



Annual pilot overview report 2017

Vienna, 03.07.2018, v1.0

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Title:

Annual pilot overview report 2017

Contractual date of delivery:

March 2018

Actual date of delivery:

June 2018

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Platform Members:

Austria

Belgium/Flanders

Czech Republic

France

Germany

The Netherlands

Slovenia

United Kingdom

Belgium/Wallonia

Denmark

Finland

Hungary

Italy

Norway

Portugal

Sweden

Spain

1. Introduction

Core Members of the C-Roads platform are European States that agree to work together to achieve deployments that enable interoperable and seamless cross-border C-ITS services for European travellers. At the current stage sixteen European States committed to participate with their pilot sites. The C-Roads Platform remains open for other European States as well, as long as they are willing to actively participate.

The annual pilot overview report should give a summary of the pilot activities performed in each participating European States. This document describes on one hand the technical aspects as well as the budgetary situation.



Figure 1: C-Roads pilot sites

2. The Austrian Pilot site

The Austrian pilot contributes to interoperable European C-ITS solutions starting from the EU C-ITS Corridor. The implementation is linked to the C-ITS Strategy Austria of the Ministry for Transport, Innovation and Technology - BMVIT, which defines the C-ITS deployment steps for the years till 2020 in an organisational framework, including the cooperation with public entities and industrial stakeholders.

The Austrian C-Roads-Pilot builds on the core elements of the EU C-ITS Corridor project in Austria (ECo-AT) and extends them to a motorway based network of C-ITS stations in 2020, as defined in the Austrian C-ITS Strategy.

There is already a pilot area (“Living Lab”) in place with a total of 19 C-ITS stations, with an infrastructure operational and open for stakeholders. Consequently, there has already been active participation of stakeholders from the automotive industry within 6 test cycles of the ECo-AT-Corridor.

Following up on this, there is a C-ITS Masterplan (till 2020) in place for a roll-out to the major parts of the Austrian motorway network.

This includes:

- A tender procedure for rolling out C-ITS infrastructure
- A proactive participation in standardisation bodies (ETSI, CEN/ISO)
- An adoption of specification also by international governments
- A deployment of the developed services on Austrian roads (Day 1, Day 1.5 etc.)
- Common quality assurance
- Common development towards “Automated Driving”

Involved partners

- ASFINAG

Location

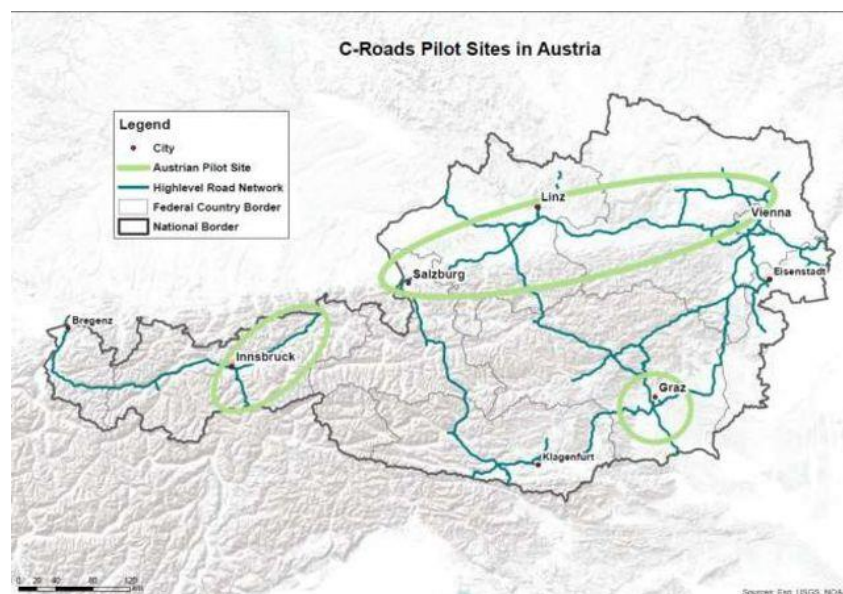


Figure 2: Location of the Austria pilot site

The Austrian C-Roads pilot site covers several different areas of heavily frequented motorway networks:

- The motorways around Vienna, already in operation for the “Living Lab”, will be updated to full deployment status
- The motorways from Vienna to Salzburg (including Linz), a stretch of nearly 300km and the Austrian part of the C-ITS corridor between Netherlands, Germany and Austria, will be one of the first C-ITS areas with several C-ITS installations, mainly concentrating on traffic sensitive hotspots along the way
- The motorways around the city of Graz will also receive a number of C-ITS installations. At that particular site, C-ITS will also will part of the test track for automated driving established there by the ALP.Lab consortium.
- Based on an analysis of traffic flows and accident rates, selected hotspots (around e.g. Innsbruck, Wiener Neustadt, Vöcklabruck) not covered by the other installations will also receive selective C-ITS coverage.

Overview of progress by End of 2017

The C-Roads Austria pilot preparations have been performed in several aspects, e.g. C-ITS stations been updated to latest versions of messages according to standards, and internal preparations of the pilot partners have been performed.

The Austrian road operator ASFINAG has deployed a fully operational C-ITS test infrastructure called the "ECo-AT Living Lab" around the city of Vienna and its three main motorways (A23, S1, A4). A central ITS station and 24 roadside ITS stations (5 of them traffic lights) are sending out all ECo-AT use cases permanently. Overall around 50 different messages are continuously sent and monitored by the ITS stations. The message set includes DENM (Roadworks Warning and Hazardous Location / Event Warnings), CAM (CAM Protected Zones and CAM Aggregation), IVI (In-Vehicle Signage) and SPATEM / MAPEM messages.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
450	1.530	8.590	6.240	2.290

3. The Belgium (Flanders) Pilot site

The main objective of the C-Roads Flemish pilot is to operate and assess the deployment of a cloud based ‘virtual infrastructure’ for the effective deployment of C- ITS services connecting road users with the Traffic Management Centre (TMC) while allowing the TMC to directly interact with the end users. The pilot also will bring an opportunity to upgrade Traffic Information Services and Traffic Management Services as offered today.

At the test site existing cellular based 3G-4G/LTE mobile communication networks will be used in combination with the HERE Location Cloud and the local Traffic Management Centre, which should allow a group of approximately 1000 test drivers to receive and potentially update selected Safety Related Traffic Information (SRTI) using low latency data exchange, in line with the European Commission Delegated Regulation 886/2013 and the recommendations in the final report (phase I) of the EU C-ITS platform.

Involved partners

- Flemish Department of Mobility
- HERE
- ITS.be
- Tractebel Engineering

Location



Figure 3: Location of the Belgium (Flanders) pilot site

The pilot will cover all motorways part of the core network in Flanders, including R001, E313, E17/ E19, E34 and E40 that are part of TEN-T corridors. For evaluation purposes emphasis will be given to the E313/ E34 segments.

Overview of progress by End of 2017

The pilot of C-Roads in BE Flanders, a first analysis was started in 2016 on the use cases and the technological realization of planned pilot operations. In 2017, the main achievements were the definition and the design of the use cases for the Flemish pilot.

C-Roads Flanders focuses on the following Day-1 Services including 10 use cases; 8 Hazards warnings and 2 signage applications:

- 1) Temporarily slippery road
- 2) Reduced visibility
- 3) Exceptional weather conditions
- 4) (Fixed/stationary) Road works
- 5) Slow and stationary vehicle
- 6) (Unprotected) Accident area
- 7) Obstacle on the road
- 8) Traffic jam ahead warning
- 9) Current speed limit: static from HERE map and dynamic from TMC
- 10) Shockwave Damping based on Wide Moving Jam

Instead of using ITS-G5, Belgium Flanders will make use of Cellular communication currently being 4G/LTE. The main advantage of cellular communication is that there is no dependency to road side units. Where possible, we will use the terminology used by the ETSI standards ETSI TS 102 673-X for Intelligent Transport Systems (ITS).

Furthermore, there was the setup of a preliminary evaluation plan, containing all of the elements necessary for an evaluation. There was a slight delay because of an internal discussion on data logging and impact assessment that needed to be solved.

There was the delivery of a specific Communication & Dissemination plan for the Flemish pilot. Furthermore the dedicated website on the national pilot is up and running.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
20	600	1400	900	300

4. The Czech Pilot site

Czech Republic has, in accordance to the project proposal, defined implementation and pilot testing of hybrid C-ITS services in six phases (further reported as DT – Deployment & Tests) split based on their geographical location and responsible implementation bodies. The DTs are the following:

- **DT0** – *Is an existing C-ITS deployment project called “MIRUD - ITS corridor Mirošovice - Rudná” on the Prague bypass motorway (D0) connecting motorways D5 (Prague-Pilsen-direction Nürnberg) and D1 (Prague-Brno-direction Wien / Ostrava - Gdańsk) and small parts of D1 and D5 motorways near Prague. This deployment is being viewed as a base stone for future DT1 and DT3 deployments as the C-ITS back office has been developed for Road and Motorway Directorate (further stated as RSD). ITS G5 technology has been deployed for defined use cases supported by existing LTE services to increase coverage and accessibility of services.*
- **DT1 – Brno agglomeration**, RSD is responsible for ITS G5 deployment, and LTE-based services will be offered by the mobile phone operator O2 Czech Republic. C-ITS services will be deployed over hybrid ITS G5 / LTE system and the pilot will cover part of the D1 motorway along with selected major roads going to the city of Brno.
- **DT2 – Brno city**, Brnenské komunikace (BKOM) is responsible for deployment of ITS G5 technology, and LTE-based services will be offered by the mobile phone operators O2 and T-Mobile. C-ITS services will be provided via hybrid ITS G5 / LTE system and the pilot will be deployed on urban roads, which will be selected complementarily to the major roads equipped by RSD within DT1.
- **DT3 – Motorways D1, D5, D11 and I/52 / D52**, RSD is responsible for ITS G5 technology deployment, LTE-based services will be offered by the mobile phone operators O2 and T-Mobile. New telecommunication services as LTE-V will be tested within this pilot operation. C-ITS services will be provided via hybrid ITS G5 / LTE (or/and LTE-V) technologies and the geographical area for this pilot will cover selected stretches of the D1, D5 and D11 motorways which create major connection links to the Dutch-German-Austrian C-ITS corridor.
- **DT4 – Public transport deployment in cities of Ostrava and Plzen**, The public transport company of Ostrava and public transport company of Plzen together with project partner INTENS are responsible for ITS G5 deployment, and LTE-based services will be offered by mobile phone operators O2 and T-Mobile. C-ITS services will be offered via hybrid ITS G5 / LTE system and the pilots will cover selected streets / sections of cities in order to demonstrate selected use cases.
- **DT5 – Railway crossing pilot**, Sprava železniční dopravní cesty (Railway network operator - SŽDC) together with project partner AŽD are responsible for ITS G5 deployment, and LTE-based services will be offered by mobile phone operators O2 and T-Mobile. C-ITS services will be offered via hybrid ITS G5 / LTE system and the pilot will be deployed on 2 level railway crossings. Both will be equipped with security systems where one is equipped with barriers and one is without barriers.
- **DT6 – Cross border testing**, RSD is responsible for ITS G5 technology deployment, LTE-based services (along with LTE-V or/and LTE-B) will be offered by mobile phone operators O2 and T-Mobile. Within this DT interoperability of C-ITS services developed by C-ROADS CZ partners with other C-ROADS partners' systems will be tested.

Involved partners

- Deployment of C-ITS services via ITS G5
 - o Road and motorway Directorate (RSD) of the Czech Republic
 - o City of Brno (via. Brněnské komunikace)
 - o Správa Železniční Dopravní Cesty of the Czech Republic (SŽDC)
 - o City of Ostrava a Plzeň (via. their public transport companies)
 - o INTENS Corporation
 - o AŽD Praha
- Deployment of hybrid C-ITS system based on ITS G5 and current LTE technologies
 - o O2
 - o T-Mobile
 - o Škoda Auto
- Deployment of new cellular technologies (LTE-V and/or LTE-B)
 - o T-Mobile
- Evaluation and Assessment of implemented systems:
 - o Czech Technical University in Prague, Faculty of Transportation Sciences (CTU)

Location

The C-ROADS CZ pilot sites are located on:

- the Rhine-Danube Core Network Corridor, from Rozvadov at the Czech/German border to Praha
- the Orient-East Med Core Network Corridor, section Praha – Brno
- the urban nodes Plzeň, Brno and Ostrava. Plzeň and Ostrava are situated on the Rhine-Danube Core Network Corridor. Ostrava and Brno are situated on the Baltic-Adriatic Core Network Corridor.

The deployment of C-ITS system and services will be carried out at least on the following parts of the Czech road network split into individual DT's:

- **DT1 Brno agglomeration** will cover southern sector of the city of Brno, in particular the following roads / motorways:
 - o Part of motorway D1 (E50/E65) in approx. length of 28 km between km 182 and km 210
 - o Major radial roads (capacity roads connecting the outer ring road to the city center) in the southern sector of the city of Brno
 - EXIT 190 (road I/23 direction to Pisárecký tunnel)
 - EXIT 194 (road I/52 / motorway D52 direction to Vienna (Austria) and direction towards city Brno centre)
 - EXIT 196 (motorway D2 direction towards Bratislava (Slovakia) and towards city Brno centre (I/41))
 - EXIT 203 (road I/50 direction towards city Brno centre).
 - o Southern part of inner city ring road consisting of the I/42 road
- **DT2 Brno city**, this pilot will take place on the 1st class radial roads connecting the city centre and outer ring road of Brno (motorway D1), as well as on the southern part of the Brno inner ring road. This DT will be closely coordinated with DT1 in order to supplement RSU installations on the major city roads. Additionally lower class roads will be investigated to be equipped by RSUs in case they create an important alternative route to the major roads.

- **DT3 – Motorways D1, D5, D11 and I/52 / D52** C-ITS equipment and services will be deployed on the D1 motorway between Prague and Brno, D5 motorway between Prague and Rozvadov (German border), on the D11 motorway between Prague and Hradec Králové, and on the D52/I52 connection road between Brno and the Austrian border. Total length amounts to more than 360 km. This pilot site includes both cross-border locations – on the D5 motorway with Germany, and on the D52/I52 motorway/road with Austria.
 - o Motorway D1 (E50/E65) between Prague and Brno, where ITS-G5 technology will be deployed around the Brno agglomeration and cellular technology will be used for C-ITS services coverage on the remaining part of the motorway.
 - o Motorway D5 (E50) between Prague and the German border, where ITS-G5 technology will be deployed on the section between Prague and Plzeň (km 6 – km 90) and cellular technology will be used for C-ITS services coverage on remaining part of the motorway.
 - o Motorway D11 (E67) between Prague and Hradec Králové (km 0 – km 90), where ITS-G5 technology will cover whole motorway section and cellular technology will be used as a secondary communication tool for C-ITS service provision.
 - o Combined motorway D52 and 1st class road I52 (E461) from Brno to the Austrian border will be covered by cellular technology to provide C-ITS services.
- **DT4 – Public transport deployment in cities of Plzen and Ostrava** will be performed in existing city streets/roads and intersections with tram rail infrastructure. Suitable junctions equipped with traffic lights will be selected for public transport priority use case as well as “dangerous” locations for passengers or critical collision points between public and individual transports will be identified for deployment of safety related applications.
- **DT5 – Railway crossing pilot** will be performed on the Heřmanův Městec – Moravany railway line, the section of Chrudim – Hrochův Týnec in the Pardubice region, where ITS-G5 will be deployed at two railway level crossing equipped with interlocking and security signalling systems (one with- and one without barriers).
- **DT6 – Cross border testing**, will be situated mainly on the D5-A6 motorway (Czech - German border) and the I/57 – E59 road (Czech - Austrian border), but other C-ROADS CZ test sites may be selected as well. All C-ROADS Platform partners will be invited to the testing.

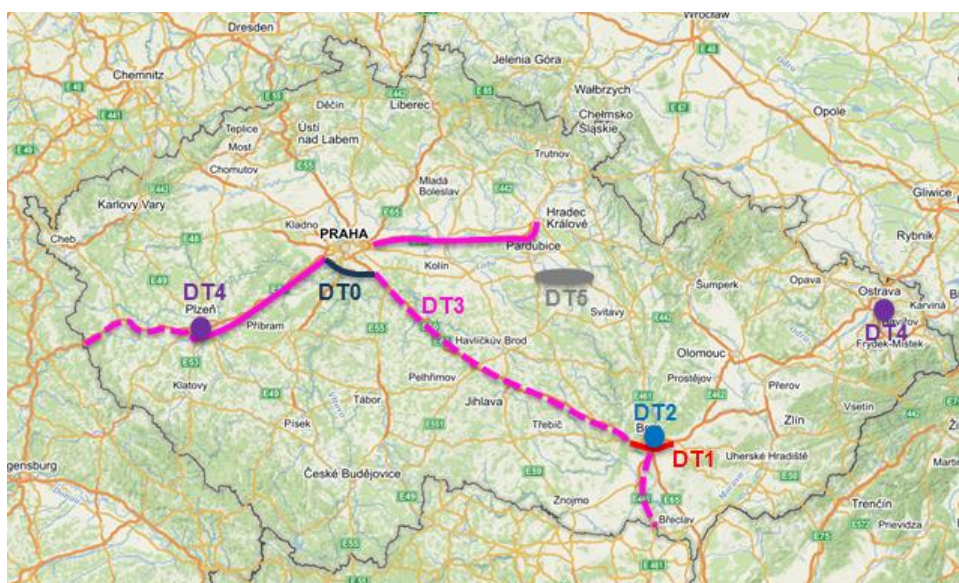


Figure 4: Location of the Czech pilot site

Overview of progress by End of 2017

The preparation works focused on future C-ITS deployment has progressed in all DT's defined in the text above in 2017, where project team has been working on national WP's 2.1, 2.2, 2.3 as well as on international WP's 1, 2 and 3. During this period detailed use case catalogue and technical specification has been developed as a guide for national C-ITS deployment. Detail interim progress is described below for each DT:

- **DT0 – MIRUD**, the project has been completed and operational in 2017 for all defined use cases.

DT1 – Brno agglomeration, RSD has launched and completed public procurement for technical specification in 2017, which will set base requirements for the deployment tender. The works has been concluded on autumn 2017, where detailed specification has been developed reflecting all available C-ROADS platform specification and envisage future modification to secure interoperability operations and security requirements. Development of public procurement documents for deployment tender has started with planned tender start in winter 2018 and expected completion by end of 2018. O2 has started preparation works for developing C-ROADS CZ Integration platform and national PKI server deployment securing certificate distribution to all C-ROADS CZ components (for all project partners) in conjunction with data protection requirements. O2 has as well started preoperational works for public procurement by defining functional and technical specifications for O2 back office, mobile application and hybrid OBU to secure deployment in close coordination with ŘSD ČR.

DT2 – Brno city, Brněnské komunikace has started preparation works for public procurement on supplier, who will define technical and functional specification for “city” based C-ITS deployment reflecting all available technical specification, PKI requirements and defined use cases. The tender is planned for beginning of 2018 with ambition to have technical and functional specification ready by end of Q2/2018 and launching deployment tender on beginning of Q3/2018 with expected delivery by end of Q4/2018. Telco operators has started preparation works to offer supplementary LTE services in

order to create hybrid solution covering by C-ITS services larger road network. The ambition is to deploy the hybrid services by end of 2018.

DT3 – Motorways D1, D5, D11 and I/52 / D52, preparatory works on public procurement technical specification for this DT will start once the public tender for deployment will begin in DT1. In the main time analytical works has started in order to identify best locations for C-ITS RSU deployment, data and power connectivity, operational platform extension etc. Telco operators have as well started preparatory works for deployment of hybrid C-ITS solution on these corridors. This DT is aiming being deployed and operational by end of 2018.

- **DT4 – Public transport deployment in cities of Ostrava and Plzen**, new working task force has been created to focus on specific needs of public transport C-ITS deployment. Preparatory works has been launched on site of INTENS Corporation and public transport companies in Ostrava and Plzen to cover deployment of C-ITS devices in tramways and other public transport vehicles (busses and trolleybuses are being considered) and on selected traffic light controllers. There is no public procurement expected in this DT and all works are being covered by project partners directly. In early 2018 will continue preparatory works to complete installations of C-ITS system on public transport vehicles by end of 2018.
- **DT5 – Railway crossing pilot**, Preparatory works has been started by project partner SŽDC and AŽD (RADOM) focusing on technical and functional specification of C-ITS system deployment on selected railway crossings. Special task force has been created to tackle specific needs / issues related to this DT. The ambition is to prepare deployment of C-ITS services by end of 2018, not specific tender is being planned to deliver this DT (the works will be carried out by project partners).
- **DT6 – Cross border testing**, RSD is responsible for ITS G5 technology deployment, LTE-based services (along with LTE-V or/and LTE-B) will be offered by mobile phone operators O2 and T-Mobile. Within this DT interoperability of C-ITS services developed by C-ROADS CZ partners with other C-ROADS partners' systems will be tested.

Generally we can summarise:

Active participation of dedicated project partners on national and international Work packages, preparatory works for public procurements, deployment and integration of C-ITS system has been carried out.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
142 520,90 EUR	804 252,48 EUR	12 407 674,31 EUR	3 930 027,35 EUR	1 517 687,64 EUR

5. The French Pilot site

C-Roads France is a pilot project whose objective is to develop and experiment innovative road C-ITS solutions. C-Roads France will push for the early adoption of flexible, interoperable and scalable C-ITS solutions, anticipating the commercialisation of equipped vehicles.

C-Roads France will develop 2 types of new end-user services: services in the urban environment and at the urban/interurban interface, and traffic information services increasing comfort on transit stretches. Hence, it will provide a consistent solution for the deployment of almost all Day-1 services and of some Day-1,5 services as defined by the EC C-ITS Platform.

The Action aims to reach a seamless continuity of services at the urban/interurban interface. It will provide enhanced and extended test fields including strategic sections of the TEN-T Core Network, key bottlenecks, black spots and interfaces with urban nodes, to reach a critical mass. The action is supported by 2 car manufacturers to maximise interoperability with the infrastructure and ensure future roll-out of vehicles.

C-Roads France advocates for a pragmatic and user-centric approach: the Action will develop a C-ITS smartphone application supporting early I2V (infrastructure-to-vehicle) services roll up and further scale up. The services will be supported by a hybrid technology enabling a seamless switch between ITS G5 and cellular for not safety-critical applications.

C-Roads France builds on the results of SCOOP@F.

Involved partners

ROAD OPERATORS	<ul style="list-style-type: none"> – Ministry: public road operators (DIRs Est, Centre-Est, Atlantique, Ouest) – ASFA: concessionaries road operators (APRR, SANEF and VINCI Autoroutes)
MAJOR URBAN NODES	<ul style="list-style-type: none"> – Strasbourg Eurométropole – Bordeaux Métropole
CAR MANUFACTURERS	<ul style="list-style-type: none"> – Renault – PSA
RESEARCH INSTITUTES	<ul style="list-style-type: none"> – CEREMA – IFSTTAR
UNIVERSITIES AND HIGHER EDUCATION AND RESEARCH INSTITUTIONS	<ul style="list-style-type: none"> – Université d'Auvergne Clermont-Ferrand – Université de Reims Champagne-Ardenne – Institut Mines Télécom (Telecom ParisTech)
SECURITY EXPERTS	<ul style="list-style-type: none"> – IDnomic
MOBILITY LABS	<ul style="list-style-type: none"> – Car2road – Transpolis

Location

The action will be implemented on 4 local pilot sites combining TEN-T network and urban sections.

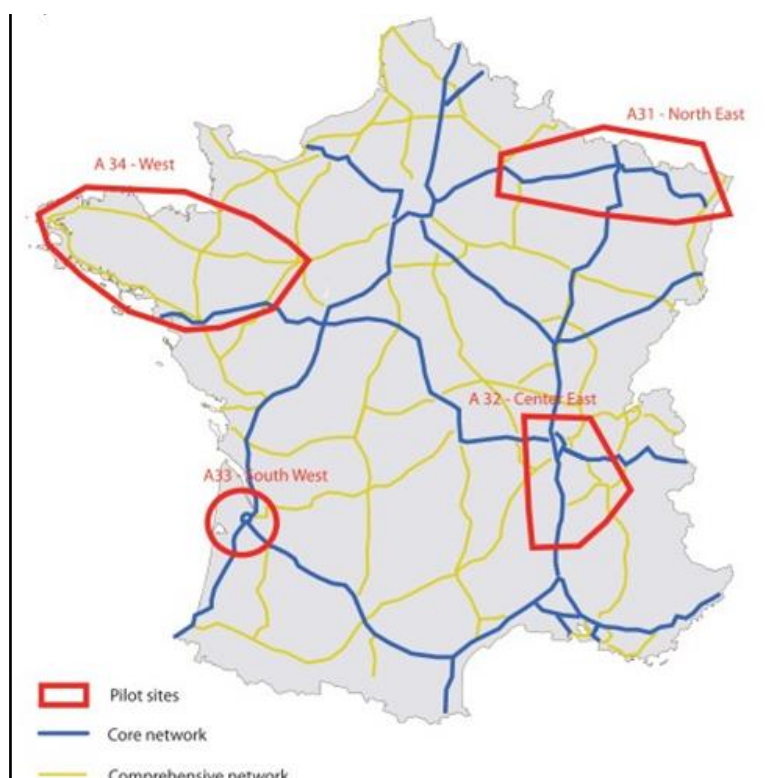


Figure 5: Location of the French pilot sites

Overview of progress by End of 2017

C-Roads France has defined and prioritized services. The resulting catalogue of services has been coordinated with French partners of SCOOP@F and InterCor and includes comprehensive functional descriptions based on an European template. It has been a major contribution to the C-Roads Platform.

Based on that, pilot sites have defined the services they intend to deploy, and the precise sections to be equipped. Local Steering Committees have been put in place to coordinate each pilot site and additional stakeholders have been involved thanks to a MoU template developed by the project.

A first tender has been awarded by the North-East pilot site before June 2017 to deploy a few road side units for a demonstrator at the European ITS Congress, which was a big success with all slots fully booked. Another has been awarded in November 2017 to cover updates of the Traffic Management Systems of 3 road operators involved in the project.

For the specification, development and validation work, based on the experience of SCOOP@F and considering the time needed to consolidate the specifications at C-Roads Platform level, it was decided to anticipate some specifications and to use a stepwise approach with several updates of the specifications and prototypes. The first release of the specifications (including hybrid) has been finalized by 30/03/18.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
1.238,768	1.085,861	4.981,043	4.438,558	2.447,953

6. The German (Hessia, Lower Saxony) Pilot site

Germany as Member State will contribute to the C-Roads cooperation by the findings of the implementation and operation of in total seven different C-ITS services, which will be deployed in two different pilot sites and harmonised by the Federal Highway Research Institute (BAST).

The national action promotes an ideal manner for the future rollout/larger scale deployment of Cooperative ITS in whole Germany by deploying additional new and extending already existing C-ITS services, respectively. Following goals should be achieved in this project:

- provision of a deployment pattern for a rollout of these C-ITS services in Germany according to EU regulations and standards and in line with the recommendations/outputs of the "C-ITS platform"
- demonstration of long-term viability and scalability of C-ITS (in terms of technology, financial sustainability, governance) as well as in conjunction with legacy systems
- encouragement of the German automotive industry to equip their cars with appropriate devices and thus stimulation of end-users to buy V2X-enabled cars to benefit from the services

To achieve these goals, the mentioned services in the Hessian and Lower Saxony pilot road network will not only be deployed but also delivered as a transferable C-ITS framework, harmonised on European level in cooperation with other pilot sites in the frame of the C-Roads Platform. This comprises:

- an **organisational pattern** (roles and responsibilities) for the development and deployment
- a **work program** for the development of needed infrastructure and equipment including open technical specifications and standards
- **appropriate methods and KPI** for the evaluation and assessment of the deployed C-ITS services

The Lower Saxony C-ITS Pilot will contribute to the C-Roads cooperation by implementing and deploying the following three C-ITS services:

- Slow or Stationary Vehicle Ahead Warning Service Deployment (SSVW)
- In-Vehicle Information/In-Vehicle Signage Service Deployment (IVI/IVS)
- Probe Vehicle Data Service Deployment (PVD)

The C-ITS Pilot Hessen will contribute to the C-Roads cooperation by implementing and deploying the following seven C-ITS services:

- Roadworks Warning Service Deployment (RWW) (extension of the existing service for long-term roadworks)
- Slow or Stationary Vehicle Warning Service Deployment (SSVW)
- Emergency Vehicle Approaching Service Deployment (EVA)
- Traffic Jam Ahead Warning Service Deployment (TJW)
- Shockwave Damping Service Deployment (SWD)
- Green Light Optimal Speed Advisory Service Deployment (GLOSA)
- Probe Vehicle Data (PVD) Service Deployment (extension of the existing version to support the services TJW and SWD)

Involved partners

Pilot activities at single test and validation locations are prepared by different bodies. The Hessian pilot site will be organised by the local public road operator Hessen Mobil. For the

Lower Saxony pilot site the two companies NORDSYS and OECON Products & Services are responsible for the local activities. They will be supported by the associated partner DLR.

Full list of consortium members:

- ITS automotive nord GmbH
- Federal Highway Research Institute
- Hessen Mobil – Straßen- und Verkehrsmanagement
- Continental Teves AG & Co. oHG
- SWARCO Traffic Systems GmbH
- AVT STOYE GmbH
- GEVAS software Systementwicklung und Verkehrsinformatik GmbH
- Heusch/Boesefeldt GmbH
- Bayerische Medien Technik GmbH
- Hessen Digital Radio GmbH
- Garmin Würzburg GmbH
- NORDSYS GmbH
- ESCRYPT GmbH – Embedded Security
- INGENIEURGESELLSCHAFT FUER AUTO UND VERKEHR GMBH
- e-Shuttle GmbH
- Niedersächsisches Ministerium für Wirtschaft, Arbeit und Verkehr
- OECON Products & Services GmbH

Location

The seven so called Day One Services are trialled in the German testbeds in Lower Saxony (motorway A2 near Brunswick, see figure 6 **Fehler! Verweisquelle konnte nicht gefunden werden.**) and Hessen (DRIVE-test field Hessen for connected automated traffic around Frankfurt, see figure 7).

In Lower Saxony, the currently existing R&D test area “Application Platform for Intelligent Mobility (Anwendungsplattform Intelligente Mobilität (AIM))” focuses on the urban area in the city of Brunswick and serves as a platform for application-focused science, research and development in the field of intelligent mobility services. Within this year the test field will be enlarged and transferred under the lead of the Ministry for Economy, Labor and Transport of Lower Saxony (Niedersächsisches Ministerium für Wirtschaft, Arbeit und Verkehr (MW)) and the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt (DLR)) to federal roads and motorways between Hannover, Brunswick and Wolfsburg. On the motorways (especially on the A2) of this new Test Site Lower Saxony amongst others it is planned to extend existing gantries with ITS Road Side stations (R-ITS-S) to provide C-ITS services for testing and development activities via ITS G5.

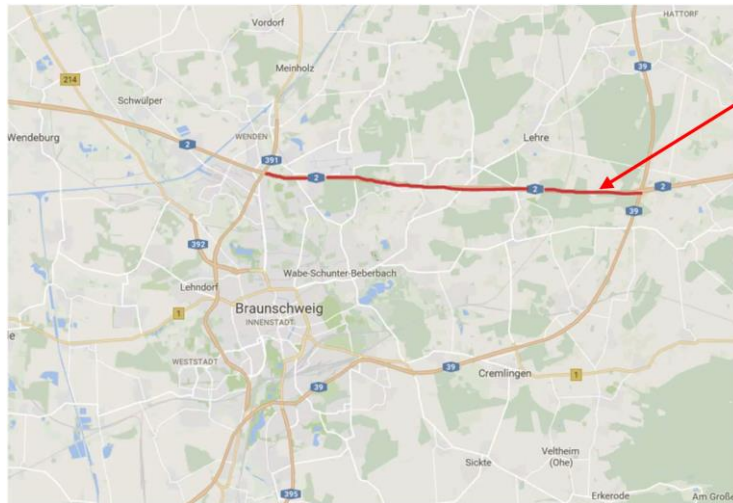


Figure 6: Overview of the test field of the C-ITS Pilot Lower Saxony¹

The activities of the Hessian pilot will be realised on the following motorway sections:

- A3 around Offenbach, Frankfurt and the airport in Frankfurt to Mönchhof-Dreieck
- A5 in the whole area between central Hessen (Wetterau) and the South Hessian state border including Frankfurt and Darmstadt
- A60, A67 and A671 in the whole Hessian area
- sections of the A661 near Frankfurt

Furthermore, the GLOSA service will be implemented on national roads in two cities in the Rhine-Main region (marked with rectangles in figure 7).

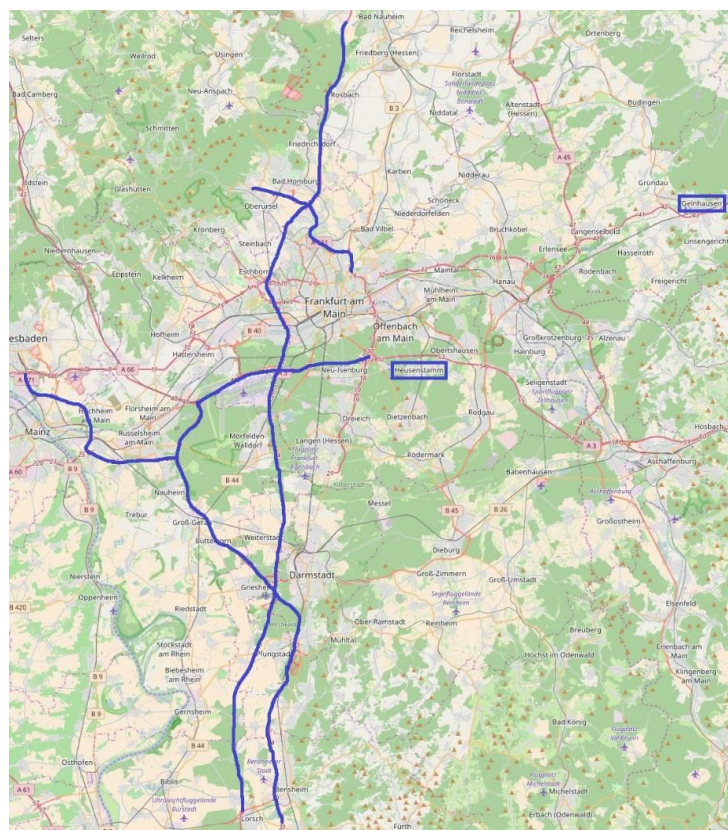


Figure 7: Overview of the test field of the C-ITS Pilot Hessen²

¹ Source of the map: © 2017 GeoBasis-DE/BKG (©2009).Google

Overview of progress by End of 2017

C-Roads Germany has fully taken up speed during its first full year of the pilot execution. The initial start-up difficulties concerning the late signature of the Grant Agreement at the end of 2016 and the structuring – both project-internally and within the C-Roads Platform – were successfully managed. The actual resource consumption of C-Roads Germany is still slightly below the original target figures but the consolidated structures now permit a more intensive goal-orientated engagement and full use of the budget in the remaining project duration.

The coordination of C-Roads Germany on national level has gained momentum in 2017. Project management and technical coordination are facilitated by bi-weekly Coordination Group meetings (Web Conferences). These are complemented by physical meetings on demand basis, e.g. Technical Coordination Meeting. The concept of the “Service Peers”, established for all sub-activities in the two pilots, has been extended to “Expert Groups” (service peer, responsible for national coordination, plus experts from 2 to 5 partners). This concept was introduced at the Technical Coordination Meeting on 30.05.2017 at BAST and has been evolved since then continuously. This process is particularly effective when a harmonised German opinion has to be introduced into the C-Roads Platform Working Groups.

The pilot in Hessen has prepared functional descriptions for all piloted C-ITS services. The Organisational and Deployment Plan as well as the Architecture and overarching technical specification have been developed in time during 2017. Before Christmas, the Hessian partners have started to define the ITS Roadside Stations specification, resulting in a first draft. The public procurement procedure has been launched for a first service (three IVS for mounting on winter maintenance vehicles). Overall, technical progress is in line with the plan.

The pilot in Lower Saxony has also completed the work on the Organisational and Deployment plan in time. Service specifications have been drafted, further – amongst others – hardware requirements and security issues (PKI testing) have been progressed well, too. The dialogue with the Lower Saxony road operator has been intensified (needs and requirements, also in the context of Traffic Management Centre integration).

On platform level, C-Roads Germany has actively contributed to all Working Groups and Task Forces. Task Force 1 on security is coordinated by Germany. Examples of input provision comprise different ETSI drafts in order to consider the requirements of the C-ITS Certificate Policy, the TF 1 security report (final in 2018), the first release of the infrastructure communication profile and the service chain illustrations/mapping in preparing the report on organisational issues (due mid 2018).

The state-of play of C-Roads Germany has been presented at various conferences (ITS European Congress in Strasbourg, Eurometropolis meeting in Braunschweig, Hypermotion fair in Frankfurt). Furthermore, the website (www.c-roads-germany.de) and a leaflet (both in English in German) have been put in place to share the facts and findings of the pilot with the C-ITS community.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
724,88	1.553,46	3.250,38	2.307,08	1.845,14

² Source of the map: OpenStreetMap-participants, Hessen Mobil, CC-BY-SA 2.0

7. The Dutch Pilot site

The Dutch pilot area is situated in the south of the Netherlands. The area consists of the TEN-T Core Network road section from Europoort Rotterdam to the Belgian border, A15 A16 and the motorway section from the Belgian border via Eindhoven to Venlo, A67. To connect these two Core network sections and have a meaning full ongoing corridor to roll out the proposed services, the road section Breda to Eindhoven (A58, A2) of the comprehensive network, has been added because of the major C-ITS developments which takes place there. Next to that also the Core network section on the A2 around the Leidsche Rijn Tunnel is added. The total network stretches out for 268km of which 60km or 22% is comprehensive network. Next to these road sections the port of Rotterdam, industrial and logistic area makes part of the Dutch corridor. Also the Moerdijk industrial area and the Venlo Trade Port are included. Both Rotterdam and Moerdijk are seaports on the core network. Venlo Trade Port is a multimodal platform on the CEF Corridor North Sea Mediterranean. To strengthen the corridor A58 and A67 in the Province of Noord Brabant, budgets have been allocated for innovative solutions. To improve the accessibility of the region “Smart Mobility” solutions will be piloted and implemented. Combining the Brabant Corridor initiatives with the services proposed within the InterCor project, the region will benefit even more.

Involved partners

The project coordinator is Rijkswaterstaat, a part of the Dutch Ministry of Infrastructure and Water management. Furthermore the Province of Noord-Brabant and the Province of Utrecht are involved.

Location

The services will be piloted along the Dutch part of the Rhine-Alpine corridor, formed by the Dutch motorways A67, A2, A58, A16 and A15 as well as along the A2 in the area of the city of Utrecht.

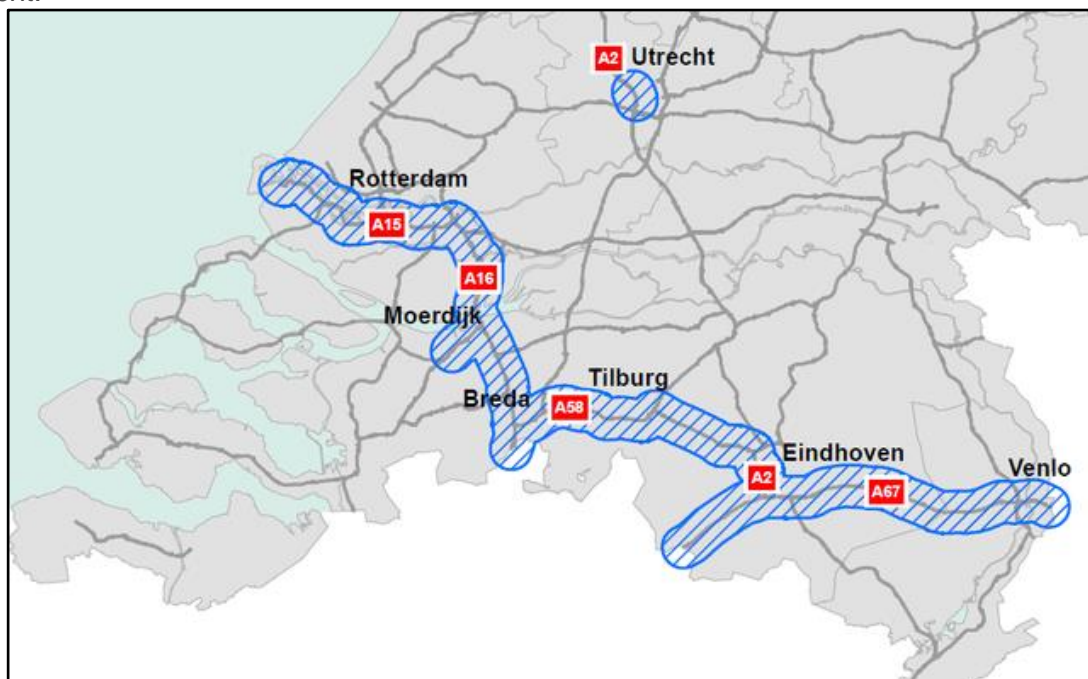


Figure 8: Location of the Dutch pilot site

Overview of progress by End of 2017

In 2017 the focus was on developing the specifications for the pilot operation, carrying out a number of tests and organising activities to ensure the international interoperability of services.

Using specifications from the C-ITS Corridor project as a base (aligned with the German and Austrian partners), in the InterCor-project (with France, Flanders and the UK) agreement was reached on specifications for the ITS-G5 services RWW, GLOSA, IVS and PVD. These specifications were submitted to the C-ROADS platform and became an important building block for the harmonised C-ROADS specifications.

In conjunction with developing the specifications, the Netherlands has already carried out extensive tests on parts of the pilot site. In November 2016 there was a test on RWW with a safety trailer equipped with ITS G5 (on the A16 motorway between Rotterdam and Dordrecht), in December 2016 a test on PVD on the A58 between Tilburg and Eindhoven with about 35 RSUs and in March 2017 tests on RWW and IVS on the A16 near Dordrecht. All tests took place in normal daily traffic and, in case of RWW, in combination with real roadworks. The motorway A16 was selected for the tests, because of the complicated road lay-out, including a tunnel and parallel carriageways (in the same direction). In preparation for the more large scale pilot operation in the Netherlands, also preparatory work was carried out for using cellular communication for a number of services. This concerns GLOSA, RWW and IVS, including adapting a number of traffic control systems for implementing GLOSA.

To ensure interoperability of services, it is important to carry out cross-border tests. Therefore, in July 2017, the Netherlands organised a so-called ITS G5 “TestFest” on a part of the pilot site. Roughly 20 vehicles from several EU-countries and various types of organisations (OEM, supplier, road operator, etc.) took part in this successful event. During four days the participants tested the interoperability of the use cases RWW, IVS and PVD in normal daily traffic, using a number of scenarios with real roadworks and some virtual scenarios. In this TestFest 13 RSUs were used, sending DENM and IVI messages. The results of the TestFest were used for the further alignment of the specifications and the input to the C-ROADS platform, as mentioned before.



Figure 9: ITS G5 TestFest in the Netherlands

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
1.100	3.700	5.200	3.300	-

8. The Slovenian Pilot site

The objective of the “The C-Roads Slovenia” pilot is to improve real time traffic information on pilot section and to test C-ITS hybrid communication solutions for C-ITS day 1 services related to motorways.

Goal of the activity is to supplement or complete critical road sections and systems with C-ITS ready roadside ITS equipment with the integration of deployed systems in TMC Centres as real time services for the higher level of traffic control and management that will correlate with the better real time traffic information and in the preparation for the future full scale hybrid C-ITS services.

C-ITS-G5 infrastructure will be deployed and tested will be relevant C-ITS Day 1 services on motorways within a limited area of the first phase pilot (A1 motorway section Postojna - Divača, length 30 km with at least 10 C-ITS G5 roadside stations). In the second phase roadside C-ITS-G5 infrastructure will be extended to the pilot length of 300 km on selected locations on complete motorway A1, A3 and H4 and at critical points of A2 with the Central C-ITS-G5 Server real-time platform located at Traffic Management Centre Dragomelj. Roadside C-ITS-G5 stations would also be installed at motorways cross-border areas to ensure coexistence of Cooperative ITS G5 with RTTT DSRC tooling system.

3G/4G/LTE Cellular Connected Vehicle with the Cloud Information Services will be deployed on complete motorway network by 2020. Upgraded will be national mobile traffic information application with the location and driving direction awareness and C-ITS services.

National assessment papers will be drafted and cross-fertilized with the C-Roads Platform assessment and evaluation plans and findings and a final C-Roads Pilot Slovenia evaluation will be delivered at the end.

Involved partners

- Ministry of Infrastructure
- DARS d.d. (Motorway Company of the Republic of Slovenia)

Location

The C-Roads Slovenia Pilot first phase (G5 and cellular) is planned along 100 km of TEN-T core network (Baltic-Adriatic and Mediterranean Corridor) in Slovenia and is located on the A1 highway (section Ljubljana – Koper), A3 (section Divača - Sežana) and H4 (section Razdrto – Vipava).



On the C-ITS Slovenia pilot site the “C-Roads Slovenia 2” roadside C-ITS-G5 infrastructure will be extended to pilot length of 300 km on selected locations on complete motorway A1, A3 and H4 and at critical points of A2 with the Central C-ITS-G5 Server real-time platform located at Traffic Management Centre Dragomelj.

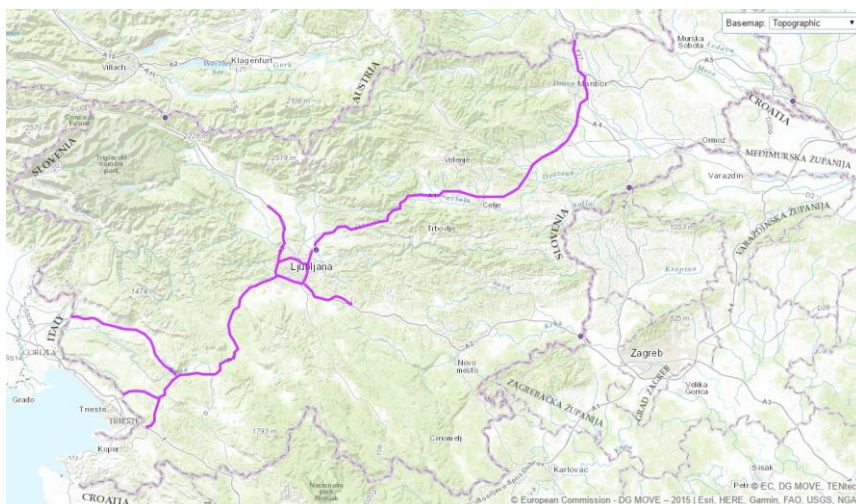


Figure 10: Location of the Slovenian pilot site

Overview of progress by End of 2017

C-Roads Slovenia pilot Technical workgroup at implementing body DARS is active and operational and Slovenian C-Roads Platform representatives were assigned to actively participate in C-Roads Platform workgroups and taskforces. Slovenian representatives have internal monthly coordination meetings. Beneficiary Ministry of infrastructure nominated the representative in C-Roads Platform Steering Committee (Dean Herenda) and overlooks C-Roads Slovenia pilot.

Overall action progress was estimated according the effort to produce tendering documentation and regarding the cooperation in C-Roads Platform and according to the financial realisation in 2016 and 2017 and financial plan for the remaining period 2018-2020.

Realisation will be assured by signed contract (TED 2017/S 209-434246) for the "Implementation of C-ITS over mobile networks 3g/4G/LTE" signed by 26/10/2017 with contract DARS št. 834/2017 valued 802.890,00 EUR (award delay 4 months).

Tender for C-ITS-G5 Roadside Infrastructure Network deployment is ongoing (valued 290.000,00 €) and is expected for contracting in mid 2018 (12 months delay according to plan). Tender was published 15/12/2017 (JN010236/2017-B01, 16.12.2017 TED: 2017/S 242-503407).

The remaining roadside infrastructure will also be deployed in 2018 (Technical documentation is prepared, tendering will follow in 2Q 2018).

55% of the action is realised, contracted or in tendering. Full financial realisation is expected by the end of project.

Delays are related mostly to technical deployment issues and time consuming procedures for tendering related to EU funds where additional control of implementing body public procurement documentation by beneficiary is mandatory and harmonisation of documentation could be time consuming.

Main activities were delayed for 6 -12 months and progress of realisation is still coherent also regardless of low financial realisation which is postponed. All main procurements were published, some already contracted and further tender documentation is prepared to reach action objectives.

Cooperation in C-Roads platform is fruitful and exchange of knowledge and experience between experts is of tremendous value that leads to harmonised EU wide services. Slovenian experts actively follow the development of harmonisation of C-ITS services, provide needed input and expose country specifics if they need to be incorporated in harmonised documentation.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
227,59	1.386,46	686,86	430,66	91,50

9. The UK Pilot site

The A2/M2 Connected Vehicle Corridor (A2/M2 CVC) is to be established by the Department Of Transport in partnership with Highways England, Transport for London and Kent County Council. It will pilot the infrastructure, data management and service delivery necessary for connected vehicle services. This Corridor offers a variety of operating environments that make it attractive and unique as a pilot. Commencing in inner London near to Blackwall Tunnel with potential links to urban ITS applications; it provides the interface between the trunk road (A2), motorway network (M25 and M2) and Kent local roads (A229/A249).

The Corridor will be a pathfinder for future investment and the blueprint for the wider roll-out of connectivity across the UK road network. Importantly, when it is fully operational in 2019, it will provide an open test-bed where the UK motor manufacturing sector and after-market companies can develop new interactive customer services for C-ITS applications in addition to the core traffic and safety services which are market-ready. It will demonstrate how Connected Vehicle (CV) technology can help highway and roads authorities to manage their urban and inter-urban road network more effectively with the aim of achieving substantial benefits, shown in other trials (i.e. halving incident-related delays, reducing rear-end collisions by up to 12% and lowering fuel consumption /emissions by up to 25%).

The UK recognises the need for interoperability and the need to be able to operate across boundaries. The A2/M2 CVC project is the UK part of the InterCor (“Interconnected Corridors”) programme with France, Belgium and the Netherlands – to develop a network of Corridors which link in to the C-ITS Corridor (Vienna to Rotterdam) and the French projects (SCOOP@F). This close collaboration between European states aims to ensure the interoperability of services. The functional and technical specifications that will be delivered through this project will help to ensure that future UK deployment of these services will be compatible and interoperable with European deployment of the four services (RMM, IVS, PVD and GLOSA).

Involved partners

- Department for Transport (DfT)
- Highways England (HE)
- Transport for London (TfL)
- Kent County Council (KCC)

Location

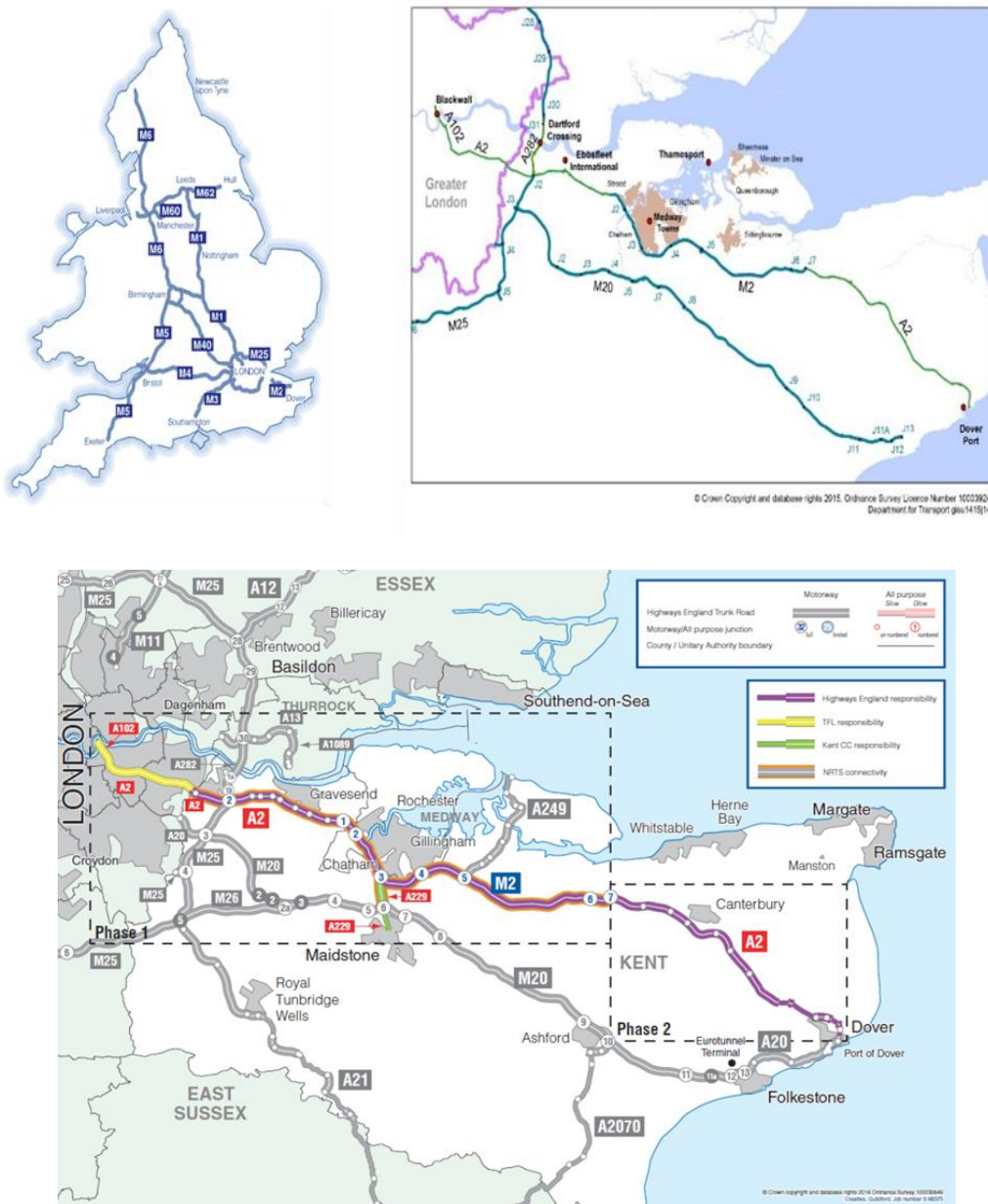


Figure 11: Location of the UK pilot site (Phases are indicative)

Overview of progress by End of 2017

The majority of 2017 has been spent in pilot planning, preparation and procurement that will enable deployment in 2018.

This has involved contributing to technical working groups in InterCor and C-Roads to review specifications for ITS G5, Security/PKI and day 1 C-ITS Services and Use Cases. Participation in the InterCor ITS-G5 TESTFEST in July 2017 provided essential learning towards the planning of the InterCor Hybrid Communications TESTFEST, scheduled for October 2018 in the UK and the deployment of the pilot itself.

The scope and location of the C-ITS pilot on the A2 / M2 corridor has been refined and the UK partnership has agreed specific responsibilities. Alongside this there has been a strong focus on developing a set of technical and operational specifications for the procurement and subsequent implementation and operation of the on-road pilot, scheduled to commence in November 2018. Technical support contracts were let and the UK developed a strategic approach to procurement, deployment and operation that allows for revisions to C-ITS specifications, that may be subsequently issued by InterCor partners or C-Roads, to be incorporated at a later stage of the procurement and deployment process. This approach helps to mitigate risk to the validity of the pilot.

The UK are leading the InterCor Evaluation Activity and co-chairing the C-Roads Working Group 3 on evaluation as well. A great deal of effort and expertise is being spent on developing the evaluation approach alongside InterCor partners and has identified the outline data requirements for the purposes of evaluation necessary for the major procurement exercise in January 2018.

Finally, procurement preparation was completed including engagement with suppliers ready for 2018, which was key to achieving the scheduled deployment of the pilot.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
40	1.190	7.310	3.950	tbc

10. The Belgium (Wallonia) Pilot site

The main objectives of the C-Roads Wallonia pilot are to operate and assess the deployment of several safety end-users services based on a cloud ‘virtual infrastructure’ with both long-range (cellular 3G/4G) and short-range (ETSI G5) communication mediums.

„Day 1 services“ Slow or stationary vehicles, Traffic jam ahead warning, Road works warning, Weather conditions, Shockwave damping, In-vehicle speed limits and Other hazardous notifications will be deployed.

„Day 1,5 service“ On-street parking management and information will be deployed to test truck parking availability and information throughout the 58 truck parking areas located in the pilot area.

A minimum of 1000 test drivers will be selected to evaluate the service quality based in particular on their feedback. The pilot will also include a limited number of road side units to test ITS-G5 communication and compare use cases testing.

Involved partners

- SOFICO (road operator)
- ITS.be
- Tractebel Engineering

Location



Figure 12: Location of the Belgium (Wallonia) pilot site

The pilote will be deployed along approximately 427 km of the following motorways:

- A3 (E40) : BK 44 → BK 135 [limit Flanders up to German border]
- A4 (E411) : BK 13 → BK 187 [limit Flanders up to Luxemburg border]
- A26 (E25) : BK 2 → BK 102 [between Liege and A4 interchange]
- A602 (E25/E40) : BK 0 → BK 13 [E25/E40 junction]

The pilot will however focus on a the A602 junction as it hosts important traffic volumes and features major security issues since it consists in an urban environment highway featuring a succession of tunnels and bridges through the city of Liège. Furthermore, many existing ITS equipment's are already deployed which will help assess C-ITS message transmission in comparison to traditional fixed ITS messages.

Overview of progress by End of 2017

The pilot of C-Roads in BE Wallonia started in October 2017. A first analysis on the use cases and the technological realization of planned pilot operations was initiated. In 2017, the main achievements are the definition of the day-1 and day 1.5 use cases for the Walloon pilot.

As a continuation of this 2017 work the pilot detailed technical design will take place in 2018. In parallel to this activity, a Detailed Evaluation plan and a specific Communication & Dissemination plan will also be elaborated.

In June 2017 SOFICO has launched the first public procurements to equip the pilot with the needed elements (e.g. DATEX II Node and the equipment of parking). There was a delay to award this but the first procurement has been awarded in June 2018.

The investments for procurement will mainly take place during 2018 and Q1 2019. Associated costs will occur during the pilot tests (2019 - 2020) because it will be a progressive deployment of the different use cases (i.e. SW development cost, parameterization cost ...)

During 2017, the Walloon staff was somehow insufficient. The project team has been strengthened in January 2018.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	18	840	3800	462

11. The Danish Pilot site

Denmark does not have its own national pilot, and consequently not a separate pilot budget. Denmark is part of NordicWay2 but is the only country in NordicWay2 without its own national pilot. It was cleared before signing the C-Roads platform agreement that it was okay for Denmark to become a C-Roads member due to the participation in NordicWay2 horizontal activities, despite Denmark not having a national pilot.

Denmark is contributing within the NordicWay2 horizontal activities, such as interoperability issues, data sharing, communication and tests – including testing on the Danish road network.

Involved partners

The Danish Road Directorate

Location

Danish state road network which means that all larger roads in Denmark are included.

Overview of progress by End of 2017

N/A

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	0	0	0	0

12. The Finnish Pilot site

The Finnish pilot site is part of the NordicWay pilots running in the Nordic countries Denmark, Finland, Norway and Sweden. The main objective of this Action is to deploy pilot studies in order to further develop interoperable Day-1 and Day 1,5 C-ITS services and support infrastructure readiness for connected and automated driving in Denmark, Finland, Norway and Sweden.

NordicWay pilots will:

- Contribute to the harmonisation and interoperability of the C-ITS services in Europe in line with requirements agreed by the C-Roads Platform.
- Support the deployment of new "Day-1" and "Day-1,5" C-ITS services in Nordic countries and extend its use in vital road freight transport routes subject to extreme weather conditions and in urban and interurban environments.
- Support the infrastructure readiness for connected and automated driving in Nordic countries in snowy and icy arctic conditions.
- Assess the socio-economic impacts of the piloted Day 1 and Day 1,5 C-ITS services as well as the effect on users mobility and traffic behaviours and on public acceptance.

The Finnish pilots are (1) the Artic Challenge for Automated driving in snowy and icy arctic conditions and (2) relevant C-ITS Day 1 services on core corridor.

Artic Challenge for Automated driving in snowy and icy arctic conditions

This pilot covers the design and implementation of a pilot intended to address automated driving in snowy and icy arctic conditions. The pilot will monitor automated driving with two different types of deployment phase automated vehicles.

Relevant Day 1 services on core corridor

This Activity contributes to specifically the specific objective of 2 and 4 by covering the design and implementation of a pilot to test relevant Day 1 services on the Scan-Med core corridor.

The piloted C-ITS services are planned to be:

Day 1 C-ITS services:

- Hazardous location notifications:
 - Slow or stationary vehicle(s) & traffic ahead warning
 - Road works warning
 - Weather conditions
 - Emergency vehicle approaching
 - Other hazards
- Signage applications:
 - In-vehicle signage
 - In-vehicle speed limits

- Signal violation / intersection safety
- Traffic signal priority request by designated vehicles
- Green light optimal speed advisory
- Probe vehicle data

Day 1.5 C-ITS:

- Traffic information and smart routing

The communication technology tested under the Finnish pilots will be cellular communication. Selected roadside infrastructure and vehicles may also be equipped with ETSI ITS-G5 when needed to ensure interoperability.

Involved partners

The Artic Challenge for Automated driving in snowy and icy arctic conditions is led by the public authorities of Finnish Transport Agency (FTA) and Finnish Transport Safety Agency Trafi. Studies are carried out by the following three coalitions:

- Lapland University of Applied Sciences (leader) and Roadscanners Ltd
- Sensible 4 Ltd (leader) Metropolia University of Applied Science Ltd, Sharpeye Systems Ltd, MHR Consulting, F-Secure Ltd, Solidpotato Ltd and Nodeon Ltd
- VTT Technical Research Centre of Finland Ltd (leader), Dynniq Finland Ltd, Indagon Ltd, Infotripla Ltd and Ukkoverkot Ltd.

The relevant C-ITS Day 1 and Day 1.5 service providers and partners will be selected through an open tendering. The tendering will start in spring 2018 and be completed in fall 2018. The first open market discussion was held in 1st of December 2017 at Helsinki, Finland.

Location

The Artic Challenge for automated driving in snowy and icy arctic conditions will take place in the Finnish-Norwegian E8 corridor, on a section of the comprehensive network section with frequent extreme weather conditions and low traffic volumes to minimise the safety risks involved with having automated vehicles driving on an open road together with manually operated vehicles.

The relevant C-ITS Day 1 and Day 1.5 services will take place on the core corridor. The exact coverage of the pilot will be determined based on the socio-economic assessment carried out in the EU CEF Action NordicWay 2014-EU-TA-0060-S as well in open market discussion when planning the C-ITS deployment in Finland. The corridor location in minimum is the E18 corridor (Scan-Med corridor) between Helsinki and Turku, including the urban links and especially the incident prone ring roads and arterials in the Helsinki region.

Overview of progress by End of 2017

E8 CAD pilots tendering started in February 2017. Three consortia, with 15 companies, were selected using public procurement. The contracts were signed in September 2017. The main part of the pilot infrastructure was completed in 2017 and final completion in 2018 is based on request from the pilot coalition companies.

For the CAD pilot, two test weeks are scheduled in 2018, one for January and the second for October. The planning and preparations of the first test week were conducted in 2017. In addition to technical preparations, an information event was held to the local people. The third and last test week is scheduled for spring 2019.

The planning of the tendering process for relevant Day 1 services on core corridors started in December 2017 with market discussion and a call for tender for technical support. Tendering of the C-ITS pilot will start in spring 2018 and consortia selection is scheduled for fall 2018.

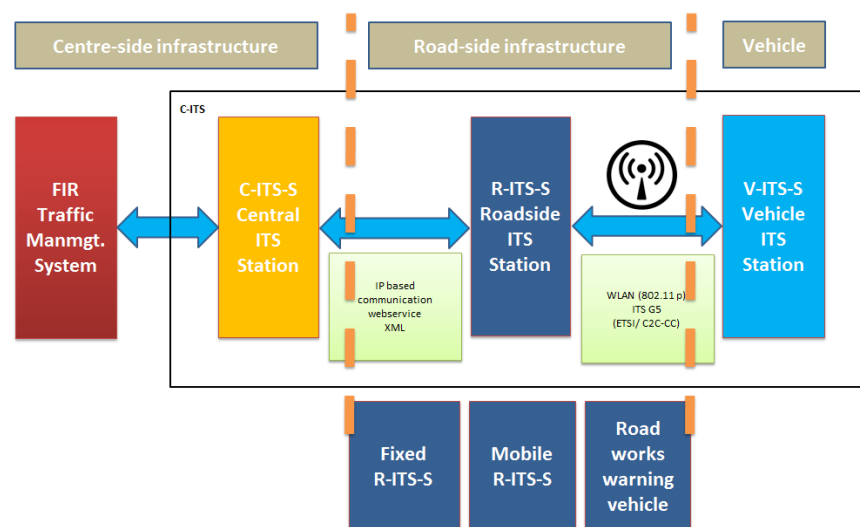
Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	1900	1668	982	600

13. The Hungarian Pilot site

In Hungary, C-ITS deployment started within CROCODILE project Phase I in 2015, the improvement of road safety –especially in work zones – was the key issue.

A 136km-long stretch of the M1 motorway between Austria and Budapest was selected for C-ITS services pilot deployment. For maintenance vehicles, mobile RSUs were also installed, which can operate in stand-alone mode as well. The communication between RSUs and OBUs is thus far based solely on ITS G5. The system itself covers ‘Day-1 services’ comply with ECO-AT specifications (‘Traffic jam ahead warning’, ‘Hazardous location notification’, ‘Road works warning’, ‘Weather conditions’, ‘In-vehicle signage’, ‘In-vehicle speed limits’). The system architecture – the 3 components – follows the ECO-AT specifications, too.



In the framework of C-Roads Hungary pilot extension the Implementing Body intends to extend the C-ITS deployment both in terms of geographical coverage, and offered services. The focus shall be put on urban deployment, in particular GLOSA/Time-to-green as well as intersection safety (signal violation). The upgrade should also concern the communication technology – deployment of hybrid DSRC / cellular technology is envisaged in near future.

Involved partners

Beneficiary: Ministry of National Development (MND)

Implementing body: Hungarian Public Road Non-profit PLC.

Partners planned to be involved:

- Budapest University of Technology and Economics (BUTE)
- Budapest Public Road PLC.
- Automotive Proving Ground Zala LTD. (APZ)
- City of Győr
- ITS Hungary Association (dissemination)

Location

With the extension, major part of motorway M7 (Mediterranean corridor) will be covered, and urban deployment will be carried out in the city of Győr by motorway M1 (Orient-East Med corridor). In order to improve coverage and ensure continuity of service, new transceivers and other devices will be implemented on motorway M1 Győr bypass section at the same time. This Győr bypass section is part of the existing 136-km-long M1 pilot section, motorway M1 between km 105-130. In the C-Roads Hungary project we are focusing on motorways M1, M7 and urban pilot in the city of Győr by motorway M1.

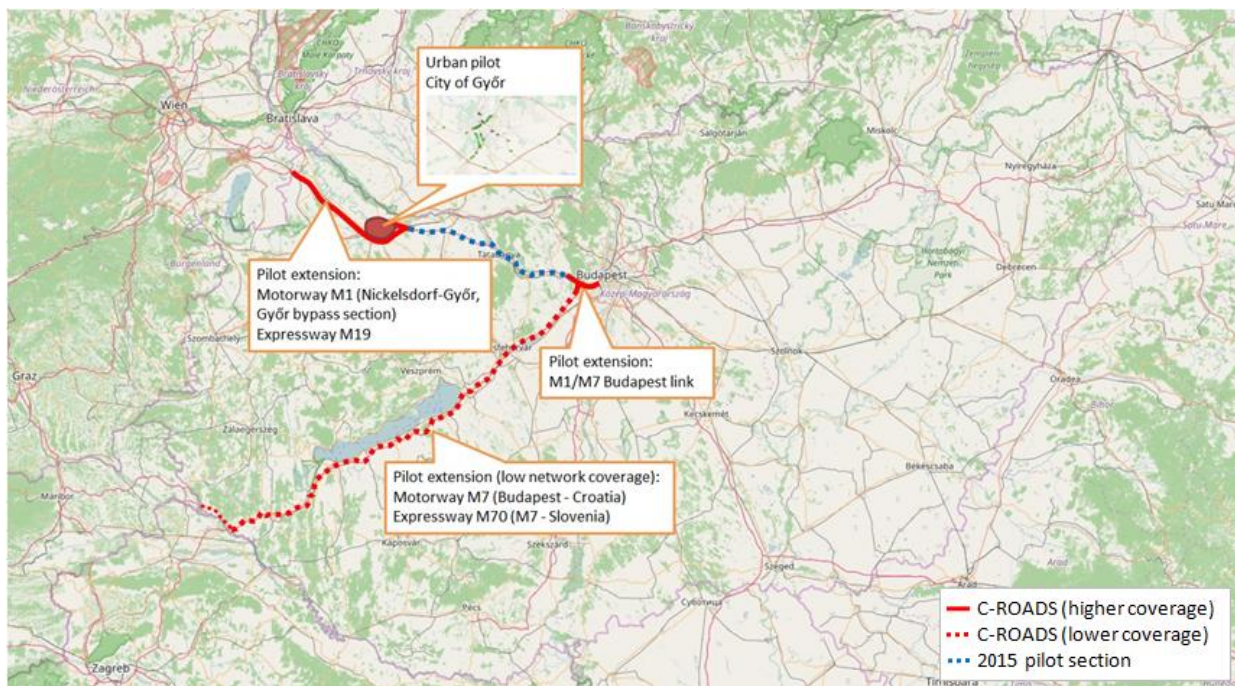


Figure 13: Location of the Hungarian pilot site

Overview of progress by End of 2017

Since Hungary was an associated member of C-Roads platform from 2016 (with the signature of the "Platform agreement for becoming an associated member"), Hungarian representatives were taking part in Steering Committee Meetings, and Technical Workshops. Moreover we have delegated experts to the working groups and Task Forces (in 2017, mainly to webex meetings), however Hungary became a full member of the Platform on 07/11/2017. Our experts became authors of common documents as well. We are doing a strong dissemination work beside the C-Roads platform dissemination. We took the opportunities to held presentations, to spread brochures in order to ensure a great visibility, inform the relevant stakeholders and secure the success of the project. The service contracts for the implementations are planned to be signed in 2018-2019, though the new version of ETSI TS 103 097 indicates extra workload, mainly regarding the existing pilot. In Hungarian C-ROADS pilots we plan to implement only the version 1.3.1, so further migration will be necessary concerning the existing C-ITS pilot system from 2015. The exact time schedule is not decided yet, but approx. until 2019 Q4 the latest.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	-	120	630	1.245,431

14. The Italian Pilot site

The main goal of the C-Roads ITALY project is to implement and test, in real traffic conditions, cooperative systems based on V2X technologies, for the following automated driving applications:

- trucks Platooning
- passenger cars Highway Chauffeur
- combined scenarios of trucks and passenger cars.

That implies the infrastructure upgrade and the integration of V2I C-ITS service and V2V information with vehicle control strategies.

C- Roads ITALY planned to pilot a set of “Day1” and “Day1,5” C-ITS services as recommended by the EC C-ITS Platform.

The expected impact to be demonstrated is mostly on mobility, considered in terms of:

1. Safety – to demonstrate the reduction of risk related to cooperative/automated technology in truck and passenger cars scenarios, and also in combined scenarios
2. Traffic fluidity – to show the potential for efficient use of the infrastructure with Platooning technology and Highway Chauffeur technology
3. Energy efficiency – to measure in real life conditions the potential for fuel consumption and related emission reduction.

The Italian implementing bodies (Road concessionaires, OEMs, telecom operator, research centre, etc...) will invest in their infrastructure and the industry will use that pilot test infrastructure to test components and services.

All Italian implementing bodies, according to their technical expertise, will be involved in the different WGs and Task Forces established by the C-Roads Platform; reporting about the status of national pilots, contributing to the harmonization of the different technical issues that will be discussed within the C-Roads Platform.

The results and lessons learned from C- Roads ITALY will be fully shared across Europe through the cooperation in the C-Roads Platform.

Involved partners

The Beneficiary (Member State) is the Ministero delle Infrastrutture e dei Trasporti the, the following entities are considered as implementing bodies:

- Iveco S.p.A.;
- North Italy Communications S.r.l.;
- Ministero dell’Interno – Dipartimento della pubblica Sicurezza – Servizio Polizia Stradale;
- Autostrada del Brennero S.p.A.;
- F.lli Codognotto di Codognotto Gianfranco & C. – S.N.C.;
- Politecnico di Milano – Dipartimento di Design;
- Centro Ricerche FIAT S.C.p.A.;
- CAV Concessioni Autostradali Venete S.p.A.;
- Telecom Italia S.p.A.;
- Azcom Technology S.r.l.;

- Autovie Venete S.p.A.

Location

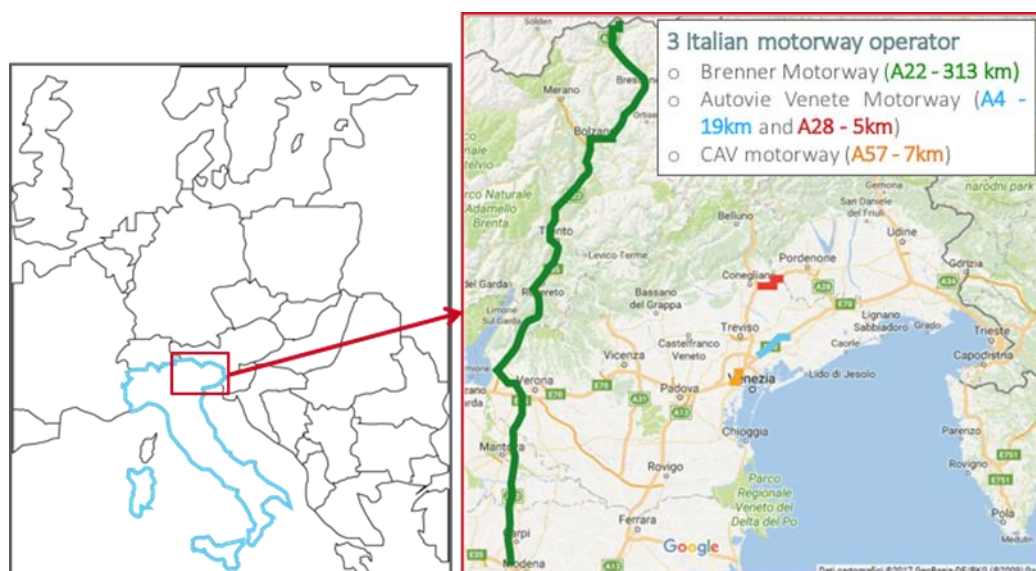


Figure 14: Location of the Italian pilot site

Overview of progress by End of 2017

The Kick-off, two national Steering Committees and two technical management meetings have been organized.

Except a slight delay of one month, all the planned national Milestones have been confirmed. C-Roads Italy pilot is organised in order to provide contribution in each of the WGs and TFs of the Platform, involving all national implementing bodies, according to their technical expertise. C-Roads Italy is Leader of WG3 and the Co-Leader of WG2.

A2 “C-ROADS ITALY Pilot: Chauffeur” is on schedule.

The plan was edited in fall 2017, along with internal deliverables to achieve Activity 2 Milestones. Partners’ role has been identified, and the next period will be devoted to the operational management. Use cases have been analyzed, especially the data availability from C-ITS services in the different scenarios and locations, and also hybrid V2X connectivity. The modelling of data from C-ITS to the on-board system has started from Road Works Warning and is progressing. Also bench tests have already started. A joint testing phase on message exchange with A22 motorway RSU V2X box has started, to check conformity to ETSI standard.

A3 “C-ROADS ITALY Pilot: Platooning”, is on schedule,

Propaedeutic activities were carried-out in order to achieve the planned Milestones. Platooning use case analysis related to the implementation of C-ITS services started and is under completion. Moreover, a V2X OBU Antennas positioning optimization as well as the breaking system optimisation analysis to increase the safety study stated.

A4 “Infrastructure update” is on schedule.

Test RSU started to evaluate its efficiency and functioning.

At the same time, deep analysis of the infrastructure and on-site surveys were carried out to identify the places where to install the RSUs needed for the project.

Activities concerning the software development to manage the interface between RSU - C-ITS-S communication started. along A22 Brenner, a new fiber optic network for connectivity between the TCC LAN and the new RSU antennas was done.

About the Hybrid communication preliminary studies were done to find the solution to integrate in the C-ROADS architecture the Platform used for IoT.

Moreover, the definition of the requirements for the IoT Platform for the C-ROADS Project started.

In particular, the interaction between vehicles and infrastructure can be done in two different ways (Hybrid communication):

- ITS-G5, 802.11p Wi-Fi connection
- 4G (and 5G when will be available) cellular connection.

Moreover, one national implementing bodies has been engaged in a deep understanding of the actual regulations about road safety as well as about impacts of Platooning on the tachograph regulations and on the next generation of tachograph, i.e. tachograph 4.0.

Furthermore, also the impact on the logistic supply chain of C-ITS applications from the point of view of the end-user, started.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	2.119,3	9.748	4.827,4	4.169,4

15. The Norwegian Pilot site

The Norwegian pilot site is part of the NordicWay pilots running in the Nordic countries Denmark, Finland, Norway and Sweden. The main objective of this Action is to deploy pilot studies in order to further develop interoperable Day-1 and Day 1,5 C-ITS services and support infrastructure readiness for connected and automated driving in Denmark, Finland, Norway and Sweden.

NordicWay pilots will:

- Contribute to the harmonisation and interoperability of the C-ITS services in Europe in line with requirements agreed by the C-Roads Platform.
- Support the deployment of new "Day-1" and "Day-1,5" C-ITS services in Nordic countries and extend its use in vital road freight transport routes subject to extreme weather conditions and in urban and interurban environments.
- Support the infrastructure readiness for connected and automated driving in Nordic countries in snowy and icy arctic conditions.
- Assess the socio-economic impacts of the piloted Day 1 and Day 1,5 C-ITS services as well as the effect on users mobility and traffic behaviours and on public acceptance.

The two Norwegian pilots include (1) use cases of Day 1 and Day 1.5 C-ITS services on the peripheral networks and (2) mapping of infrastructure readiness for connected and automated driving on major freight routes of the comprehensive network in Norway

Use cases of Day 1 and Day 1.5 C-ITS services on the peripheral networks

The pilot will design, and implement, test and evaluate use cases of Day-1 and Day-1.5 C-ITS services on the peripheral networks, to allow for smooth transitions between the networks.

Testing on the comprehensive and peripheral networks ensures a broader test of functionality than on the core network. If tests are successful on the peripheral or comprehensive network, the Day-1 and Day-1,5 C-ITS services tested will be applicable under extreme weather conditions on the core network.

In particular, the pilot will explore the feasibility of the following Day-1 and Day-1,5 services on these rural routes with poor cellular connectivity and without full access to power mains:

Day 1 services:

- Hazardous location notifications:
 - Slow or stationary vehicle(s) & Traffic ahead warning
 - Road works warning
 - Weather and road conditions
 - Emergency brake light
 - Other hazardous notifications

- Signage applications:
 - In-vehicle signage
 - In-vehicle speed limits
 - Signal violation/ intersection safety
 - Green light optimal speed advisory
 - Probe vehicle data

Day 1.5 services:

- Information on fuelling & charging stations for alternative fuel vehicles
- On street parking information and management
- Traffic information & Smart routing
- Cooperative collision risk warning

The interoperability of the following C-ITS services will be tested throughout the whole NordicWay2 network:

- Slow or stationary vehicle(s) & Traffic ahead warning
- Weather conditions
- Traffic information & Smart routing

The service “Weather conditions” will include slippery road detection since this is an important functionality to ensure traffic safety and traffic ability on rural roads in wintertime. Moreover, the “Green light optimal speed advisory” test will be oriented to test the use of the virtual “traffic lights”.

The communication technology tested under this pilot will be cellular communication. Selected roadside infrastructure and vehicles may also be equipped with ETSI ITS-G5 when needed to ensure interoperability.

Mapping infrastructure readiness for connected and automated driving on major freight routes of the comprehensive network in Norway

The pilot will map and assess the infrastructure readiness for connected and automated driving on major freight routes of the comprehensive network in Norway.

The pilot will aim at identifying what parts of the network are hard to read for the vehicle sensors and exploring the potential for communicating information from the road authorities’ backend instead of rebuilding the infrastructure using C-ITS. The pilot will cover a larger area, but this area will not require instrumentation as the pilot is to study infrastructure readiness. The area already is equipped with connected signalized intersections in Trondheim and in Oslo. The route will start at the E8/Finish border and continue south on the E6 to Trondheim and from there down to Oslo and onwards to the Swedish border.

In case that the results of the pilot as described above are inconclusive, the pilot area will be extended to the E136 on the peripheral network from Åndalsnes to Dombås in the Norwegian pilot. This road is a major freight route from Western Norway with a steep incline through a valley with tunnels, high mountains on both sides and with the challenges this entails concerning connected and automated driving. The results from E136 will be applicable under extreme weather conditions on the core network.

Involved partners

Norwegian Public Roads Administration and public sector and private sector partners through open tendering processes

Location

The C-ITS pilot will be on the corridor from Tromsø to the Finnish border. The main pilot stretch will be from Skibotn to Kilpisjärvi, but other road sections on E8 and connecting roads can be included in pilot activities if it is appropriate to cover specific issues.

The mapping of the infrastructure for connected and automated driving readiness will start at the E8/Finish border and continue south on the E6 to Trondheim and from there down to Oslo and onwards to the Swedish border.

Overview of progress by End of 2017

In Norway, the preparation of the infrastructure on E8 for demonstrations from Tromsø to the Finnish border accompanied by the first round of procurements of C-ITS pilots is adhering to plan. A new round of C-ITS pilot procurements are considered in 2018. The C-ITS pilot infrastructure investments will be finalised in the spring of 2018.

For CAD infrastructure mapping, a logging platform for data collection has been developed. Cooperation with partners to ensure collection of the correct data has started. A pilot of long data collection has been completed.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	1690	1510	1650	750

16. The Portuguese Pilot site

C-Roads Portugal consists in the deployment of 5 C-ITS testbed Macro Pilot cases in the Atlantic Corridor in Portugal, covering relevant sections of the core network and comprehensive network and of its two urban nodes.

Combined with the testbed pilot cases, the project will also develop a study aiming for the National large scale deployment of C-ITS services, notably Day-1 services and, selected, Day-1,5.

Pilot 1 – Single Access Point – SPA and SPApp usage app for SPA Services

This activity consists on the design of the National Single Point of Access (SPA) prototype designed in compliance with the Commission Delegated Regulation (EU) 2015/962 and the Commission Delegated Regulation 886/2013 and covering information of around 3390 km (20%) of the network. In addition, a mobile application (SPApp) that will provide added value services on the basis of the information provided by the SPA will be also tested together with the SPA prototype. This pilot will pave the way for the future implementation of the SPA in Portugal.

Currently, in Portugal, there are several traffic data producers, namely the different road operators such as BRISA, ASCENDI or NORSCUT, that send information to distinct entities (already) in DATEXII format. This means that, although already using an open UE standard for traffic data exchange, there is no official Portuguese National Access Point.

The pilot will consist of the following two sub-activities:

Sub-activity 1.1: The first sub-activity will identify the technical and financial requirements, both in terms of hardware and software, to establish the SPA on the basis of the existing traffic data communication network. In particular, the following aspects will be analysed and defined:

- specific requirements to set up the SPA in compliance with the Commission Delegated Regulation (EU) 2015/962 and the Commission Delegated Regulation (EU) No 886 / 2013;
- system modelling including the data interfaces according to the DATEXII model; normalization of the data frames sent by each road operator;
- the "discovery/search and browse" functionality

Moreover, a prototype to validate the approach and analyse the different required functionalities will be developed and piloted. This prototype will be tested (i.e. pilot operation) before the major deployments of other pilots carried out under the other activities are taken place, enabling its usage as the data sharing point for the different collaborative services in test.

Sub-activity 1.2: This sub-activity covers the design and development of a SPA mobile application (SPAapp) based on an existing technological platform that will enable interactive added-value services between the driver and the highway operator. In particular the app will cover the following Day-1 C-ITS services:

- Day-1 C-ITS services:

- Slow or stationary vehicles;
- Traffic Jam ahead warning;
- Other hazardous location notification;
- Road works warning;
- Weather conditions.

This app looks to demonstrate the potential of the SPA base services. In particular this Activity will design and develop an application layer for static road data, dynamic road status data and traffic data provided by the data sharing backbone system delivered under sub-activity 1.1 (i.e. the basis for the future SPA in Portugal). The system will compile transportation data from the nodes provided by SPA to be used by a consumer-facing app. The SPAapp will be tested together with the SPA prototype as a part of the pilots delivered under other activities.

This Activity will cover the procurement tasks, i.e. the preparation of procurement documents and contracts, which are necessary to implement the above sub-activities.

Pilot 2 – Portuguese network for C-ITS

This activity consists on the deployment of a pilot to test Day 1 and Day 1.5 services over 460 km of the core and comprehensive network, including cross-border sections in Valença and Caia, and roads giving access to urban nodes of Lisbon and Porto.

This activity will test these services in different kind of roads (metropolitan areas, interurban roads, streets and highways) using hybrid communication system (ITS G5 and Cellular).

The activity is desegregated in the following sub-activities

Sub-activity 2.1: Demonstration of C-ITS services in the core (A1, A2, A3, A6 and A12) and comprehensive (A2, A22, A27 and A28) network, including cross-border sections in Valença (A3 and A28) and Caia (A6), and roads giving access to urban nodes of Lisbon (IC 17 and IC 19) and Porto (A4 and A20 — VCI).

This sub-activity will expand the network of cooperative systems on the basis of the results of a CEF funded Action 2014-EU-TA-0669-S- SCOOP@F Part 2 with the deployment of around 88 RSU, 29 OBU and 29 vehicles testing the following Day-1 and Day -1.5 C-ITS services:

- Day-1 C-ITS services:

- Emergency electronic brake light;
- Emergency vehicle approaching;
- Slow or stationary vehicles;
- Traffic Jam Ahead warning;
- Other hazardous location notification;
- Roads works warning;
- Weather conditions;
- In-vehicle signage;
- In-vehicle speed limits;
- Probe vehicle data;
- Shockwave damping.

- Day-1.5 C-ITS services:

- Off street parking information;
- Park and Ride information;
- Information on alternative fuel vehicles and charging stations;
- Traffic information and smart routing;
- Zone access control for urban areas;
- Wrong way driving.

Sub-activity 2.2: Development and testing of an in-vehicle app that will provide C-ITS services to the users on the highway A25 and urban node of Lisbon (entrance through the N6 road)

This sub-activity will develop and test an In-Vehicle App, using a hybrid communication system (ITS G5 + cellular), that will be able to provide the following Day-1 and Day -1.5 C-ITS services on the highway A25 and on the access to the urban node of Lisbon through the N6 road :

- Day-1 C-ITS services:

- Slow or stationary vehicles;
- Traffic Jam Ahead warning;
- Other hazardous location notification;
- Roads works warning;
- Weather conditions.

- Day-1.5 C-ITS services:

- Off street parking information;
- Traffic information;
- Smart routing.

The sub-activity will cover the following task:

- Development of the in-vehicle App;
- Installation of 24 RSU on two roads: A25 and N6 (access to urban node of Lisbon);
- Installation of 20 OBU in 20 vehicles;
- Connection of the in-vehicle App with the server(s) that will receive and process the information received from the installed RSUs and OBUs,
- Piloting of the In-vehicle App: the provision of all C-ITS services by the in-vehicle App will be tested and monitored during a period of at least 12 months.

Sub-activity 2.3: Development of C-ITS services in tunnels: Túnel da Gardunha (A23)

This sub-activity will pilot the provision of Day-1 C-ITS services inside and in the surroundings of the "Gardunha tunnel" located in the A23 road using a hybrid communication system (ITS G5 + cellular).

- Day-1 C-ITS services:

- Emergency vehicle approaching;
- Slow or stationary vehicles;
- Traffic Jam Ahead warning;
- Other hazardous location notification;
- Roads works warning;
- Weather conditions;
- In-vehicle signage;
- In-vehicle speed limits.

The sub-activity will cover the following task:

- Installation of 6 RSUs in 20 km of the A23, inside and outside the "Gardunha tunnel";
- Equipment of 10 vehicles with 10 OBUs,
- Testing and monitoring of the provision of the Day-1 C-ITS services inside and in the surroundings of the tunnel during a period of 12 months.

This Activity will cover the necessary adaptation of the vehicles to perform the pilots and will cover the procurement tasks, i.e. the preparation of procurement documents and contracts, which are necessary to implement the above sub-activities.

Pilot 3 – Network preparation for Connected and Autonomous Vehicles

This activity consists on the deployment of a pilot that will prepare TEN-T network for Connected and Autonomous Vehicles with levels of automation 2 and 3, also using hybrid communication system (ITS G5 and Cellular).

This activity covers three sub-activities that will carry out the following pilots in real environment.

Sub-activity 3.1: Pilot of Connected and autonomous vehicles in open roads

Under this sub-activity, around 6 RSU will be installed over around 24.7 km of the A27 highway (Viana do Castelo - Ponte de Lima), 88.6 km of A28 (Porto-Caminha) and 40 km of the A3 (Porto-Braga).

Moreover, one vehicle will be equipped with two different OBUs in order to test with two different levels of automation (level 2 and 3) the provision of the following Day-1 and Day-1.5 services:

- Day-1 C-ITS services:

- Emergency electronic brake light;
- Slow or stationary vehicles;
- Traffic Jam Ahead warning;
- Other hazardous location notification;
- Roads works warning;
- Weather conditions;
- in-vehicle signage;
- in-vehicle speed limits;
- Signal violation/intersection safety.

- Day-1.5 C-ITS services:

- Off street parking information;
- Park & ride information;
- Connected and cooperative navigation.

Sub-activity 3.2: Pilot on the A2, the "Holiday motorway"

This pilot will be implemented over 240km of the A2 network ("Intelligent Holiday Motorway" from Almada to Albufeira) and will involve some of the RSUs and OBUs installed under sub-activity 2.1 as well as around 50 additional RSUs that will be installed under this sub-activity. The pilot will test the provision of the following Day-1 and Day-1.5 services with around 30 vehicles (cars and trucks):

- Day-1 C-ITS services:

- Emergency electronic brake light;
- Slow or stationary vehicles;
- Traffic Jam Ahead warning;
- Other hazardous location notification;
- Roads works warning;
- Weather conditions;
- In-vehicle signage;
- In-vehicle speed limits;
- Probe vehicle data.

- Day-1.5 C-ITS services:

- Park & ride information;
- Information on alternative fuels & charging stations;

- Traffic information;
- Smart routing;
- Zone access control for urban areas;
- Wrong way driving;
- Connected and cooperative navigation.

Sub-activity 3.3: Pilot on Connected vehicles for advanced services.

This pilot will be implemented over 204 km of highways of the Core network and accesses to urban nodes (66 km of A1, 54 km of A2, 25 km of A5, 35 km of A9 and 24 km of A12) and will involve some of the RSUs and OBUs installed under sub-activity 2.1 as well as around 30 additional RSUs and 50 OBUs that will be deployed under this sub-activity. The pilot will be carried out with around 50 vehicles that will test the following Day 1 and Day 1.5 services:

- Day-1 C-ITS services:

- Emergency electronic brake light;
- Slow or stationary vehicles;
- Traffic Jam Ahead warning;
- Other hazardous location notification;
- Roads works warning;
- Weather conditions;
- In-vehicle signage;
- In-vehicle speed limits;
- Probe vehicle data.

- Day-1.5 C-ITS services:

- Park & ride information;
- Information on alternative fuels & charging stations;
- Traffic information;
- Park & ride information;
- Information on alternative fuels & charging stations;
- Traffic information;
- Smart routing;
- Zone access control for urban areas;
- Wrong way driving
- Connected and cooperative navigation.

Under this sub-activity in-vehicle/driver data will be analysed in order to feed data models to adequate traffic and guidance information. Additionally, this pilot will deploy a dynamic route pricing system that will calculate the price according to the distance travelled, type of roads and levels of congestion, usage-based insurance models and road usage charging models.

Pilot 4 – C-ITS Pilot in the Lisbon Urban Node

This activity consists in the deployment of a C-ITS Pilot in the Lisbon urban node.

The activity covers three sub-activities:

Sub-activity 4.1: Traffic service level monitoring and travel time prediction in Lisbon node to be tested along 10,5 km of A36 (2^a circular) using cellular communication.

This sub-activity will deliver and pilot an application that will provide the following Day-1 and Day 1.5 C-ITS services over the 10,5 km of A36 (2^a circular) using cellular communication:

- Day-1 C-ITS services:
 - Slow or stationary vehicles;
 - Traffic Jam Ahead warning;

- Day-1.5 C-ITS services:
 - Traffic information;
 - Smart routing;

This application will retrieve data on total vehicle volumes (with classes identification) to generate at least two O/D (origin/destination) pairs that will feed the municipal Traffic Management Centre. The RSUs deployed under activities 2.1. and 2.2. over the IP network IC 19/ CRIL/A36) will also be connected to this pilot case.

Sub-activity 4.2: Pilot of a Parking availability system in Lisbon node (Lisbon central axis - Entrecampos - Marques do Pombal, along 2,7 km)

This sub-activity will deliver and pilot with around 25 vehicles an integrated C-ITS application that will be able to provide the following Day-1,5 C-ITS services using cellular communication:

- Day-1.5 C-ITS services:
 - On-street parking;
 - Off-street parking;
 - Park & ride information;
 - Information on alternative fuels & charging stations;
 - Smart routing;

This C-ITS application will be built on the existing EMEL Smart Parking Solution which is an integrated infrastructure-based sensor system that gives precise information on where available parking spaces in Lisbon can be found and how long each space has been occupied.

The EMEL Smart Parking Solution will be integrated with other technologies and improved in terms of the robustness of sensor devices, the stability and timeliness of sensor networks, the quality and agility of urban service, and user-centred considerations in order to be able to provide the services specified above.

Sub-activity 4.3: -Pilot of an In-Vehicle App that provides parking and traffic information in the Urban Node of Lisbon (Lisbon Node, 9.8 km of A36 (2^a circular) and N6)

This pilot will test an In-vehicle App that will provide information about parking availability inside the city (Day-1.5 service) and about traffic conditions and hazardous situations (Day-1 services) over 9.8 km of one of the most congested access road to Lisbon and main connection to the core airport (A36 – 2^a Circular) and over the N6 (one of the 5 main commuting entrances).

The test will involve 5 vehicles and will use hybrid technologies (ETSI G5 and Cellular).

Vehicles (cars, buses, trucks) shall be equipped with smartphones/tablets where the app prototype will be available along with the V2X-enabled In-Vehicle System (IVS) that allows the collection of data on the vehicle environment (like road conditions, driving conditions, traffic conditions and general environmental conditions) while at the same time acting as a receiver of information coming from other vehicles and/or the central C-ITS management system.

The app prototype will make use of state-of-the-art recommendations related to ensure safe driving while relaying the required information to the driver. Moreover, specifications already

adopted by the C-Roads platform and technology neutrality and efficient use of radio spectrum will be key principles in order to ensure complementarity and co-existence with existing communication technologies.

Sub-activity 4.4: Signal corridors and bus corridors prioritization in Lisbon node

Endow the central corridor of Lisbon ("Campo Grande - Marques de Pombal" axis) with the suitable infrastructure capable of improving the efficiency of the public transport lanes by prioritising the emergency vehicles.

This solution will allow to implement a prioritization system (Green Light Optimal Speed Advisory (GLOSA) / Time To Green (TTG)) based on cellular communication technology through the adaptation of the existing OBUs and communication server and via the upgrade of the central traffic management and the development of middleware.

Sub-activity 4.5: Mobility hub in the Lisbon node

This pilot will cover some of the inter-urban highways that give access to Lisbon (A2, A5 and A9). Through this pilot test, the potential benefits of the integration of private car usage with other modes of transportation in the last mile of inter-urban motorway corridors will be studied and evaluated through the analysis of solutions such as carsharing, carpooling, park & ride or any other services which contributes to the implementation of the "mobility as service" (MAAS) concept.

Moreover, the pilot will also test the provision of the following Day-1 and Day 1.5 services using hybrid communication technologies (ETSI G5 and Cellular communications):

- Day-1 C-ITS services:

- Emergency electronic brake light;
- Emergency vehicle approaching;
- Slow or stationary vehicles;
- Traffic Jam Ahead warning;
- Other hazardous location notification;
- Roads works warning;
- Weather conditions;
- In-vehicle signage;
- In-vehicle speed limits;
- Probe vehicle data;
- Shockwave damping.

- Day-1.5 C-ITS services:

- Park & Ride information;
- Information on alternative fuel vehicles and charging stations;
- Traffic information;
- Smart routing;
- Zone access control for urban areas;
- Wrong way driving.

Pilot 5 – C-ITS Pilot in the Porto Urban Node

This activity consists in the deployment of a C-ITS Pilot in the Lisbon urban node.

Under this Pilot, the following two sub-activities will be tested:

Sub-activity 5.1: Pilot to test a Cooperative Intelligent Transport System (C-ITS) for short-medium term traffic predictions in Porto node

This sub-activity will test a Cooperative Intelligent Transport System that will provide traffic predictions in real time and in future-two-hour travel time using Cellular, Wifi and DATEX communication technologies.

This system will transfer real-time traffic information such as traffic flow, traffic speed, traffic concentration, accident occurrence, congestion, roadworks and public transport information to the traffic management centre (TMC) enabling the TMC to react and put in place contingency plans to tackle network bottlenecks and other traffic disruptions.

The pilot will monitor the traffic service level in real time and will predict the service level in 2 hours, in a total extension of about 24 km inside the Porto city.

The equipment deployed in sub-activity 2.1 will be connected to this pilot allowing to extend the area covered by the pilot (i.e. covering critical penetration roads in Porto such as commuting entrance/exits of the urban node).

The Day-1 and Day 1.5 C-ITS services that will be tested under this pilot are the following:

- Day-1 C-ITS services:

- Traffic Jam Ahead warning;
- Roads works warning;
- Weather conditions;
- In-vehicle signage;
- Shockwave damping;
- Traffic signal priority request by designated vehicles.

- Day-1.5 C-ITS services:

- On-street parking management;
- On-street parking information;
- Traffic information;
- Smart routing.

Sub-activity 5.2: V2I and I2V integration of an intelligent bus with the infrastructure in Porto node

This pilot will test the integration of an "intelligent bus" with the infrastructure in the city of Porto in a corridor of around 1,4 km for information and services sharing, using DATEXII communications protocol and cellular communication technologies. The pilot will require the installation of at least a RSU and the equipment of the intelligent bus with at least an OBU. This will allow the exchange of information between the infrastructure owner and the intelligent bus.

The following Day-1 and Day 1,5 C-ITS services will be tested:

- Day-1 C-ITS services:

- Traffic Jam Ahead warning;
- Roads works warning;
- Weather conditions;
- In-vehicle signage;
- n-vehicle speed limits;
- Probe vehicle data;
- Shockwave damping;
- Traffic signal priority request by designated vehicles.

- Day-1.5 C-ITS services:

- Traffic information;
- Smart routing;
- Connected and cooperative navigation.

Involved partners

The C-ROADS PORTUGAL involves 31 Partners from the public and private sector:

- Instituto da Mobilidade e dos Transportes, I.P.;
- Infraestruturas de Portugal, I.P.
- IP Telecom, S.A.;
- Câmara Municipal de Lisboa;
- Câmara Municipal do Porto;
- STCP - Sociedade de Transportes Coletivos do Porto, S.A.;
- EMEL - Empresa Publica Municipal de Estacionamento de Lisboa, E.E.M.;
- FEUP - Faculdade de Engenharia da Universidade do Porto;
- Brisa Concessão Rodoviária, S.A.;
- Ascendi Beiras Litoral e Alta, Auto Estradas das Beiras Litoral e Alta, S.A.;
- Autoestradas Norte Litoral – Soc. Concessionaria - AENL, S.A.;
- Autoestrada do Algarve - Via do Infante – Soc. Concessionaria - AAVI, S.A.;
- CaetanoBUS - Fabricação Carroçarias, S.A.;
- Brisa Inovação e Tecnologia, S.A.;
- GMVIS Skysoft, S.A.;
- ARMIS, Sistemas de Informação, Lda.;
- Siemens, S.A.;
- Vialivre, S.A.;
- DMS Displays & Mobility Solutions Lda.;
- Scutvias - Autoestradas da Beira Interior, S.A.;
- Lusoponte - Concessionaria para a Travessia do Tejo, S.A.;
- Brisal - Autoestradas do Litoral, S.A.;
- AEDL - Autoestradas do Douro Litoral, S.A.;
- AEA - Autoestradas do Atlântico- Concessões Rodoviárias de Portugal, S.A.;
- Ascendi Grande Lisboa - Autoestradas da Grande Lisboa, S.A.;
- Ascendi do Grande Porto - Autoestradas do Grande Porto, S.A.;
- Ascendi Norte - Autoestradas do Norte, S.A.;
- Ascendi Costa de Prata - Autoestradas da Costa de Prata. S.A.;
- Norscut Concessionaria de Autoestradas, S.A.;
- TIS.PT, consultores em Transportes, Inovação e Sistemas. S.A.;
- Via Verde Serviços, S.A.;

Location

Region(s) (using the NUTS2 nomenclature): Alentejo (PT18), Algarve (PT15), Centro (PT) (PT16), Lisboa (PT17), Norte (PT1 1)

Pilots 1 to 5

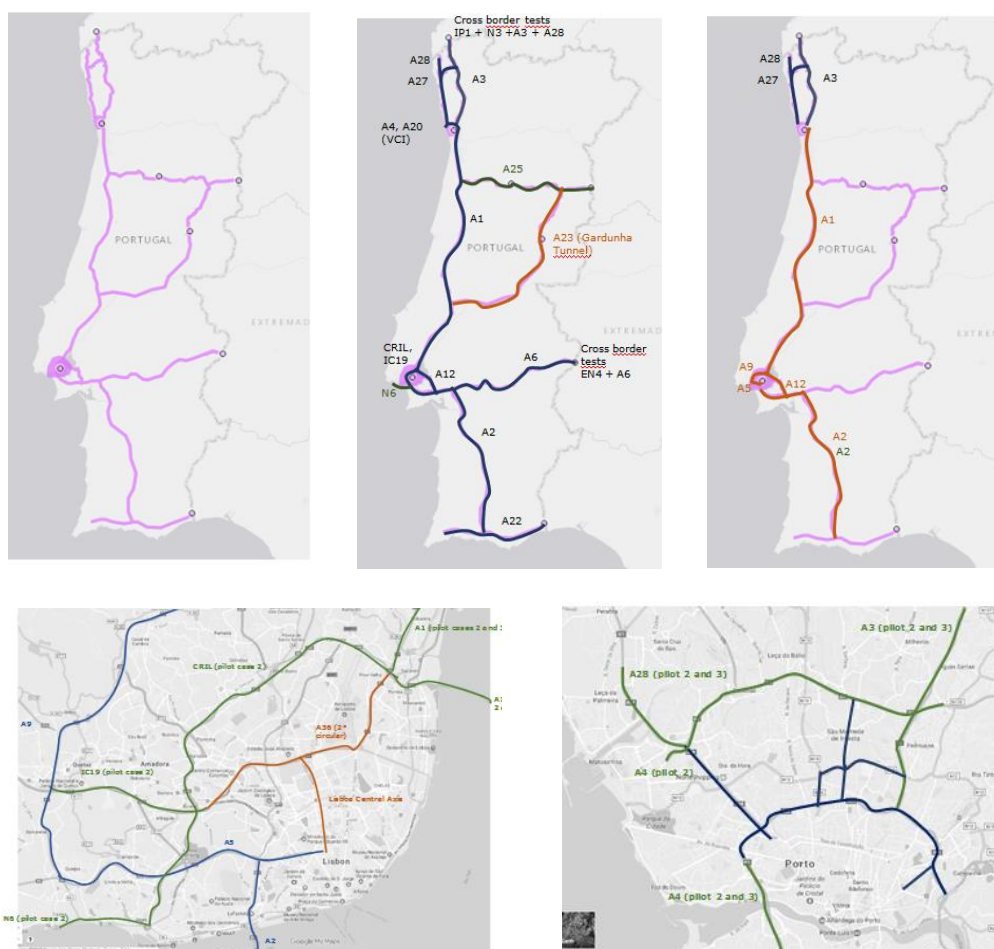


Figure 15: Location of the Portuguese pilot site

Overview of progress by End of 2017

The Portuguese Action started in February 2017, and the pilots all needed input from two preliminary activities – A3: Specifications and A4: Pilot Specific Studies. The overall progress of the pilots is in-line with the expected. A3 and A4 showed some delays in the development of the specifications and pilot studies. An important component of specifications for several pilots derives from the cross-tests promoted in the SCOOP@F project which suffered relevant delays. Despite so, some progress has been realised and the lessons from those cross tests are now an important source to adjust the C-Roads specifications.

Pilot 1 – Single Access Point – SPA and SPApp usage app for SPA Services

This pilot achieved a 11% technical progress during 2017 (based on the level of costs reported as compared to the projected overall total cost of the corresponding activity). The architecture for the SPA, as well as the definition of a SPA management agreement in view of further

implementation of the national solution is ongoing as planned. Revision of specifications, architecture design and tests for the SPA interface, required additional staff hours, that were originally predicted for 2018. Overall the Pilot is on schedule.

Pilot 2 – Portuguese network for C-ITS

This pilot did not start during 2017, given the need of input from Pilot 1, and the project was rescheduled for 2018. There has been some informal work connected with Pilot 1, regarding the planning for hardware and software development, as well as the update of specifications.

Pilot 3 – Network preparation for Connected and Autonomous Vehicles

Each of the three activities within the pilot are ongoing: “Connected vehicles for advanced services” pilot is more advanced having started already in 2017 some of the studies originally scheduled for 2018; “Holliday Motorway” is developing studies regarding network alterations and business cases, “Connected and autonomous vehicles in open roads” is slightly delayed, to be recovered in 2018. The overall progress is ahead of schedule.

Pilot 4 – C-ITS Pilot in the Lisbon Urban Node

The “Mobility Hub” (4.5) pilot activity fully started in 2017, with significant advancement of the planned studies. It is expected to have a faster development during 2018. Some of the tasks regarding the “Parking Availability System” were delayed in the initial work plan, due to the need to evaluate technologies available on the market against specifications (from Pilot 1). The activity “Signal corridors and BUS corridors prioritization” is in advanced stage progressing in the revision of specifications for expansion. A first pre-test of the pilot happened in December. Pilots “Traffic service level monitoring and travel time prediction” and “In-Vehicle App” are progressing according to planning.

Pilot 5 – C-ITS Pilot in the Porto Urban Node

The project has been deployed taking advantage of previous specifications. Data monitoring and prediction systems are being developed. The V2I and I2V BUS project is under specifications and analysis of the equipment available in the market.

Independently of minor delays in the onset of some of the Pilots, the planned implementations remain on track to deliver as planned until the end of the Action. All the work programme is planned to be complete as planned and in-line with the original planned budget by the end of the defined period, and the reported under-spend is expected to represent no impact on Action objectives or ongoing Milestones completion.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	791,72	4259,31	2126,63	1177,14

17. The Swedish Pilot site

The Swedish pilot site is part of the NordicWay pilots running in the Nordic countries Denmark, Finland, Norway and Sweden. The main objective of this Action is to deploy pilot studies in order to further develop interoperable Day-1 and Day 1,5 C-ITS services and support infrastructure readiness for connected and automated driving in Denmark, Finland, Norway and Sweden.

NordicWay pilots will:

- Contribute to the harmonisation and interoperability of the C-ITS services in Europe in line with requirements agreed by the C-Roads Platform.
- Support the deployment of new "Day-1" and "Day-1,5" C-ITS services in Nordic countries and extend its use into vital road freight transport routes subject to extreme weather conditions and in urban and interurban environments.
- Support the infrastructure readiness for connected and automated driving in Nordic countries in snowy and icy arctic conditions.
- Assess the socio-economic impacts of the piloted Day 1 and Day 1,5 C-ITS services as well as the effect on users mobility and traffic behaviours and on public acceptance.

The Swedish Pilot covers C-ITS Day-1 and Day-1,5 services within urban and interurban areas

The Swedish pilot covers the design, implementation, test and evaluation of relevant Day-1 and Day-1,5 services within urban and interurban areas. By including a range of operating environments, from city streets to inter-urban motorways, the pilot will have the possibility to assess the viability of different applications on different types of road networks.

The pilot will be based on the use of a set of state-of-the-art passenger cars, public transport buses and heavy goods vehicles which will be equipped with appropriate driver interfaces and connected through clouds by cellular and, for certain applications, ETSI ITS-G5 communication technologies.

The aim of the Swedish pilot is to demonstrate the possibility to communicate between vehicles, infrastructure and clouds and to show the interoperability, scalability and flexibility of the NordicWay interchange network with connected clouds. This will be shown by testing Day-1 and Day-1,5 services.

C-ITS Day-1 services:

- Emergency vehicle approaching (EVA)
- Connected Traffic Signals including:
 - Traffic signal priority request by designated vehicles (TSP)
 - Green Light Optimal Speed Advisory (GLOSA)
- Hazardous Location notification (HLW): Roads works warning, emergency brake light, Emergency vehicle approaching and other hazards.

C-ITS Day-1,5 services:

- Traffic information and smart routing (TISR)
- Connected & Cooperative navigation into and out of the city (CCN)

Involved partners

The Swedish Transport Administration and the following public and private organisations:

- Telefonaktiebolaget LM Ericsson
- Scania CV AB
- Volvo Car Corporation
- City of Gothenburg
- City of Stockholm
- VOLVO AB
- Kapsch TrafficCom AB
- Myndigheten för samhällsskydd och beredskap
- Uppsala kommun
- Södertälje kommun
- Zenuity AB
- IBM Svenska AB
- Swarco Sverige AB
- Technolution AB
- Springworks AB
- Carmenta AB
- DB Schenker
- Veridict AB
- Statens Väg och Transportforskningsinstitut
- Mindconnect AB
- Chalmers University of Technology
- KTH - Integrated Transport Research Lab (ITRL)
- Combitech AB
- Triona AB
- RISE Interactive Institute AB

Location

The pilot is cellular based and will thus be functional in most parts of Sweden as well as Norway, Finland and Denmark where the services are applicable. The Swedish pilot focuses on C-ITS piloting in the cities of Gothenburg, Stockholm, Södertälje and Uppsala including their access routes E6, E4, E20, E18 and RV40 which are all included in the Core Network and part of the Scandinavian – Mediterranean CEF corridor.

Overview of progress by End of 2017

In Sweden two workshops and a number of bi-weekly meetings have been held with the Swedish Transport Administration and the Swedish implementing bodies. The objective has been to specify and define the C-ITS pilot services, the number of vehicles, and the roles and responsibilities of the Swedish implementing bodies. There is active industry involvement of the implementing bodies as well as involvement of cities and research organizations.

The first version of the Pilot plan for the Swedish pilot, including services to be piloted and the specific responsibility of each partner, will be completed summer 2018. This will outline the work for each implementing body and serve as a management document throughout the project.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
-	140	1800	1600	1700

18. The Spanish pilot site

The pilot report is meant to introduce the pilot sites foreseen in C-Roads Spain, as well as their services and technologies. C-Roads consists of different C-Roads pilots operated in different national environments, being Spain one of their pilot sites' locations.

The Spanish pilot is made out of five different pilots, each of them with their unique set of technologies and C-ITS services, and with the involvement of different partners. This heterogeneity is meant to cover a wide spectrum of use cases, for the sake of assessing the impact of connected mobility in many representative scenarios. In this sense, the effective execution of the piloting phase depends on an accurate ex-ante scheduling and definition of evaluation methodology. This set of pilots have been carefully chosen in order to verify interoperability at national and European level, as well as the added value of C-ITS services in different scenarios.

Involved partners

A multidisciplinary group of partners is involved in the execution of tests:

- Public authorities:
 - Dirección General de Tráfico – Ministry of Interior (DGT).
 - Dirección General de Carreteras - Ministerio de Fomento (DGC).
 - Madrid Calle 30 S.A.
- Associations:
 - Foro de Nuevas Tecnologías en el Transporte (ITS España).
 - Asociación Clúster de Movilidad y Logística de Euskadi (MLC ITS EUSKADI).
- Private companies:
 - Transport Simulation Systems SL (TSS).
 - Equipos de Señalización y Control (ESYCSA).
 - Indra Sistemas S.A. (Indra).
 - Grupo Mecánica del Vuelo Sistemas S.A.U. (GMV Sistemas).
 - Opus Remote Sensing Europe (OPUS RSE).
 - Gertek Sociedad de Gestiones y Servicios S.A. (Gertek).
 - ICEACSA Consultores, S.L.U.
 - Ingartek Consulting, S.L.
 - Abertis Autopistas España S.A.
 - Automóvil Club Asistencia S.A. (ACASA).
 - SenseFields S.L.
 - Ferrovial Corporación S.A.
 - Kapsch TrafficCom Transportation S.A.U.
 - SEOPAN, Asociación de empresas constructoras y concesionarias de infraestructuras.
- Universities:
 - Universidad Politécnica de Madrid (UPM).
 - Universitat Politècnica de Catalunya (UPC).
 - Universitat de Valencia – Estudi General (UEVG).
- Research Centres:
 - Fundación para la Promoción de la Innovación, Investigación y Desarrollo Tecnológico en la Industria de Automoción de Galicia (CTAG).
 - Asociación Centro Tecnológico Ceit-IK4.

- Regional authorities:
 - Council of Vigo city.
 - Diputación Foral de Bizkaia - Bizkaiko Foru Aldundia.

Location

The five Spanish pilots are the following:

- **DGT 3.0**, located along the overall road network in Spain with an extension of approximately 12,270 Km. It will be deployed using cellular-based communication technologies (3G and 4G/LTE).
- **SISCOGA Extended**, comprehending the extension of an existing test site infrastructure located in the city of Vigo and its metropolitan area already prepared to test ITS-G5 communication technology. It will span 150 Km.
- **Madrid Calle 30**, located along the road "Calle 30" in Madrid, with approximately 32 km. C-ITS services will be deployed using hybrid communication technologies.
- **Cantabrian pilot**, deployed along approximately 75 km at the north of Spain using hybrid communications.
- **Mediterranean pilot**, deployed along approximately 125 km at selected road sections located in Catalonia and Andalusia using hybrid technologies.

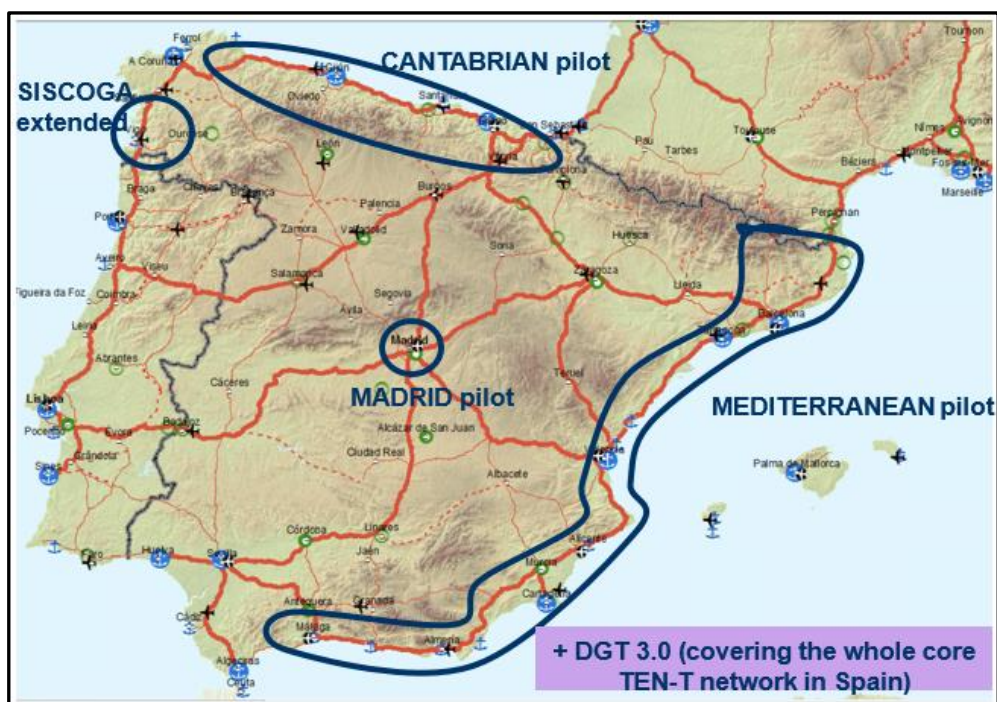


Figure 16: Location of the Spanish pilot site

Overview of progress by End of 2017

From the technical point of view, during 2017 an early planning and technical setup of the Spanish local pilots has been performed. It has been based mostly on the work and preliminary results derived from the C-Roads Platform's Task Forces.

Under this pre-deployment stage the Spanish group has been reviewing the technical documentation released by the C-Roads Platform in order to anticipate the technical modifications required to start the evaluation activities. Preliminary tests and studies have been performed in each subpilot, which will be reviewed and adjusted when the C-Roads Platform's TF3 has delivered the final technical specifications for the hybrid-communication scenario in milestone M16 (scheduled for June, 2018).

Meetings have been held between the pilot sites' leaders and public authorities in order to clarify technical aspects and responsibilities, and perform initial field evaluations on the specific locations where the new RSUs should be deployed.

Technical specifications of the RSUs and OBUs to be used during the piloting phase were made available during 2017, in order to start the setup and experimentation process. Complementarily, preliminary tests were made on RSUs and OBUs in order to verify their compliance with the technical specifications released by the Working Group 2 and related international standards.

Regarding public procurement, the DGT 3.0 platform, whose coordinator is the Spanish Traffic General Directorate (DGT), has been subject to a public tendering procedure during 2017. After some administrative delays, the evaluation of applications and the final awarding are expected for 2018, together with the start of piloting activities.

The final deployment and setup of the equipments, as well as preliminary tests, are expected to be finished by 2Q 2018. The start of the piloting phase is scheduled for July 2018 onwards and no delays are expected at present time.

A series of regular and Steering Committee meetings, apart from conference calls, have been held on the 22nd of March, 10th of July, 27th of October, and 4th of December, with the participation of C-Roads Spain partners. Governance and technical involvement has been structured, and roles and responsibilities have also been specified, although they will be subject to constant revision and refinements during the whole life of the Action. These meetings have resulted in an improved collaboration, a coordinated effort, and a unified position towards the C-Roads Platform.

Dissemination activities of the action took place during the event "TRAFIC 2017" (October 2017 in Madrid) in a dedicated session entitled "Jornada C-Roads Spain: Carreteras Conectadas", covering the organisation and relation of the C-Roads Platform and C-Roads Spain, as well as the Spanish pilot.

Indicative budget overview (in k€)

2016	2017	2018	2019	2020
0	1.546	7.751	5.428	3.254

19. Summary

In 2017 first prioritized use cases and technical specification has been developed as a guide for national C-ITS deployments. Based on that, pilot sites have defined the use cases they intend to deploy, and the precise sections to be equipped. Active participation of dedicated platform partners on national and international preparatory works for public procurements, deployment and integration of C-ITS system has been carry out.

To ensure interoperability of services, it is important to carry out cross-border tests. Therefore, in 2017 first cross-border tests took place (e.g. Netherlands, Germany, France and Austria).

Member State	2016	2017	2018	2019	2020
Austria	450	1530	8590	6240	2290
Belgium/Flanders	20	600	1400	900	300
Czech Republic	143	804	12408	3930	1518
France	1239	1086	4981	4439	2448
Germany	725	1553	3250	2307	1845
Netherlands	1100	3700	5200	3300	-
Slovenia	227,59	1386,46	686,86	430,66	91,5
UK	40	1190	7310	3950	-
Belgium/Wallonia	-	18	840	3800	462
Denmark	-	-	-	-	-
Finland	-	1900	1668	982	600
Hungary	-	-	120	630	1245
Italy	-	2119	9748	4827	4169
Norway	-	1690	1510	1650	750
Portugal	-	792	4259	2127	1177
Sweden	-	140	1800	1600	1700
Spain	-	1546	7751	5428	3254
Sum	3944,59	20054,46	71521,86	46540,66	21849,5

Figure 17: Indicative budget overview (in k€)