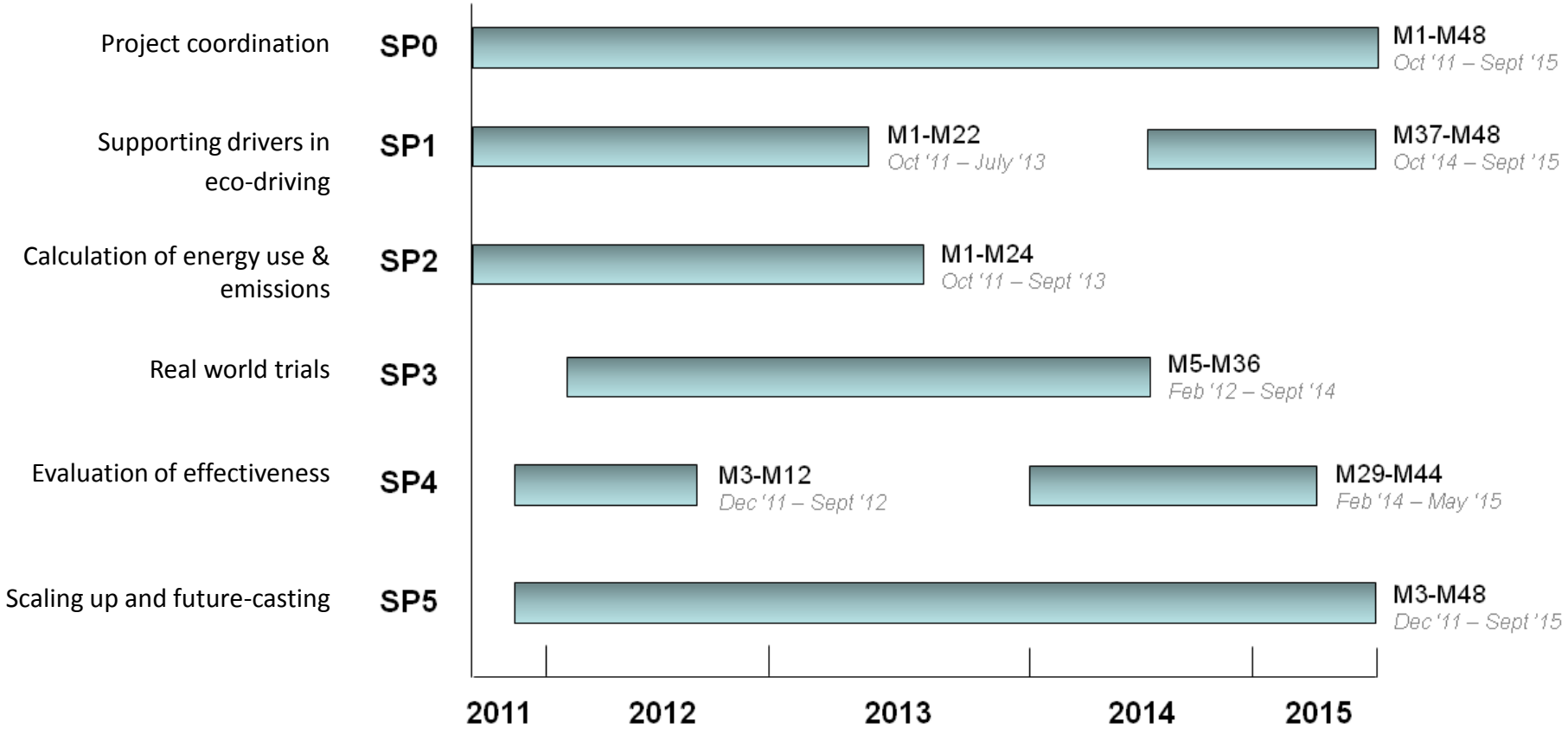
Work Plan

- **Supporting drivers in eco-driving (SP1) – TNO**
  - Identify the most effective eco-driving feedback mechanisms and develop eco-driving applications
- **Calculation of energy use & emissions (SP2) – TNO**
  - Derive powertrain models to estimate CO_2 emissions and validate those algorithms
- **Real world trials (SP3) – CTAG**
  - Carry out real world trials and validate the 20% reductions proposal
- **Evaluation of effectiveness (SP4) – BMW**
  - Comprehensive evaluation of the field trials and compare the effectiveness of nomadic with non-nomadic devices
- **Scaling up and future-casting (SP5) – VTI**
  - Estimate potential European wide impacts by scaling up the results from the test trials;
  - Explore the impact of future technological, political and lifestyle scenarios on eco-driving support systems and CO_2 emissions
  - Carry out a social cost-benefit analysis

Work Plan


information on vehicles, power-trains, fleets
information on user needs
Power train models
Feedback of results
SP1 Driver support strategies for Eco driving
SP5 Scaling-up and future casting
real time analyses of energy and emissions
• Systems
• Type of vehicles
• Type of drivers
Real world effects
SP2 Real-time calculation of energy use and emissions
SP4 Evaluation of effectiveness
Assessment tools
SP3 Real-world trials
Real world data
real world data

Work Plan


Project coordination
SP0
M1-M48
Oct '11 – Sept '15
Supporting drivers in eco-driving
SP1
M1-M22
Oct '11 – July '13
M37-M48
Oct '14 – Sept '15
Calculation of energy use & emissions
SP2
M1-M24
Oct '11 – Sept '13
Real world trials
SP3
M5-M36
Feb '12 – Sept '14
Evaluation of effectiveness
SP4
M3-M12
Dec '11 – Sept '12
M29-M44
Feb '14 – May '15
Scaling up and future-casting
SP5
M3-M48
Dec '11 – Sept '15
2011
2012
2013
2014
2015

Supporting Drivers in Eco-driving (SP1)

- **Coordinator: TNO**
- **Purpose:**
  - Identify the most effective eco-driving feedback mechanisms for a range of scenarios and, based on this, develop eco-driving applications
  - Provide a state-of-the-art on existing eco-driving support systems and provide descriptions of potential human-machine interfaces and feedback strategies
  - Perform a series of simulator experiments
  - Based on these experiments, develop the best feedback and human-machine interfaces and feedback solutions or nomadic and built-in applications, including:
    - Driver's style detection and specific feedback strategies
    - A wide range of driving profiles, powertrains and vehicle types
  - Integrate the refined ecoDriver solutions in demonstrator vehicles

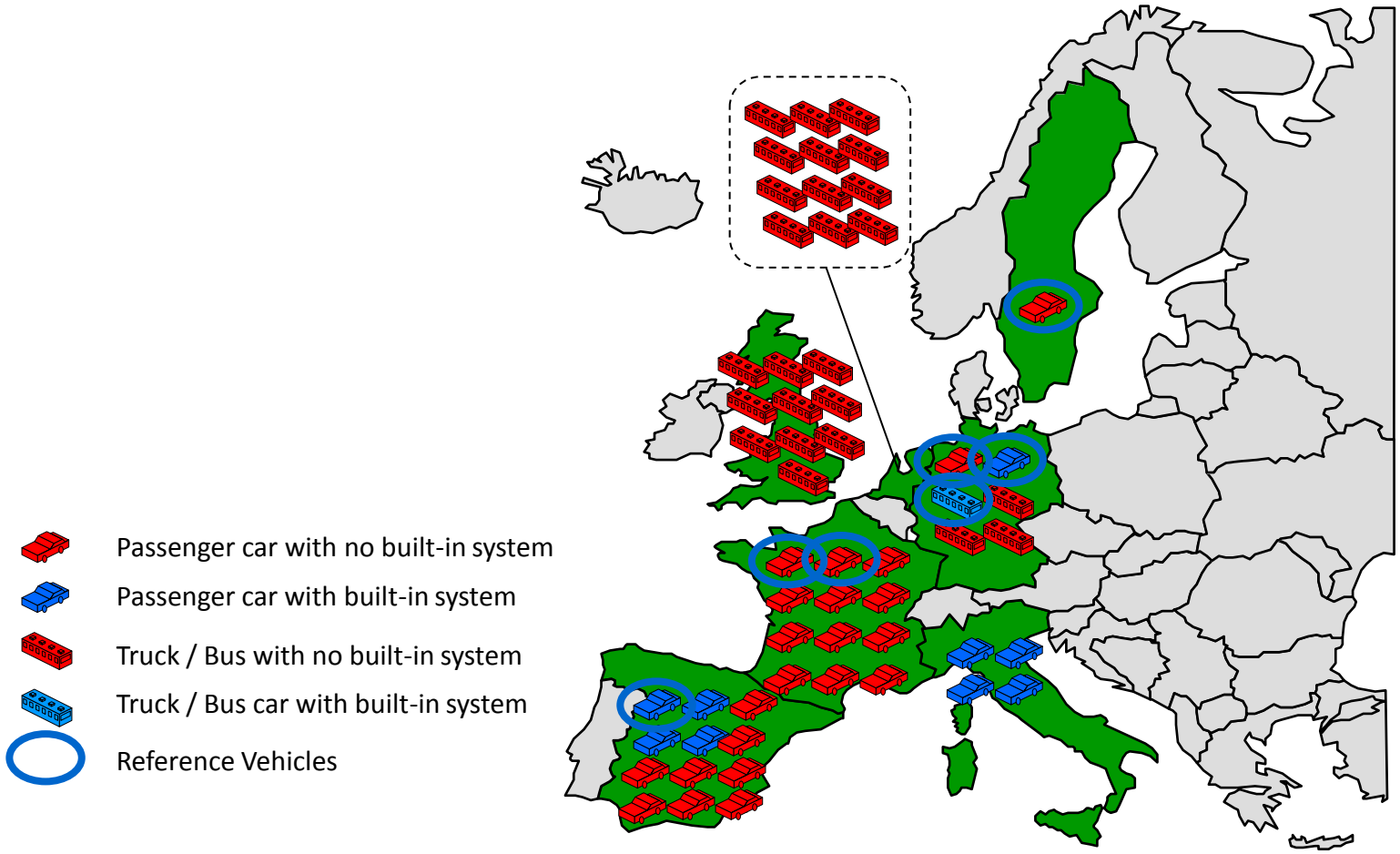
Calculation of Energy & Emissions (SP2)

- **Coordinator: TNO**
- **Purpose:**
  - Derive powertrain models to accurately estimate CO_2 emissions and validate such algorithms using real measurements
  - Provide a reference signal to the Human-Machine Interface
  - Develop a real time "calculation engine" to:
    - Evaluate current driver behaviour (throttle, brake, gear)
    - Calculate the impact of driver behaviour on energy consumption and emissions
    - Estimate how to improve energy efficiency by modifying demand to powertrain (throttle, brake, gear)
  - Validate and enhance the accuracy of the models
    - On-line estimation using vehicle data
    - Surrounding data also considered (additional sensors, navigation)

Real World Trials (SP3)

- **Coordinator: CTAG**
- **Purpose:**
  - Carry out real world trials across a range of driving scenarios, powertrains, vehicles types and climate and environmental characteristics.
  - Coordinate all Vehicle Management Centres (VMCs) that will support the local trials:
    - VMC France
    - VMC Germany
    - VMC Italy
    - VMC Netherlands
    - VMC Spain
    - VMC Sweden
    - VMC United Kingdom

Real World Trials (SP3)



Evaluation of Effectiveness (SP4)

- **Coordinator: BMW**
- **Purpose:**
  - Carry out a comprehensive evaluation of the field trials conducted in SP3
  - Evaluate the real world tests in terms of fuel consumption and CO_2 emissions, using models and tools from SP2
  - Validate the proposed reduction of 20% in CO_2 emissions based on the data gathered with these real world experiments
  - Provide an overview of the factors influencing driver acceptance
  - Compare the effectiveness of nomadic with built-in devices

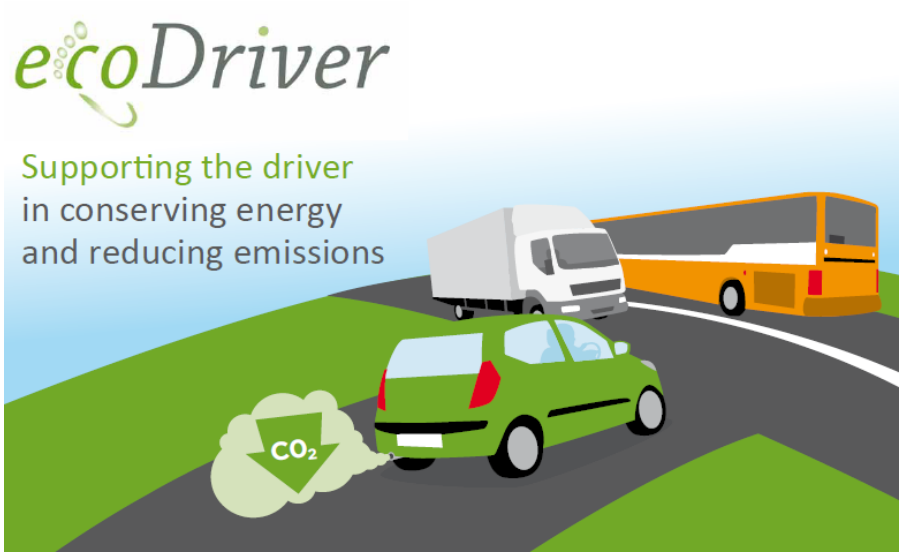
Scaling-up and Future-casting (SP5)

- **Coordinator: VTI**
- **Purpose:**
  - Estimate potential European wide impacts by scaling-up the results obtained during the test trials
  - Explore the impacts of future technological, political, and lifestyle scenarios on green driving support systems and on CO_2 emissions
    - Technological development
    - Lifestyle and attitude towards eco driving of individual drivers
    - Political decisions with respect to eco-driving
  - Assess the potential ecoDriver market deployment in terms of costs and benefits for both society as a whole and for sub-groups such as manufacturers and consumers
  - Carry out a cost-benefit analysis for a range of systems and scenarios

Milestones

Date	Milestone
Mar 2012	Website
May 2012	State of the art review, user expectations, and storyboards
Aug 2012	Definition of use cases and scenarios per test site Performance indicators and acceptance analysis of the ecoDriver design
Jan 2013	Evaluation results of the HMI and feedback solutions Test scenarios for validation of vehicle algorithms
Jul 2013	Vehicle energy and environmental estimator HMI driver reference and signal generator
Oct 2014	Real world trials
Jan 2014	Scenarios for green driving support systems
Feb 2014	Analyses of acceptance, eco-driving in the real world, and emission reductions
Sep 2015	Cost-benefit analysis Final event (including live demonstrations, conference, brochure, video, and press conference)

For more information about ecoDriver



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