




# PROJECT PROGRESS PERIODIC & MANAGEMENT REPORT

**Grant Agreement number:** 288094

**Project acronym:** eCOMPASS

**Project title:** eCO-friendly urban Multi-modal route PlAnning Services for mobile uSers

**Funding Scheme:** Collaborative Project (Small or Medium-scale focused Research Project)

**Date of latest version of Annex I against which the assessment will be made:** 15.07.2014

**Project Progress Periodic & Management Report:** 3rd

**Part 2:** *Publishable Summary*

**Period covered:** **from** 1 November 2013 **to** 31 December 2014

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[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement .
[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

## Abbreviations

| Abbreviation | Expansion |
|---|---|
| DM | Deliverable Manager |
| DoW | Annex I – "Description of Work" of the eCOMPASS Grant Agreement |
| IPR | Intellectual Property Rights |
| QP | Quality Plan |
| QPR | Quarterly Progress Report |
| PCB | Project Consortium Board |
| PCO | Project Coordination Office |
| PQB | Project Quality Board |
| S&T | Scientific & Technological |
| TMB | Technical Management Board |
| WP | Workpackage |

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# 1 Publishable Summary

eCOMPASS addresses the high environmental impact of urban mobility by introducing new mobility concepts and establishing a methodological framework for route planning optimization. eCOMPASS aims at delivering a comprehensive set of tools and services for end-users to enable eco-awareness in urban multi-modal transport.

## 1.1 Project Context and Objectives

The eCOMPASS project addresses high-demand urban mobility aspects, primarily aiming at reducing the environmental footprint related with the mobility of people and goods in the urban space. In this context, eCOMPASS primarily investigates two mobility scenarios with significant contribution to urban $CO_2$ (and other) emissions and energy consumption:

- Mobility of humans using private vehicles.
- Mobility of goods through fleets of vehicles carrying light or heavy freights.

The former is addressed through intelligent on-board navigator systems that seamlessly provide 'green' route recommendations, i.e., those with minimal environmental footprint and fuel consumption. The latter is addressed through the development of a logistics and fleet management system used by human administrators in conjunction with on-board systems mounted on vehicles and used by drivers. In parallel, eCOMPASS aims at developing advanced web and mobile information services that will facilitate the use of complex contemporary urban public transportation networks, thereby making inherently 'green' human transports more appealing and usable to urban resident populations and tourists. In addition to establishing solid theoretical foundations for the proposed route planning services, an important objective of eCOMPASS is to implement novel and efficient algorithmic solutions and deliver the respective services to familiar end-user devices.

The main objectives of eCOMPASS project are:

1. Optimization of private vehicles navigation with respect to environmental footprint. In particular, innovative algorithmic approaches will be developed to enable efficient and effective routing methods for private vehicles moving within urban environments.
2. Optimization of vehicle fleets route planning with respect to environmental footprint. In particular, novel algorithmic approaches will be developed towards automating the logistics management and route planning for fleets of vehicles, hence minimizing the overall environmental footprint.
3. Optimization of route planning over urban multi-modal public transportation networks. The key objective of eco-friendly urban human mobility is predicated on the increased use of the - inherently 'green'- public means of transportation. In this context, this objective refers to route planning web and mobile applications, aiming at hiding the complexity and increasing the usability of multi-modal urban public transportation networks. This objective is broken down into two sub-objectives, each addressing an individual mobility scenario:
    a. Optimized origin-destination multi-modal public transportation route planning.
    b. Optimized, personalized daily multi-modal public transportation routes for tourists.

## 1.2 Work Performed and Main Results

The work performed within eCOMPASS and the main results achieved in the specific reporting period are as follows.

| Period | Work Performed and Main Results |
|---|---|
| M25-M38 | We continued our S&T work in WP2, WP3, WP4, WP5, and WP6. In particular:<br>• We delivered a sound set of new algorithms for eco-friendly routing of private cars and vehicle fleet routing in urban environments. Our work on time-dependent route planning is the first systematic effort based on considerable theoretical advances and also enjoys a very efficient practical behavior.<br>• We successfully concluded the re-evaluation, re-engineering, and extension of the new time-dependent routing algorithmic solutions for private cars and the corresponding traffic prediction algorithms, as well as the final validation of the new eco-friendly (compact and balanced) routing algorithmic solutions for vehicle fleets, including $CO_2$ emission calculations. The technically most mature solutions have been identified.<br>• We successfully re-evaluated, re-engineered and fine-tuned the multi-modal route planning algorithms, including $CO_2$ emission calculations, and designed new interfaces for their effective integration in WP5.<br>• We have investigated new algorithmic approaches on the arc orienteering problem to incorporate scenic routes in the tourist trip design problem modeling. We have finalized the assessment of technical fitness for deployment in the pilot.<br>• The multimodal multi-criteria routing prototype as well as the tourist trip design prototype are the technically most mature solutions and have been extensively tested during the pilots.<br>• The semantic repository of CGM has undergone substantial updates in order to support requests for real traffic data (live data). We added support for restful services and JSON output data format. In addition to Weather, POI's and Public Transport services, the Map service has been fixed so that it is operational as a restful service. Also, support for Fuel Cost service was added, as well as a new service about the provision of fleet management data.<br>• We provided a basic mechanism against cyber threats as part of the CGM security mechanisms. We integrated the CGM services in WP5 applications. A demo mobile application for Android was developed for testing the CGM services.<br>• We successfully finalized our integration activities for the private cars application, including alternative routes, through our agile development approach, by performing software engineering tasks, by adapting and integrating the algorithmic designs to the software prototype, and by extensively testing the prototype application in real-world conditions.<br>• We successfully finalized our integration activities for the vehicle fleet application, including our new clustering and balancing approach towards eco-friendly trip designs, through an agile development approach, by performing software engineering tasks, by adapting and integrating the algorithmic designs to the software prototype, and by extensively testing the prototype application in real-world conditions.<br>• We successfully finalized our integration activities for the multimodal passenger routing and tourist trip planners through our agile development approach, performing software engineering tasks, adapting and integrating the algorithmic designs to the software prototype, and by extensively testing the prototype application in real-world conditions.<br>• For the multimodal passenger routing and tourist trip planners, we developed a multi OS (Android, Mac OS, iPhone, Windows) web-based and mobile application |

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| | GUI, a dedicated Android GUI, and a separate web-based tourist trip planner GUI.<br>• We successfully finalized our integration activities for CGM, including the development of additional CGM services, the extension of interfaces, a new CGM service to provide logistics-related data feeds, and by extensively testing the prototype application in real-world conditions.<br>• We successfully carried out our pilot activities in the city of Berlin. To achieve this goal, we aligned the pilot preparations with the progress of WP5, finalized the recruitment of participants and the procurement of equipment, as well as the detailed timing of pilot phases. We specified the additional pilot-specific functionalities to be included in the pilot application and the underlying algorithms to support all test cases envisioned. We carried out two pilot-related workshops (Stage 1 and Stage 2) to demonstrate and assess our prototypes.<br>• We successfully carried out the consolidation of the pilot results.<br>We set up and effectively maintained a bulk of facilities for the dissemination of project results (WP7) and the efficient communication and coordination among partners (WP8). In particular:<br>• We maintained our three Task Forces (TF) to further boost research and enforce collaboration in WP2 and WP3: TF1– Optimization under uncertainty, TF2– Multimodal public transportation and tourist trip design, TF3– Robust/alternative/time-dependent route planning.<br>• We updated and enhanced our dissemination material as well as our dissemination plan (including target dissemination groups, publication policy, user forum and events planning). We maintained and updated the project's web site, including a detailed calendar of events.<br>• We have significantly enhanced our external experts user forum, comprising now of more than 300 actors coming from 13 countries.<br>• We carried out successfully the major dissemination event of the project (a European Workshop after M24 on a central European location), the 2nd eCOMPASS Workshop on "Eco-Friendly Mobility: Concepts and Algorithms", which took place in Zurich on 22-24 January 2014. The workshop was hosted and co-organized by partner ETHZ. It attracted about 60 participants from academia and industry (Google, Ford, Deutsche Bahn, AWK, ASTRA, etc). More than 30 of the participants were external (to the project) experts, providing useful feedback to the so far project achievements, thus achieving fully the target set.<br>• We maintained and updated the project's facilities for the internal communication among project partners that include: the project's web site internal pages (storing all deliverables, technical reports and publications of the project partners), the project's wiki (for facilitating communication among partners for a carrying out the S&T work and for exchanging and sharing documents), and various mail lists.<br>• We concluded our cost-benefit and cost-effectiveness analyses, as well as our exploitation and business plan. |

## 1.3 **Final Results and their Impact**

The final results of eCOMPASS comprise four independent end-products/services:

- A *private vehicle navigator system* seamlessly offering visualization and narration of computed routes, including alternatives, through familiar on-board navigator terminals.
- A *fleet/logistics management system* which will target all involved actors and include a 'centralized' management system used in the headquarters premises as well as on-board systems used by drivers.

- A *multimodal public transportation route planning* service dedicated to city citizens and corresponding to the mobility scenario described in objective 3.a. The service is provided through web and mobile applications.
- A *tourist tour planner* service dedicated to tourists visiting a city and corresponding to the mobility scenario described in objective 3.b. The service is provided through web and mobile applications, including a dedicated Android application for smart phones.

The final results of eCOMPASS are expected to have the following impact:

- Improve freight logistics and transport in Europe and enhancing the competitiveness of European industry and services in an environmentally sustainable way.
- Improve energy efficiency and reduce emissions through traffic avoidance, transfers among different transportation modalities, optimized utilization of existing transport capacities, and by promoting environmentally friendly transport modes, traffic prediction, and "eco-guidance" to drivers.
- Provide substantial benefits for fuel economy and environmental impacts, including:
    - Savings of driving time and fuel consumption, avoiding traffic jams through real-time traffic information.
    - Reduction of mileage driven in unfamiliar areas.
    - Less time caught in traffic jams, with lower energy consumption and emissions when supported by intermodal information.
    - Support citizens and tourists with real-time data about pre-trip & on-trip multi-modal journey planning, weather information, nearest public transport lines and fares, etc.
- Offer new green ICT-based services and widening the market for new ICT-based mobility and transport services in Europe and worldwide. The four main eCOMPASS end-products offer new features and services, currently not in offer.
- Open up promising avenues towards commercial benefits to the European car navigation and route guidance market.

## 1.4 Project Web Site, Contact Details and Logo

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