eCoMove

Cooperative Mobility Systems and Services for Energy Efficiency

WD6.3.3	Test Sites Planning (Draft)

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Abstract	This document presents all the information related with the eCoMove test sites preparation. It is a 'live document' that means that it will be updated until the final test sites set-up. In this version (v06) the current state until the preparation date is included. In order to test the eCoMove applications, six test sites were selected: - Munich - Helmond - Berlin - French Motorways - Torino - Motorway A9 Badhoevedorp (Netherlands) During the verification, validation and assessment steps, different testing methods will be used: field trials, traffic simulation tests and driving simulation tests. Taking into account the specific characteristics of each one of the test sites, the applications and the tests defined in the verification and validation plans, the tests to be carried out in the different test sites will be the following: - Munich: verification, validation and demonstration tests will be carried out in real environment and in traffic network simulation environment. - Helmond: verification and validation tests will be carried out in real environment and in traffic network simulation environment. - Berlin: verification tests will be carried out in real environment. - French Motorways: verification and validation test will be carried out in real environment and in traffic network simulation environment. - Torino: verification and validation tests (only SP3 applications) will be carried out in real environment. - Motorway A9 Badhoevedorp (Netherlands): verification tests and data collection for validation (only for ecoRamp Metering application) will be carried out in real environment and in traffic network simulation environment. In this document, each test site will be described including the pilot area description, the available equipment, the partners involved in the test site preparation, the applications to be tested, the eCoMove demonstrators involved in the test site tests and the estimated budget. This document is closely linked to Deliverable D6.2 (Validation and evaluation plan V2.0) where a summary of the Validation Test Sites is included.

Control sheet

Version history			
Version	**Date**	**Main author**	**Summary of changes**
01	06/07/2011	Rosa Blanco (CTAG)	Template
02	26/08/2011	Rosa Blanco (CTAG)	Added collected information until this moment and information from other documents
03	17/09/2011	Rosa Blanco (CTAG)	Harmonization of pilot site leader's contributions (PEEK, PTV, DLR and CRF).
04	26/08/2011	Rosa Blanco (CTAG)	Update of document with pilot sites contributions (PEEK, PTV, VIALIS, ASFA)
05	6/11/2011	Rosa Blanco (CTAG)	Introduction chapter, tables in annexes, format of document
06	8/11/2011	Rosa Blanco (CTAG)	Modifications after pilot site leaders (PEEK, PTV, VIALIS, CRF, ASFA and DLR) and Ertico revision.
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TERMS AND ABBREVIATIONS

Abbreviation	Definition
AADT	Annual average daily traffic
DSRC	Dedicated Short Range Communications
ITS	Intelligent Transport System
LOS	Level of Service
MTM	Motorway Traffic Management
RSU	Road Side Unit
SP	Subproject
RSU	Road Side Unit
TBD	To be Defined
TMC	Traffic Management Center
TS	Test Site
VIB	Verkehr in Bayern
VMS	Variable Message Signal
VNetS	Virtual Networks
WD	Working Document

1. Introduction

The last steps in the development process situated in the right site of the V-model, in which the eCoMove concept is presented (see Fig. 1), are focused in the test of the applications implemented. Two different levels of testing will be carried out:

- Verification tests aiming to ensure whether the requirements of functional specifications at the higher levels are fulfilled (see Verification Plans in documents **[M2.3], [M3.3] and [M4.3]**).

- Validation tests is determining if eCoMove applications as well as the overall system complies with the requirements and performs functions for which it is intended, i.e. meeting the high level objectives and user needs (see the Validation Plan in document **[D6.2]**).

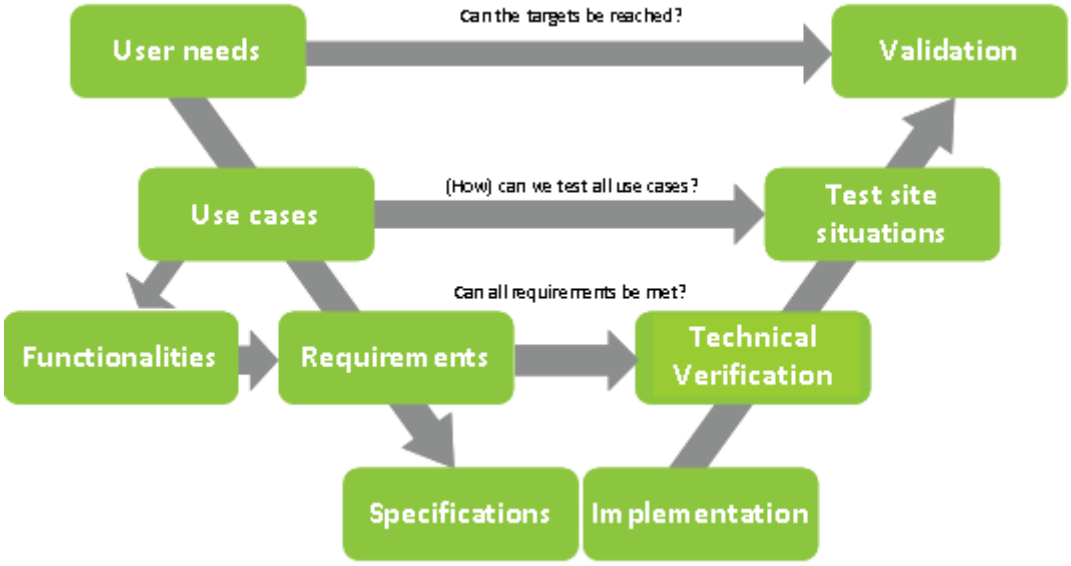


Figure 1: eCoMove V-Model

For the execution of these tests within the eCoMove project, six different sites were selected:

- Munich
- Helmond
- Berlin
- French Motorways
- Torino
- Motorway A9 Badhoevedorp (Netherlands)

The different characteristics of these six test sites provide an overall support to create different testing scenarios in order to test the eCoMove applications, not only in cities, but also in other common roads. To have different test sites give the possibility of

performing the tests in different traffic environments and different situations, so the results obtained for the eCoMove applications will be closer to the results obtained in a real environment of use.

1.1. Test Sites and Test methods

In general, two different types of tests will be carried out:

- Verification tests: following the verification plans defined ([M2.3], [M3.3], [M4.3], [M5.3]).
- Validation tests of the eCoMove concept: following the validation plan defined in D6.2.

In all the sites verification tests will be carried out at different level. Berlin will be a specific verification test site (only verification site) where the communication platform will be tested in controlled conditions.

The validation and assessment of the whole eCoMove concept (see **[D6.2]** and **[WD6.4.3]**) will be done at four test sites: Munich, Helmond, French Motorways and Torino.

While in Munich and Helmond all applications will be verified and validated, French Motorways and Torino will be partial validation sites. That means, in French Motorways only validation of a limited number of applications in a Traffic Network Simulation Environment will be performed and Torino SP3-dedicated test site where no infrastructure will be used. A summary table containing which applications are going to be tested in each test site is included in Annex 2, and in next sections, a description per site is included.

The selection of Munich and Helmond as main validation and impact assessment sites was done taking into account the available equipment and the capability for access the traffic management system (it supposes to do less investment). Both cities offered the possibility of testing the eCoMove concept in different traffic conditions and in different scenarios. The size of the pilot sites was also taking into account, as a bigger area supposes a bigger number of vehicles around (impact assessment).

The Motorway A9 Badhoevedorp (Netherlands) is also a specific test site where only one application (ecoRamp Metering) will be due to the specific characteristics of this test site, allowing the preparation of this field trials. Verification tests for this application will be done (is a verification site) and data will be collected to be used in the assessment of this application.

In general, in all these sites, the available infrastructure will be expanded with the installation of new equipment in order to support the test of the eCoMove applications.

From all these test sites, Munich was selected as demonstration test site (taking place at the end of the project), mainly because at this site, most of the eCoMove applications will be tested.

Depending on the type of application and the objective of the tests (verification / validation / impact assessment), real environment (on-site), traffic simulation and driving simulator tests are planned (see **[M2.3],** [**M3.3], [M4.3]**, **[D6.2]** and **[WD6.4.3]**).

Taking into account that for the traffic simulation tests the real traffic network will be recreated in the simulation tool (see **[D5.3]**), real environment tests and traffic simulation tests are associated to a specific test site. Next table summarizes which tests (on-site/traffic simulation) will be carried out in each site:

TEST SITE	VERIFICATION		VALIDATION	
	ON-SITE	TRAFFIC SIMULATION	ON-SITE	TRAFFIC SIMULATION
Munich	X	X	X	X
Helmond	X	X	X	X
Berlin	X			
French Motorways	X	X		X
Torino	X		X	
Motorway A9 Badhoevedorp (Netherlands)	X		X*	X*

**At this site the eCoMove concept only one application will be tested, and data will be collected in order to perform the assessment as explained in[WD6.4.3] and will therefore contribute to the validation process.*

Table 1: Overview of type of tests to be carried out in each test site

Though the driving simulator studies are not associated to a test site, it is important to comment that eCoMove will perform these tests in addition to the on-site and the traffic network simulation tests, aiming to contribute to the assessment of the applications (see [WD6.4.3]) from the point of view of driving behaviour. The different studies will be carried out in the driver simulators available at DLR (passenger vehicle), TUM (passenger vehicle) and VTEC (trucks) and at the moment this report was prepared, these studies are still under definition (see description in [WD6.4.3]).

1.2. Purpose of this document and relation to other SPs

The aim of this working document is to present the information related to the test sites preparation for the verification and validation tests that should be carried out within the eCoMove project. This is a 'living document' that will be updated until the final configuration of the sites will be ready to carry out the tests in M28.

A detailed description of the methodology to be followed during the tests is described in deliverables related to the simulation environment [D5.3], validation planning [D6.2] and impact assessment [WD6.4.3]. The applications to be tested and the vehicles to be used during the tests are also described in other documents (see Chapter

2). It is beyond the purpose of this document to repeat the content of these deliverables here.

Below the main relations with other SPs work is detailed:

Each SP (SP2-SP3-SP4-SP5) has its own verification plan and a general validation plan for the eCoMove applications was developed in SP6:

- M2.3 SP2 Verification Plan
- M3.3 SP3 Verification Plan
- M4.3 SP4 Verification Plan
- M5.3 SP5 Verification Plan
- D6.2 Validation and evaluation plan (version: V2.0)

For the verification and validation field trials, the different vehicle demonstrators developed in SP3 and SP4 will be moved to the different test sites.
The SP3 demonstrators involved in the tests will be:

- CRF-MM-1 (see [D3.10]): CRF city car demonstrator
- CRF-MM-2 (see [D3.11]): CRF family car demonstrator
- BMW-NAVTEQ (see [D3.12]): BMW demo vehicle (high class car)
- FFA (see [D3.13]): FFA demo vehicle
- BOSCH passenger car demonstrator

The SP4 demonstrators involved in the tests will be:

- DAF (see [D4.6]): DAF Truck demo vehicle (long haul)
- VTEC (see [D4.7]): Volvo demo vehicle (distribution)

Regarding the traffic simulations, the traffic network simulation environment will be developed in SP5 (see [D5.3]).

1.3. Structure of Deliverable

This version (V0.5) of the document contains seven sections and two annexes.

The first section is the introduction chapter in which a general overview of the test sites and methods used for doing the tests is included. The purpose of the document and the relation with other SPs is also overviewed.

In chapter two a relation of the different documents referenced in this report and the status of each one (already finished or date in which it's planned) are included.
The next six sections describe the different test sites status (one section per test site). All of them have more or less the same structure containing the following information:

- Description including the available equipment in the area, the area selected for the tests and the partners involved in the preparation of this test site.
- Applications and vehicles to be tested in this test site.

- For those test sites in which traffic simulations will be carried out, the Traffic Network Simulation Environment is described.
- In case additional equipment is needed in order to carry out the tests in the different tests sites is also detailed.
- The estimated budget needed for the preparation of the test site. This version of the document doesn't include the final budget for the preparation of the test sites that will be submitted at the end of 2011.
- The general planning (at the moment of preparation of this document) to be followed in the preparation of the test site is also included. In next versions of this document, for each test site the planning will be more detail.

Finally, a chapter summarizing the next steps is included.

Two Annexes were included:

- A table summarizing the main characteristics of each test site.
- A table summarizing which applications will be tested where and which type of test (Verification/Validation). Also the demonstration tests are included in this table.

2. Referenced Documents

This chapter provides a listing of all documents referenced by this deliverable, including details known at the time of writing.

2.1. eCoMove Deliverables

This section contains deliverables (to be) produced within the eCoMove project. All public deliverables will be available for download on the eCoMove project website http://www.ecomove-project.eu/publications/deliverables/.

2.1.1. Finalised eCoMove Deliverables

Ref	Doc	Version, Date
[D6.2]	Validation and evaluation plan	V2, 2011-11
[D5.3]	Extension of Simulation Functionalities and Test Site Modelling	V1, 2011-07

Table 2: Finalised eCoMove Deliverables

2.1.2. Current eCoMove Working Documents

In this section the internal documents until development and the version considered for the preparison of this document are included:

Ref	Doc	Version, Date
[WD6.4.3]	Assessment of the impact to the traffic system for cities/regions/networks	V0.3, 2011-11

Table 3: Current eCoMove Working Documents

2.1.3. Future eCoMove Deliverables

Ref	Doc	Date
[D1.8]	Final event presenting eCoMove results (planning)	M24
[D3.10]	CRF city car demonstrator	M26
[D3.11]	CRF family car demonstrator	M26
[D3.12]	BMW demo vehicle (high class car)	M26
[D3.13]	FFA demo vehicle (diesel engine)	M26
[D4.6]	DAF Truck demo vehicle (long haul)	M28
[D4.7]	Volvo demo vehicle (distribution)	M28

Table 4: Future eCoMove Deliverables

2.2. *eCoMove Reference Documents*

This section contains internal documents produced within the eCoMove project. All documents are available for download on the eCoMove project collaboration portal on ProjectPlace: https://secure.projectplace.com/en/Log-in. All partners in the consortium have access to the portal, whose account management is owned by ERTICO.

Ref	Doc	Version, Date
[DoW]	DoW-PartB_eCoMove_v1.3-amend04_v0.9.doc	V2.0, 2011-09-09

Table 5: eCoMove Referenced Documents

2.3. *Milestones of the Project*

This section contains the list of the milestones referenced within this document:

Ref	Milestone	Version, Date
[M2.3]	SP2 Verification Plan	M10
[M3.3]	SP3 Verification Plan	M10
[M4.3]	SP4 Verification Plan	M10
[M5.3]	SP5 Verification Plan	M10

Table 6: Milestones of the Project Referenced

2.4. *External Documents & Standards*

Not applicable.

2.5. *Web Links to Referenced Projects*

This section contains external links to projects referenced by this and other validation documents.

Project	Link
FREILOT	http://www.freilot.eu/
SAFESPOT	http://www.safespot-eu.org/
simTD	http://simtd.de
CVIS	http://www.cvisproject.org/
RCI project	* http://www.ertico.com/rci

Table 7: Web Links to Referenced Projects

** Information about this project could be found in this link. Not the official web.*

3. Munich

Munich is one of the test sites selected for verification, validation and assessment of most of the eCoMove developments. On-site tests and traffic simulation tests will be carried out, so, in this chapter, environments, real environment and traffic network simulation environment are described.
Munich is also selected as demonstration test site for eCoMove project. The demonstration plan is under preparation and a plan will be delivered on month M24 in D1.8(1) "Final event presenting eCoMove results (planning)". In the text below, only a general description of the area selected for the demonstration is included.

3.1. Description

Munich is the capital city of Bavaria, Germany. It is located on the River Isar north of the Bavarian Alps. With about 1.35 million inhabitants within the city limits and about 2.6 million people living in the metropolitan area, Munich is the third largest city in Germany.
The Area of Munich is an integral part of the motorway network of Southern Germany. North-South and East-West Motorways terminate at Munich (Autobahn 8 and 9), allowing direct access to the different parts of Germany, Austria, Switzerland, the Czech Republic and Italy. A ring of motorways connects the transnational routes around the city.
Bearing such an important position within the network, traffic in and around Munich is often heavy. Traffic jams are commonplace most often during rush hours but also during the holiday season.

3.1.1. Available Equipment

The area of Bavaria and especially Munich is equipped at large scale with traffic detection equipment. Induction loops and cameras build the backbone of the traffic detection equipments.
For the test area of Munich, several traffic data sources are available
Via the information portal Bayerninfo (Verkehr in Bayern - VIB) the whole area of Bavaria is represented for all Roads of Functional Road Class 1 to 4 with

- Traffic Volume (q)
- Traffic Speed (v)
- Level of Service (LOS)
- Traffic messages/information
  - Construction sites
  - Traffic messages (Accidents etc.)
  - Automatically generated congestion events (no prognosis)
  - Weather messages
- Intermodal routes
- Dynamic mIV routes

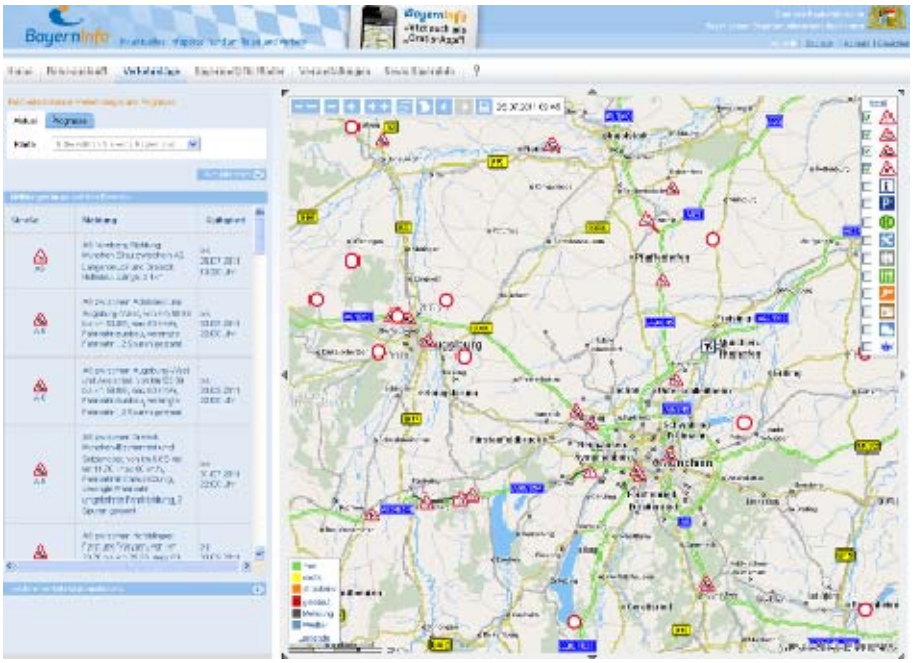


Figure 2: Bayerninfo web-frontend

Besides data sources' connected to Bayerninfo, in the area of the City of Munich additional systems are installed, allowing an increased traffic state calculation. Via City of Munich and Technical University Munich a camera system is used for automatic number plate recognition for a calculation of travel times in the city area.

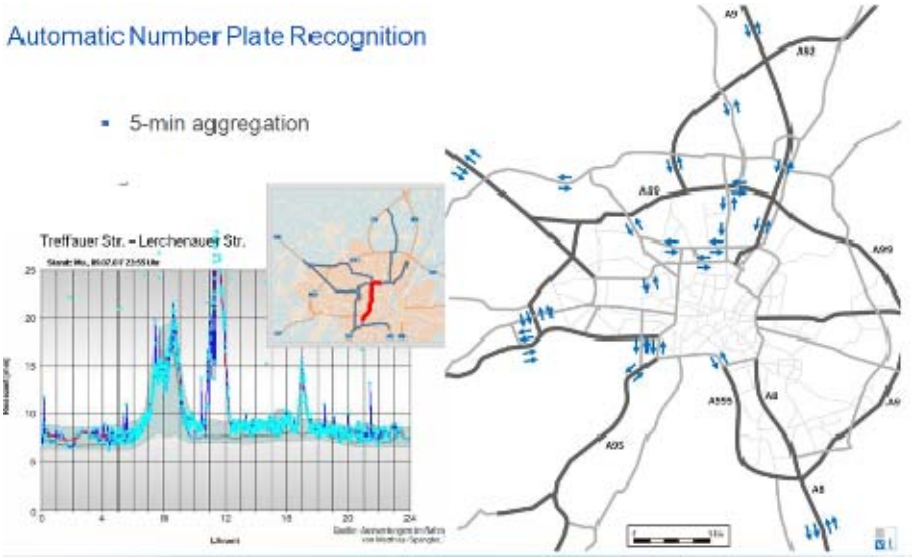


Figure 3: Automatic Number Plate Recognition in Munich

Furthermore a significant amount of detectors is installed within the city frame. In principle, those detectors can be distinguished into three separate fields according to their technical specifications and the data they provide on basis of those.

Traffic Light detectors (VNetS)	Traffic flow detectors (VNetS)	Traffic Light detectors (ZBR)
▪ generally aggregation 2-min ▪ traffic volume ▪ velocity ▪ occupancy ▪ online	▪ generally 1min-agregation ▪ traffic volume (incl. smoothing) ▪ in part occupancy (incl. smoothing) ▪ in part velocity (incl. smoothing) ▪ In part LOS (6-steps) ▪ online	▪ generally 5min-agregation ▪ traffic volume (incl. smoothing) ▪ in part occupancy (incl. smoothing) ▪ in part velocity (incl. smoothing) ▪ In part LOS (6-steps) ▪ Not online by now

Table 8: Existing detector types in Munich

Figure 4: Locations of existing detectors in Munich

Additionally detailed and calibrated traffic models exist for Bavaria and Munich via PTV, City of Munich and State of Bavaria, allowing short,-mid- and long term predictions.

3.1.2. Pilot area

The geographical circumference of the TS Munich comprises the whole conurbation area for server based applications.

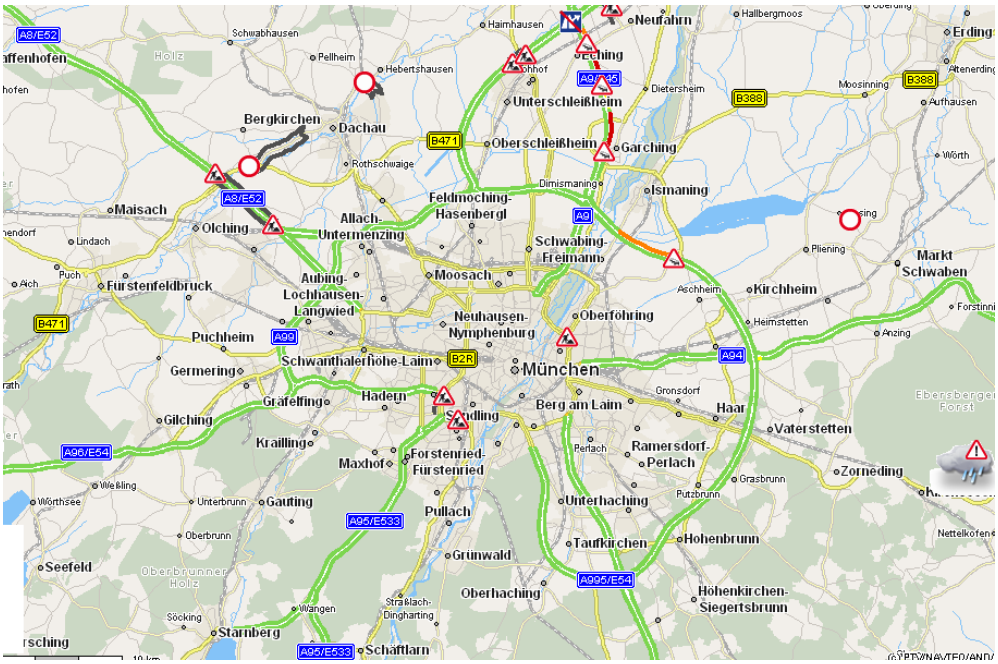


Figure 5: Conurbation area of the Test Site Munich

Additionally, a number of PEEK traffic lights in the city limits will be enabled to support applications requiring direct communications between traffic lights and vehicles. Due to the probable location of the final event (if executed in Munich) within the BMW premises (to be confirmed) in and a high equipment rate of intersections with PEEK traffic lights in the northern part of Munich, this area is the anticipated location for the infrastructure communication based applications.

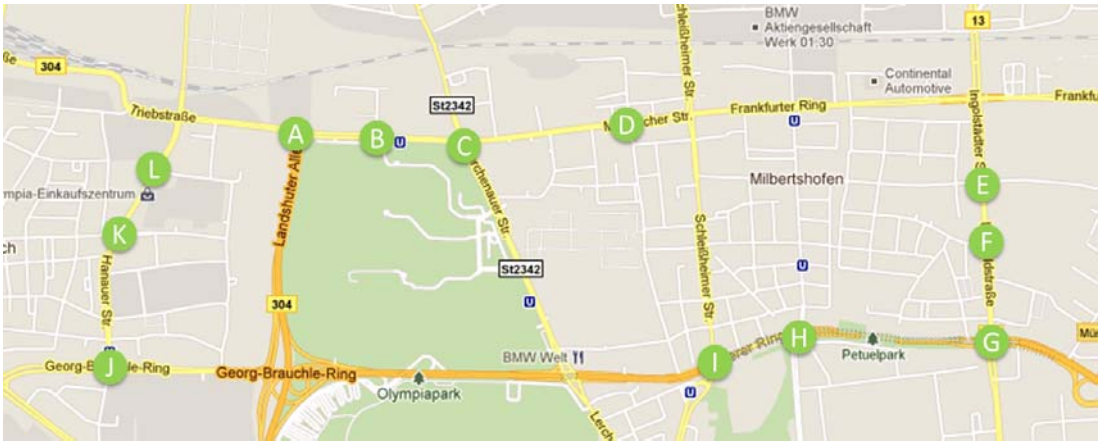


Figure 6: Road Network for potential vehicle-infrastructure communication based applications in the Test Site Munich

At the northern part of Munich major road sections feature PEEK traffic lights, dynamic traffic management strategies, implemented by the city of Munich, are already regularly in place. These comprise a dynamic green wave but also public

transport priorisation. Hence there is a need to harmonize any demonstration measures with the city of Munich (which offered its support to the project) if traffic light cycles are to be influenced.

Also, the major urban arteries in the conurbation area of Munich suffer from very high traffic loads, especially during peak hours. Hence the demonstration of platooning cars might be rather difficult to show good results during these critical time periods. The circumference of the TS demonstration could be amended by the facilities at Offenbachstraße in the city quarter Pasing in the West of Munich reusing the BMW SIM-TD project test track (as technology of eCoMove shall be fully compatible). This has to be discussed considering the backdraws and advantages.

While SP3 will demonstrate applications which require direct communication between traffic lights and vehicles, SP4 will use direct communications with RSU at limited level. Hence, the requirements of SP3 towards the circumference of the area equipped with traffic lights are decisive, as SP 4 will demonstrate pre-/post- trip measures and on-trip applications which communicate via broad band measures.

Peek, as TS partner, can equip the traffic lights with the required hardware. Also, the TS will consider only PEEK traffic lights as they are quite numerous in the TS area and as other providers, e.g. SIEMENS, would require full payment for any services for which the part unfunded by the EC would have to be carried by a project partner. Hence, the TS Munich will, in principle, comprise the whole conurbation area with the city of Munich (via TUM) and VIB (via PTV) that will provide the required data. The demonstration area for applications dependent on communication with traffic lights comprises following the proposal at the moment three units located on the Frankfurter Ring just north of the BMW Head Quarter at Olympiazentrum.

3.1.3. Partners Involved

To date, the main demonstration site partners confirmed to participate in test site Munich include the following ones:

- PTV is the test site leader, in charge of the provision of traffic data for the interurban road network, support of traffic model generation for validation and demonstration, provision of centre-side applications for demonstration and testing as well as the test site management
- TUM (Technical University of Munich) provides the traffic model for validation and the urban detector data delivered by the city of Munich.
- Mat.traffic: provides traffic model for the applications and centre-side applications for demonstration and testing.
- PEEK will modify the applicable traffic lights according the project's requirements (eg. and provides traffic light computation/communication capability.
- BMW will provide a test site vehicle together with SP2 applications.

The other partners involved in the test site provide core service technologies and test vehicles. Concerning logistics applications, PTV will provide the centre side technologies; a demonstration partner for the vehicle side is currently defined.

3.2. Applications and Vehicles

The applications considered in the test site Munich are originating from the SP2, SP3, SP4 and SP5 and comprise applications for cars, logistics applications and centre sided applications.

The range of applications planned to be demonstrated in the test site comprises in detail (see [D6.2]).

For SP3, only one BMW vehicle will be durably available to the TS. Other vehicles mentioned in the DOW will be available during short, pre-planned time periods for verification, validation and demonstration.

SP3 will demonstrate individual motorized vehicle applications:

- ecoInformation
- ecoTripPlanning
- Dynamic ecoNavigation
- ecoDriving Support
- ecoPostrip
- ecoMonitoring

SP3 will be using direct connections between vehicles and equipped traffic lights for their demonstrations. As SP4 and SP5 have no requirements towards the locations of traffic lights, SP3 requirements towards the circumference of the test site for traffic light communication Munich are decisive.

For SP4 it has to be discussed with Logistics partner, how many test vehicles should be included. As for centre-based applications, the number of vehicles is not limited by technical issues apart of possible OBUs.

SP4 develops logistics applications which are either server-based or unrelated to direct execution of trips. Hence, SP4 does not require a direct connection between vehicle and traffic light.

- ecoTourPlanning
- Truck ecoNavigation and
- ecoDriverCoaching

SP5 builds central applications and will erect a dedicated information server in Munich (PTV and mat.traffic).

The dedicated information server will collect all data from the city of Munich (via TUM) and the VIB GmbH (via PTV) and provide them to the project´s applications and services. Also, SP5 has to analyze, if a traffic status can be provided for the SP4 applications not only for the interurban and high level road network (via VIB) but also for the downtown areas of Munich on basis of a first analysis of urban data provided by the city of Munich. Hence the information server for Munich could feature a traffic

model for the urban area of Munich providing traffic static and traffic messages similar to the data and information on the interurban and high level road network provided by the VIB.

The following SP5 applications are proposed:

- ecoRoute Advice
- ecoPark Advice
- ecoBalanced Priority (Limited functionality)
- ecoGreen Wave (Limited functionality)
- ecoApproach Advice
- ecoTraffic Strategies
- ecoAdaptive Traveller Support
- ecoAdaptive Balanced and Control

Concerning the applications on motorways, direct access to the controls of the VMS/LCS are to be understood to be available to the project or several of the related applications on motorways have to be reassessed for applicability in the TS Munich.

Concerning the applications on motorways, direct access to the controls of the VMS/LCS are to be understood to be available to the project or several of the related applications on motorways have to be reassessed for applicability in the TS Munich.

SP	APPLICATIONS
SP2	eCoComunication Platform, ecoMessage, ecoMap, ecoSituational Model, ecoStrategical Model (eStraM)
SP3	ecoInformation, ecoTripPlanning, ecoNavigation, ecoDriving Support, ecoMonitoring and ecoPostrip
SP4	ecoTourPlanning, Truck ecoNavigation and ecoDriverCoaching
SP5	ecoRoute Advice, ecoPark Advice, ecoBalanced Priority (limited functionality), ecoGreen Wave (limited functionality), ecoApproach Advice, ecoAdaptive Traveler Support, ecoTraffic Strategies, ecoAdaptive Balancing and Control.

Table 9 eCoMove applications to be tested in Munich.

The eCoMove demonstrators to be tested at Munich will be the following:

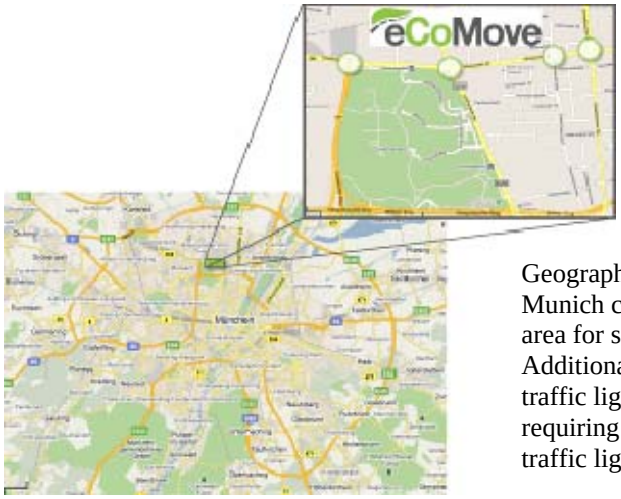
- Passenger car: BMW-NAVTEQ [D3.12], CRF-MM1 [D3.10], CRF-MM2 [D3.11], BOSCH, FFA [D3.13] (For FFA, verification/validation test will be done in Helmond. The demonstration will done in Munich)
- Trucks: DAF [D4.6] and VOLVO [D4.7]

3.3. Traffic Network Simulation Environment

Numerous simulation activities in the project and the test site Munich depend on reliable network data. These data need to be elaborated for a macroscopic level and a microscopic level and need to be very detailed, e.g. including specific information sets

on traffic light control, traffic volumes etc. Simulation activities and results will be used in validation, calibration and demonstration activities.

As described above, the test site Munich actually consists of two parts, namely the test area for applications requiring vehicle to infrastructure communications which is located next to the BMW premises which is integrated into the larger frame of the test site comprising the whole conurbation area with 1,4 mio inhabitants (strictly speaking, the test site Munich comprises the whole free state of Bavaria for certain applications as e.g. truck scheduling and routing in logistics) where especially logistics applications can be tested.



Geographical circumference of the TS Munich comprises the whole conurbation area for server based applications. Additionally an amount of a few (PEEK) traffic lights in the city for applications requiring direct communications between traffic lights and vehicles can be enabled.

Figure 7: geographical circumference of the TS Munich

The road network harbouring the vehicle-infrastructure demonstration will be simulated in greater detail than the conurbation area to depict traffic behaviour and effects of the single applications on the traffic conditions. As the project will feature around 5 test vehicles for vehicle-infrastructure communication, simulation is essential for validation to verify the expected results under real traffic conditions.

Data and information sets on traffic streams, travel times, traffic light control etc. are available and can be used within the traffic models and networks implemented within the TS Munich activities.

3.4. Additional equipment to be installed

As already mentioned above, different hardware requirements exist for the test site Munich. These originate from the applications to be demonstrated and can be, roughly, clustered into those requiring communication with traffic lights as well as local computation on the hardware side and those which do not require local hardware communication. Both types, however, require traffic related data which will be supplied via a dedicated centre and set of interfaces. These may be traffic status and prognoses or road closures, to name but a view.

The existing systems in the test site comprise PEEK traffic light systems installed at a multiplicity of intersections. A set of these traffic lights need to be equipped with additional hardware to support eCoMove´s extended functionality.

Additionally, other intersections are equipped with potentially suitable thought third party equipment. This means, that external costs would be arising for the project due to sub contracting needs which is unfavourable as PEEK units can be used as well. However, the potential of the test site would be understood to be rather easily (though costly) be extensible.

Equipment on the centre side comprises data sources for the urban and interurban road network of the test side. These sophisticated systems also provide prognoses and planned road closures due to construction sites etc. as well as directly measured travel times for major road links in the core demonstration area featuring vehicle to roadside infrastructure based cooperation (in comparison to the centre-based cooperative applications eg. Implemented in the logistics field.

The test side will provide, together with the other SPs, project compatible implementations to supply traffic data and other relevant information to any applications requiring those data. This e.g. comprises the ecoMap provided by SP2, support for simulation and validation tasks by providing models or their basis and other tasks.

Of course, test vehicles are required to validate and demonstrate the vehicle-infrastructure communication.

Additional equipment to be installed for the final event is under definition and will be provided in D1.8(1).

3.5. Budget

As a first basis, it is estimated that 3-5 RSU´s (depending on the technical ancillary conditions at the specific locations) can be equipped within the current PEEK budget. If the demonstration requires more units to be equipped or also units which were provided by third parties, new funds need to be generated for this task.

The final event is currently under discussion in terms of which location could be chosen for this. As the test site Munich is one candidate, the preliminary planning

suggests BMW premises to be used for this occasion. These buildings highly acclaimed by the architectural community harbour the headquarters and the showroom of the company as well as meeting and event facilities which are frequently used for exhibitions, conferences and public parties. The world renowned Olympic park with its unique tent structures made of glass and steel where the 1970s Olympics took place sets the scene for a truly memorable meeting place. The core test site demonstration track is in direct vicinity to these premises. This setting makes Munich the ideal candidate city for the final event.

The budget for the final event is still to be defined as are the requirements towards it on side of the test site and it is not included in this document (plan for the demonstration will be ready by M24 in D1.8).

In the next table the estimated budget for the Munich test site is presented:

TEST SITE: MUNICH			
	Description	**Costs**	**Total**
Additional Equipment & Resources	10 RSU's	4.000 €	40.000 €
	Additional hardware in 10 legacy systems	7.500 €	7.500 €
	1 TMC	4.000 €	4.000 €
	Test site manager	TBD	TBD
	Fleet operators	TBD	TBD
	Validation Simulation Tools (Tes site specific)	TBD	TBD
	Cost for network model (included HW)	TBD	TBD
Additional Equipment Total Costs			51.500 €

Table 10 Summary of estimated budget for test site Munich

3.6. General Planning

The general planning is depending on the general time plan of the project.

As first preparatory steps, the data to be collected are defined and data collection procedures are launched respectively.

Also, within the subsequent steps, the work comprises the setup or support in setting up detailed traffic models for specific network sections, the ecoMap and other processes or services in eCoMove.

The detailed demonstration planning is another step to be launched by M24 (03/2012).

The following table contains the list of tasks which are currently planned for the short to medium term future.

TASK	PARTNERS INVOLVED	DUE TO MONTH
Define data	TS partners, SP2,3,4,5	M18, 09/2011
Start data collection	City of Munich, OBB, VIB, PTV, TUM	M19, 10/2011
Define traffic model basis for demonstration	TUM, PTV, mat.traffic, PEEK	M19, 10/2011
Elaborate traffic model(s)	TUM, PTV, mat.traffic, PEEK	
Launch detailed demo planning [D1.8 (1)]	TS partners, SP2,3,4,5	M24, 03/2012
Prepare Final Event	ERTICO, PTV, BMW	Q1/2013

Table 11 Planning for test site Munich

4. Helmond

Helmond is one of the verification and validation site. Data collected at this site will also be used also for the assessment of the eCoMove applications. The tests will be carried out in real environment and in a traffic network simulation environment.
This chapter describes the main features of this test site and the status of the test site preparation (at the date of preparation of this document version).

4.1. Description

Helmond is a medium sized city (87.000 inhabitants) in the south east of The Netherlands. Since the early 20th century it has been a city with a lot of industrial activities. In recent times it has become part of the automotive centre of The Netherlands.

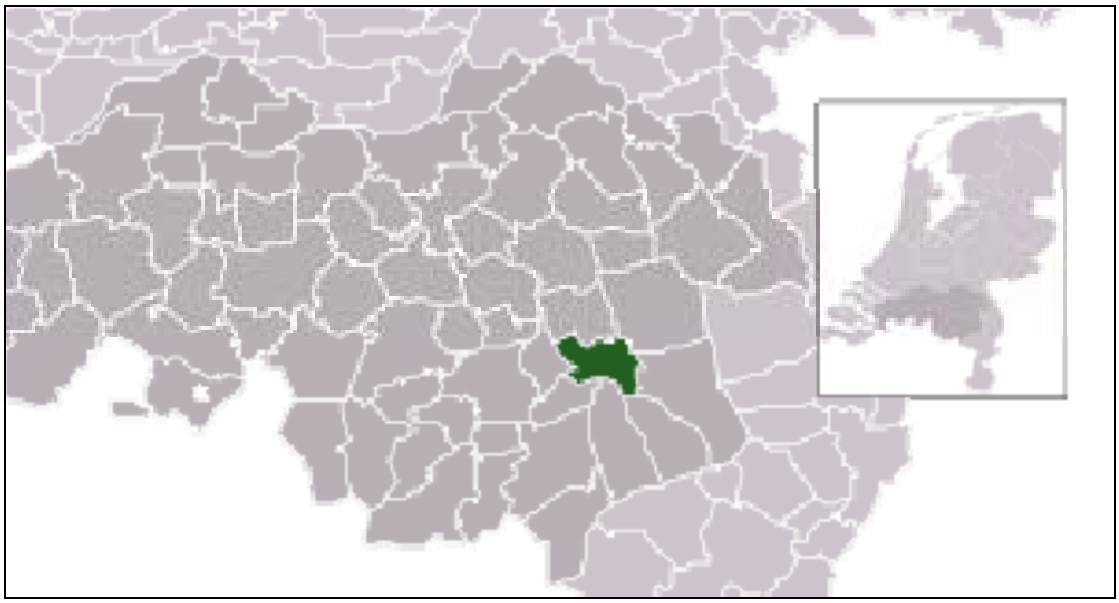


Figure 8: overview signalized intersections with

In the last ten years, Helmond has invested in an extensive adaptive urban control network. This network provides a ready platform for innovative control solutions as can be seen from the fact that Helmond serves as a test-site for the CVIS as well as SAFESPOT integrated projects on Cooperative Systems and the FREILOT pilot for fuel-efficient freight.

4.1.1. Pilot area

For urban application the pilot area is restricted to the signalized intersections on the N270 (De Kasteeltraverse). These are the same intersections as used for the FREILOT pilot (yellow markers on picture below). The N270 is a four lane urban arterial with a maximum speed limit of 50 kilometres per hour. This road is intensively used by all vehicle classes, including a high share of truck and busses. As the road passes the city centre many pedestrian and bicycle crossing are present.

It is planned to upgrade all the roadside units to the latest standards defined in and adopted by eCoMove. For most roadside units the upgrade is limited to software, but for three intersections below also the hardware needs to be replaced. Only three intersections in the city of Helmond (marked with red) will be used for the implementation of traffic management applications. These are the intersection 101, 102 and 103, circle in red on the figure below. In the second half of 2011 these three intersections will be equipped with a new state-of-the-art adaptive traffic light control algorithm, which serves as the basis for the applications.

Figure 9: Overview Signalized Intersections

Figure 10: Impression of the Three Selected Intersections

For the implementation of the ecoStrategic Model all the major roads of the Helmond network will be considered. These are shown in the VISSIM model of the Helmond network, see the Figure below. If this proves to be too time consuming only a sub-section of the network will be considered. For example, they are suggested in the Figure below.

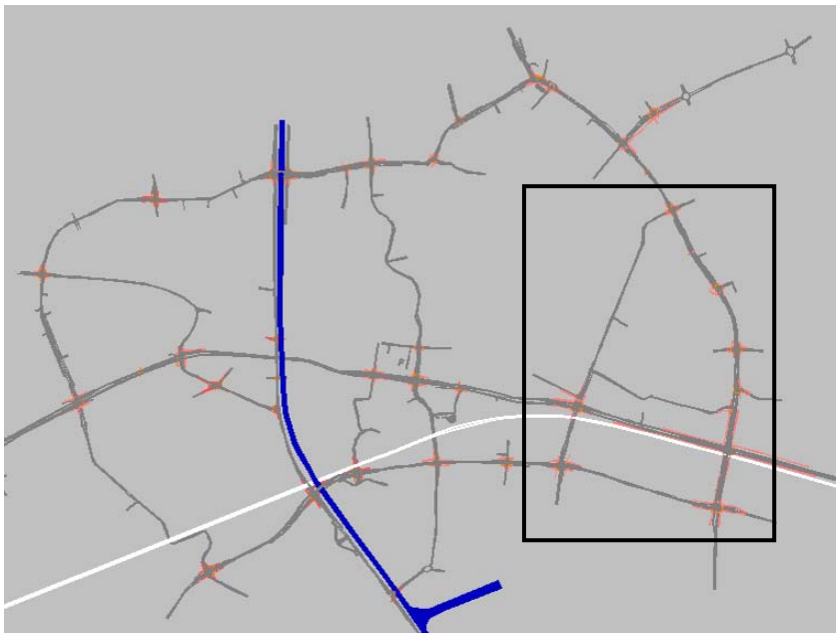


Figure 11: VISSIM network Helmond with major roads

Helmond is linked to Eindhoven by the 5 kilometre A270-motorway which is well equipped with ITS Stations. It is possible to use these test facilities within eCoMove, but at the moment this is not planned. If other projects announce new trials on the A270 it will be reconsidered if eCoMove tests can be included.

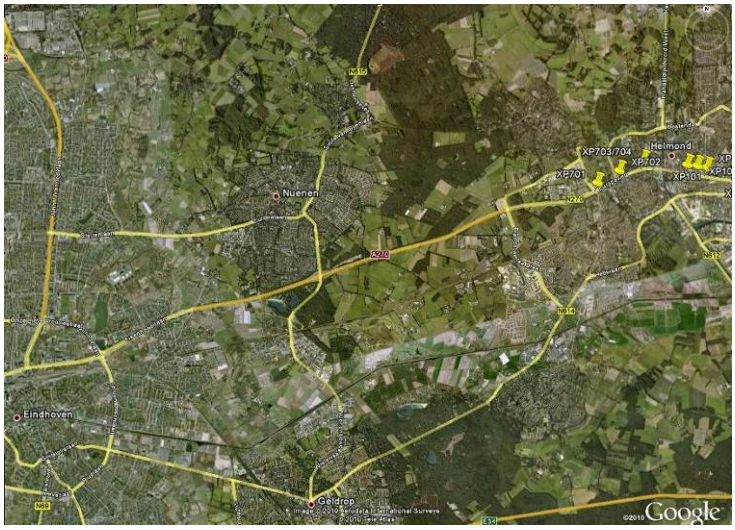


Figure 12: Overview of the A270-motorway

4.1.2. Available Equipment

The Helmond pilot site is extensive equipment with systems that are well accessible with a remote connection. The available equipment involves:

- 14 roadside units at signalized intersections
- ITS Gateways with camera, every 500 meters on 4.5 km of motorway
- Wired connection with 52 traffic light controllers and its detectors
- 26 counting stations, including vehicle classification and vehicle speed
- Camera-based travel time measurements on all major arterials.

Figure 13: Example of a roadside unit at signalized intersection

Figure 14: illustration of ITS Gateways, test fleet and control room motorway

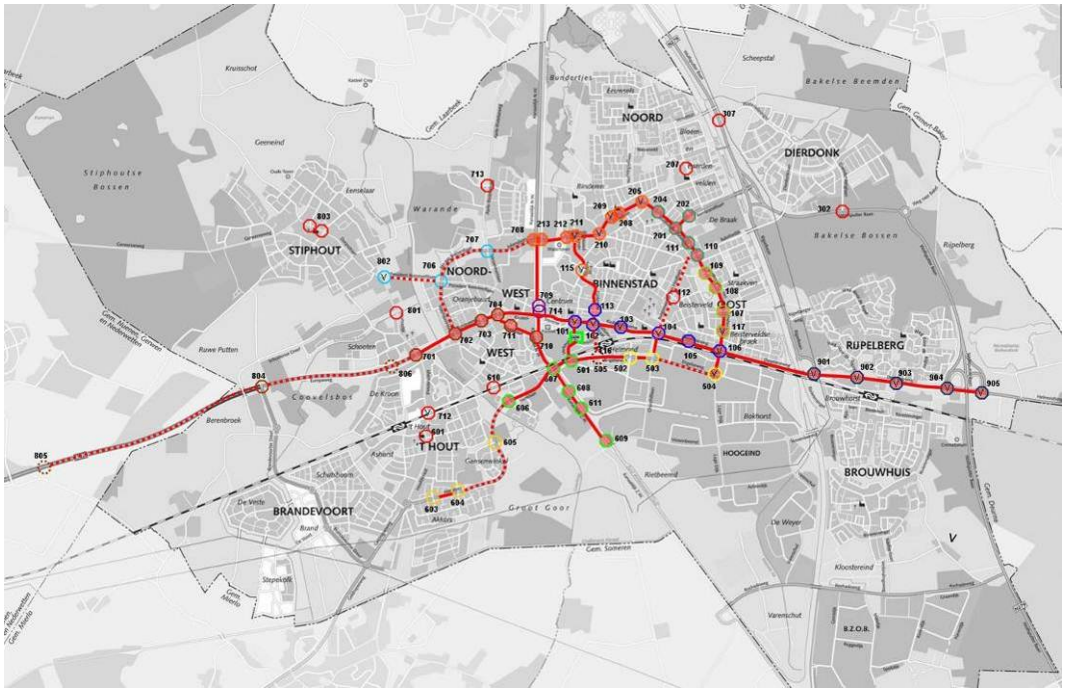


Figure 15: Overview of signalized intersections and communication network

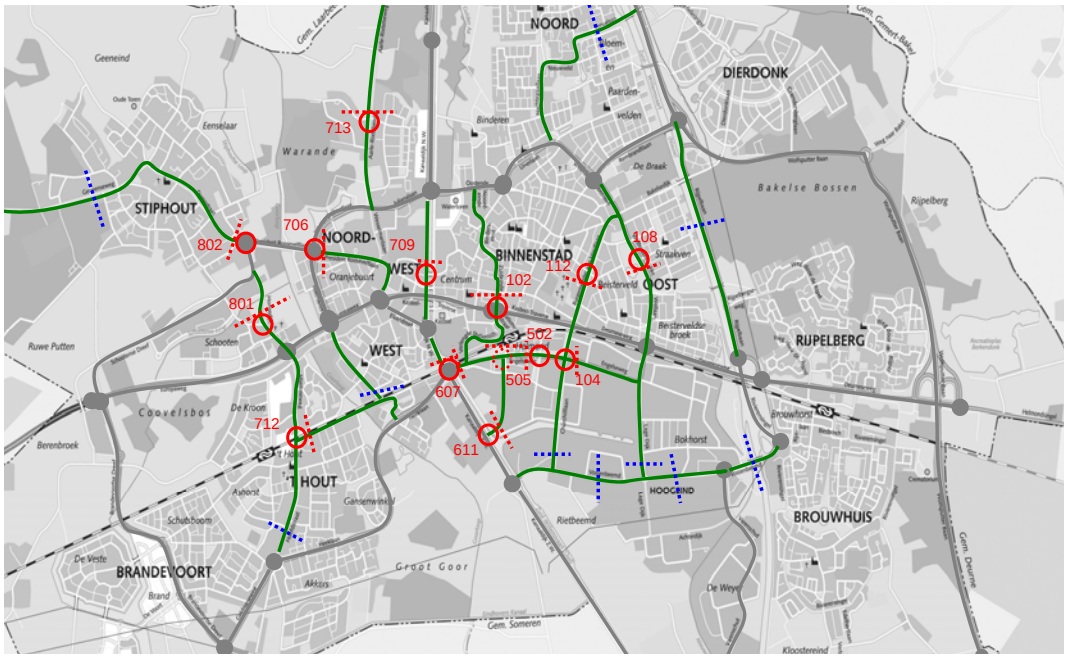


Figure 16: Overview of counting stations

4.1.3. Partners Involved

To date, the following partners confirmed to participate in test site Helmond:

- PEEK, is test site leader, responsible for the roadside equipment and the implementation of ecoBalanced Priority, ecoApproach Advice, ecoRoute Advice and ecoTraffic Strategies.
- TNO, is involved in the development and implementation of the ecoStrategic Model and the ecoBalanced Priority application.
- MAT.TRAFFIC, is involved in the development and implementation of the ecoStrategic Model.
- TECHNOLUTION, is involved in the development and implementation of the ecoRoute Advice application.
- PTV, is involved in the development and implementation of ecoAdaptive Traveller Support.
- FFA, responsible for equipped vehicle and the implementation of ecoDriving Support, ecoInformation, ecoRouting, ecoPostTrip and ecoMonitoring
- NAVTEQ, responsible for the development of the ecoMaps.
- NEC & Q-FREE, are involved in the development and implementation of ecoMessages.
- DAF & VTEC, are involved in the development and implementation of SP4-applications and willing to support tests and validation in Helmond if needed.

4.2. Applications and Vehicles

SP2

ecoStrategic Model – will be implemented for the whole network of Helmond only including the major roads. If that proves to be too time consuming a sub-section of the network will be considered.

ecoMaps – will be implemented for the whole network of Helmond to support the ecoStrategic Model and several of the SP5 applications.

Communication platform – will be implemented on vehicles, roadside units and traffic management centre to allow short- and long-range communication between these entities.

ecoMessages-ecoTraffic Situation Data – broadcast of traffic signal states will be implemented on all roadside units at signalized intersections, if proven to be useful and feasible. Traffic lights in Helmond are adaptive which means that traffic signal states may not be very predictable, and thus accurate enough for calculation of speed advice. Minimally, this service will be implemented on the intersection 101, 102 and 103.

SP3

ecoDriving Support – will be implemented on the FFA-vehicle and uses information coming from infrastructure. Details to be determined [D3.13].

ecoInformation – will be implemented on the FFA-vehicle and uses information coming from infrastructure. Details to be determined [D3.13].

ecoNavigation – will be implemented on the FFA-vehicle and uses information coming from infrastructure. Details to be determined [D3.13].

ecoPostTrip – will be implemented on the FFA-vehicle and uses information coming from infrastructure. Details to be determined [D3.13].

ecoMonitoring – will be implemented on the FFA-vehicle and uses information coming from infrastructure. Details to be determined [D3.13].

SP4

None

SP5

ecoApproachAdvice – this application provides speed and lane recommendation to vehicle and will be implemented on the intersections 101, 102 and 103. If the effort involved is acceptable the application can also be implemented at other intersections.

ecoRouteAdvice – the micro-routing part of this application will be implemented in a scenario that involves a railway crossing. The railway crossing is located close to intersection 104, at which queues and waiting times significantly increase when the crossing closes. In these cases, micro-routing will advise traffic to avoid this intersection by recommending alternative routes.

Limited functionality: ecoBalancedPriority – this application deals with traffic lights and due to regulation cannot be implemented entirely. Nonetheless, the behaviour of the application will be implemented as good as possible by changing the configuration of the existing traffic light control algorithm. This application will be implemented on the intersections 101, 102 and 103. Please note that this approach means that the application is implemented with limited functionality. Simulation offers more flexibility to test, evaluate and demonstrate the full functionality of the application.

Limited functionality: ecoGreen Wave – this application deals with traffic lights and due to regulation cannot be implemented entirely. Nonetheless, the behaviour of the application will be implemented as good as possible by changing the configuration of the existing traffic light control algorithm. This application will be implemented on the intersections 101, 102 and 103.Please note that this approach means that the application is implemented with limited functionality. Simulation offers more flexibility to test, evaluate and demonstrate the full functionality of the application.

ecoAdaptive Traveller Support – this system deals with provisioning of current and predicted traffic state information of the road network. This TPEG service will be offered based on the outcome of the ecoStrategic Model.

ecoTraffic Strategies – this component assesses the outcome of the ecoStrategic Model and determines control targets for local applications. It is planned to define a scenario for which this whole chain can be demonstrated, for example the railway closure mentioned above. Minimally, the sequence of traffic state estimation, hotspot detection, strategy selection and transmission of control targets will be tested. Simulation models will be used for validation and impact assessment.

Limited functionality - ecoAdaptive Balancing and Control – this system is the result of the joint activity of several of the applications mentioned above: ecoRoute Advice, ecoBalanced Priority and ecoGreen Wave. The ecoTraffic Strategies component aims to set control target for each of these to create synergies and proportionally higher benefits. Due to the various limitations mentioned earlier also this system is implemented with limited functionality. Simulation models will be used for validation and impact assessment.

Optional: ecoSpeed and Headway Management – this application provides speed recommendation to motorway vehicles to anticipate to downstream traffic conditions and resolve shock waves. Similar functionality has been tested before on the A270 motorway. Maybe further test with strong input from eCoMove can be initiated. To be determined.

SP	APPLICATIONS
SP2	eComunication Platform, ecoMessages, ecoMaps, ecoSituational Model, ecoStrategical Model
SP3	ecoInformation, ecoDriving Support, ecoPostrip, ecoNavigation and ecoMonitoring
SP4	n/a
SP5	ecoApproachAdvice, ecoRouteAdvice, ecoBalancedPriority (limited functionality), ecoGreenWave, (limited functionality), ecoAdaptive Traveler Support, ecoTraffic Strategies, ecoAdaptive Balancing and Control, and ecoSpeed and Headway Management (optional)

Table 12 eCoMove applications to be tested in Helmond.

The eCoMove demonstrators to be tested at Helmond will be the following:

- Passenger car: FFA [D3.13]

4.3. Traffic Network Simulation Environment

As the pictures below indicate a model of the road network of the Helmond area is already available. On the left you can see the equipped intersections in the City of Helmond. On the right modelled road network in the microscopic traffic simulation VISSIM. The following applications will be considered for simulation in the Helmond network, to what extent and in which scenarios however needs to be determined:

- ecoAdaptive Balancing and Control
  - ecoRoute Advice
  - ecoBalanced Priority
  - ecoGreen Wave
  - ecoApproach Advice
  - ecoTraffic Strategies

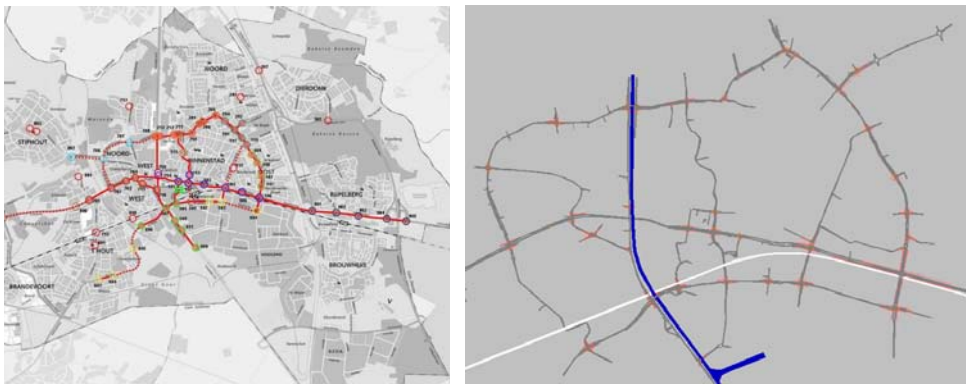


Figure 17: Road Network of Helmond

4.4. Additional equipment to be installed

As mentioned before already 14 intersections are equipped with a roadside unit. Three of them, at the intersections 101, 102 and 103, will be replaced by a more powerful roadside unit to meet the demands of the eCoMove applications. In addition, one intersection will be equipped with a vehicle detection camera (i.e. presence, class & speed) to simulate 100% market penetration of equipped vehicles. This camera allows perfect monitoring of queue evolution and therefore enables transmission of highly reliable approach advice (i.e. speed and lane advice). A Traffic Management Centre (TMC) will be setup in the PEEK office in Amersfoort. This TMC collects traffic data from difference sources, stores in the ecoMaps, hosts the ecoStrategic Model and offers route advice and traffic information services to eCoMove vehicles. Hardware of some of the traffic systems in the field may be out-dated or not suitable for making data available centrally, and therefore may require additional hardware at low cost. Other cost may involve operational cost (e.g. 3G data traffic and subscription to third-party service providers) and tools for validation (e.g. measurement devices).

4.5. Budget

In the next table the complete budget for the Helmond test site is presented:

TEST SITE: HELMOND			
	Description	**Costs**	**Total**
Additional Equipment & Resources	Replacement 3 Roadside Units	€ 5.500,-	€ 5.500,-
	1 vehicle detection camera	€ 5.000,-	€ 10.500
	1 Traffic Management Centre	€ 4.000,-	€ 14.500
	Additional hardware legacy systems	(TBD)	(TBD)
	Operational cost	(TBD)	(TBD)
	Tools for validation	(TBD)	(TBD)
Additional Equipment Total Costs			

Table 13 Summary of estimated budget for test site Helmond

4.6. General Planning

TASK	PARTNERS INVOLVED	DUE MONTH
Development of applications	SP2, 3 and 5	M24, 03/2012
Integration of applications	SP2, 3, 5 and TS Partners	M24, 03/2012
Hardware installation	TS Partners	M24, 03/2012
Implementation of applications at test sites	SP2, 3, 5 and TS Partners	M28, 07/2012
Data collection for validation	TS Partners	M32, 11/2012

Table 14 Planning for test site Helmond

5. Berlin

Berlin was selected as a verification site mainly because it is possible to prepare and develop different tests in controlled conditions. The verification done in this site will be focused in the communication applications (SP2, core technologies) testing will be performed according to the indications given in the verification plan document (see Milestone **[M2.3]**).

Main characteristics of this site are described in the following sections.

5.1. Description

Main characteristics of the Berlin test site are the following ones:

- 1.2 km roads connecting inner Berlin with the areas Köpenick and Adlershof;
- Measuring of traffic for traffic surveillance, traffic safety, traffic data management, transport models evaluation (traffic condition reconstruction; traffic forecast and traffic management);
- Test site for established and novel sensors as well as own developments (vehicle counter, noise detectors, road surface analysis);
- Test site for development of safety features;
- Test site for verification/evaluation of practical relevance and user friendliness of sensing devices, data acquisition equipment, data evaluation algorithms and final data use.

In general, in this test site the applications and projects carried out until this moment are related to Traffic Management, Traffic Surveillance, data management, traffic and transportation, traffic models, traffic simulation (SUMO) and evaluation.

Generally:

- Development and validation of traffic sensor technologies (video based sensors, profiler sensors [laser scanner], fusion sensors)
- Test site and demonstrator for new traffic sensor techniques
- Data source for studies

Particularly:

- Determination of traffic parameters
- Stationary video based traffic detection
- Video based Wide area traffic surveillance
- Situation detection and assessement
- Traffic state detection with wireless communication techniques (e.g. Bluetooth, WiFi, …)
- Sensor testing (e.g. video systems)

5.1.1. Pilot area

The pilot area is composed of 1.2 km of roads connecting inner Berlin with the areas Köpenick and Adlershof. In the next figures is possible to see the map and geographical classification:

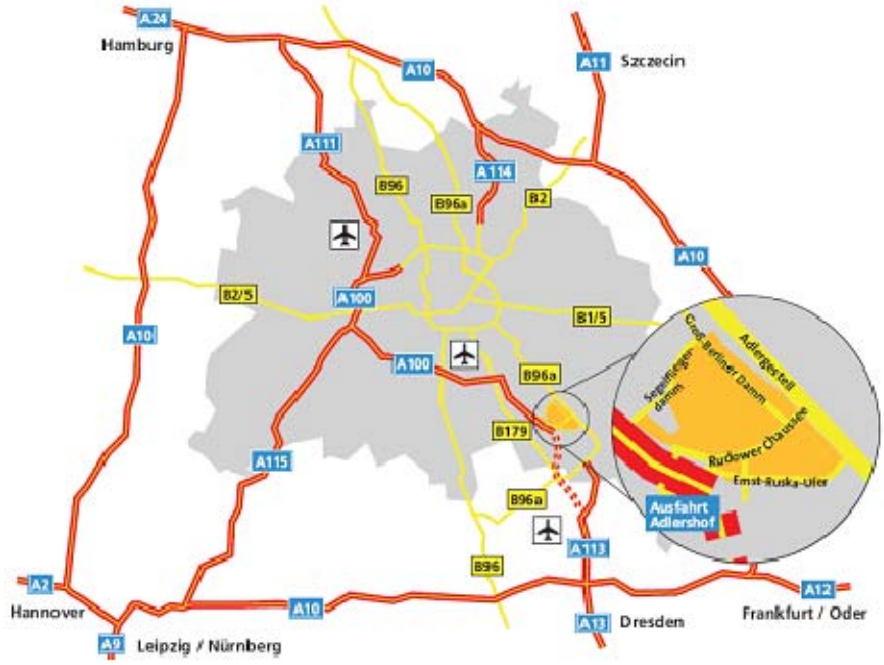


Figure 18: Detectors and positions: loop detectors are placed at any drive and exit

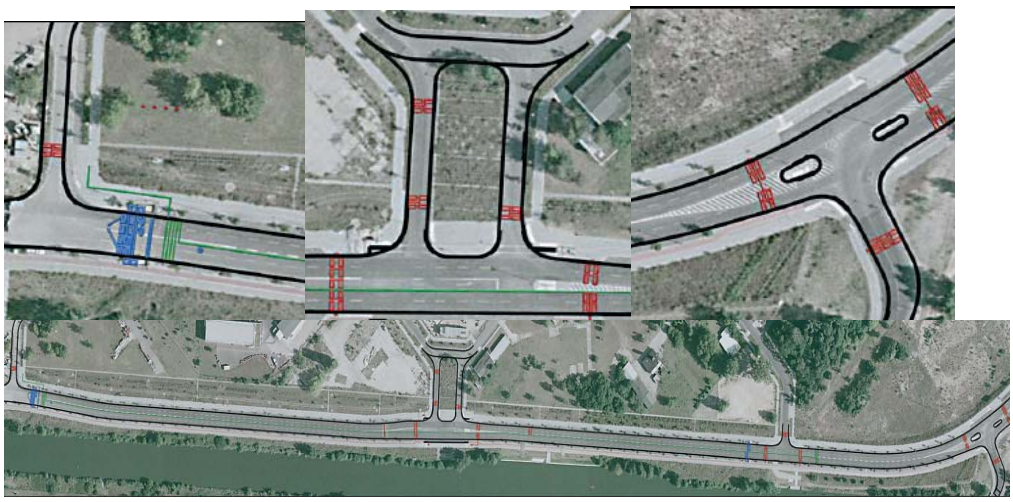


Figure 19: Red: loops, blue: radar, green: already decomposed temperature sensors

** Please notice that the temperature sensor has already been taken out of service.*

5.1.2. Available Equipment

The available equipment in this test site is composed of:

- 45 inductive loop detectors at any access and exit roads,
- Several radar sensors,
- Noise and meteorological sensors,
- 17 digital and analogue cameras for intelligent local and wide area measurements;
- Data access by internet possible;
- Connection to a virtual Traffic Management Center (Traffic Tower);
- Intelligent surveillance measures of the whole test track.

5.1.3. Partners Involved

In this case the test site leader is DLR, who offers the installations and tools to do the verification tests defined in the test site.
Additional partners involved will be PEEK, IKA, LOGICA, TNO and CONTINENTAL.

5.2. Applications and Vehicles

The main focus of the tests to be carried out is the verification of the integration of the different applications developed in the eCoMove project. So, taking this into account, the applications that are going to be tested are the following ones:

SP	APPLICATIONS
SP2	ecoCommunication Platform, ecoMessages.
SP3	n/a
SP4	n/a
SP5	n/a

Table 15 eCoMove applications to be tested in Berlin.

No demonstrator vehicles will be used in Berlin as testing is only related to the Communication platform and ecoMessages.

5.3. Additional equipment to be installed

In order to be able to test the communication platform in Berlin TS the following equipment will be needed:

- eCoMove Communication platform
- 1 TMC (Traffic Management Centre)
- 2 RSUs (Road Side Units)

5.4. Budget

In the next table the complete budget for the Berlin test site is presented:

TEST SITE: BERLIN			
	Description	**Costs (1 unit)**	**Total**
Additional Equipment & Resources	**1 TMC**	4,000 €	4,000 €
	2 RSUs	4,000 €	8,000 €
		Additional Equipment Total Costs	12,000 €

Table 16 Summary of estimated budget for test site Berlin

5.5. General Planning

The detailed planned for the TS Berlin is still not available. The general tasks and dates for the verification process are included in the table:

TASK	PARTNERS INVOLVED	DUE TO MONTH
Installation of Applications	TS Partners	M24, 03/2012
Verification Tests	TS Partners	M28, 07/2012

Table 17 Planning for test site Berlin

6. French Motorways

In French Motorways, both on-site tests / data collection and simulations tests will be carried out. On-site tests with one application (ecoTruck Parking) will be carried out and as validation and assessment test site, the traffic network environment will be used.

6.1. Description

ASFA, Association of French motorways, tunnel and bridge operators, is a unique professional organisation gathering all motorways operators in France. ASFA represents 15 companies and more than 8.000 km of motorways; 3 of these companies are involved in eCoMove (ASF, Cofiroute, and Escota), representing more than 4.000 km of toll motorway.

The motorways network of ASF, Cofiroute and Escota are composed with major transeuropean axis who are connecting, southern and northern parts of Europe, France, Italy, Spain and Switzerland.

The French motorway network has already been used for testing innovative applications in European projects: for example tests were carried out on Cofiroute's network for RCI project and on ASF's network for CVIS.

6.1.1. Pilot area

Three different sites on the French motorway road network will be used for the development, testing and demonstration of functional components and applications of the eCoMove project:

- **A7, A46 ASF motorways** , south of Lyon city for ecoTruck Parking (1 on the map),
- **A8 ESCOTA** toll plaza of "Antibes" for ecoTolling (2 on the map),
- **A10 Cofiroute** motorways on a 36 km section between Monnaie and Sorigny toll barriers on the area of the city of Tours for eCoSpeed and Headway Management (3 on the map).

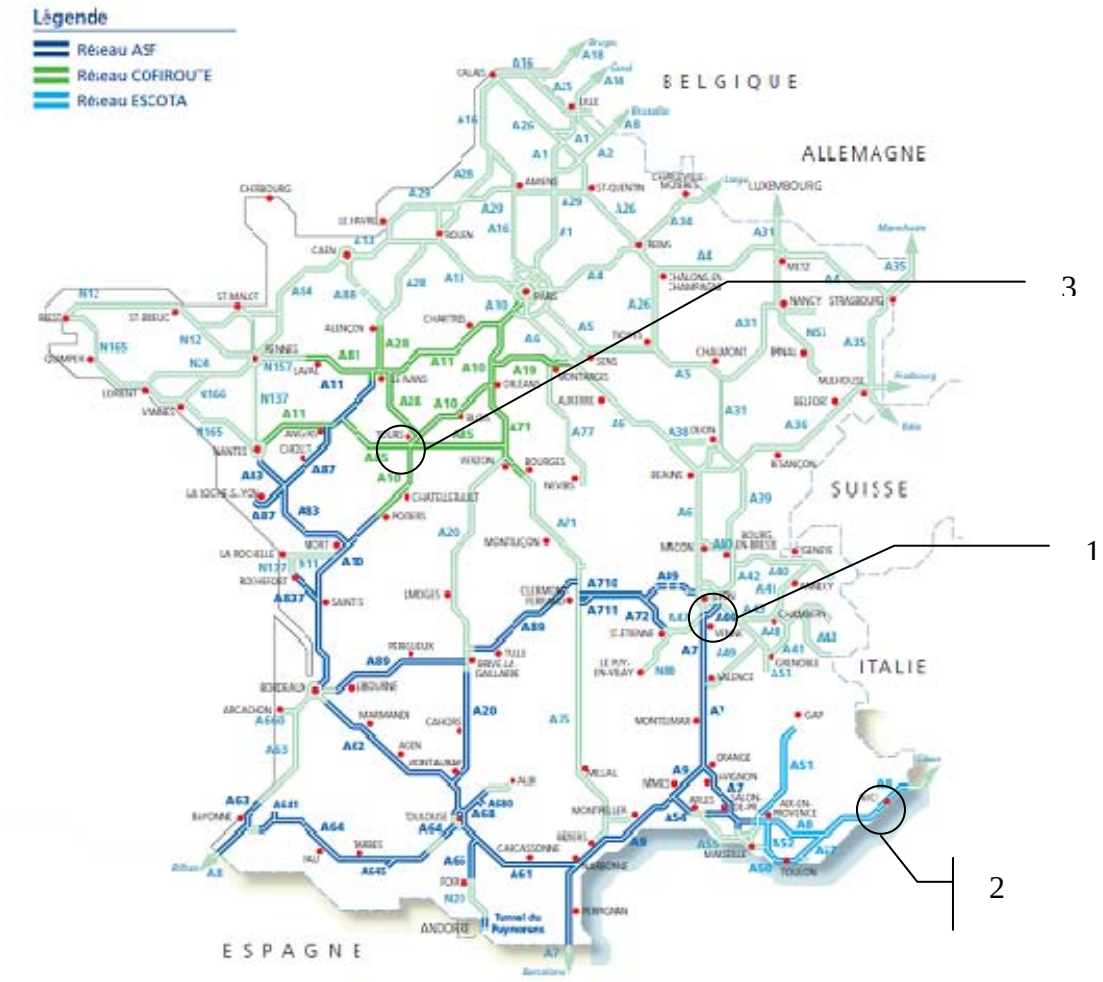


Figure 20: French Motorway validation site image.

All sections are equipped densely with communication and energy infrastructure, as well as detection devices (traffic counting stations, VMS, video cameras, weather stations, toll plazas with manual to semi rapid toll lanes…). Some sections are already equipped with applications such as dynamic travel time and speed control, and all are supervised by Traffic Control Centres.

ecoTruck Parking:
The north part of A7 and the A46 motorways, close to Lyon (ASFA/ASF) have been chosen to make the data collection session for the evaluation of the benefit of the ecoTruck Parking applications. These Motorways are considered as ones of the trans-European most important axis between north and south. The Traffic concerning trucks is considerable.

Four truck parking areas have been targeted to supporting the data collection/ validation plan:

- A46 – "Communay Sud" West bound
- A46 – "Communay Nord" East Bound
- A7 – " Saint Rambert d'Albon Ouest" South Bound
- A7 – "Roussillon, Truck Only Area" South Bound

These parking areas are representatives of the areas we can find on the ASFA network. The parking areas of Communay are in slope (positive and negative), that makes measurements very interesting. The Roussillon's parking area is a truck only area well known by drivers. Mixing cars and trucks parking, Saint Rambert d'Albon Ouest is the most common parking area that we can find.

Figure 21: Areas of Testing in French Motorways

ecoTolling
A first prototype of ecoTolling has been implemented at the Antibes barrier (in the direction towards Italy). Measurements from this location will be used for the simulation activities discussed below.

- 2 lanes are dedicated to trucks
- 4 lanes are dedicated to light vehicles

Where nominal rated crossing speed for is 30 km/ h.

ecoSpeed and Headway Management
The motorway section considered is located on A10 motorway, on the area of the city of Tours (COFIROUTE motorway network). The whole stretch is 36 km long, between Monnaie and Sorigny toll barriers. It is a dual 3 lanes carriageway on the first 21 km and a dual 2 lanes carriageway on the remaining 15 km. It includes 9 interchanges (2 of them with other motorways) and 2 rest areas, which amounts to 42 entrance or exit ramps. This motorway section will be modelling in VISSIM for simulation purposes.

6.1.2. Available Equipment

For the different applications and areas, the equipment available is the following one:

ecoTruck Parking
Concerning ecoTruck Parking, live truck parking place availability information will be used as input to the application. The parking place collector system is already available on few areas from A7 and A9 ASFA/ASF motorways.

eCoTolling
In order to evaluate this application within eCoMove, the eCoTolling will be integrated into the simulation model of the application Speed and Headway Management.

The network modelled will be the Cofiroute motorways one. The ecoTolling will be included in the simulation model instead of a Cofiroute barrier looking similar to Antibes.

Calibration of the eCoTolling model will be based on:

- architectural drawings and traffic data of the Antibes barrier
- and hypothesis and rules for traffic distribution while approaching the barrier (speed recommendations to slow down, lane advice regarding occupancy lanes)

To calibrate the model the number of vehicles that daily cross the barrier (annual average) will be available with the following details:

- Total number of light vehicles
- Total number of trucks
- Total number of vehicles that cross with a T-Tag.

These statistical data will be extracted from the operating test site that is being implemented on the Antibes barrier. The equipments to be deployed are (outside the civil construction works on the lanes):

- Upstream barrier : composed of an antenna whose input is the signal detection of toll tag inside the vehicle;
- The upstream barrier : composed of
    a. An antenna
    b. A closing/opening barrier
    c. Vehicle detection/classification system

  Input / output data: the signal detection from the vehicle tag is verified by the lane management system that checks authorisation crossing.
- Lane Management System: it communicates with the backoffice toll Information System to checks authorisation crossing and compute toll transactions. It manages barrier opening/crossing, communications radio messages from the vehicle toll tag.

Note : the toll tag is the equipment in the vehicle that is detected when approaching the toll barrier through DSRC communication (5.8 GHz communications).

ecoSpeed and Headway Management:
For this simulation oriented task, the inputs are the information's to models this ASFA/COFIROUTE motorways section. 11 traffic counting stations are located on the section; speed and flow data will be provided to the simulation tools. Other data such as speed limits and AADT are also provided to be used as input for model calibration for the algorithm.

6.1.3. Partners Involved

The partners involved in the testing of the different applications will be the following ones:

- ecoTruckParking :ASFA, VTEC
- ecoTolling: ASFA, PTV, TNO
- ecoSpeed and Headway Management: ASFA, TNO, PTV, PEEK
- ecoMotorway Management: ASFA, PEEK, PTV, TNO
- ecoRamp Metering: VIALIS, PTV, ASFA

6.2. Applications and Vehicles

The applications considered in the French Motorway test site are from SP5 (linked to SP4 for ecoTruck Parking).

ecoTruck Parking:
Concerning eCoTruckParking validation, a measurement session will be done with a specially equipped Volvo Truck. Measurements of consumption will be made to evaluate the wasted fuel done by a truck for an unsuccessful search of a parking place.

This special Volvo Truck will make a sequence of deceleration and a real stop and search sequence for an available parking place (sequence to be confirmed):

- Deceleration from cruse speed to enter the parking area
- Drive along the parking places to simulate a search
- Stop and start twice to consider a standard truck parking typology
- Acceleration to cruse speed to escape from the truck parking area

Real measurement results must be extended from one type of truck to the most significant types of trucks by using a consumption profile provided by Volvo Truck.

This result will be scaled up to the ASFA network using ASFA statistical databases.

The eCoTruckParking Application will be developed by ASFA/ASF. The sub-module are:

- Parking Place data collector (to collect the number of available places)
- Parking Place data manager (to define the status of the area)
- MapMatching (to put in relation the questioning truck and the motorway network)
- Available parking search engine (to give the status of the truck parking areas to the questioning truck according to his position)

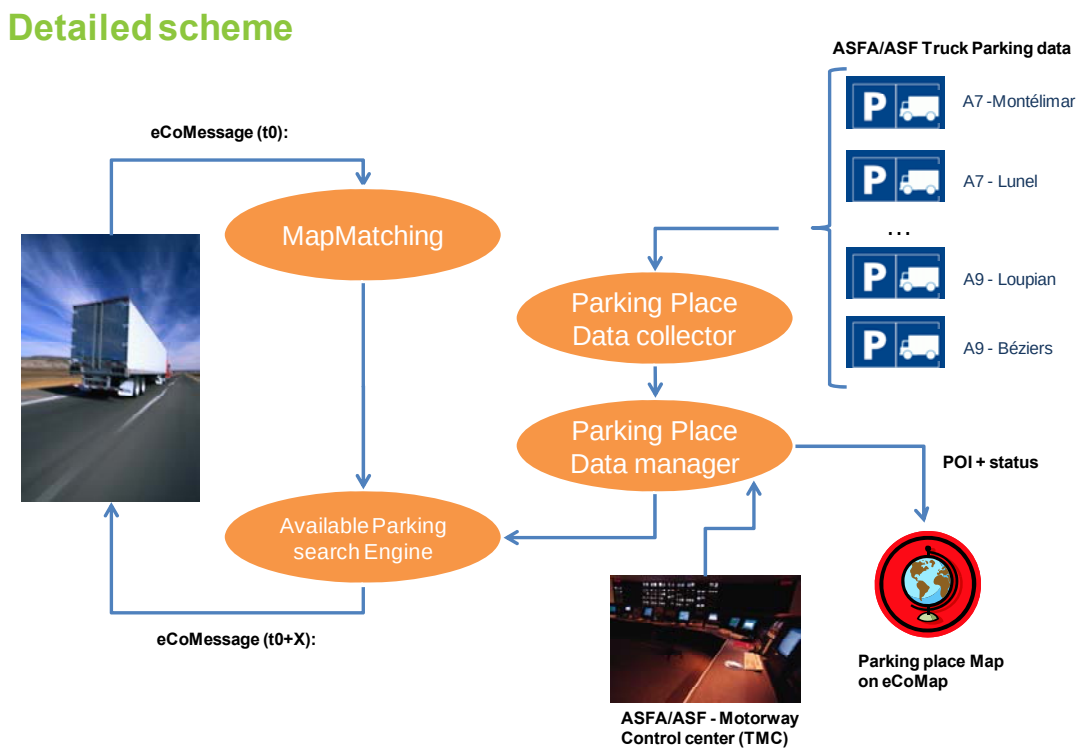


Figure 22: EcoTruck Parking Detailed Scheme

ecoTolling
The simulated application will inform drivers when approaching the barrier about:

- Approaching speed limit recommendations
- Speed limit allowed for crossing
- Lane advice

ecoSpeed and Headway Management
This application aims to provide speed recommendations to drivers in unstable traffic conditions to harmonize traffic flows and increase vehicle headways to absorb instabilities such as shock waves.

ecoRamp Metering
This application aims to control the in-flow of traffic on to the motorway, by providing speed advice to vehicles on the on-ramp to help them entering the motorway and prevent stop-and-go movement of traffic on the ramp and reduce fuel consumption.

ecoMotorway Management
ecoMotorway Management is the combination of the three previous applications (ecoTolling, ecoSpeed and Headway Management and ecoRamp Metering). The goal is to estimate the additional benefits on fuel consumption by combining the different applications versus each application separately.

Next table summarizes the applications to be tested in French Motorways:

SP	APPLICATIONS
SP2	n/a
SP3	n/a
SP4	ecoTruck Parking (application part)
SP5	ecoTruck Parking (data collection, validation) ecoTolling (simulation) ecoSpeed and Headway Management (simulation) ecoRamp Metering (simulation) ecoMotorway management (simulation)

Table 18: eCoMove applications to be tested in French Motorway

The eCoMove demonstrators to be used at French Motorways TS will be the following:

- Truck: VTEC [D4.7]

6.3. Traffic Network Simulation Environment

eCoTolling:
In order to evaluate this application within eCoMove, the ecoTolling will be integrated into the simulation model of the application Speed and Headway Management.

The network modeled is a section of Cofiroute motorway network. The ecoTolling will be included in the simulation model instead of a Cofiroute barrier looking similar to Antibes.

Calibration of the ecoTolling model will be based on:

- Architectural drawings and traffic datas of the Antibes barrier
- And hypothesis and rules for traffic distribution while approaching the barrier (speed recommendations to slow down, lane advice regarding occupancy lanes)

In addition, although a tool for calculating the gain of CO2 is also being studied as part of eCoMove, ESCOTA calculations will allow calculation of CO2 gain emissions in relation to real traffic data. These calculations could be compared with those of the eCoMove tool to improve the calculation models.

eCoSpeed and Headway Management:
The simulation concerning ecoSpeed and Headway Management will measure the consequences of speed recommendations for drivers on the A10 motorways. The simulations will measure the impact of these recommendations to harmonize the

traffic flows, when the conditions are unstable. These simulations will measure the importance of instabilities with and without the recommendations to drivers.

ecoRamp Metering
This application aims to control the in-flow of traffic on to the motorway. Besides it provides speed advice to vehicles on the on-ramp to prevent stop-and-go movement of traffic and reduce fuel consumption. In order to evaluate this application within eCoMove, the ecoRamp Metering application will be integrated into the simulation model of the application Speed and Headway Management.

6.4. Additional equipment to be installed

Main SP5 applications to be tested in the French Motorway are the ecoSpeed and Headway Management, ecoTolling and ecoTruckParking.

In order to develop and perform the validation tests on these SP5 applications, additional equipment is needed:

- For eCoTruck Parking applications the equipment to be installed are mainly hardware (servers and PC).
- Validation a simulation tools (test site specific).

6.5. Budget

In the next table the estimation of budget for the French Motorways test site is presented:

TEST SITE: FRENCH MOTORWAYS			
	Description	**Costs**	**Total**
Available Equipment & Resources (already included in DoW)	**ecoTruckParking**		
	Hardware equipment (PC, servers, etc)	30,000 €	30,000 €
		Available Equipment Total Costs	30,000 €
Additional Equipment & Resources	Validation Simulation Tools (Tes site specific)	TBD	TBD
		Additional Equipment Total Costs	TBD

Table 19 Summary of estimated budget for test site French Motorways

6.6. General Planning

For the moment, the detailed planned is not available for the French Motorways test site activities. Below, the first task planned is included:

TASK	PARTNERS INVOLVED	DUE TO MONTH
eCoTolling - Model calibration regarding datas and operating rules	ASFA, TNO	M23, 02/2012

Table 20 Planning for test site French Motorways

7. Torino

Torino is a verification and validation site in which only SP3 applications will be tested. Next sub-chapters describe the main characteristics of this test site and the status.

7.1. Description

Torino is a high interest test area for different reasons:

- At least two partners developing 2 demonstrator vehicles belonging to the Torino area;
- Different scenario and possibilities to cover use cases for the ecoTripPlanning, ecoNavigation and ecoSmart Driving applications are available;
- The presence of two vehicles in the same place is enabling the verification of V2V communication.

The ecoInformation application will be also tested in this environment.

7.1.1. Pilot area

The Torino road network offers interesting peculiarity for the test phase of different eCoMove applications.

The Torino area is attracting many daily commuters as it is the main regional industrialized area providing many workplaces. At the same time the Torino motorway network serves as a transition connecting different regions and countries (mainly France, Milan and Genova).
The network, especially the city, has detection devices (loop, infrared and video detectors, camera…). 5T daily manages the traffic control computer system for the whole city area (integration of traffic lights, etc.). Many of these data are available as high level data on the web via the 5T portal (http://www.5t.torino.it/5t/it/traffico/percorsi.jsp). Other data are available from the TOMTOM web service. For the verification purposes at now is not planned to use these info at least to have any eCoMove service coming from SP5.

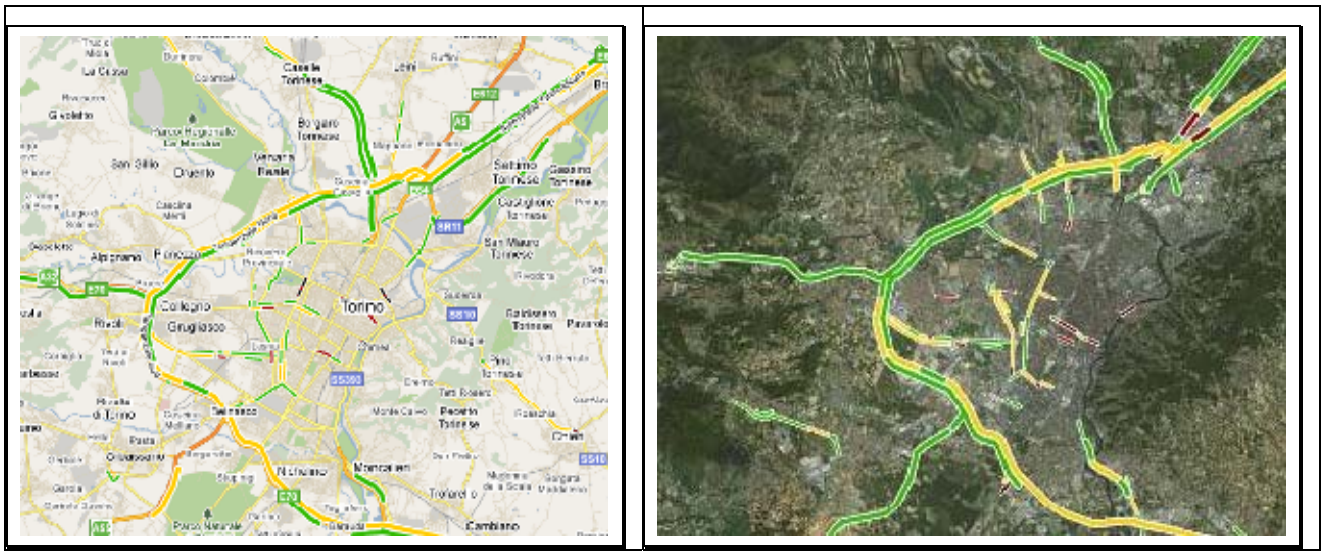


Figure 23: Traffic condition at different hours

Figure 24: Traffic Info from TOMTOM

7.1.2. Available Equipment

The Torino test site is planned for verification of the SP3 functions and is therefore not foreseeing any equipment installation on the road side.

7.1.3. Partners Involved

CRF (test site leader), Magneti Marelli, TOMTOM are the partners operating on the Torino test site.

7.2. Applications and Vehicles

The applications under test are mainly of two categories: navigation related and driver coaching related. In the first category there are the ecoTripPlanning and the ecoNavigation applications that will be developed and verified. In the second category there are the ecoInformation and the ecoSmartDriving applications. Special attention will be dedicated to the ecoSmartDriving application: it will be tuned and verified on different routes (including urban, extra-urban, rural and highway roads, in congested and non-congested conditions).
The implementation of the same application on two different vehicles (FIAT 500 and FIAT QUBO) will be finalized not only to tune the algorithms but also to identify vehicle features that make the difference in the behavior and energy consumption. The target is to start with a functionality tuned without the eco horizon support, and then to verify the benefits coming from the eco horizon implementation.

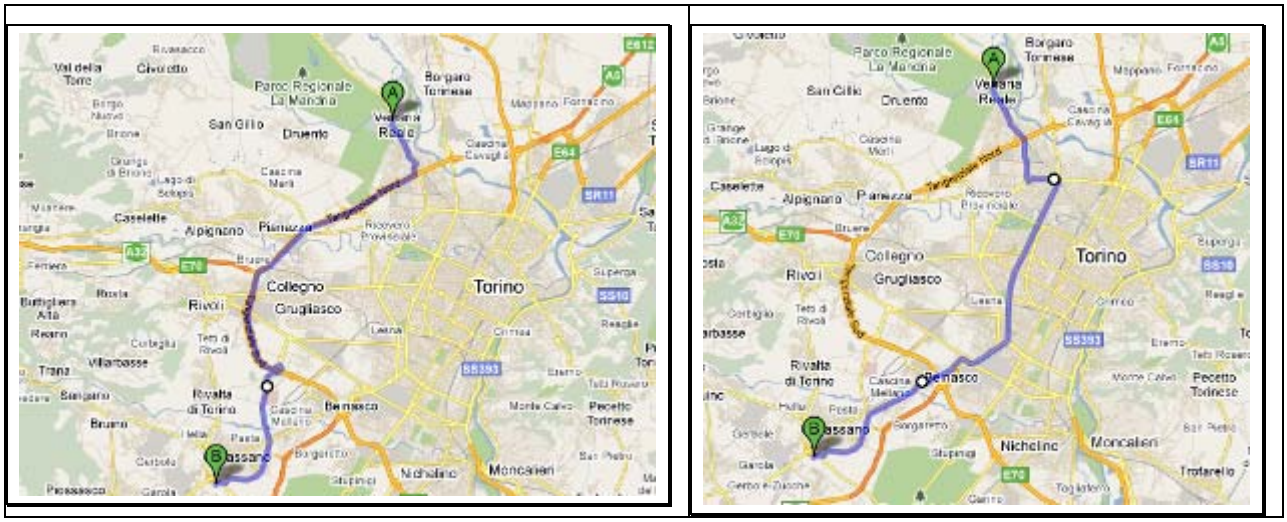


Figure 25: Possible test route with the same source and destination but using extra urban path or town area

Next table summarizes the applications to be tested in Torino:

SP	APPLICATIONS
SP2	eCoComunication Platform, ecoMessage, ecoMap, ecoSituational Model
SP3	ecoTripPlanning, ecoNavigation, ecoInformation, ecoDriving Support, ecoPostTrip, ecoMonitoring
SP4	n/a
SP5	n/a

Table 21 eCoMove applications to be tested in Torino

The eCoMove demonstrators to be tested at Torino will be the following:

- Passenger car: CRF-MM1 [D3.10] and CRF-MM2 [D3.11].

7.3. Additional equipment to be installed

The verification of the functionality of the – cooperative approach – among vehicles will be tested in the FIAT Centro Sicurezza test track for safety reasons.

Figure 26: FIAT Centro Sicurezza test track close to CRF site

On this test track the verification test will take advantage of:

- Stationary communicating vehicle located at different distances to verify the communication range
- Moving vehicles at different distances and speeds to verify the range and error rates

7.4. Budget

Function tested or planned phase	Hypothesis of work necessary
Stationary vehicle at different distances to verify the static range	Test track rent cost 5000 Euro
Moving vehicles at different distances and speeds to verify the range and error rates	Test track rent cost 5000 Euro
PreTrip	TBD
ecoRouting	TBD
ecoInformation	TBD
ecoSmartDriving without eco Horizon	TBD
ecoSmartDriving with eco Horizon without cooperative information	TBD
ecoSmartDriving with eco Horizon and with cooperative information	TBD

In the next table the current estimation of budget for the Turin test site is presented:

TEST SITE: TORINO			
	Description	**Costs**	**Total**
Available Equipment & Resources	**Data logger**	TBD	TBD
	CAN analyzer	TBD	TBD
	Portable PC external to the vehicles	TBD	TBD
	Internal drivers	TBD	TBD
	Test track	10000	10000
	Available Equipment Total Costs		TBD
Additional Equipment & Resources	**External drivers non possible for restriction low**	TBD	TBD
	Additional Equipment Total Costs		TBD

Table 22 Summary of estimated budget for test site Torino

7.5. General Planning

The planning is related to prepare all the equipment to perform the tests.
In particular the following test phases are envisaged:

- PreTrip verification
- ecoRouting verification
- ecoInformation verification
- ecoSmartDriving without eco Horizon verification
- verification of ecoSmartDriving with eco Horizon without cooperative information
- verification of ecoSmartDriving with eco Horizon and with cooperative information

For each of these test phases it is planned to prepare the instruments and resources necessary to perform the verification tests.

The general tasks and estimated dates are included in the following table:

TASK	PARTNERS INVOLVED	DUE TO MONTH
PreTrip verification	TS Partners	M28, 07/2012
ecoRouting verification	TS Partners	M28, 07/2012
ecoInformation verification	TS Partners	M28, 07/2012
ecoSmartDriving without eco Horizon verification	TS Partners	M28, 07/2012
verification of ecoSmartDriving with eco Horizon without cooperative information	TS Partners	M29, 08/2012
verification of ecoSmartDriving with eco Horizon and with cooperative information	TS Partners	M30, 09/2012
Final validation of SP3 applications	TS Partners	M36, 03/2013

Table 23 Planning for test site Torino

8. Motorway A9 Badhoevedorp

8.1. Description

Several ramps at Motorway A9 between Haarlem and the Southern part of the Amsterdam region in the Netherlands are equipped with a ramp metering controller to control the flow on the on ramp entering the motorway.

8.1.1. Available Equipment

The available equipment is:

- Motorway Traffic Management system (MTM) at the Motorway A9
- Ramp Metering Controller at the ramps.

8.1.2. Pilot area

The ramp Badhoevedorp is situated after the transition from a three to a two lanes motorway. It is equipped with a ramp metering controller to prevent a traffic jam downstream.

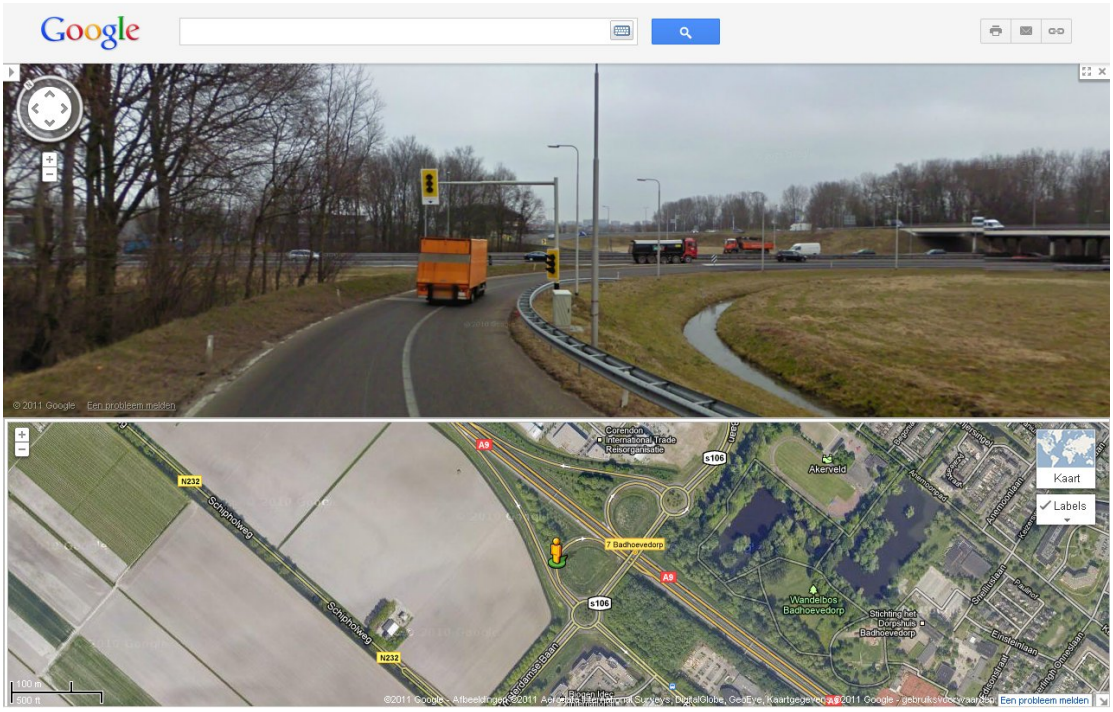


Figure 27: Ramp Metering installation at on ramp Motorway A9 Badhoevedorp

8.1.3. Partners Involved

The following partners are involved:

- VIALIS, is responsible for the roadside equipment and the implementation of ecoRamp Metering Application
- NAVTEQ, responsible for the development of the ecoMaps.
- NEC & Q-FREE, are involved in the development and implementation of ecoMessages.

8.2. Applications and Vehicles

SP	APPLICATIONS
SP2	n/a
SP3	n/a
SP4	n/a
SP5	ecoRamp Metering

Table 24 eCoMove applications to be tested in Motorway A9 Badhoevedorp (The Netherlands)

8.3. Traffic Network Simulation Environment

In order to evaluate this application within eCoMove, the ecoRamp Metering application will be integrated into microscopic traffic simulation model VISSIM. This model shall be derived from the macroscopic traffic simulation VISUM model showed in Figure 28.

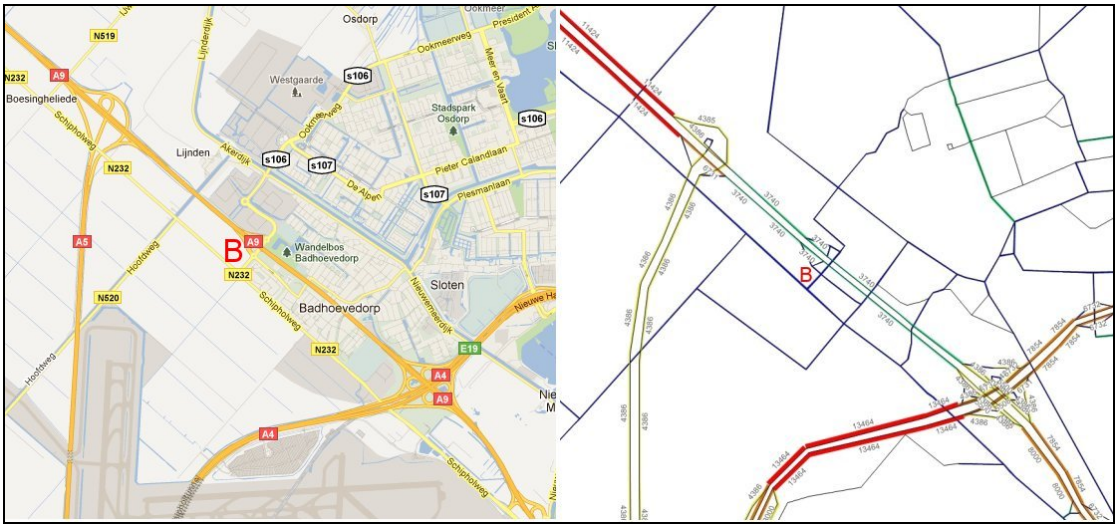


Figure 28: "B" at the map on the left and "B" at the VISUM-model on the right indicate the on ramp Badhoevedorp.

8.4. Additional equipment to be installed

The Ramp Metering Controller shall be extended with cooperative roadside unit.

8.5. Budget

In the next table the complete budget for the Motorway A9 Badhoevedorp test site is presented:

TEST SITE: MOTORWAY A9 BADHOEVEDORP			
Additional Equipment & Resources	One roadside unit	5.500 €	5.500 €
		Additional Equipment Total Costs	5.500 €

Table 25 Summary of estimated budget for test site Motorway A9 Badhoevedorp (The Netherlands)

8.6. General Planning

The general tasks to be carried out are included in the following table:

TASK	PARTNERS INVOLVED	DUE TO MONTH
Development of application	Vialis	M22, 01/2012
Integration of application	Vialis	M24, 03/ 2012
Hardware installation	Vialis	M26, 05/2012
Implementation of application at test site	Vialis	M28, 07/2012
Data collection for validation	Vialis	M32, 11/2012

Table 26 Planning for test site Motorway A9 Badhoevedorp (The Netherlands)

9. Next Steps

As it was already stated in the introduction, this version is a draft version of the working document WD6.3.3 Test Sites Planning in which all the information related to the preparation of the test sites and the test trials will be included in next months.

The evolution of this document will be aligned with the WP6.3 Field Trials and Validation timeline included in D6.2 V2.

		M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36
SP6 Validation -	**Resp**																								
WP6.3 Field trials and validation																									
D62 V2 Validation plan	TECN								D62 V2																
D62 V3 Validation plan	TECN										D62 V3														
WD6333: Validation scenarios	CTAG												M64												
WD6333: Finalised planning of the validation tests	CTAG																WD 633								
D6.3: Validation results	IKA																		D63						
WP6.4 Impact assessment																									
D64 Assessment results	DLR																					D64			

Table 27 Field trials and validation timeline (extracted from D6.2 V2)

The evolution of this document will be the following one:

- M21: budget needed for the different test sites defined.
- M24: new version of WD6.3.3 including the validation scenarios.
- M28: new version of WD6.3.3 including the finalised planning of the validation tests taking into account the validation matrix (Performance Indicators, Measures and Sensors), the validation scenarios and test cases defined and the time planning (Which application in which vehicle is tested when, where and by whom?).

Annex I. Summary of main characteristics of test sites.

	Munich	Helmond	Berlin	France (Avignon / Tolouse)	Turin	Motorway A9 Badhoevedorp
Type of test site	Verification, Validation & Demostration	Verification & Validation	Verification	Verification & Validation	Verification & Validation (Only SP3 applications)	Verification & Data Collection for assessment (of one application: eCoRamp Metering)
Description of the test site	Urban and Interurban roads in the north of Munich	Three main areas to be used in the EcoMove testing: 1) 6 km, urban road (15 roadside units). Plus possibly: 2) 4,5 km, motorway (every 500m ITS gateways) 3) 3 km, urban road in Eindhoven (7 roadside units)	1,2 km of test track, situated in the suburban area of Berlin connecting the center and the airport and motorway A100.	Three different locations in the French motorway road network: A7, A46 ASF Motorways, A8 ESCOTA, A10 Cofiroute.	Urban area of Turin. Motorway network.	Motorway at the south of Amsterdam equipped with Ramp Metering Controller
Test site leader	PTV	Peek Traffic	DLR	ASFA	CRF	Vialis
Applications to be tested	SP2: eCoComunication Platform, ecoMessage, ecoMap, ecoSituational Model, ecoStrategical Model (eStraM) SP3: ecoNavigation, ecoInformation, ecoPostTrip, ecoSmart Driving, ecoMonitoring. SP4: ecoTruck Planning, ecoDriver Coaching, Truck ecoNavigation SP5: ecoRoute Advice, ecoPark Advice, ecoBalancedPriority (limited functionality), ecoGreen Wave (limited functionality), ecoApproach Advice , ecoTraffic Strategies, ecoAdaptive Balancing and Control, ecoAdaptive Traveler Support.	SP2: eCoComunication Platform, ecoMessage, ecoMap, ecoSituational Model, ecoStrategical Model (eStraM) SP3: ecoNavigation, ecoInformation, ecoDrivingSupport, ecoPostTrip, ecomonitoring. SP5: ecoRoute Advice, ecoBalanced Priority (limited functionality), ecoGreen Wave (limited functionality), ecoApproach Advice, ecoAdaptive Traveler Support, ecoSpeed and Headway Management, ecoTraffic Strategies, ecoAdaptative Balanced and Control	SP2: eCoConmunication Platform, ecoMessages	SP5: ecoRamp Metering, ecoSpeed and Headway Management, ecoTolling, ecoMotorway Management, ecoTruck Parking.	SP2: ecoConmunication Platform, ecoMessage, ecoMap, ecoSituational Model SP3:ecoTripPlanning , ecoNavigation, ecoInformation, ecoDriving Support, ecoPostTrip, ecoMonitoring.	SP5: ecoRamp Metering

	Munich	Helmond	Berlin	France (Avignon / Tolouse)	Turin	Motorway A9 Badhoevedorp
Available equipment	Traffic detection equipment: induction loops and cameras. Several traffic data sources available: via the information portal Bayerinfo. Via City of Munich and TUM a camera system available for automatic number plate recognition. Significally amount of detectors already installed: traffic light detectors, traffic flow detectors.	- 14 roadside units at signalized intersections - ITS Gateways with camera, every 500 meters on 4.5 km of motorway - Wired connection with 52 traffic light controllers and its detectors - 26 counting stations, including vehicle classification and vehicle speed - Camera-based travel time measurements on all major arterials.	45 double introduction loops, two gantries (800m distance), 17 cameras, Traffic Tower as virtual Traffic Management Centre, 3D laser profiler, fibber optic cable for communication Precise and reliable vehicle positioning, Car-to-Infrastructure (C2I) communication via CVIS communication platform	Communication and energy infrastructure, detection devices (Traffic Counting stations, VMS, Video Cameras, weather stations, toll plazas with manual to semi rapid toll lanes…), dynamic travel time and speed control. Traffic control center supervision	Detection devices (loop, infrared and video detectors…) Traffic control computer system (whole area)	Ramp Metering Contoller Motorway Traffic Management System (MTM)
Possibilities and limitations to install further equipment	LOI from OBB (interurban) and city of Munich (urban) existing.	Equipment mentioned is already in place and currently in use for FREILOT and SPITS. Roadworks are being planned on the Motorway section.	No limitations	No limitations indicated.	No limitations indicated	Permission from road authority
Additional equipment needed	Traffic management components for SP5 applications: 10 RSU's, additional hw in 10 legacy systems; 1 TMC, Test site manager Fleet operators Validation Simulation Tools (Tes site specific)	Replacement of 3 Roadside Units 1 Vehicle detection camera 1 TMC Additional hardware legacy systems Operational cost Tools for validation	1 TMC + 2 RSUs	Occupancy detection for three parking areas, Road Side Units at three parking areas and one Traffic Management Center (for the ecoTruckParking application). Simulation tools.	Budget ofr the tracks	One roadside unit
Possible types of data to be collected	Bayerninfo data platform (PTV), APNR camera system, TLC detectors, motorway detectors.	Loop detector data, Floating Vehicle Data	Environmental and physical data (temperature, humidity, air pressure, etc.), loop data (vehicle classes, length), video data, laser data (vehicle profile)	TBD	Data available on the web via 5T portal and from the TOMTOM web service.	Data from National Data Warehouse

	Munich	Helmond	Berlin	France (Avignon / Tolouse)	Turin	Motorway A9 Badhoevedorp
Test scenarios	Urban / Interurban	1) Urban 2) Motorway	Controlled Integration Test Scenario defined in the verification and integration plan of the project (SP2 - T2.5.1)	Motorway	Inter -urban/Motorway, tracks	Motorway
Involved partners in test activities	PTV, TUM, MAT.TRAFFIC, PEEK, BMW, BOSCH, CRF, FFA, VOLVO and DAF.	PEEK, TNO, MAT.TRAFFIC, TECHNOLUTION, PTV, FFA, NAVTEQ, NEC & QFREE, DAF and VTEC.	DLR, PEEK, IKA, LOGICA, TNO, CONTINENTAL.	ASFA, TNO, VTEC, PTV, PEEK and VIALIS.	CRF, MM and TOMTOM.	Vialis
eCoMove Vehicle Demonstrator to be tested	Passenger car: BMW-NAVTEQ, CRF-MM1, CRF-MM2, BOSCH, FFA (only demonstration) Trucks: DAF and VOLVO	Passenger car: FFA.	n/a	Trucks: VOLVO.	1 CRF city car 1 CRF family car.	TBD

Table 28 Summary of TS main characteristics

Annex II. Applications tested in each test site.

This table summarizes which applications are going to be tested in each test site, identifying verification (VE), validation (VA) and demonstration (DEMO) tests. To have a more detailed information of the level of implementation and the method used for the tests (field trials or traffic simulation tests), review the TS specific chapters.

		APPLICATIONS											
		Munich		Helmond		Berlin		French Motorways		Turin		Motorway A9 Badhoevedorp	
		ON ROAD	SIMULATION	ON ROAD	SIMULATION	ON ROAD	SIMULATION	ON ROAD	SIMULATION	ON ROAD	SIMULATION	ON ROAD	SIMULATION
SP2	eCoCommunication Platform	VE VA DEMO		VE VA.		VE.				VA.			
	ecoMessages	VE VA DEMO		VE VA.		VE.				VA.			
	ecoMap	VE VA DEMO		VE VA.						VA.			
	ecoSituational Model	VE VA DEMO		VE VA.						VA.			
	ecoStrategical Model (eStraM)	VE VA DEMO		VE VA.									
SP3	ecoNavigation	VE VA DEMO		VE VA.						VE VA.			
	ecoInformation	VE VA DEMO		VE VA.						VE VA.			
	ecoDriving Support	VE VA DEMO		VE VA.						VE VA.			
	ecoTripPlanning	VE VA DEMO								VE VA.			
	ecoPostTrip	VE VA DEMO		VE VA.						VE VA.			
	ecoMonitoring	VE VA DEMO		VE VA.						VE VA.			
SP4	ecoTourPlanning	VE VA DEMO											
	ecoDriverCoaching	VE VA DEMO											
	Truck ecoNavigation	VE VA DEMO											
SP5	ecoRoute Advice	VE VA DEMO	VA.	VE VA.	VA.								
	ecoPark Advice	VE VA DEMO	VA.										
	ecoBalancedPriority	VE VA DEMO	VA.	VE VA.	VA.								
	ecoGreen Wave	VE VA DEMO	VA.	VE VA.	VA.								
	ecoApproach Advice	VE VA DEMO	VA.	VE VA.	VA.								
	ecoAdaptive Traveler Support	VE VA DEMO		VE VA.									
	ecoRamp Metering								VA.			VE VA *	VA *
	ecoSpeed and Headway Management			VE VA.					VA.				
	ecoTruck Parking							VE.					
	ecoTolling								VA.				
	ecoTraffic Strategies	VE VA DEMO	VA.	VE VA.	VA.								
	ecoAdaptive Balancing and Contro	VE VA DEMO	VA.	VE VA.	VA.								
	ecoMotorway Management								VA.				

Table 29 Applications vs. Test Sites

** In Motorway A9 Badhoevedorp data for assessment of the application ecoRampMetering will be collected. It is not considered as a validation site for the whole eCoMove concept.*