smartCEM

Smart connected electro mobility

D3.1 Operational plans for smartCEM platform

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Table 0.1 Abbreviations

Abbreviation	Definition
3G	3rd generation of mobile telecommunications technology
AD	Activity Diagram
API	Application programming interface
APP	Application (software)
BEV	Battery Electric Vehicle
BO	Back office
CAN	Controller Area Network
CDB	Central Database
CIP	Competitiveness and Innovation Framework Programme
CS	Charging Station
CSV	Comma Separated Values
CYC	Charge Your Car
DB	Data base
DOD	Degree of Discharge
EV	Electric Vehicle
FC	Functionality
FTP	File transfer protocol
FTS	Forensic Telecommunications Services
GPRS	General packet radio service
GPS	Global Positioning System

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Abbreviation	Definition
GTFS	General transit feed specification
GUI	Graphical user interface
HMI	Human Machine Interface
HTTP	Hypertext Transfer Protocol
ICE	Internal Combustion Engine
ICT	Information and Communication Technology
ID	Identity
IEEE	Institute of Electrical and Electronics Engineers
iOS	i operating system
ITS	Intelligent Transport Systems
IVR	Interactive Voice Response
LTE	Long term evolution
MCB	Miniature Circuit Breaker
MSDU	MAC Service Data Unit
NC	Network classes
OBU	On-Board Unit
OCPP	Open charge point protocol
O-D	Origin-Destination
OSM	Open street map
PAYG	Pay as you go
PHEV	Plug-In Hybrid Electric Vehicles
PI	Performance Indicator

Abbreviation	Definition
POI	Point Of Interest
PT	Public transport
RCB	Residual Current Breaker
RCD	Residual Control Device
REST	Representational state transfer
RFID	Radio Frequency Identification
RQ	Requirement
SaaS	Software as a service
SC	Speed classes
SDK	Software development kit
SH	Stakeholder
SIM	Subscriber Identity Module
SMMT	Society of Motor Manufacturers and Trader
SOA	Service-Oriented Architecture
SOAP	Simple Object Access Protocol
SOC	State Of Charge
TCP/IP	Transfer Control Protocol/Internet Protocol
UC	Use Case
UCAP	Ultra capacitors
UMTS	Universal Mobile Telecommunications System
UN	User Need
UNEW	Newcastle University

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Abbreviation	Definition
VPN	Virtual Private Network
WDM	Workflow and Demand Manager
WiFi	Commercial name of the wireless communication standard IEEE 802.11b
WP	Work Package
WSDL	Web Services Description Language
XML	eXtensible Mark-up Language

Executive Summary

D3.1 Operational Plans for smartCEM Platform defines the operational piloting approach and the trial characteristics for the whole of WP3, in alignment with the aims and objectives of the Evaluation-Validation Plan. This will ensure that all pilot sites are working towards a common goal and that the appropriate support and maintenance mechanisms are available to all sites throughout the functional operation phase.

The operations phase is closely linked to both the implementation and evaluation phases. *D2.5 Technical Verification of Functionalities* is the 'bridge' between implementation and operation, reporting the testing of the integrated smartCEM services 'on the ground' prior to the operations phase beginning. The main function of the operations phase is collection of quantitative and qualitative data for evaluation 'with smartCEM' against a baseline 'without smartCEM', with a view to assessing the extent to which the smartCEM system and services operate as designed, and influence user acceptance and uptake. Therefore, this deliverable must be read in conjunction with, *D4.1 Evaluation Framework*, *D4.2 Evaluation Criteria and Performance Indicators*, and *D4.3 smartCEM Experimental Design*.

D3.1 describes the approach to the functional operations phase across the four pilot sites and relates to work carried out in all tasks within WP3. However as T3.4 *Functional Operation* and T3.5 *Continuing Functional Operations* are ongoing, and because there may be slight differences between operations as they are planned and operations as they take place in practice, a further deliverable, D3.3 *Execution of Operations*, will be produced towards the end of the operations phase.

1   Introduction

1.1 Purpose and scope of D3.1

This document describes the approach to the functional operations phase across the four pilot sites.

At the time of writing the final integration of a range of smartCEM services is taking place at the sites in Barcelona, Gipuzkoa, Newcastle upon Tyne, and Reggio Emilia. These services are centred on the five areas of e-mobility: *EV-Navigation, EV-Efficient Driving, EV-Trip Management, EV-Charging Station Management*, and *EV-Sharing Management*. Some of the services already exist and some have been developed specifically for the project, but as an integrated smartCEM concept it is expected that they will, in the operations phase, increase awareness of e-mobility, enhance acceptance, and encourage uptake of EVs in everyday life.

The operations phase of smartCEM therefore focuses on the pilot sites. It manages and monitors trials aimed at testing the services and integrated system, and obtaining quantitative and qualitative data relating to both technical performance and user experience. Together these data will be used by the smartCEM evaluation partners for measurement of key performance indicators.

This document is closely linked to, and should be read in conjunction with, *D4.1 Evaluation Framework, D4.2 Evaluation Criteria and Performance Indicators*, and in terms of description of the 'on-the-ground' practicalities of the operations phase, *D4.3 smartCEM Experimental Design* and *D2.5 Technical Verification of Functionalities*. It is the main written output of the following WP3 tasks: T3.1 *Preparation for Pilot Operations*, T3.2 *Develop Stakeholder Engagement Process and Marketing*, and T3.3 *Establish Baseline*.

1.2 Structure of the document

The structure of the document is as follows:

- Chapter 2 describes the implementation of the evaluation plan in the pilot sites. It draws specifically on aspects of *D4.1 Evaluation Framework* and *D4.3 smartCEM Experimental Design*

- Chapter 3 provides background information about the pilot sites' characteristics and the stakeholders involved, along with a description of the baseline phase of data collection. It should be read closely with *D4.3 smartCEM Experimental Design*. The information about stakeholders per site is the output of work conducted in T3.2, the description of the baseline is the output of T3.3

- Chapter 4 summarises the status and results of the technical verification at the sites, proposed operational characteristics (including useful information such as helpdesk contacts), envisaged timescales for the operations phase,

interdependencies with the evaluation phase, and sustainability of operations post smartCEM. The chapter presents the situation as the operations phase is about to commence, its work relating directly to T3.4 and T3.5, which are 'ongoing' at the time of writing. Therefore this chapter is subject to updating and will form the core of the future deliverable D3.3 *Execution of Operations*

2 Implementation of the evaluation plan in pilot sites

2.1 The V-model evaluation methodology

The smartCEM Evaluation Framework described in D4.1 is based on a standard approach to implement a harmonised methodology across the four pilot sites. It describes the V-model [1], which considers evaluation activities from the start of a project [2]. It also ensures a direct connection between success criteria, the definition and execution of tests, and the assessment of impacts. The same methodology can be used even when sites have different implemented applications and functionality, as is the case in smartCEM. The methodology will help to maximize the synergy between the sites in the evaluation phase.

Although the evaluation model for smartCEM is based on the FESTA methodology [3], it has been adapted to meet the needs of smartCEM and match already available pilot site services. The smartCEM V-model is thus structured in three main phases: *Definition, Evaluation and Deployment* (see Figure 2-1).
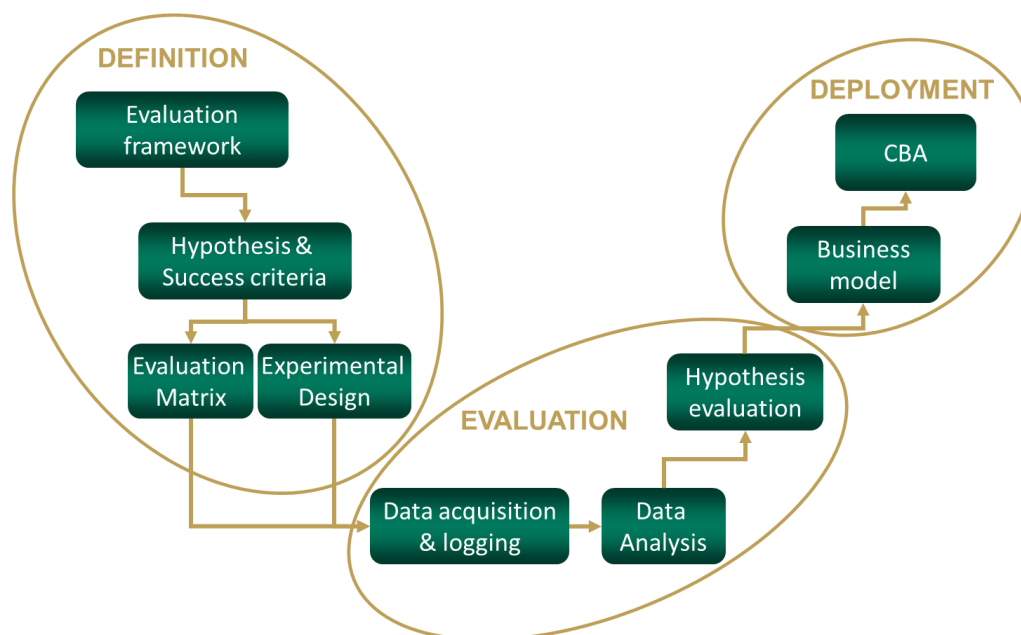
Fig. 2-1. smartCEM evaluation approach

Definition phase: a process that establishes the evaluation criteria, services to be evaluated, scenarios and test cases at the test sites where these services will be implemented and evaluated (together with vehicles and infrastructure required for the tests). The main outputs of this phase are:

- **Evaluation criteria:** each pilot site follows the evaluation criteria generation process, in terms of hypothesis and success criteria, completing an evaluation matrix as part of the process. The evaluation matrix is also linked to the other output of this phase, the experimental design

- **Experimental design:** containing the set of evaluation scenarios, i.e.

the process to be followed in order to evaluate the smartCEM services in different situations. The evaluation test cases, the test methods to be used, the situational variables and control factors, the data to be logged, the timeline for baseline and functional operation, are also constituted in the experimental design

Evaluation phase: includes establishing the baseline and the functional operation of the services in the pilot sites, i.e. data acquisition, logging and analysis of the required measures, in order to calculate the indicators, and therefore evaluate the hypotheses. The main outputs of this phase are:

- **Logged and analysed data at each pilot site**: the obtained indicators during baseline and functional operation for comparison

- **Evaluation results**: the analysis carried out in order to evaluate if thresholds established by success criteria during the definition stage have been reached

Deployment phase: this phase provides evidence for the policy decision-makers and/or the stakeholders, on the advantages and disadvantages of smartCEM services by assessing their potential impacts. In the project this phase is managed through T3.5 and thus links to WP6, especially *T6.2 Business Models*, *T6.3 Exploitation Plan* and *T6.4 Cost Benefit Analysis*.

D3.1 is primarily concerned with aspects of the definition and evaluation phases, notably <u>implementation of the experimental design</u> and the <u>proposed functional operation</u> of the services in the pilot sites.

2.2 Experimental design

As smartCEM is a pilot demonstration project the most relevant test methods, defined in D4.3, are:

- **Field trials:** testing in real conditions to identify and evaluate technical and/or non-technical aspects while using the system. It describes any test performed under specific conditions in the four smartCEM pilot sites. In these tests, the behaviour of the system and of the user will be monitored during the normal operation of the EVs within their natural activity environment. A large quantity of data will be recorded continuously during the planned months of testing, and the required measures for evaluating the performance indicators will be obtained from filtering the data

- **Test drives:** also performed under real conditions, but in this case there is a limit to the distance and time (start and end) of the test. Test drives will be used in smartCEM mainly for verification of the functionality of the applications (T2.5) and to test data acquisition (T3.3). In some cases they can be used for specific assessment of the drivers' behaviour and acceptance. One disadvantage of this type of test is that the repeatability of

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the measure is needed in order to guarantee the integrity of the performance indicators and impacts. Nevertheless, in a test drive every real driving situation is unique (situational variables such as traffic situation, other road users, weather, daylight, etc. may change); theoretically only a high number of samples allows typical situations to be classified or influencing values to be defined as significant

- **Subjective assessment methods (interviews/questionnaires):** the users of the smartCEM services (bus drivers, car drivers, passengers, etc.) are carefully considered within the evaluation process. A common approach for the four sites is followed with deployment of a suite of common questionnaires on user acceptance and uptake along with additional site-specific questions. The use of interviews/questionnaires is suitable for collecting systematic information on personal opinions, knowledge and behaviour. The use of pre-defined questions, answers or scales simplifies the analysis of results as well as facilitating their comparability (see D4.4 *smartCEM assessment tools*)

- **Observation:** can be done in an objective or subjective way, or both. Normally, this kind of assessment is carried out together with another method (e.g. test drives). Different goals can exist, for example observation of driver behaviour during specific situations (such as speed adaption at junctions, lane changes during peak hours, etc.)

2.3 A harmonised approach

Performance indicators are grouped into categories of evaluation, which are adapted from existing work in other projects or programmes, e.g. TeleFOT, FESTA, FITS, to meet the specifics of the smartCEM project. The categories of evaluation are:

- **Environment:** environmental impacts of the transportation system e.g. carbon emissions due to charging events. The carbon emission calculations will additionally take into account the energy mix of the area

- **Transport & Mobility:** specifies road users' attitudes, opinions and choices concerning travel behaviour such as trip decisions, mode choice, route choice or travel time, travel delays, vehicle speeds and traffic density

- **User Uptake:** how drivers make use of smartCEM services, invest in them, trust and accept them. Additionally, aspects of usability/user experience are relevant influences on user uptake as well as trust in the impact and functionality of the services, and willingness-to-pay

- **Driver Behaviour:** relates to changes in individual driving behaviour, such as acceleration and braking. These indicators can be used to contribute to an objective safety assessment

As will be seen in Chapter 3 the pilot sites have their own local characteristics and implement different use cases and services through specially designed scenarios. Ultimately they have different regional operation criteria and business models. This means that not all performance indicators, success criteria and measures can be the same in all sites, and therefore only some elements of the above evaluation categories will be comparable.

Detailed information about evaluation categories, performance indicators and measures is provided in D4.2. A full list of evaluation measures per site is provided in D4.3.

2.4 Towards functional operations - baseline

Trial activities need a starting point against which the impact of the systems and services that have been implemented can be measured. This is commonly known as the baseline or reference case. D4.3 proposed the following general definition of the baseline and functional operation in smartCEM:

- **Baseline**: current systems and services are up and running but the smartCEM services are not activated. Other measures that could be influencing the results should be measured during the tests, e.g. situational variables such as weather conditions
- **Functional operation**: the smartCEM services will be activated. In this case the same situational variables should be logged. This is known as the 'operations phase' in the remainder of this document

The next chapter provides an overview of the smartCEM pilot sites, correct as of April 2014, including brief description and outline of scenarios to be undertaken in the pilot demonstrators. It goes on to detail the stakeholders involved in the operation and evaluation phases and the establishment of the baseline position at each site.

3 Pilot site scenarios and stakeholders

3.1 Overview of pilot sites

The smartCEM Pilot Sites (Barcelona, Gipuzkoa, Newcastle and Reggio Emilia) have defined their own scenarios for the implementation of the smartCEM services which are based on sets of use cases defined in D2.1 *Reference Architecture*. Each site therefore has its own specification in terms of vehicles, in-vehicle equipment, infrastructure, and back-office equipment. In some cases several or even all the services work together in a single scenario, whereas in others each scenario is composed of a single service. Each scenario is designed in order to address different hypotheses and corresponding success criteria. Evaluation is carried out at both the smartCEM level and the pilot site level.

The scenarios are defined in detail in *D4.3 smartCEM Experimental Design* and the implemented services per site in D2.5 *Technical Verification of Functionalities*. There follows here a brief descriptive overview of the pilot sites including lists of scenarios per site.

3.1.1 Barcelona

The Barcelona pilot site will involve deployment of electric scooters. More specifically, an advanced open sharing service for electric scooters will be implemented involving the introduction of a unique innovative solution based on concepts such as "mobility on demand", intelligent infrastructures, dynamic pricing or incentive schemes for users. smartCEM services to be implemented include EV-Sharing Management, EV-Navigation, and EV-Efficient Driving.

The following scenarios have been defined based on use cases presented in D2.1:

Scenario code	Scenario title
SC-BCN-01	Electric scooter sharing service registration and booking
SC-BCN-02	Riding electric scooter
SC-BCN-03	Electric scooter sharing service check-in (start trip)
SC-BCN-04	Electric scooter sharing service check-out (end trip)

3.1.2 Gipuzkoa

The Gipuzkoa pilot site will implement hybrid public transport and EV car sharing. The hybrid bus scheme will run on two bus routes in San Sebastian. These routes are chosen due to their topography and topology.

The following smartCEM services will be implemented for the operational phase. Classified as pre-trip services, the EV-Sharing Management developed by ENNERA and Multi-Modal Trip Planner provided by Pluservice will be implemented. For on-trip scenarios, the PTV EV-Navigator (for EV-Sharing) and the Efficient Driving application (for Hybrid Buses) will be implemented.

5 different scenarios based on predefined use cases have been defined:

Scenario code	Scenario title
SC-GIP-01	Preparing the e-car sharing trip
SC-GIP-02	Driving in electric car sharing environment
SC-GIP-03	Preparing the trip for hybrid bus
SC-GIP-04	Driving hybrid bus
SC-GIP-05	Multimodal traveller

3.1.3 Newcastle upon Tyne

The Newcastle pilot site will be based on existing implementations of EVs in the city and wider region. Activities will involve compact urban electric cars, and will implement the EV-Charging Station Management services supplied by CYC, along with value-added services, namely the EV-Efficient Driving (UNEW), the EV-City Policy Tool (NEC), and a link to an existing Multi-Modal Transport Planner, Transport Direct. PTV-Navigation will also be implemented in conjunction with BlueDash on a small number of vehicles.

Two scenarios are defined based on 14 use cases:

Scenario code	Scenario title
SC-NEW-01	User manages services for charging
SC-NEW-02	Driving EV efficiently

3.1.4 Reggio Emilia

The Reggio Emilia pilot site will implement an experimental scenario in which the employees of a local administration can access smartCEM services in a fleet of equipped EVs. Users will be able to access services including EV-Navigation and EV-Efficient Driving. The EVs are provided by the local administration, the Municipality of Reggio Emilia).

Scenario code	Scenario title
SC_REG_01	Route to the nearest available charging point
SC_REG_02	Most efficient route to go from A to B
SC_REG_03	Find charging point

The following table (updated from D4.3) provides an overview of the physical and environmental context of the cities hosting smartCEM demonstrators.

	Barcelona	Gipuzkoa	Newcastle	Reggio Emilia
Environment	Urban (3,5 million population)	Urban (150.000 population), interurban	Urban, interurban, semi-rural (over 1 million population)	Urban (170.000 population)
Services	EV navigation, EV efficient driving, EV sharing management	EV navigation , EV trip management, EV efficient driving, EV sharing management	EV charging station management EV efficient driving EV policy tool EV navigation EV trip management	EV navigation, EV efficient driving
Transport type	Passengers (individual)	Passengers (individual and public; for EV sharing town council and municipality workers)	Passengers (individual)	Light weight goods transportation and passengers (individual)
Vehicles	45 EV scooter-sharing fleet	Hybrid bus, EV car-sharing	10 electric cars	10 minivans and cars
Infrastructure	Connected charging B.O., EV operator B.O., 137 charging points, in-vehicle data-loggers, smartphones (iPhone / Android) for EV users	2 bus lines, bus operator B.O., EV car sharing back office, front office, on-board devices, mobile devices	Over 1000 charging stations region-wide	14 charging stations and Power supply system

Table 3-1.Overview of pilot site environments

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3.2 Stakeholder engagement process

3.2.1 Involvement of key stakeholders

D4.1 Evaluation Framework provided recommendations for pilot sites relating to identification and recruitment of key stakeholders, with emphasis on end users who will undertake trials at pilot sites. Stakeholder categories are: Industrial, End User (driver or passenger), Research, Government, and Transport Service Provider. More specifically within these categories will be the following stakeholders:

- EV driver: umbrella term for any person driving one of: e-Car, e-Scooter, Hybrid Bus, e-Van

- Passenger: the person who uses the public hybrid bus transport

- EV sharing operator: service provider personnel entrusted with managing the fleet of electric vehicles in a sharing scheme

- Car sharing back office operator: person who revises the state of the EV, when the user returns the vehicle

- Public transport operator: person entrusted to provide the public transport (PT) service

- Car sharing operator: person who controls the level of charge for the electric vehicles, when the vehicles are returned, and who is going to charge the EV if needed for future use

- Enforcement officer: person that is legally able to enforce access to charging stations that are installed in public places

The next section summarises for each smartCEM pilot site the following information:

- Stakeholders involved

- Identification and recruitment of end users

- Engagement of stakeholders in operations and evaluation phases

- Training to be undertaken and recommendations

3.2.2 Barcelona stakeholders

Stakeholder # 1	Explanation	Response
Stakeholder name	The name of the local stakeholder	RACC
Category	What category is the stakeholder: • Industrial • End user • Research • Government	End user (automobile club)

	• Transport service provider • Other	
Number (end user only)	The number of end users involved	Approximately 250 registered users to the MOTIT service
Stakeholder contact	Organisational contact e.g. website	Josep Laborda josep.laborda@racc.es
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Pilot site leader
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	Ensure that all stakeholders directly involved in WP3 (MOTIT operator – Going Green - and IDIADA) cooperate effectively, by means of regular meetings and general coordination, with the help of CREAFUTUR
Training	Do you envisage any training for this stakeholder? Please give details	
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	

Stakeholder # 2	Explanation	Response
Stakeholder name	The name of the local stakeholder	GOING GREEN
Category	What category is the stakeholder: • Industrial • End user • Research • Government	Service provider (operator of the EV-Scooter sharing service, aka "MOTIT")

	• Transport service provider • Other	
Number (end user only)	The number of end users involved	Approximately 250 registered users to the MOTIT service
Stakeholder contact	Organisational contact e.g. website	http://www.goinggreen.es/en/
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Regular meetings
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	GG will ensure that data needed for evaluation is collected by the data-loggers, packed, compressed and correctly sent to IDIADA's local database on a permanent basis; if data interface is interrupted for whatever reason, RACC or IDIADA will coordinate with GG technical staff in order to have problems fixed in a timely manner
Training	Do you envisage any training for this stakeholder? Please give details	Might need some testing and bugs fixing before start collecting baseline data, in close cooperation with IDIADA
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	RACC will invite GG to showcase MOTIT service to different kinds of audiences; for example, RACC to organize iMobility Challenge event in Barcelona, in cooperation with the FIA, where MOTIT will be shown (expected Q3 2014); demonstration of MOTIT service during smartCEM consortium meeting Barcelona 16-18 December 2013

Stakeholder # 3	Explanation	Response
Stakeholder name	The name of the local stakeholder	IDIADA

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Category	What category is the stakeholder: • Industrial • End user • Research • Government • Transport service provider • Other	Research and Service Provider
Number (end user only)	The number of end users involved	Approximately 250 registered users to the MOTIT service
Stakeholder contact	Organisational contact e.g. website	Álvaro Arrúe Alvaro.Arrue@idiada.com
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Regular meetings
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	In charge of the local database implementation, receiving data from the e-scooters, storing and posting to the smartCEM central database by UNEW; evaluation of equivalent CO2 emissions
Training	Do you envisage any training for this stakeholder? Please give details	Might need some testing with GG before start collecting baseline data
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	

Stakeholder # 4	Explanation	Response
Stakeholder name	The name of the local stakeholder	CREAFUTUR
Category	What category is the	Research / Consultancy

		stakeholder: • Industrial • End user • Research • Government • Transport service provider • Other	
Number (end user only)	The number of end users involved	Approximately 250 registered users to the MOTIT service
Stakeholder contact	Organisational contact e.g. website	Martí Jofre m.jofre@creafutur.com
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Regular meetings
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	
Training	Do you envisage any training for this stakeholder? Please give details	
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	

Stakeholder # 5	Explanation	Response
Stakeholder name	The name of the local stakeholder	Barcelona Municipality
Category	What category is the stakeholder: • Industrial	Government

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	• End user • Research • Government • Transport service provider • Other	
Number (end user only)	The number of end users involved	Approximately 250 registered users to the MOTIT service
Stakeholder contact	Organisational contact e.g. website	Simon Hayes simonjd.hayes@gmail.com
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Regular meetings
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	
Training	Do you envisage any training for this stakeholder? Please give details	
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	

3.2.3 Gipuzkoa stakeholders

Stakeholder # 1	Explanation	Response
Stakeholder name	The name of the local stakeholder	EV drivers

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Category	What category is the stakeholder: • Industrial • End User (driver or traveller) • Research • Government • Transport service provider • Other	two types of End Users: - Individuals (public) - Town council and municipality workers
Number (end user only)	The number of end users involved	Around 40
Stakeholder contact	Organisational contact e.g. website	NA
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Car sharing operators informed public about the sharing service with advertisements in the local media and the internet.
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	Drivers will take an active role as the focal point of the operations and evaluation phase. They complete before and after questionnaire surveys (baseline/ operations) to evaluate smartCEM services from the user perspective
Training	Do you envisage any training for this stakeholder? Please give details	Before starting the operational phase, some kind of information or workshops must be prepared for the EV-drivers, in order to explain updates in the service. These should be conducted by the car-sharing operator, as service provider.
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further	Workshops to explain smartCEM services and to collect questionnaire feedbacks.

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		details where they are known	

Stakeholder # 2	Explanation	Response
Stakeholder name	The name of the local stakeholder	Dbus (Municipal bus Company of San Sebastián)
Category	What category is the stakeholder: • Industrial • End user • Research • Government • Transport service provider • Other	Public Transport Service Provider, end user of the EV Efficient Driving Service.
Number (end user only)	The number of end users involved	390 Drivers
Stakeholder contact	Organisational contact e.g. website	Eduardo González egonzalez@dbus.es www.dbus.es
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Pilot Site for the EV Efficient Driving Service.
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	Ensuring that all the phases of the project are accomplished. The Technical department of Dbus will take the responsibility of involving all the organization of Dbus to achieve all targets. (with for ex: meetings with unions, dissemination leaflets shared between drivers…)
Training	Do you envisage any training for this stakeholder? Please give details	
Events	Will your site be organising any events e.g. workshops, networking, results and	

	feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	

Stakeholder # 3	Explanation	Response
Stakeholder name	The name of the local stakeholder	Public transport travellers
Category	What category is the stakeholder: • Industrial • End user • Research • Government • Transport service provider • Other	End users
Number (end user only)	The number of end users involved	185000 inhabitants. Potential users of Public Transport in Donostia.
Stakeholder contact	Organisational contact e.g. website	
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	They are the current users of Dbus
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	Mainly through dissemination channels: • Local Press notes • Information in Dbus web page • Information in Dbus TV channel (inside buses)
Training	Do you envisage any training for this stakeholder? Please give details	
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc.	As long as results are obtained in the evaluation phase those will be used to reinforce dissemination

	- For this stakeholder - For all stakeholders Please give dates and further details where they are known	information to Dbus users.

Stakeholder # 4	Explanation	Response
Stakeholder name	The name of the local stakeholder	DATIK
Category	What category is the stakeholder: - Industrial - End user - Research - Government - Transport service provider - Other	Industrial. Technology Provider
Number (end user only)	The number of end users involved	
Stakeholder contact	Organisational contact e.g. website	www.datik.es
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Previous contacts with Dbus offering such similar products as EV-efficient Driving for SmartCEM
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	DATIK has developed the system and works closely to Dbus during all phases from the beginning. During the project DATIK has to maintain the system operational and solve and update the system when needed.
Training	Do you envisage any training for this stakeholder? Please give details	
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. - For this stakeholder	Regular meetings are arranged to discuss the results and problems identified. Usually arranged in Dbus facilities so if it's

	• For all stakeholders Please give dates and further details where they are known	needed the Hybrid bus is there for testing.

Stakeholder # 5	Explanation	Response
Stakeholder name	The name of the local stakeholder	EMUGI (service provider)
Category	What category is the stakeholder: • Industrial • End user • Research • Government • Transport service provider • Other	Government: - Elgoibar municipality, which provides EMUGI car-sharing service to its employees and public end-users.
Number (end user only)	The number of end users involved	
Stakeholder contact	Organisational contact e.g. website	http://emugi.net/ http://emugicochecomparti do.net/es/
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	Elgoibar municipality collaborates in smartCEM with their car-sharing service EMUGI. Regular meetings will be conducted between Gip PS smartCEM partners and EMUGI in order to control smartCEM services inclusion process and to have updates about project status.
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	Elgoibar municipality has been operating with EMUGI EV-sharing service for more than two years. They will let smartCEM collect information from their systems during baseline and operational phases. At the same time, they have seen as positive the inclusion of new smartCEM services to

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		test in their car sharing during the operational phase.
Training	Do you envisage any training for this stakeholder? Please give details	Training sessions or informative meetings will be scheduled in order to explain to the stakeholder the usage process for the different smartCEM services added for the operational phase. At the same time, it is expected to forward these new services usage training information to end users via web or organising some kind of workshops.
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	Involvement in Mobility Events. Not defined or scheduled yet.

Stakeholder # 6	Explanation	Response
Stakeholder name	The name of the local stakeholder	ENNERA (technology provider)
Category	What category is the stakeholder: • Industrial • End user • Research • Government • Transport service provider • Other	Industrial
Number (end user only)	The number of end users involved	
Stakeholder contact	Organisational contact e.g. website	http://www.ennera.com
Site links with stakeholder	How are you establishing links with this stakeholder?	ENNERA is a smartCEM partner and jointly delivers the Gipuzkoa pilot site.

		Regular meetings and conference calls are held to discuss strategic approach
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	ENNERA has installed its EV fleet monitoring system, known as MOBERA, in the main car-sharing services in Gipuzkoa Province.
Training	Do you envisage any training for this stakeholder? Please give details	NA
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	Involvement in Mobility Events for smartCEM.

3.2.4 Newcastle stakeholders

Stakeholder # 1	Explanation	Response
Stakeholder name	The name of the local stakeholder	Charge Your Car (CYC)
Category	What category is the stakeholder: • Industrial • End User (driver or traveller) • Research • Government • Transport service provider • Other	Industrial
Number (end user only)	The number of end users involved	
Stakeholder contact	Organisational contact e.g. website	http://chargeyourcar.org.uk/

Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	CYC is a smartCEM partner and jointly delivers the Newcastle pilot site. Regular meetings and conference calls are held to discuss strategic approach
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	CYC supplies the CS infrastructure and the CYC APP, along with selected charging transactions data
Training	Do you envisage any training for this stakeholder? Please give details	NA
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	Involvement in a Final Mobility Event (date late 2014)

Stakeholder # 2	Explanation	Response
Stakeholder name	The name of the local stakeholder	Hyperdrive
Category	What category is the stakeholder: • Industrial • End User (driver or traveller) • Research • Government • Transport service provider • Other	Industrial
Number (end user only)	The number of end users involved	
Stakeholder contact	Organisational contact e.g. website	http://hyperdrivetechnologies.co.uk/
Site links with	How are you establishing links	Hyperdrive is a smartCEM

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stakeholder	with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	partner and jointly delivers the Newcastle pilot site. Regular meetings and conference calls are held to discuss strategic approach
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	Hyperdrive is equipping vehicles with Bluedash technology along with its own OBU for participation in the operations phase.
Training	Do you envisage any training for this stakeholder? Please give details	NA
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	Involvement in a Final Mobility Event (date late 2014)

Stakeholder # 3	Explanation	Response
Stakeholder name	The name of the local stakeholder	Individual drivers
Category	What category is the stakeholder: • Industrial • End User (driver or traveller) • Research • Government • Transport service provider • Other	End user (driver)
Number (end user only)	The number of end users involved	10
Stakeholder contact	Organisational contact e.g. website	NA
Site links with stakeholder	How are you establishing links with this stakeholder?	Recruitment takes place from existing pool of drivers

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		who participated in project SWITCH EV
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	Drivers will take an active role as the focal point of the operations and evaluation phase. They complete before and after questionnaire surveys (baseline/ operations) to evaluate smartCEM services from the user perspective
Training	Do you envisage any training for this stakeholder? Please give details	The NCL PS will hold briefing meetings for involvement of end user drivers where they will receive technical and legal/ethical advice
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	Involvement in a Final Mobility Event (date late 2014)

3.2.5 Reggio Emilia stakeholders

Stakeholder # 1	Explanation	Response
Stakeholder name	The name of the local stakeholder	Reggio Emilia Municipality
Category	What category is the stakeholder: • Industrial • End User (driver or traveller) • Research • Government • Transport service provider • Other	Government

Number (end user only)	The number of end users involved	20
Stakeholder contact	Organisational contact e.g. website	http://www.municipio.re.it/ (Italian language)
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	RE municipality is the owner of the fleet of EVs which will be used to evaluate smartCEM services in the REG PS
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	UNIMORE will install the components required to use the smartCEM services on the vehicles and will manage operational phase. All the operations will be performed in close contact with RE Municipality by means of both physical meetings and conference calls.
Training	Do you envisage any training for this stakeholder? Please give details	UNIMORE will perform an evaluation of smartCEM services after the operational phase and provide a feedback to the Municipality.
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	- Meeting for involvement of end users (e.g. training). - Final pilot site forum

Stakeholder # 2	Explanation	Response
Stakeholder name	The name of the local stakeholder	ENEL
Category	What category is the stakeholder: • Industrial • End user (driver or traveller) • Research	Industrial

	• Government • Transport service provider • Other	
Number (end user only)	The number of end users involved	
Stakeholder contact	Organisational contact e.g. website	http://www.enel.com
Site links with stakeholder	How are you establishing links with this stakeholder? This can include for example driver recruitment, launch workshops, etc.	UNIMORE will keep ENEL informed of the progress and the results of the operations at the test site
Details of stakeholder involvement	How will the stakeholder be involved throughout the operations and evaluation phase? This might include for example regular meetings, incentives, feedback sessions, etc.	ENEL wrote a LOI with regards to the project. It is not directly involved in the project, but it is very interested in the results and in the possible outlooks of the smartCEM services. ENEL is the energy provider and manager of Public Charging spots available in Reggio Emilia.
Training	Do you envisage any training for this stakeholder? Please give details	A full report of the project operations will be submitted by UNIMORE to ENEL at the end of the project
Events	Will your site be organising any events e.g. workshops, networking, results and feedback, etc. • For this stakeholder • For all stakeholders Please give dates and further details where they are known	ENEL will be invited to attend Final pilot site forum

3.3 Establishing the baseline

The baseline is the standard against which smartCEM WP4 will perform the evaluation, using defined performance indicators and systems and services implemented at sites. It therefore provides the basis for subsequent assessment of how efficiently the system or application behaves according to expected

objectives, enabling conclusions to be drawn about the overall impact of smartCEM.

Baseline data is both quantitative (operational) data and qualitative (questionnaire-based) data obtained from drivers and other users of EV services. User questionnaires developed in WP4.4 gather initial stakeholder opinions and feedback on proposed smartCEM services. This subjective baseline is used, post-trial, to assess the degree of improvement in indicators such as user acceptance, vehicle performance, and in some cases willingness to pay for smartCEM services.

This section focuses on the collection of the operational data, with a sub-section for each site explaining how the process is performed.

3.3.1 Barcelona baseline

In Barcelona data will be supplied from the MOTIT scooter sharing service. MOTIT is a new service which on launch already has integrated smartCEM services available. This means that a "before smartCEM" baseline is not possible in the conventional sense. To address this, the Barcelona partners in collaboration with the evaluation partners have analysed the Barcelona performance indicators to identify several areas where limited baseline data may be obtained. Additionally, the EV-Efficient Driving service (post trip analyser) is being delivered separately from other smartCEM services and can therefore be evaluated in "before and after" fashion, although with a limited baseline and operations phase, whilst selected questions on user surveys reveal before and after viewpoints. **This limited data collection is performed during March-April 2014.**

3.3.2 Gipuzkoa baseline

The baseline process for Gipuzkoa is conducted in three different blocks: The baseline data coming from the EV-Sharing service, the Hybrid Buses, and the hospital service. The approach is illustrated in Fig. 3-1. **In Gipuzkoa the baseline process for the Hybrid Bus was performed during April-July 2013, whilst for EV-Sharing it has been performed from December 2013-March 2014. Baseline for the hospital service will be performed in June 2014 and will be described in D3.3.**

EV-Sharing Service

ENNERA has installed the car fleet management system in the main car-sharing services for the Gipuzkoa province. EMUGI car-sharing, located in the municipality of Elgoibar, is the case study that takes part in smartCEM. The fleet management system of EMUGI already monitors data in order to control the car-sharing service. Data comes from the OBUs installed in the vehicles, and also from the inputs of users and administrators via management web interfaces. The data is stored within the EV-Sharing system database.

For the baseline, this system database has been analysed in order to check which of the data already being stored is required for evaluation and what more needs to be acquired.

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Another database has been created within the ENNERA servers, in which part of the system data is transferred and other data is collected via external APIs (Google Maps, Weather-Euskalmet, etc.). A script has been generated to execute this data transfer/acquisition process every midnight, creating new registers per day in a new database. Data format in this database has been adapted according to the evaluation requirements defined for WP4.

Every day, after registering the corresponding information for the day in the database, three of the tables (RESERVATIONS, EVENTS and POSTPROCESS tables) are exported in .csv format and uploaded to the central server with the timestamp and table names defined in the filenames.
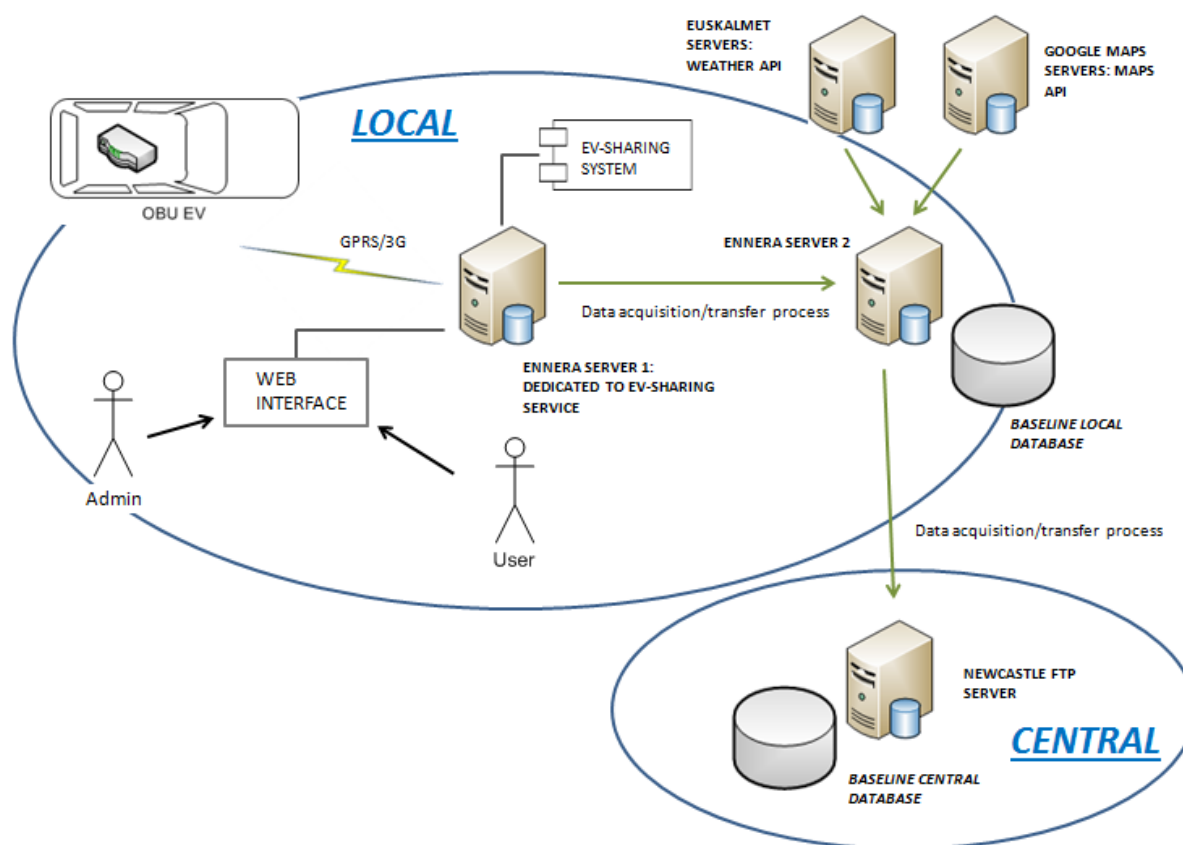

Fig. 3-1. Gipuzkoa baseline data collection

Hybrid Bus

The EV-Efficient Driving system was installed by DATIK and DBUS in the hybrid bus in April 2013. From July, the system was occasionally switched on in a testing phase. With the feedback from this period the Alerts system was enhanced. In October the system was officially and continuously switched on. At the same time the back office tool (iPanel) was developed and DBUS personnel were trained to analyse the information generated. All the information generated by the EV-Efficient Driving system can be monitored in real time once each trip is completed.

3.3.3 Newcastle baseline

In Newcastle the baseline data collection has been performed from December 2013-March 2014.

The process mirrors the full operations phase giving a full "before and after" picture of EV operations in smartCEM at the Newcastle pilot site. The process is conducted using off-the-shelf vehicle loggers fitted to participating vehicles. The logger has the capability to measure position (through GPS) and also to extract multiple different variables from the vehicle's CANbus. The data is then transmitted back to the central server (located at UNEW) via GPRS. The collected data is then processed over each vehicle trip to form a series of aggregate variables that can be used to easily analyse the data.

3.3.4 Reggio Emilia baseline

The baseline data collection in Reggio Emilia was delayed because of technical implementation issues specific only to that site. As a result it has been agreed that a 2-month baseline data collection will suffice, to be performed in May-June 2014.

Baseline quantitative data are collected by means of the fleet of EVs (Piaggio Porter minivans) owned by the Municipality of Reggio Emilia: the EVs are available for free for the Municipality's employees, who can use them for personnel and light goods transportation around the city.

All of the EV keys are stored at the Municipality premises and are managed by an electronic cabinet, consisting of a cupboard containing keys, which can be accessed by using a magnetic badge. When a user is identified, the system releases a set of keys, based on the user's privileges, from which he or she can choose one to take. 10 vehicles will be used to both collect baseline data and later to test the services, and a pre-defined group of 20 smartCEM users will be directed towards the vehicles. When a user takes a key, the system logs information such as: user ID, EV ID, time of usage (taking and returning of the key).

In order to gather vehicle data from the EVs, UNIMORE installed a set of OBUs on the 10 selected vehicles: in particular, for the baseline period only a BlueDash unit and a signal machine (an analogic/digital converter) were installed on the vehicles. This latter unit has the purpose of interfacing the BlueDash with the EV's electrical network, due to the fact that this type of EV lacks the CANbus.

The technical equipment will gather vehicle data (e.g. state of charge, current, tension) and will communicate them to a remote server located at UNIMORE. Data will be sent to this "on-site" server via GPRS (3G in case of data transfer operated by tablet). Data will also be sent to the central server located at UNEW. Users will drive the vehicles normally in this first configuration and will be later given access to smartCEM services during the operational phase.

Concerning subjective data, the involved Municipality's employees will be asked to fill in a set of questionnaires defined in WP4: their answers will be used as a comparison after the operational phase in order to assess the acceptance of the smartCEM services.

4 smartCEM operations phase

Chapter 4 describes the key features of the smartCEM operations phase per site. The first section provides an overview of the functional verification of smartCEM services, in effect the 'bridge' between the implementation and operations phases.

Section 4.2 lists key operational characteristics at each site, for example contacts, infrastructure, number of vehicles, and number of drivers. This section will be elaborated in a more descriptive way in D3.3. A timeframe is also provided (section 4.3).

Section 4.4 describes the interdependencies between the operations phase and the evaluation phase. The work of T3.5 is not described here, as it is only at a formative stage. Detailed reporting of that task will take place in D3.3.

4.1 Functional verification of smartCEM services

This section presents a summary of the key steps taken to perform functional verification of smartCEM services at the pilot sites. This process is the final link between the implementation phase (WP2) and the full operations phase (WP3), and as such its execution is prerequisite to the commencement of the operations phase.

For a full description of the functional verification process including step-by-step approach, images, and results, the reader is referred to D2.5 *Technical Verification of Functionalities*.

Functional verification of smartCEM services was carried out at all sites during February 2014.

4.1.1 Barcelona

The focus in Barcelona is the EV-Sharing service. The following scenario for functional verification covers the core functionality of the smartCEM services to be tested (EV-Sharing, EV-Navigation, and EV-Efficient Driving):

- When using the sharing service in Barcelona the end user needs to register to the service providing personal information by filling a form. If everything is correct the service administrator will accept the registration and enable the bookings for this user fulfilling BCN_UC_01: User registration

- Afterwards, the user can start making a booking of the shared vehicles using both the web application or the iOS/Android application fulfilling BCN_UC_04: Immediate Spot Trip Booking, BCN_UC_05: Planned Spot Trip Booking, BCN_UC_06: Time-based booking and BCN_UC_08: Incentives management (dynamic pricing) for efficient fleet management

- Once the booking is completed, the user can modify booking parameters or also cancel the reservation using the web application or the smartphone application fulfilling BCN_UC_10: Cancellation / modification of spot trips

- After the confirmation of the correct booking parameters, the user gets a notification on where to pick up the vehicle during the booking period. The user smartphone app is used in the picking up process, as it is used to lock and unlock the vehicle during the booking progress fulfilling BCN_UC_07: e-scooter check-in

- When driving the vehicle, the user has the possibility to use the on board tablet as an EV-Navigation system, in order to have some driving aids during the trip (indications, battery level, etc.) fulfilling BCN_UC_11: e-scooter riding

- After finishing the trip, the user needs to indicate through the smartphone application that the trip has been finished without problems fulfilling BCN_UC_12: e-scooter check-out

The testing of this scenario covers all the services implemented for Barcelona Pilot Site.

4.1.2 Gipuzkoa

In order to perform the functional verification of smartCEM services, Gipuzkoa has carried out three principal scenarios, as follows.

An EV-Sharing user books a vehicle for a trip (EV-Sharing, EV-Navigation, and CS Management):

- When using a sharing service in Gipuzkoa the end user needs to register the service providing personal information on a form. If everything is correct the service administrator will provide a user card fulfilling GIP_UC_01: e-Carsharing registration/EV-Sharing

- Afterwards, the user can book service vehicles, using both the web application or the android application provided for clients fulfilling GIP_UC_02: e-Carsharing booking/ EV-Sharing

- Once the booking is complete, the user can modify booking parameters or also cancel the reservation using the web application or the android application fulfilling GIP_UC_04: Web/android application booking modification/ EV-Sharing

- After confirmation of the correct booking parameters, the user goes to the car-sharing station to pick up the car. The RFID card is used in the picking up

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process, as it is used to lock and unlock the vehicle during the booking progress fulfilling GIP_UC_06: start e-CarSharing/EV-Sharing

- On trip the user can also modify the booking parameters using the OBU fulfilling GIP_UC_08: On-Board booking modification/ EV-Sharing

- When driving the vehicle, the user has the possibility to use the on-board tablet as an EV-Navigation system, in order to have some driving aids during the trip (indications, efficiency, battery level, etc.). The CS Management service shows the list of CS. If a CS is selected, the EV-Navigation service is executed and gives indications to reach the place fulfilling GIP_UC_07: e-Carsharing driving / EV Navigation, CS-Management Service

- After finishing the trip, the user needs to indicate that the next RFID card reading will close both the vehicle and the booking fulfilling GIP_UC_09: finish e-CarSharing and GIP_UC_10: e-CarSharing Data Analysis/ EV-Sharing

A user driving the Hybrid Electric bus equipped with the EV-Efficient Driving system:

- The tester (driver) must validate the beginning of his driving shift, introducing this information in the ticketing machine. The information is sent to the Efficient Driving application to activate the specific parameters of eco-driving

- Specific information is given to the driver during the trip, via the Efficient Driving application

- Once the shift is completed, the data recorded is sent to the local server

A user combining EV-Sharing/Public Transport (Multimodal Trip Planner):

- If an already registered EV-Sharing user wants to travel using different transport modes, the user has the option to plan the trip using the Multimodal Trip Planning service fulfilling GIP_UC_03: Multimodal travel planning /Multimodal Trip Planner

- When a multimodal travelling service is selected, the end user has the possibility to combine two options:

  i. EV-Sharing driving (Refer to Test Case: An EV-Sharing user books a vehicle for a trip)

  ii. Public Transport travelling fulfilling GIP_UC_05: Multimodal travelling/Multimodal Trip Planner

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The testing of these three scenarios covers all the services implemented for Gipuzkoa Pilot Site.

4.1.3 Newcastle

Two scenarios are defined at the Newcastle site, based on 14 use cases. Functional verification scenarios are based closely on these full scenarios, as follows.

User manages services for charging:

- The basis for testing this scenario is access to the CYC APP. The user registers for the service and downloads the APP to his/ her smartphone. Once this is done the tester launches the APP fulfilling NEW_UC_01: Charging station management APP access

- The user is then able to perform a variety of actions testing the functionality of the CYC APP. These include searching for a charging station, checking its availability, its cost, whether it is standard or fast charging, and seeing attributes in either list or map form. A route can be plotted to the charge point. These actions fulfil NEW_UC_07: CS search and NEW_UC_14: Integration with EV navigation. The tester then notifies the system of intention to charge (NEW_UC_12)

- Following this the testing process moves to the EV itself. The main features to test here are: efficiency of navigation function to charging station using on board unit; charging station access and user validation. Tests will involve use of RFID which will be swiped on the charge post to validate the user's ID and authorize payments. If this process is successful the charge post will display the appropriate user interface and is unlocked ready for use, along with notification of payment. This step tests NEW_UC_02: Charging station access with RFID and NEW_UC_13: User validation

- The final steps involve the charging process and the conclusion of the charging process (NEW_UC_05: Charging initiation; NEW_UC_06: Charging conclusion). This requires effective attachment of the charging cable and on completion of charging, correct detachment of the cable and full efficient communication with back office (BO) in order to re-set the charge point

Driving electric car efficiently:

- This scenario is tested on desktop PC. The tester opens the web-based tool registration page. Upon registration a username is generated along with a password. The tester can then log into the system. The log-in process will ensure that each user can only access his/ her driving data. The relevant use case is NEW_UC_11: Efficient driving

- Once in the system the tester can choose a vehicle id from a drop down menu (vehicle registration number) and can access data relating to his/ her trips in that vehicle as the registration number is referenced against his/ her unique user id. Efficient driving advice is provided related to: acceleration, speed, regenerative braking, and time of charging. Links to CYC and the Transport Direct multi-modal trip planner will also be tested

4.1.4 Reggio Emilia

The end users who will experience and take advantage of the smartCEM services are the employees of the Municipality of Reggio Emilia, which has a fleet of EV (Piaggio Porter) available for the work trips of the employees. The scenario devised to perform functional verification can be described as follows:

- After registering to the list of EV users, a municipality employee driver is able to book his trip with an EV fulfilling use case REG_UC_02: EV-sharing standard booking

- If the booking was successful, the municipality employee can access the CS and pick the EV up fulfilling REG_UC_04: EV-pick up

- He drives the EV to his destination taking advantage of the smartCEM on-board services, then brings it back to the CS fulfilling REG_UC_05: EV-sharing driving

- Any interaction with the fleet is reported to the e-Car Sharing Server where it is stored and processed fulfilling REG_UC_07: Car-sharing data report

- After the first trip of each user, tailored real-time advice on efficient driving will be provided to the driver according to his/her records fulfilling REG_UC_08: Real-time advice on efficient driving

4.2 Description of approach to operational phase

This chapter presents a checklist of key operational information for each pilot site.

4.2.1 Barcelona

Operational characteristics	Describe
Site manager	Josep Laborda (ACASA - RACC) josep.laborda@racc.es
Site technical integrator	Álvaro Arrúe (IDIADA) Alvaro.Arrue@idiada.com

	Martí Jofre
	m.jofre@creafutur.com
Database manager	Álvaro Arrúe (IDIADA)
	Alvaro.Arrue@idiada.com
Helpdesk (if different from above)	
# of vehicles	45 motorcycles
# drivers	1000 registered users
# charging stations	141
On-board equipment	Datalogger + Android-based tablet (attached to the e-scooter handlebar)
Subjective data collection	Local survey (online); only operation (no baseline)
	Non-EV users survey (online)
Operations phase Start date	September 2013
Operations phase End date	October 2014

4.2.2 Gipuzkoa

EV Sharing

Operational characteristics	Describe
Site manager	Txomin Rodriguez (TECNALIA)
Site technical integrator	ENNERA, oiribar@ennera.com,+34943028676
Database manager	ENNERA, oiribar@ennera.com,+34943028676
Helpdesk (if different from above)	N/A
# of vehicles	4 Electric Cars
# drivers	Around 40 drivers (EV-Sharing service users)
# charging stations	4 standard charging points divided in 2 CS
On-board equipment	4, OBU, working for data logging and as a user interface for the booking management. Provided with 3G/GPRS and GPS communications, and a RFID

	reader.
	4, On board android tablets with the corresponding windscreen support, used for EV-Navigation and the CS-Management applications.
Subjective data collection	Ex Ante and Post Ante user surveys
Operations phase Start date	01/04/2014
Operations phase End date	01/10/2014

Hybrid BUS

Operational characteristics	Describe
Site manager	Eduardo González / egonzalez@dbus.es
Site technical integrator	Eduardo González / egonzalez@dbus.es
Database manager	Beñat Aramburu / baranburu@datik.es
Helpdesk (if different from above)	
# of vehicles	1 Hybrid Bus
# drivers	390 Municipal Bus Company Drivers
# charging stations	None
On-board equipment	CAN BUS Data Logger for vehicle data capture
	Bluetooth Connector for data transmission to tablet
	Samsung Galaxy Tab II 7.0 as HMI interface
	Dedicated wirings, connectors and anti-vandalism mounting
Subjective data collection	Surveys to be carried out among drivers / More than 30
	Drivers acceptance transmitted to DBUS in regular meetings with Unions
Operations phase Start date	October 2013
Operations phase End date	Not defined

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4.2.3 Newcastle

Operational characteristics	Describe
Site manager	Simon Edwards, simon.edwards@ncl.ac.uk
Site technical integrator	Graeme Hill, g.a.hill@ncl.ac.uk
Database manager	Graeme Hill, g.a.hill@ncl.ac.uk
Helpdesk (if different from above)	As above
# of vehicles	2 x HYPERDRIVE CUE Vs with BlueDash 7-10 x UNEW Peugeot Ions
# drivers	10 car drivers
# charging stations	A mixture of over 600 standard and fast charge points is available in the region, which has the highest density of CS in the UK (1400 CPs in UK as a whole)
On-board equipment	Data loggers: • BlueDash on HYPERDRIVE vehicles • RDM data loggers on remaining vehicles
Subjective data collection	Common survey baseline and operations Local survey baseline and operations Non-EV users survey (online)
Operations phase Start date	1st April 2014
Operations phase End date	30th September 2014 (smartCEM Final Event in Newcastle on 25th September 2014)

4.2.4 Reggio Emilia

Operational characteristics	Describe
Site manager	Leandro Guidotti leandro.guidotti@unimore.it
Site technical integrator	Leandro Guidotti leandro.guidotti@unimore.it
Database manager	Leandro Guidotti leandro.guidotti@unimore.it

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Helpdesk (if different from above)	Leandro Guidotti leandro.guidotti@unimore.it
	Daniele Pinotti daniele.pinotti@unimore.it
# of vehicles	10 fully electric Piaggio Porter
# drivers	20 municipality employees
# charging stations	Standard
On-board equipment	• 1 tablet (ASUS Fonepad) with charging cable and customized bracket and box • 1 BlueDash unit (i.e. DQuid Xee) for data gathering, data transmission and sensors (e.g. GPS). • 1 signal machine (analogic/digital converter) to interface the BD unit with the Porter. • Dedicated wiring and connectors.
Subjective data collection	• EV acceptance • smartCEM services acceptance • Range Anxiety
Operations phase Start date	June/July 2014
Operations phase End date	December 2014

4.3 Timeline

Figure 4-1 below presents the timeline for completion of the baseline and operations phases per site. This clearly illustrates the specific baseline data collection in Barcelona, the proposed hospital service data collection in Gipuzkoa (H), and the delay to the baseline and operations phase data collection in Reggio Emilia.

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Site	M24 Dec 13	M25 Jan 14	M26 Feb 14	M27 Mar 14	M28 Apr 14	M29 May 14	M30 Jun 14	M31 Jul 14	M32 Aug 14	M33 Sep 14	M34 Oct 14	M35 Nov 14	M36 Dec 14
BASELINE													
BAR				▓									
GIP	▓	▓	▓	▓			H						
NEW	▓	▓	▓	▓									
REG						▓	▓						
OPERATIONS													
BAR					▓	▓	▓	▓	▓	▓			
GIP					▓	▓	▓	▓	▓	▓	▓		
NEW					▓	▓	▓	▓	▓	▓			
REG								▓	▓	▓	▓	▓	▓

Fig. 4-1. Timeline for baseline and operations phases

Key: thick black lines indicate deadline for completion of baseline and operational questionnaire data collection

4.4 Interdependencies with evaluation phase

The Operations phase of smartCEM has a strong link to the Evaluation phase (WP4). In the following sections the key considerations of this relationship can be found, with all terminology used as defined by WP4.

4.4.1 From 'acquired' measures to performance indicators through 'required' measures

The following definitions are needed to better understand what is explained below:

- **Performance indicator**: used as evaluation criteria to determine the performance or impact of smartCEM services

- **'Required' measures**: measures needed for the calculation of the performance indicators, as indicated in D4.2 *Evaluation Criteria and Performance Indicators* and in the "SMARTCEM Measures-V11.xlsx" Excel file. Required measures are the ones directly linked to the indicators needed for the data analysis and evaluation process

- **'Acquired' measure**: measures as stored in the local database. Tables were defined for each pilot site in D2.4 *Logging Tools DB Definition* according to requirements for the generation of the required measures list from acquired measures. An example of an acquired measure is GPS coordinates, which in themselves are not relevant to the performance indicators; however, from GPS coordinates required measures like trip start and end point, and thus distance, can be determined

The interdependence between acquired measures, required measures and performance indicators can be seen in Figure 4-2.
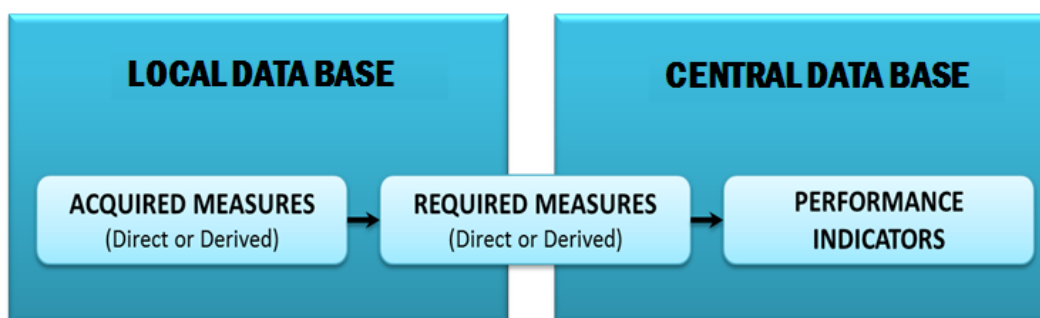
Fig.4-2. Relationship between acquired measures, required measures and performance indicators

In addition, the CO_2 tool developed in WP4 post-processes obtained indicators on energy and fuel consumption.

Finally, user uptake questionnaires, an important part of the evaluation process, are to be stored. The questionnaires are developed according to, and consistent with, the general questions defined for the 4 CIP projects. These questionnaires

are defined in D4.4 along with the specific implementation guidance for smartCEM. These questionnaires have been defined with a core part that is common for all four pilot sites in order to obtain higher level conclusions where possible. This will depend on the context of each pilot site (e.g. type of vehicles, type of users and their profile, or the environment of the application). The user uptake questionnaires analysis will be performed within WP4.

PI Evaluation Category	Research Question	Hypothesis	Success Criteria	Indicator ID	Indicator description	Required measures		Equation
Environment	Do EV- efficient driving and EV-navigation services change energy consumption?	EV-efficient driving and EV-navigation service will reduce energy consumption of EV	The average energy consumption will be < 12 kWh.	PI_NEW_1	Average energy consumption (kWh/100 km)	ME-404	Energy consumption (per trip)	"=(kWh consumed*100/km driven) per user"
						ME-120	Travelled distance (per trip)	

Table 4-1. Example of relationship between a performance indicator and its required measures extracted from D4.2 annex

4.4.2 Implementation of questionnaires

<u>User uptake questionnaire</u>

A core questionnaire has been defined for the four pilot sites (see Annex 1). This core questionnaire contains questions for the four subcategories identified for evaluation: EV acceptance, smartCEM services acceptance, range anxiety and willingness to pay.

smartCEM services acceptance evaluates the usefulness and satisfaction levels separately for each service. Pilot sites consider only the questions corresponding to the services implemented.

Wherever one of these four subcategories is addressed, the core questions will be applied. For some sites certain questions are not relevant. Table 4-2 summarises the subcategories according to the user profiles at each Pilot Site).

	BARCELONA	GIPUZKOA			NEWCASTLE	REGGIO EMILIA
		Car-sharing	Hybrid bus	Hospital		
EV acceptance	Y	Y			Y	
smartCEM acceptance	Y	Y	Y	Y	Y	Y
Range anxiety	Y	Y			Y	Y
Willingness to pay	Y	Y				

Table 4-2. Application of questionnaires per pilot site

The aim is to compare ex-ante (baseline) and ex-post (operations) where possible. This means that both questionnaires are needed to properly evaluate the results. In some parts of the questionnaire, like the one corresponding to the evaluation of smartCEM services, comparative questions have been implemented.

Pilot Sites implement questionnaires and collect opinions ensuring data quality, whilst the CDB ensures common platform and format and WP4, as internal customer of the questionnaires, verifies that the info stored is what is needed.

Platforms for collecting users' opinions include a number of different strategies including meetings with users (institutional, professional users), mailing, in-vehicle questionnaire (paper) or internet applications. This is at the discretion of the sites.

Non-EV user questionnaire

It is highly relevant to survey non-EV users as this is the future untapped market for EV uptake and it is important to understand what barriers or perceived barriers exist to achieving this. The same questionnaire will be implemented for all the sites.

Given the nature of the targeted participants, it makes no sense to differentiate between the baseline and operational stages.

This questionnaire will not be stored in the CDB. The wider scope of the target population requires the results from this online survey to be post-processed directly from the survey website. This analysis will be a task of WP4.

4.4.3 Quality data assurance

The objectives of quality data assurance are to ensure collecting means, process robustness and a minimum of opinions required. A list of recommendations for smartCEM addressing this issue is presented below, with more details available in D4.3 *Experimental Design*:

- Effective participant data collection, including age, gender and other demographic information

- Consideration of situational variables (where possible) to allow data analysts to put in context the calculated indicators

- Ensure robust data acquisition and avoid loss of data by periodic testing of data logger hardware and software, ensuring their functionality during the test periods

- Ensure that in-vehicle systems continue to behave in a reliable and expected way

- Ensure that nomadic devices used as interfaces operate properly, including the issue of battery depletion

- Obtain a significant sample size, preferably a number of valid samples greater than 50

- Ensure calibration of systems to correlate measures from different source and verification against established requirements

- Effective data transmission to establish a routine procedure to ensure correct storage and reduce data losses

- Ensure data consistency to ensure storage capacity by only storing relevant data for analysis, including checking data consistency before deletion from data loggers

- Synchronization to ensure that measures from different data loggers in one pilot site are linked through a correct temporal relationship using consistent time-stamping protocols

- Ensure effective data storage to ensure free space in data loggers and databases to avoid data losses

Pilot site database managers have a responsibility to ensure data quality at their sites. Guidance has been provided by the Evaluation partners in a spreadsheet "SMARTCEM Quality Data Assurance" Excel file. This file contains four worksheets to be uploaded to the project's shared space as follows:

- Implementation: to be filled only once (unless pending issues exist to be updated)

- Daily (acquisition): calendar table with 4 data to be filled daily

- Weekly (acquisition): calendar table with 4 data to be filled daily

- Period (acquisition): summary of numbers and lessons learnt on acquisition

4.5 Sustainability of operations post-smartCEM

As T3.5 *Continuing Functional Operation* has not yet started, this section will be reported in the forthcoming D3.3.

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5 Conclusion

D3.1 reports the work of T3.1-T3.4 of smartCEM. It has explained the process of baseline data collection and the plans for the operations phase per pilot site within the context of the Evaluation Framework and the Experimental Design devised in WP4. The close interdependencies with the evaluation phase are stated throughout, especially in Chapters 2, 3, and section 4.4.

The dependency of the operations phase on the implementation phase is strong, and attempt has been made to emphasise this. A specific task, T2.5, acts as a bridge between the implementation and operations phase; it is in this task that the smartCEM services per site are tested prior to commencement of full operations. Without this technical verification of functionalities, the operations phase could not take place.

It has been stated in the text that this deliverable cannot report all the work of WP3. Furthermore, pilot site operations tend to be quite fluid in their planning, continuing to evolve until the day operations begin. It is in recognition of these facts that an additional deliverable, D3.3 *Execution of Operations*, is proposed for delivery later in 2014.

References

[1]   Systems Engineering - System life cycle processes, ISO/IEC 15288 (2009)

[2]   Driessen, B., Hogema, J., Wilmink, I., Ploeg, J., Papp, Z., & Feenstra, P. (2007). The SUMMITS Tool Suite: supporting the development and evaluation of cooperative vehicle- infrastructure systems in a Multi-Aspect Assessment approach (TNO memo 073401-N17). Delft: TNO Verkeer en Vervoer

[3]   FESTA: http://www.fot-net.eu/download/festa_handbook_rev4.pdf (accessed 14th October 2013)

[4]   smartCEM, D2.1, Reference architecture, 2012

[5]   smartCEM, D2.4, Logging tools DB definition, 2013

[6]   smartCEM, D2.5, Technical verification of functionalities, 2014

[7]   smartCEM, D4.1, Evaluation framework, 2012

[8]   smartCEM, D4.2, Evaluation criteria and performance indicators, 2012

[9]   smartCEM, D4.3 smartCEM experimental design, 2013

[10]   smartCEM, D4.4, smartCEM assessment tools, 2013

[11]   smartCEM, Description of Work, 2012

List of Tables

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6 Annex 1 User Uptake Questionnaires

User-questionnaire: general user-uptake intermediate version

Demographic

What is your age?

_____

What is your gender?

❏ female   ❏ male

How many average km per trip do you usually drive with an EV?

less than 25 km	26-50 km	51-75 km	76-100 km	101-125 km	126-150 km	more than 150 km
❏	❏	❏	❏	❏	❏	❏

User acceptance (Electric vehicles acceptance)

1. What is your opinion about driving an electric car/scooter based on your experience?

bad opinion	inadequate opinion	fair opinion	good opinion	excellent opinion
❏	❏	❏	❏	❏

Why?

_____

2. Did this/these service(s) improve your previous perception about the electric cars/scooters?

Certainly not	Unlikely	About 50:50	Likely	For sure
❏	❏	❏	❏	❏

Why?

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3. From your own point of view, what benefits do you see in using an electric vehicle with the current functions based on your experience? Write a number from 1 to 6: 1 the most important, 6 the least important

_____ Low running cost (€/km)

_____ Reduced carbon emissions

_____ No noise

_____ Reliable technology

_____ Easier to drive

_____ Other:_____

4. How many times have you driven an electric car/scooter?

First time	Less than 5 times	Between 5 and 20 times	More than 20 times
❏	❏	❏	❏

5. Based on your current experience, would you consider driving electric cars/scooters more often in the future?

Certainly not	Unlikely	About 50:50	Likely	For sure
❏	❏	❏	❏	❏

User acceptance (smartCEM services acceptance)

Please tick a box on every line. The box in the middle is the neutral position

1. I find the **EV- Efficient driving application**......

1	useful	|_|_|_|_|_|	useless
2	pleasant	|_|_|_|_|_|	unpleasant
3	bad	|_|_|_|_|_|	good
4	nice	|_|_|_|_|_|	annoying

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5	effective		—	—	—	—	—	superfluous
6	irritating		—	—	—	—	—	likeable
7	assisting		—	—	—	—	—	worthless
8	undesirable		—	—	—	—	—	desirable
9	raising alertness		—	—	—	—	—	sleep-inducing

2. I find the **EV-Navigator system**......

1	useful		—	—	—	—	—	useless
2	pleasant		—	—	—	—	—	unpleasant
3	bad		—	—	—	—	—	good
4	nice		—	—	—	—	—	annoying
5	effective		—	—	—	—	—	superfluous
6	irritating		—	—	—	—	—	likeable
7	assisting		—	—	—	—	—	worthless
8	undesirable		—	—	—	—	—	desirable
9	raising alertness		—	—	—	—	—	sleep-inducing

3. I find the **EV-Trip Management service**, to plan my multimodal trip………

| 1 | useful | |—|—|—|—|— | useless |
| 2 | pleasant | |—|—|—|—|— | unpleasant |

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3	bad		—	—	—	—	—	good
4	nice		—	—	—	—	—	annoying
5	effective		—	—	—	—	—	superfluous
6	irritating		—	—	—	—	—	likeable
7	assisting		—	—	—	—	—	worthless
8	undesirable		—	—	—	—	—	desirable
9	raising alertness		—	—	—	—	—	sleep-inducing

4. I find the **EV-Sharing application**......

1	useful		—	—	—	—	—	useless
2	pleasant		—	—	—	—	—	unpleasant
3	bad		—	—	—	—	—	good
4	nice		—	—	—	—	—	annoying
5	effective		—	—	—	—	—	superfluous
6	irritating		—	—	—	—	—	likeable
7	assisting		—	—	—	—	—	worthless
8	undesirable		—	—	—	—	—	desirable
9	raising alertness		—	—	—	—	—	sleep-inducing

5. I find the **EV-Charging management** application......

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#			
1	useful	|—|—|—|—	useless
2	pleasant	|—|—|—|—	unpleasant
3	bad	|—|—|—|—	good
4	nice	|—|—|—|—	annoying
5	effective	|—|—|—|—	superfluous
6	irritating	|—|—|—|—	likeable
7	assisting	|—|—|—|—	worthless
8	undesirable	|—|—|—|—	desirable
9	raising alertness	|—|—|—|—	sleep-inducing

Range anxiety

1. Please rate the following statement: I feel comfortable concerning the range of the electric car/scooter.

fully-disagree	disagree	neutral	agree	fully-agree
❑	❑	❑	❑	❑

2. Did this/these service(s) improve your previous perception about the range of the electric cars/scooters?

Certainly not	Unlikely	About 50:50	Likely	For sure
❑	❑	❑	❑	❑

Why?

_____

3. Please rate the following statements:

	fully-disagree	disagree	neutral	agree	fully-agree

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Using the smartCEM services made me more secure about the range of my battery.	❑	❑	❑	❑	❑
Using the smartCEM services made me more confident to reach my target within the range of my battery.	❑	❑	❑	❑	❑
I trusted the smartCEM services to provide me with accurate information.	❑	❑	❑	❑	❑
The smartCEM services made me worry less about the range of my battery.	❑	❑	❑	❑	❑
The smartCEM services improved my confidence to take longer trips.	❑	❑	❑	❑	❑

Willingness-to-pay

1. Please rate the following statements:

	certainly-not	*unlikely*	*about-50:50*	*likely*	*for-sure*
I would consider buying an electric vehicle.	❑	❑	❑	❑	❑
I would pay a plus for the implemented service(s): car-sharing, trip management, etc.	❑	❑	❑	❑	❑

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