IRIS

Integrated and Replicable Solutions for Co-Creation in Sustainable Cities

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User, Business and Technical requirements of Transition Track #3 Solutions

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0.2	20/11/2017	Updated template shared with LH/FC representative partners
0.3	07/01/2018	Initial contribution by LH (pre-pilot)
0.4	15/02/2018	Consolidated version and feedback by CERTH
0.5	02/04/2018	Contribution by LH (demonstration)
0.6	02/05/2018	Final contribution by LH (all chapters)
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0.8	31/05/2018	Contribution by LH/FC (replication)
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Disclaimer

Executive Summary

The present document is the Deliverable "D1.4: User, Business and Technical Requirements of Transition Track #3 Solutions" of this IRIS project. The document presents the work undertaken in the Task 1.3 "Integration synergy on Transition Track #3: Smart e-Mobility Sector" of WP1, towards the definition of requirements and specification for the corresponding solutions (technical, operational, legislative, regulatory framework, business etc.). In addition, the aspect of lessons learnt is included, aiming primarily at helping IRIS LHs and FCs to familiarize among themselves of what is the previous experience related to the IRIS solutions expected to be investigated in detail, in the course of the project. The depicted in this Deliverable information can act as the baseline for know-how and experience exchange both among the IRIS participating entities as well as at EU level.

The 3 LH cities (Utrecht, Nice and Gothenburg) are going to deliver various demonstration use cases, taking into account the local needs of different environments (building energy inadequacy, needs for reducing the energy consumption and the household bills, noise and atmospheric pollution, etc.). The demonstrations are based on pre-pilots of previous projects that will move a step further, trying to integrate the proposed solutions to a wider extent of area, following a scalable, but at the same time replicable pathway. All LH cities and Follower cities (Vaasa, Alexandroupolis, Tenerife and Focsani will replicate the solutions using the experience by the demonstration activities, after being fitted to their local needs, overcoming their individual barriers and fostering their drivers towards transforming their cities into smarter, more energy efficient, less environmentally polluted, but most of all citizen needs centered.

The present deliverable, along with deliverables D1.2, D1.3, D1.5 and D1.6, is purposed to provide information concerning the demonstrations that are going to be undertaken in the Lighthouse cities (LH) during the IRIS project, using as a basis the pre-pilot areas of them. They have already a mature-enough based previous experience and considerable know-how of the peculiarities of most of these IRIS Solutions, since these have already been demonstrated (in a lower scale though), in their territory. The above-mentioned deliverables give the Lighthouse (LH) and Follower (FC) cities the opportunity to exchange know-how and opinions on how each of the IRIS solutions can be in the best way integrated in their site as a first point, and through the replication process at city level. During the deliverables' preparation phase, the IRIS partners established a strong collaboration both, at a local level (between the energy experienced partners of each LH and FC ecosystem), as well as, at the IRIS level (between key partners from LH and FCs). This collaboration and knowledge exchange resulted in the collection of a big amount of information about (a) pre-pilots, (b) demonstrations and (c) replications.

D1.4 takes into account the individual characteristics of each city and provides a detailed description of the pre-pilots and a top-level description of the expected demonstration and replication activities, to be conducted within the next four (4) years of IRIS project evolution. It covers a variety of topics that will be further analysed and elaborated in the context of WP3, WP5, WP6, WP7 and WP8. These work packages include tasks that will present in detail the information provided by D1.4.

D1.4 is devoted to Transition Track #3 (TT#3. The main scope of TT#3 is to implement and integrate solutions that encompass the use of electric vehicles for both Public and Private transport and the provision of innovative mobility services such as car-sharing and mobility as a service schemes. The 3 LH cities (Utrecht, Nice and Gothenburg) are going to deliver various demo use cases in different environments. All LH cities and Follower cities (Vaasa, Alexandroupolis, Tenerife and Focsani will replicate the solutions using the experience by the demonstration activities. D1.4 has undertaken a survey to provide all the data needed to deliver a clear idea with many specifications of the pre-pilots, demonstration and replication activities that are about to take place in the IRIS ecosystem. The established collaboration along with the collected information about the integrated solutions of

TT3 make it feasible for IRIS to have a quick start in order to successfully demonstrate and replicate the best practices the partners already have.

Table of Contents

Table of Figures

Table of Tables

List of Acronyms and Abbreviations

Abbreviation	Definition
EV(s)	Electric Vehicle(s)
FC	Follower City
ICT	Information and communication technology
IPT	Inductive Power Transport
LH	Lighthouse
MaaS	Mobility as a Service
PuT	Public Transport
PV	Photovoltaic
V2G	Vehicle to Grid

1. Introduction

The main objectives of Transition Track #3 (TT#3) aim at the integration and demonstration of smart e-mobility solutions. Within TT3 there are two complementary main streams, electromobility and car-sharing, in addition to mobility-as-a-service, priority for public transport and environmental apps, aiming at:

a) Increasing the use of renewable energies in the mobility sector by promoting the use of electric vehicles, both tackling public transport (buses) and private transport (vehicles)
b) Increasing the use of car-sharing systems by providing better fleet management schemes and services to the users
c) Reducing the use of private vehicles by promoting Mobility-as-a-Service schemes
d) Upgrading the improvement of the commercial speed of public transport vehicles (buses and trams) by providing low cost priority solutions at signalized intersections
e) Improving the quality of life of the citizens by providing apps dedicated to the monitoring of pollen levels in the city

The repository of Technical solutions, to be demonstrated, primarily and in short include:

a) V2G schemes to let electricity flow from vehicles to the electric distribution network and back
b) Free-floating car-sharing schemes able to provide a better service and coverage
c) Mobility-as-a-Service schemes combined with housing and neighbourhood schemes
d) Priority solutions for Public Transport based on cost-effective technologies
e) Apps for monitoring pollen concentration in urban areas

1.1 Scope and objectives of the deliverable

The purpose of this document is to update and gather more detailed information for each of the Individual IRIS Solutions. It is based on the information included in the proposal document in section 1.3.8, providing more detailed and accurate information. It will be the main point of reference for the both LH cities and the FCs. In addition, this document will be used for evaluating if the planning of demonstrations and replication is feasible, being the basis for the work in WP5-6-7, where the actual demonstration activities will actually need to take place in the course of the project.

The main objective of the deliverable is to provide a preliminary planning of the demonstration and replication activities taking into account the existing know-how from previous or on-going projects and the already tested practices from the pre-pilot areas. Towards this scope, there will be a detailed description of the pre-pilot areas and the applied technologies. The description will comprise the initial requirements and technical specifications concerning the application of the solution. In particular, this document basically supports the Transition Track's aims to increase the use of electric and smart solutions for mobility. In addition, it gives an insight for the replication of the conceived IRIS solution, which will be demonstrated, taking into consideration not only the individualities and the specific needs of the LH cities, but also the needs and the objectives of the FCs which are not yet clearly illustrated. Finally, the overall process will point out the benefits of the European Cooperation for a large share of stakeholders and investors. The collected data and the schemes of D1.4 will be the reference for the demonstration and replication activities in WP5-WP7.

In view of that, TT#3 IRIS solutions, already from the project submission phase, have been grouped in two different group of Solution, namely,

IS-3.1: Smart Solar V2G EVs charging

IS-3.2: Innovative Mobility Services for the Citizens

All LH cities have already implemented pre-pilots on the above subjects and will extend them in means of demonstration or replication, while all FC will have replication activities.

Table 1: *Planning of Pre-pilot (P) / Demonstration (D) / Replication (R) of the IRIS Solutions in the LH and FC*

Integrated Solutions	Lighthouse Cities									Follower Cities			
	Utrecht			Nice Cote d' Azur			Gothenburg			Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
IS-3.1: Smart Solar V2G EVs charging	P	D	R	P	D	R	P	-	R	R	R	R	R
IS-3.2: Innovative Mobility Services for the Citizens	P	D	R	P	D	R	P	D	R	R	R	R	R

1.2 Structure of the deliverable

The structure of this document is general enough in order to fit to the needs of each Individual IRIS Solution description, as being proposed in the IRIS proposal. The same structure has been used for Transition Tracks #1, #2 and #3. The deliverable is structured and organized in the following chapters:

- Chapter 2 introduces a basic methodology for the process of gathering information from the LH/FC cities and the involved stakeholders. It also presents the interaction phases with the participation of most of the stakeholders and the multiple well-organized routes that have been followed, to at a first level gather the necessary information and at a second level consolidate and present it, in an easy-readable manner.
- Chapter 3 provides a summary concerning the pre-pilot, demonstration and replication IRIS expected activities, along with an overview of them, setting as core element of that, the varying technology characteristics that will be demonstrated and replicated by the LHs and FCs, in the form of summarized Tables. This structure is expected to allow the reader of this Deliverable for a fast overview of the individual solutions being pre-piloted, demonstrated and expected to be replicated in each LH and FC.
- Chapter 4 provides an overview of how transition track 3 being described in D1.4 is linked with the forthcoming activities in the rest of WPs. Since the information gathered in this Deliverable is acting as the baseline onto which the IRIS will be run, it is important for someone to know what is he/she should expect to be conducted during the next four (4) years of the project. Detailed and more concrete that currently available information will be gathered and monitored in the following WPs. Moreover, key aspects as Business Models development for each of the solutions being described here, also associated with corresponding Legal issues are expected to be populated by the next WPs.
- Chapter 5 presents a very brief overview of the main conclusion derived about the IRIS solutions, after the consolidation of the information being gathered during this period of project running (i.e. nine (9) months) on the levels of a) pre-pilots, b) demonstration and c) replication areas.
- Chapter 6 lists the references used during the description of the main body and annexes of the deliverable. The reference list is not much extensive, since the provision of primary information, written in this Deliverable originates from the ecosystems of the LHs and FCs.

- Two annexes have been included at the end, including detailed data about the pre-pilot, the demonstration and the replication planning of the IRIS Solutions 3.1 and 3.2 respectively. The annexes present the application area and the available infrastructure of the pre-pilots, the potential area for the demonstration and replication activities as well as the key technical components to be used. Finally, it also includes the data management plan, the regulatory framework, the bounds and the business models to be followed.

1.3 Relation to Other Tasks and Deliverables

Table 2 depicts the relation of this deliverable to other activities (deliverables) developed within the IRIS project.

Table 2 *Contribution of D1.4 to deliverables from WPs 5-8*

Deliverable Number	Title
D5.1, D6.1, D7.1	Report on baseline, ambition & barriers for Utrecht / Nice / Gothenburg lighthouse interventions
D5.2, D6.2, D7.2	Planning of Utrecht / Nice / Gothenburg integration and demonstration activities
D5.5, D6.5, D7.5	General Framework of the integration and implementation plan of the respective IRIS Solution to be demonstrated in Utrecht / Nice / Gothenburg
D8.1	A Roadmap for replication of activities
D8.4, D8.6, D8.8, D8.10	Vaasa / Alexandroupolis / Santa Cruz de Tenerife / Focsani replication plan

D1.4 contains valuable information for the above-mentioned deliverables, as it covers a variety of topics that will be further analysed and elaborated in their context.

2. Methodology

2.1 Approach to gather information from LH/FC cities and involved stakeholders

The purpose of this report is twofold. On the one hand it will drive the process of collecting information (technical, business, lessons learned etc.) from all different stakeholders involved in the different IRIS Solutions, mainly from the Lighthouse cities. On the other hand, it will allow the rest of the cities (both Lighthouse and Follower) to have a better understanding of the details of each of the IRIS Solutions, to allow them to better map how they can be demonstrated and/or replicated. The existence of five similar deliverables in WP1 (i.e. D1.2, D1.3, D1.4, D1.5 and D1.6) made it necessary to create a common methodology for the information collection.

As the deliverables require input from a large number of partners, a key element of the data collection process was the establishment of a strong collaboration between the horizontal partners involved in WP1 activities (i.e. CERTH the leader of T1.1, T1.2 and T1.3, CIVITY the leader of T1.4, and HKU the leader of T1.5) and key representatives of LH and FCs. Moreover, concrete working teams (both technical and managerial) established from all LH and FC ecosystems for the integrated solutions of each transition track.

The communication between the local ecosystems and the horizontal partners took the form of bi-monthly virtual meetings. In addition, CERTH, CIVITY and HKU created questionnaires/templates and circulated them to LH and FCs. The purpose of these templates is to update and gather more detailed information per each of the individual IRIS Solutions, based on the preliminary information included in the proposal document in section 1.3.8. The structure of the questionnaires/templates was general enough in order to fit to the needs of each Individual IRIS Solution description, as being proposed in the IRIS proposal. As Transition Tracks #1, #2 and #3 dealt with similar technologies (i.e. energy and mobility), the same template structure and process were used for the collection of information for D1.2, D1.3 and D1.4. CERTH provided detailed instructions to assist the document preparation process.

2.2 Phases in interaction with stakeholders

The deliverables preparation phase consists of four phases (Figure 1). Each phase involved different stakeholders from LHs and FCs. The local ecosystems provide information based of the above-mentioned templates. In each phase the LH or FCs were asked to fill in specific sections of the template. CERTH evaluated the provided information and asked for clarifications or corrections. A number of iterations/discussions ensured the high quality of the collected information.

The phases with their results are described below and are further linked to each of the different sections of the annexes that present the different integrated solutions of TT3.

Phase 1: Detailed Description of Pre-Pilots **–>** Elaborated Outline of Pre-Pilots per Solution (Solution's Requirements, Geographical Overview, Key Technical Components, and Lessons Learnt).

Phase 2: Feasibility and Description of Demonstrations & Replications **–>** High-level picture of Demonstrated & Replicated Solutions in LH Cities (Brief Technical Description, Geographical Overview, and Objectives/Needs & Opportunities).

Phase 3: Business & Regulative Aspects of Demonstrations & Replications **–>** Framework Overview of Demonstrated & Replicated Solutions in LH Cities (Data Management, Regulatory Framework(s), Technology Bounds & Drivers, and Business models).

Phase 4: Replication of IRIS Solutions in FCs **–>** Impact of each IRIS Solution (Brief Technical Description, Geographical Overview, Objectives/Needs & Opportunities, Regulatory Framework(s), Technology Bounds & Drivers, and Business models).

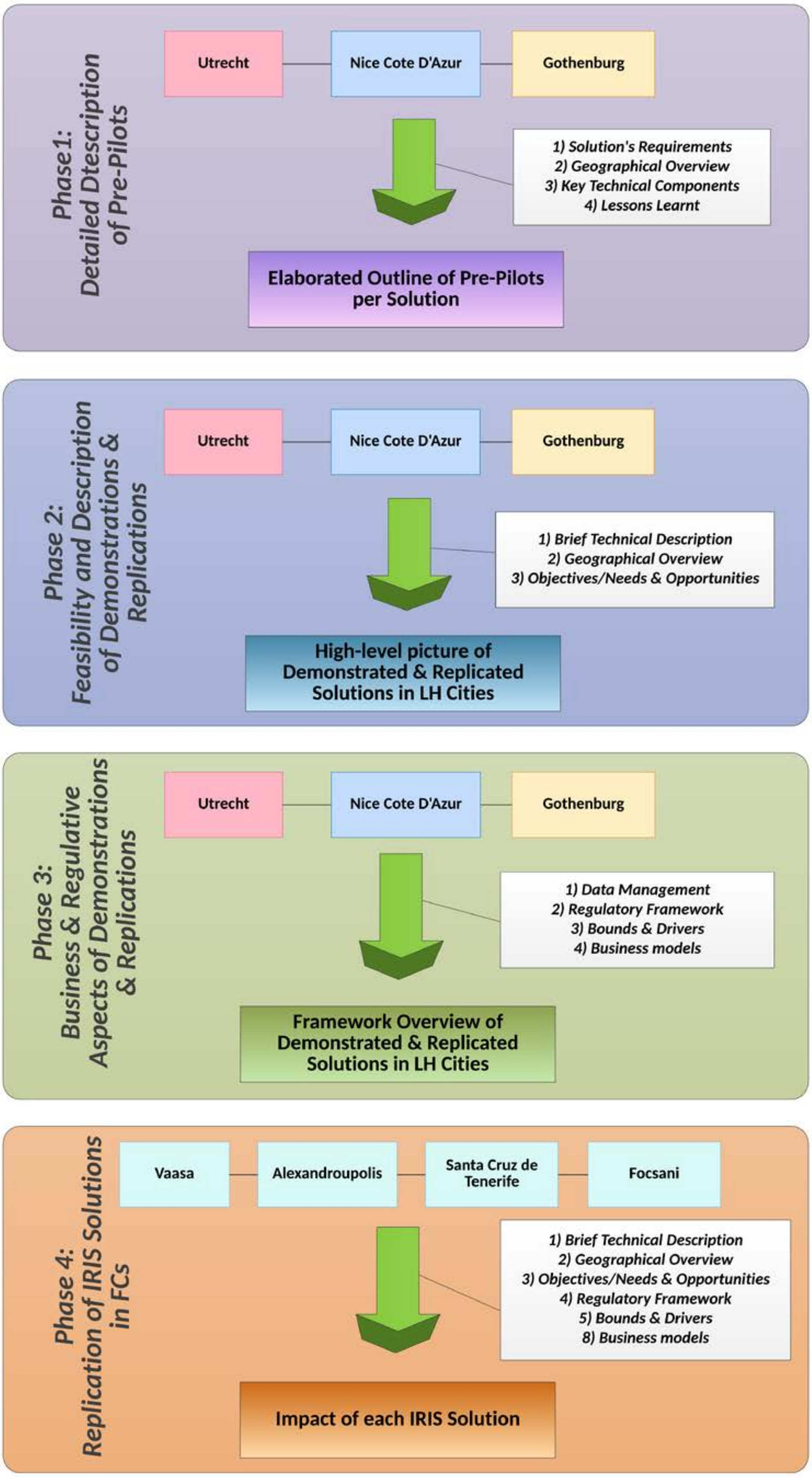

Figure 1: Phases in the preparation of D1.2

2.3 Collaboration Procedures

A two-way collaborative relationship was established between IRIS partners that resulted in collecting the required information from both LH and FCs. The collaboration worked on two levels:

1. **At a local level** with regular meetings (every 2-3 weeks) between the partners that are involved in the implementation of the relevant integrated solutions.
2. **At a project level** with bi-monthly meetings between CERTH, the representatives of LH cities (2 persons from each city) and the representative of FCs (Vaasa).

At the beginning of each phase, CERTH presented the requirements of that phase to LH and FC representatives. After an in-depth discussion, each city representative was able to guide the local partners on the collection of required information. In the local meetings, the city representatives appoint specific tasks to the partners based on their know-how and specialisation. Afterwards, the city representatives consolidated the collected information and filled in the template. CERTH reviewed and further elaborated the contributions, made comments and asked for clarifications, during the next meeting. This iterative process lasted throughout the task 1.3.

A few times, bi-lateral meetings were organised between CERTH and each LH and FC. In these meetings, all the relevant partners from the city have participated.

Apart from the virtual meetings, a physical one was significantly contributed to the preparation of D1.4. The Working Session that organised during the 2nd Consortium Plenary Board meeting in Gothenburg. It entitled "Transition Strategy: exchange on pre-pilots" and aimed to thoroughly discuss the pre-pilot information among core partners involved in WP1 and specific LH and FC partners that have a particular interest in pre-pilots executed in other lighthouse cities. CERTH had circulated a detailed presentation of the pre-pilots along with a questionnaire aiming to collect the cities' interests on specific integrated solutions. After the working session, the partner had a better understanding of the planned activities and the replication potential of IRIS solutions.

Table 3 - Timeline of the different phases during the course of the task activities

Phase	Oct 17	Nov 17	Dec 17	Jan 18	Feb 18	Mar 18	Apr 18	May 18	Jun 18
1	■	■	■	■					
2				■	■				
3					■	■ (*)	■		
4						■	■	■	
Final version									■

(*) Physical Meeting – Working Session on Transition Strategy: Exchange on pre-pilots

3. Overview of the Transition Track 3: *Smart e-Mobility Sector*

Traffic congestion and air pollution are among the most important problems in urban areas, a condition which is subject to deterioration due to cities' rapid growth and population's concentration increase reaching soon levels of 80%. The expansion created triggers the inevitable existence of accessible, reliable and sustainable transportation systems based on state-of-the-art solutions not only in a technological but also in an organizational manner. Scientific institutions in collaboration with governmental organizations within Europe are continuously working with the objective of improving current transportation systems giving these more sustainable features. Mobility as a realized idea is widely explored by researchers and engineers of the transport sector as well as the industry over the last thirty years in order to find the optimum transport scheme allowing individuals to commute with increased flexibility and reduced expenses. Adding to this the fact that the use of privately owned vehicles, despite the various advantages it offers, is responsible for a wide spectrum of social, environmental and traffic problems, the struggle to design an efficient transportation system looks more important than ever. To this path, the use of technological advanced electric vehicles currently running on roads in combination with the adoption of a car sharing model designed to the city's specific needs is considered the most superior solution, especially when this concept is bundled with other public or non-public transportation alternatives currently in action and offered to the user as a service package, which is also known as Mobility-as-a-Service. Multimodality describes accurately the connection of the different modes of transportation and the adoption of this concept is considered a fundamental strategic tool aiding the optimum use of them, allowing for a systematical approach of transportation, while offering transport services as a mode-independent door-to-door connection. This concept can be seen as a method by which passengers have the ability to travel and move about through a system of interlinked networks consisted of diverse combinations of transportation modes, such as Carsharing and Ridesharing bundled with public transit, in which all elements are connected and efficiently coordinated. Mobility-as-a-Service and also known as MaaS, realizes the concept of Intermodality offering people an extensive range of options within the framework of a united transportation system and simultaneously solving the major environmental and traffic issues cities face today. Each component of MaaS, whether this is Ride-hailing, Ridesharing, Carsharing or mass transit is inseparably connected to city's public transportation system, providing an integrated and fully operational multimodal transportation system making private car ownership an outdated alternative to public transportation. The car may look as the best alternative opposed to a moderately designed public transportation system, but even a good public transport service cannot exceed the flexibility the private car offers, thus needing a supplement – more seen as a "mobility insurance" for the circumstances where public transport cannot respond to the demand. In combination with electric vehicles' usage by the service providers one can see how great and all around are the potentials of the adoption and implementation of MaaS.

The main objective is to set the ground of the following descriptions, allowing them to act as a know-how first opportunity for ideas and experiences exchange, before being in position to conduct a holistic evaluation of them, capitalizing on the demonstration activities results during the next two-three (2-3) years of the project. In addition, except from technical requirements and information, also the rest of aspects are currently fairly enough addressed. Such include the a) data collection and their management, b) underpinning current available regulatory framework, c) business models, using as a basis the different bounds and drivers of each LH and FC towards becoming more energy self-sustainable, and smarter.

In view of this aim, as in detail explained in the previous chapters, the LH cities provided the IRIS environment with valuable experience derived by pre-pilots that are either almost or fully complete. This experience is shared among the LH cities who move a step further through the demonstrations of the proposed solutions of each IS. Finally, LH and FCs present their will for replication of the proposed solutions in their cities.

The next sections describe the scope of each Solution of TT#3, as well as the activities that are to be undertaken. Handy Tables provide information about:

- **Pre-pilots**: Key points that describe the proposed solutions and the pre-pilot activities, as well as their area and the lessons learnt.
- **Demonstrations**: Key points that describe the proposed solutions and their demonstration, as well as the area of each LH city that will accommodate it.
- **Replications**: Key points that describe the proposed solutions and their demonstration, as well as the area of each LH and FC that will accommodate it.
- **Perspectives:** Brief information is provided about the needs that have occurred and the opportunities that are presented in the LH and FCs because of the IRIS activities of TT#3. Moreover, bounds and drivers are listed concerning the undertaking of demonstration and replication activities in LH and FCs. Finally, there is the methodology and objectives of the data collection in the demonstration activities by the LH cities.

3.1 Overview of IRIS Solution IS3.1 (Smart Solar V2G EVs charging)

As part of the overall goal of carbon emissions reduction, European cities are currently putting a lot of effort in encouraging the electrification of urban transport. And in order to accommodate the charging needs of the growing number of electric vehicles in the near future, they are deploying electric vehicle charging facilities -often integrating solar systems- that however may lead to a different usage of the electricity grid with less predictable energy flows.

The challenge for this is to develop electric vehicles charging infrastructure that will not be leading to grid congestion. Smart charging solutions that are taking into account electric vehicle drivers' needs, prompting charging at suitable hours, with adequate power to minimize impact on the grid, can efficiently solve grid congestion issues. And apart from controlling electric vehicles charging demand, electric vehicles can be used as a connected asset to the grid that stores energy and can feed it back to the grid or its connected buildings when the demand for energy is high but the production is low.

This concept of the vehicle feeding the grid with power (V2G) was first described in 1997 by Kempton and Letendre in "Electric Vehicles as a New Power Source for Electric Utilities" that put forward the idea of electric utilities using battery vehicles as storage, or fuel cell and hybrid vehicles as generation. A lot of theoretical work has followed to assess electric vehicles charging impact on the distribution grid and study their integration enabling V2G systems. The first V2G implementation projects though took place in Japan and recently in 2015 Utrecht has been the pioneer in the development of such systems in Europe too.

3.1.1 Scope and Description of the IRIS Solution IS3.1 (Smart Solar V2G EVs charging)

Integrating smart charging management and renewable energy storage are leading to (a) maximum profits of renewable power, (b) maximum self-consumption reducing grid stress and curtailment, and (c) unlocking financial value of grid flexibility.

IRIS aims to demonstrate and perform replication studies for the idea of V2G and smart solar power-driven charging stations in order to support the demand-supply energy management (with a scheme of smart charging management) at district-level while increasing their large-scale energy storage capacity and promotion of more environmental friendly mobility solutions.

In IS 3.1 the various innovative pre-pilots collected in the Lighthouse cities related to Smart Solar V2G EVs charging will be the basis for the IRIS demonstration and replication activities.

The following innovative Smart Solar V2G EVs charging solutions are expected to be demonstrated within the IRIS framework:

#1 Solar powered V2G charging stations integration in apartment buildings and V2G electric vans and V2G electric buses (UTR)

#2 Smart EVs charging with the development of a dynamic charge plan and car/charger interface (NCA)

Their innovative elements are the following:

- ✓ deployment of district-scale storage, combining V2G batteries as primary storage and stationary batteries in the apartment buildings as secondary storage, supported by open ICT for interconnection, performance monitoring and new information services (Transition Track #4, #5) for aggregators, grid operators, municipality and citizens,
- ✓ smart control of charging stations and periodic maintenance for the management of pollution peaks. Instead of having specialized personnel allocated to examine if and how good a charging station is operating, the idea is to embed algorithms in their operation, capable of giving signals in the ICT platform on when and for what type of malfunction a charging is expected to be set out of order. Such a system will allow the maintenance crews to be proactive and thus offering better and more reliable services to the citizens. In addition, IRIS will experiment and evaluate the impact of incentives supplied to mobility drivers, when citizens accept to change their behaviour by following the requests proposed through Urban Pulse, with the drivers getting credits when and if are transformed into incentives,
- ✓ the use of solar charging for e-buses which can be discharged at the time that energy demand and prices are high.

Additional innovative elements that will be considered for replication are

- ✓ indoor (in building's volume) smart solar charging stations (TRL7->8), in the context of indoor bus stations minimizing power losses, since the electric cables will not be that long while preventing electricity curtailment, since EVs can as well feed the MV/LV distribution grid with additional energy for the time periods there is a high peak of demand and the additional electricity is not provided by conventional power stations required to operate in a flexible mode,
- ✓ investigation of integrating the use of electric boats as an additional mobility track element which has a strong EU aspect, since a lot of EU cities are close located to rivers and have lakes at their territory, where e-boats instead of diesel powered ones can be used, contributing in that way the CO_2 reduction footprint and further enhancing the flexibility of the distribution grid.

Most hardware components are already at (TRL8) since they are already commercial, but the software components proposed are still at (TRL7), since there have not been largely tested in real-world environments. During the project, these components will be integrated, tested and evaluated against the performance expectations, increasing the TRL to 8 after the end of the project.

IRIS activities involve the demonstrations based on pre-pilots by the LH cities and the replications by LH and FC. The following table represents the participation of each LH city in the IRIS activities concerning IS3.1:

	Pre-pilot	Demonstration	Replication
Nice Cote d'Azur	Pollution management	Dynamic charge plan for Pollution Management	
Utrecht	Charging infrastructure for shared and private e-cars		
	E-buses charging infrastructure	Smart solar V2G charging for e-vans and e-buses	
Gothenburg		NA	

Figure 2 : Overview of IS3.1

Two tables presenting an overview of the pre-pilot, demonstration and replication of the IS 3.1 solutions at the LH and FC (only replication) are included in the following chapters, while the details are included in the annexes to this deliverable.

3.1.2 Overview of pre-pilot, demonstration, replication of LH Cities of IRIS Solution IS3.1 (Smart Solar V2G EVs charging)

		Utrecht	Nice Cote D' Azur	Gothenburg
Pre-Pilot	Key Figures / Points	(a) Smart solar charging 22 solar V2G charging systems (b) induction chargers for electric buses at the Vechtsebanen terminus to support the operation of bus line No. 1 with 10 electric buses	NCA charging infrastructure - 204 points dedicated to car sharing - 136 public charging spots - 3 Fast charging Bi Standard stations	Bus line served by electric buses - 3 fully electric buses - 7 electric hybrid buses - Recharging at the two end stops (~ 6 min.)
	Area	(a) Lombok district (b) Bus-depot Kanaleneiland	nine towns of the Métropole Nice Côte d'Azur	Gothenburg bus line 55 - Campus Johanneberg-Gothenburg City centre-Campus Lindholmen (6.2 miles)
	Lessons Learnt	Bus drivers face difficulties in positioning the electric bus to induction charge	Deployment of a dense network of charging stations (every 500 meters) in the context of Autobleue car sharing system	Training the bus drivers is important. Improved livability and reduced noise and air pollution
Demonstration	Key Figures / Points	Installation of 14 solar powered V2G charging stations (utilizing solar panels on roofs of 12 apartment buildings) /Deployment of 4 V2G e-vans/ Deployment of 153 V2G e-busses	Development of a dynamic charge plan in the framework of the "Smart Management of Pollution Peaks" solution	-
	Area	Kanaleneiland Zuid district	Plaine du Var area	-
Replication	Key Figures / Points	1.000 solar V2G e-cars in sharing systems, 10.00 PV systems and 1.000 smart solar V2G charging stations by 2025 and deploy 350 V2G e-busses by 2023	Application of the smart management of pollution peaks in additional NCA areas	Will be specified at a later stage
	Area	Province of Utrecht	Additional NCA areas	-

Perspectives	Opportunities & needs	Maximum self-consumption reducing grid stress and curtailment Optimal distribution of renewables	-	-
	Data Collection	Usage of the e cars, load profile of electric vehicle, load profile electric e-buses.	More information on data collection and management will be provided at a later stage of the project	-
	Bounds & drivers	Technical barriers are not anticipated because the technology is already applied Lack of incentives to stimulate smart solar charging	The main driver for Nice Cote D' Azur is to reduce the use of vehicles and promote alternative mobility solutions.	-

3.1.3 Overview of the replication of Follower Cities of IRIS Solution IS3.1 (Smart Solar V2G EVs charging)

	Vaasa	**Alexandroupolis**	**Santa Cruz Tenerife**	**Focsani**
Key Figures / Points	district-scale storage combining V2G batteries/ smart control of charging stations and management of pollution peaks/ use of solar charging for e-buses/ investigation of integrating the use of electric boats for implementation of Vaasa – Umeå line	district-scale storage combining V2G batteries /smart control of EV charging stations / use of solar charging for e-buses/ electric boats utilization	Smart use of PV for public lighting and EVs charging.	Focsani will study, develop and implement (near future) a charging infrastructure (20 stations) at city level. The technology that IRIS will propose is Smart Solar V2G EVs charging, both for e-cars and small-medium sized e-buses for public transportation.
Area	Ravilaakso and University Campus demonstration areas	City centre of Alexandroupolis and Medical University campus	City of Santa Cruz Tenerife	main streets of the Municipality of Focsani
Opportunities & needs	City of Vaasa is planning how EVs will be adopted by the city.	Use of environmental friendly EV cars CO2 emissions from mobility sector reduction	Increase the use of electric vehicles and reduce fuel vehicles and pollution.	Increase of number of electric vehicles in the city Reduction of environmental pollution in the city

		Utilization and optimal distribution of locally produced renewable energy		
Bounds & drivers	Existing house networks are not sufficient for large number of charging EVs. No local of national framework in place yet.	No regulatory framework for V2G charging stations in Greece at the moment. Increased capital cost Lack of EVs in the area of Alexandroupolis Electric vehicles are gaining grounds in Greece Target of zero emissions mobility	Small government subsidy for for purchasing an electric vehicle. Lack of general culture about electrical vehicles.	10000 Euros Government subsidy for purchasing an electric vehicle The lack of infrastructure High price of electric vehicles compared to fossil fuels ones; Low social awareness

3.2 Overview of IRIS Solution IS3.2 (Innovative Mobility Services for the Citizens)

Private and public transport need to be merged in order to answer to the increasing demand for mobility in urban areas, leading to a more efficient and less energy-consumption mobility solution. Mobility as a Service (MaaS) is a concept that adapts into these needs combining both shared mobility and smart applications. Linguistically shifting from simple transportation into mobility, a shift on the way a transportation system is finely structured and managed is represented. Transportation is characterized as a system-centric concept, whereas mobility being a user-centric concept emphasizes on the satisfaction of the end user while acknowledging that transport products and services must be sensitive to the needs, customs as well as desires of the travellers and the society overall. To this direction thus, MaaS offers the ability to pay for the mobility service and not the means of mobility, transforming the ownership consuming model into a services one. For the end user this is translated as the capability to access different, yet bundled transportation options (public transportation, shared vehicles, etc.) for a short term and as long as this is needed, all presented as an integrated solution which can be accessed through a smartphone application.

Car sharing is a widely known service, which can operate under the MaaS concept or independently. It is a short-term car rental bridging the gap between private and public transportation and it is seen as an alternative to vehicle ownership, access and use. Its features and potentials though as well as the advantages it offers appoints it as a basic pillar of MaaS. In comparison to Ridesharing services like Uber and Lyft, Carsharing is a relatively old concept, with Switzerland, Germany and the US being pioneer countries adopting this alternative transport mode in the late 80s and early 90s. Yet, only recently and in combination with fleets consisted of electric vehicles it has gained a great reputation and advantage compared to other transport services. The main idea of it is simple; a large number of individuals share a small number of cars gaining thus the benefits of the private car without the costs and responsibilities of owning one since these are undertaken by the carsharing company. Access to the car can be done by the key found in a secured key-box found at the carsharing station or simply by a smartcard through a contactless identification from the system situated in the vehicle. The car-sharer only pays for the service, i.e. the period of time – usually from a few hours to a maximum of a day and a half - and the distance travelled with the shared vehicle, plus a membership fee in some occasions. These payments can be executed electronically either through an online platform using a credit card or automatically by linking ones bank account to the online platform. Apart from the concept of Carsharing itself, for its right operation there are some things that have to be taken into consideration. Carsharing systems require a fleet of cars that will be able to be available and accessed by the users whenever they want. For this reason, carsharing companies need to have a well designed network of stations in key points where users can take, leave or park their car. These stations will ensure a steady operation of the service as well as the user’s experience avoiding issues such as waiting too much in order to pick up the car and that parking will not be a difficult process especially in public street places. Planning of a carsharing system is therefore not a simple process, because many parameters have to be taken into account. As of today, different carsharing schemes and projects have been implemented and supported in many countries with Germany, the Netherlands, Finland, France, USA, Canada, Australia, China being only a few of the countries that have developed carsharing projects.

3.2.1 Scope and Description of IRIS Solution IS3.2 (Innovative Mobility Services for the Citizens)

In IS 3.2 various innovative mobility services were collected as pre-pilots in the Lighthouse cities, most of them related to car-sharing and MaaS, which will be the basis for the IRIS demonstration and replication activities. Additionally, two more services have been included: one related to the provision of priority for Public Transport vehicles and one related to the provision of environmental information to citizens.

IRIS will mostly focus on the car-sharing / MaaS foreseeing thus, the demonstration and replication of the idea of Integrating V2G EVs operated in an e-car sharing system in the urban mobility system for a) a local zero-emission mobility, b) lower household mobility costs and c) smart energy storage in V2G car batteries. A fare system for the use of the shared vehicles will be based on the “Mobility as a Service” (MaaS) concept and therefore, integrated with other transport modes.

The following innovative MaaS/car sharing services are expected to be exploited within the IRIS framework:

#1 Solar V2G car sharing scheme (UTR) – Utrecht City wants to promote the concept of “Mobility as a Service”. That means that each citizen will be given the mobility services that he or she needs at any specific moment. The main challenge is to stimulate citizens to change their habits of using private cars and subscribe to the We Drive Solar car sharing system. We Drive Solar is a car sharing system deploying electric cars, which are smart - solar powered - V2G, reducing consequently grid stress and promoting the trade of PV when the energy demand is high.

#2 Free floating scheme (NCA) - IRIS aims to expand the capacity stemming from Autobleue experiment to develop a performant system of EV car sharing, including the crossed use of the various fleets and the reuse of Autobleue infrastructures (charging station, car sharing platform, etc.). This study will in particular focus on electric car pooling/sharing and will be carried out in 2 steps: 1- Identification of adapted sites which are ideally gathering the right characteristics for the deployment of Autobleue; 2- Design of the technical and contractual Autobleue model.

#3 EC2B scheme (GOT) - EC2B is a new mobility concept that offers customers an attractive alternative to owning their own car, allowing easy access to a variety of transport modes (e-cars, e-bikes, public transport, etc.) in connection to where customers live and make their everyday choices for transport. The aim is to provide a “better than car mobility” service, which is needed to achieve a shift from the private car to other modes of transport.

On a nutshell, the overview of IS 3.2 is presented in Figure 3:

- Nice will extend the existing (pre-pilot) car-sharing service to new areas for demonstration and replication, while keeping the existing pollution management system only for the demonstration.
- Utrecht will extend the car-sharing system and promote it as a part of a MaaS solution following the experience of Gothenburg.
- Gothenburg will extend the MaaS system to more areas, promoting the use of car-sharing system as complementary of the PuT systems already being part of Ubigo.

IRIS activities involve the demonstrations based on pre-pilots by the LH cities and the replications by LH and FC. The following table represents the participation of each LH city in the IRIS activities concerning IS3.2:

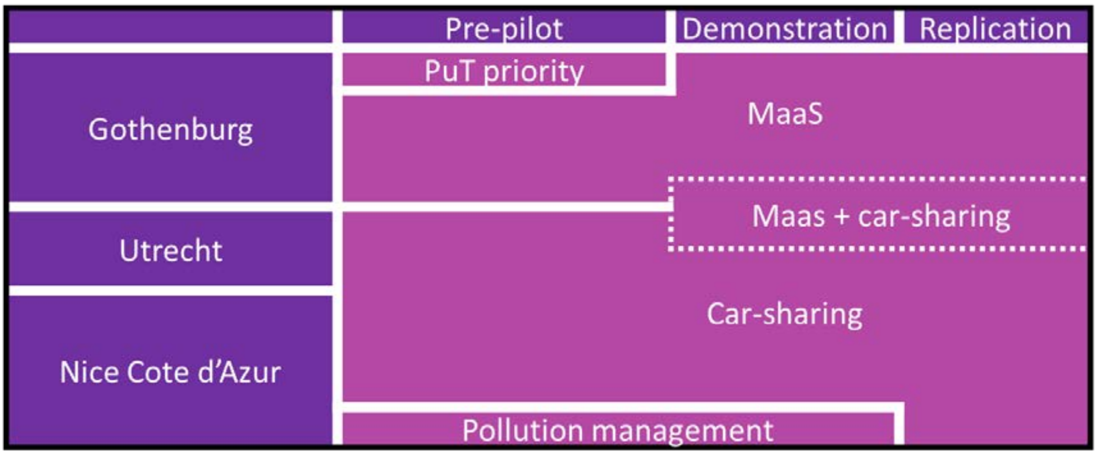

Figure 3 : Overview of IS3.2

The innovative Elements (Tools/Methods/Mechanisms/Technologies) are the following:

#1 Solar V2G car sharing scheme (UTR) - We Drive Solar is a car sharing system deploying electric cars, that are V2G and solar powered. This system has not been demonstrated anywhere in Europe. The main technology used involves the newest generation of Renault Zoe's smart solar V2G charging system, especially prepared for this project. High speed charging (22 kWh) facilitates fast absorbing surpluses of solar power. The large batteries of the Zoë provide a range of 300 km, taking away driver's anxiety of being left with no power.

#2 Free floating scheme (NCA) - The added value of these innovative mobility services, lies on the consideration of the impact of the technological evolutions on users' daily life on a territory, by examining the links between aspects (number of charging stations, level of connectivity, improvement of online offering, increase of EV's autonomy…) and behaviours (including EV's geographical distribution, energy management, dynamic pricing…), (TRL7->9).

#3 EC2B (GOT) - An innovative feature of EC2B is that it directs users towards more sustainable travel habits through providing mobility-related information. Since EC2B potentially reduces car ownership it reduces significantly demand for parking space creating value for property developers who include EC2B in their properties considering the fact that building parking lots and underground garages are very expensive. It also increases significantly the utilization rate of the vehicles (on average, parked 90% of the time), which allows for faster depreciation and more frequent renewal of the fleets. This solution demonstrates a comprehensive mobility service in the district, focusing on light and ultralight e/muscle hybrids and pure e-vehicles in addition to public transport. Riksbyggen has been allowed to plan a project with a fleet of many types of vehicles, all owned collectively by the occupants through their condominium association. When a certain vehicle is desired, each occupant is free to book and use it without cost, (TRL7->9).

Finally, with regards to TRL levels, the components of the shared vehicles are already at TRL8-9 since they have been already implemented in many cities, but the components of the MaaS *We Drive Solar* are at (TRL7->8), since there have not been largely tested in real-world environments.

Two tables presenting an overview of the pre-pilot, demonstration and replication of the IS 3.2 solutions at the LH and FC (only replication) are included in the following chapters, while the details are included in the annexes to this deliverable.

3.2.2 Overview of pre-pilot, demonstration, replication of LH Cities of IRIS Solution IS3.2 (Innovative Mobility Services for the Citizens)

		Utrecht	Nice Cote D' Azur	Gothenburg
Pre-Pilot	Key Figures / Points	WeDriveSolar (car sharing) 4035 e-cars, 2620 charging stations	Auto Bleue (car sharing), 140 vehicles, 10000 citizens UrbanPulse pollution management and information (dedicated app)	Ubigo (MaaS), 70 households / 195 persons, 6 months Bus and tram priority with cost-effective technologies (RFID and GPS)
	Area	Lombok district	nine towns of the Métropole Nice Côte d'Azur	Ubigo: three districts in Gothenburg; Kvillebäcken, Masthugget and Olskroken/Härlanda Bus and tram priority: PuT network
	Lessons Learnt	23-38% increase of electricity self-generated/consumed	Free-floating will eliminate the limitations of round trip schemes Better quality of life and reduced treatment thanks to UrbanPulse app	Good acceptance, 42.5% of the participants changed their mode of travel. There is room for improvements (larger area, travel planner…) More reliable priority service
Demonstration	Key Figures / Points	46 V2G electric vehicles connected to the DE grid / 14 MaaS Renault e-cars	Free-floating car-sharing service Smart Management of Pollution Peaks	e-mobility MaaS service EC2B for residents of the 132 apartments, employees and students
	Area	Kanaleneiland and Central Station areas	Homezone of Nice Méridia Area	Riksbyggen's Brf Viva in Johanneberg
Replication	Key Figures / Points	Replication at city level extending it to interested neighbourhoods	Replication at interested cities of the two solutions	Scale up of the EC2B service in new houses and with new collaborations (real state, employers…)
	Area	The whole city	New cities	Frihamnen and Lindholmen. On-demand transport in Johanneberg
Perspectives	Opportunities & needs	Lowering grid stress Reduce the number of cars in public space and reduce the number of km driven	Increase the utilization rate of a car Decrease the number of cars in the street Reduce traffic and pollution in the city	Reduce need to build expensive underground parking garages Reduce CO2 emissions Reduce resource use, optimize land use Reduce costs for users

				Increase revenues for mobility service providers
	Data Collection	number of subscriptions, frequency of the e-car use, amount of km driven	City Innovation Platform	user behaviour and customer satisfaction
	Bounds & drivers	stimulate citizens	better user-experience	Bounds: Integration of APIS form various providers Legislation not clear with regards to PuT and MaaS Solution for privileged groups (focuses on new contructions) Hard to fit all participants into the same business model Potential increase of motorized trips due to the all inclusive character Drivers: Technological momentum Flexible parking policy

3.2.3 Overview of the replication of Follower Cities of IRIS Solution IS3.2 (Innovative Mobility Services for the Citizens)

	Vaasa	**Alexandroupolis**	**Santa Cruz Tenerife**	**Focsani**
Key Figures / Points	showcase and a living lab for energy-efficient and sustainable solutions - Solar V2G car sharing scheme - Free floating scheme EC2B scheme	feasibility of replicating these innovative services and technologies taking into consideration the local people behavioural characteristics	- Electric or Hybrid buses. Including PB solar charging stations at the end of the lines Other private	electric busses, including PV solar charging stations at the end of the lines development of infrastructure for bicycle use Implementation of a traffic management system that

			electrical mobility vehicles	shall facilitate public transportation traffic
Area	Ravilaakso	city centre and northern part of Alexandroupolis	City of Santa Cruz de Tenerife	City of Focsani
Opportunities & needs	innovative companies can test their products and services in an enabling environment creating new market services for improved mobility and decreased emissions	Lower household mobility costs Reduced number of cars in the city centre Reduce CO2 emissions from mobility sector	- Reduce traffic and pollution. Increase quality of life.	A better mobility Reduction the use of fossil fuels for public transportation Increase in bicycle use Fluidizing traffic in the city Improvement the air quality and of quality of life in the city
Bounds & drivers	Legal framework is being adapted. Traffic will be reduced in the city center; surface parking places will be reserved for low emissions vehicles; charging infrastructure to be installed in new housing projects; MaaS to be proven feasible in medium and small cities.	lack of regulatory framework on sharing economy strong dependency of the population in private vehicles	- lack of regulatory framework on sharing economy for some potential solutions. - very strong dependency of the population in private vehicles	Legal framework must be adapted Lack of financial support

4. Next Steps (in cooperation with WP3 and WP5-WP8)

D1.4 is the first step towards the creation of a detailed transition strategy for the Smart e-Mobility Sector (TT3). This transition strategy will be further developed in many tasks where the information provided in D1.4 sections will further be analysed and elaborated. In particular, the following deliverables will be based on D1.4:

- **D1.7: Transition Strategy, Commissioning Plan for the demonstration & replication (M12):** This report will provide a detailed transition strategy plan, comprising of the demonstration, replication and opinions exchange planning among cities / administrations / cities planners and all involved stakeholders, on the basis of the analysis of all the defined solutions in the five IRIS transition tracks.
- **D5.1 / D6.1, D7.1: Report on baseline, ambition & barriers for Utrecht / NCA / Gothenburg lighthouse interventions (M12):** This report will provide precise and realistic specification of ambitions, activities and planning for each of the interventions planned, running in parallel and in close cooperation with activities in WP1 on the extraction of requirements for the 5 Transition Tracks, including baseline definition of citizen energy and mobility behaviour, along with setting up of the monitoring principles and early business modelling development.
- **D5.2, D6.2, D7.2: Planning of Utrecht / NCA / Gothenburg integration and demonstration activities (M12):** This report will provide the coordination structures and procedures concerning governance, communication, monitoring and impact analysis, local risk assessment, periodic reporting, and planning of integration and demonstration activities in each of the LH cities.
- **D5.5, D6.5, D7.5: Launch of T.T.#3 activities on Smart e-Mobility Sector (Utrecht / NCA / Gothenburg) (M24):** Report describing the set-up of demonstration activities and initial experiences of operation regarding the IRIS solutions and citizen engagement activities in T.T #3 in each of the LH cities
- **D8.1 A Roadmap for replication of activities (M25):** The roadmap (business/financing plan) will summarise the replication of activities for demonstration plans and post-project replication with a Gantt chart and a Work Breakdown Structure (WBS), as well as a schedule per task, responsible partner related subtasks, related deliverables, and dependencies on other tasks.
- **D8.4, 8.6, 8.8, 8.10 Vaasa / Alexandroupolis / Santa Cruz de Tenerife / Focsani replication plan (M36):** A replication plan (business/financing plan) for post-project replication in each of the FCs.
- **D3.7: Financing solutions for cities and city suppliers (M24):** A Report that will map and present financial pathways for IRIS solutions.

5. Conclusions

D1.4 provides preliminary planning of the demonstration and replication activities of TT3: Smart e-Mobility Sector. The document defines each solution's requirements/specifications (geographical, technical, operational, legislative, regulatory framework, business etc.) before the solutions are being deployed and demonstrated in the selected LH cities and replicated as well in the FCs. The deliverable's preparation process initiated the exchange of knowledge and opinions between the Lighthouse and Follower cities on how each of the IRIS solutions can be in the best way integrated into their site.

The deliverable includes a quite detailed description of the pre-pilot areas, based on the available information of the applied technologies from the relevant experienced consortium partners. The description comprises the initial requirements and technical specifications concerning the application of the solution. The document supports the Transition Track's aims to increase the use of innovative mobility solutions based on low emissions vehicles and public transport within the context of the envisioned Smart Cities. In addition, it gives insight for the replication of the conceived IRIS solution, which will be demonstrated, taking into consideration not only the individualities and the specific needs of the LH cities but also the needs and the objectives of the FCs which are not yet clearly illustrated.

The present deliverable is not a study, but a collection of data and information concerning the planning of the IRIS demonstrations and replications. Thus, there are no concrete "conclusions" to which the IRIS partners are driven. The primary purpose of that was, among others, the exchange of ideas and know-how among the partners, in order to create a clearer view of the demonstration and replication activities.

Nevertheless, some general comments can be derived from the cross comparison of the different endeavours:

<u>IS 3.1, primarily being characterized for the case of electric vehicles charging infrastructure development:</u> As already mentioned above, the development of adequate charging infrastructure is critical for the application of electromobility. The challenge for this is to develop infrastructure according to the different and specific vehicles' needs (cars, buses, etc.) while at the same time ensure the minimum impact on the electricity grid.

The solutions that are being put forward in Utrecht: installation of solar powered V2G charging stations (utilizing solar panels on roofs of apartment buildings); deployment of V2G e-vans and e-buses; are in that direction, aiming at maximizing self-consumption reducing grid stress and curtailment and achieving optimal distribution of renewables. Furthermore, Nice Cote D' Azur is seeking to smart control charging stations in order to manage pollution peaks in addition with evaluating the impact of incentives to electric vehicle drivers aiming at influencing their behavior. This set of solutions including: district-scale storage combining V2G batteries; smart control of charging stations and management of pollution peaks; use of solar charging for e-buses, e-vans, etc. will also be considered by the follower cities that are interested in studying them and bringing them closer to implementation in their context.

The main driver for all is the promotion of electromobility and as a result the reduction of CO2 emissions from the mobility sector. It is clear that for this, electric vehicles charging infrastructure needs to be developed, monitored and managed. However, the capital cost required for this development the small number of yet available electric vehicles (combined with their high purchase price) and the lack of incentives to stimulate smart and V2G charging to electric vehicle drivers and are bounds still limiting the large-scale implementation of smart solar V2G solutions.

<u>IS 3.2, primarily being characterized for the car-sharing and MaaS schemes:</u>

As previously and briefly discussed, different carsharing schemes have been developed worldwide, which are distinguished according to their operation arrangement and type of vehicle ownership leading us to three distinct Carsharing schemes; Free-floating, Stationary and Peer-to-peer model. In the Free-floating model or One Way system, users are allowed to pick up and return the shared car in any legal parking place within a specific area. This type of model counts less than 8 years in the market and it is mainly described by its great flexibility. On the other hand, Stationary or Round-trip Carsharing is the first and oldest model offered by carsharing providers. Here, vehicles are situated at fixed locations or stations with the pick-up and drop-off locations coinciding demonstrating thus and its greatest advantage which is no other than the reliability and ease of tracking the fleet of vehicles. In Free-floating and Stationary models, vehicles are owned and made available through the respective providers, whereas in P2P carsharing vehicles belong to private car owners willing to rent out their vehicles whenever they 're not in use by them. In this case, vehicles can only be used for round-trips. For the carsharing providers this means that they are discharged from owning and maintaining their own fleet.

The appropriate carsharing model to be chosen depends on the specific city's needs in which it will be deployed and it must be reliable, energy-efficient, fitting into the available operating budget and of course with an easy, yet steady operation. The Free-floating scheme in comparison to the Stationary one has the advantage of the larger flexibility at the cost though of the higher prices which are based on the usage time (subject to traffic congestion dependency) and the need for state-of-the-art tracking equipment and management. Moreover, providers have to collaborate with local authorities in order to bypass parking restraints within public street areas. The level of flexibility Stationary models lack though is compensated by the available fleet variety and more important the higher utilization of the vehicles since the latter are used for longer trips requiring only a small trip-planning from the user's side.

The above is confirmed by the experience of Nice, in which free-floating car-sharing schemes are expected to be more successful. A crucial element in order to work is to have a critical mass of users, ensuring a high utilization rate of the vehicles. If a 30% usage of the cars is reached, in comparison to the actual 3% of the non-shared schemes, the service will be viable and successful. Only one concern appears and is related to the possibility of promoting the use of private cars if the free-floating schemes are successfully implemented, thus increasing emissions in urban areas.

Utrecht focuses its efforts in having energy balance in the districts, while from the experience of Gothenburg it can be concluded that MaaS schemes may be implemented more successfully if combined with housing. Business model for the restricted parking spaces can be supported by MaaS and therefore, these spaces can be used for other purposes since owning a car may not be needed anymore.

Overall, the implementation of Carsharing within the concept of Maas reinforces the optimism by which the whole process is undertaken since studies and realized projects so far has shown that carsharing has the potentials to contribute into reducing vehicle travel costs. Carsharing financially speaking is characterized by its costs' transparency. Private car ownership is consisted of the fixed costs of owning and operating the vehicle as well as the variable costs of using it, which due to being lower than the fixed ones the owner drives more than it is economically realistic. Contrary to this situation, carsharing has the ability to alter the fixed costs of vehicle ownership into variable costs since payments are dependent on the actual vehicle usage. Therefore, carsharing is more effective when seen as an alternative transport mode tided with public transportation with the potential of filling up the gap created between the former and private vehicle usage.

In all the mobility services it is clear that the user acceptance and satisfaction are essential, in addition to favourable legal frameworks, such as car and parking places restrictions or promotion of vehicles fuelled by renewable energy. The acceptance of car-sharing and mobility-as-a-Service solutions though from the end user, requires the establishment of an extensive and carefully designed regulatory framework with laws and legislation in order to ensure public safety, customer protection and liability allocation as well as labour restrictions and trust-building mechanisms. Unfortunately, though, almost all European countries except for Germany, France and The Netherlands lack a legal framework addressed specifically to car sharing and mobility as a service. To the outside world it is bad for the governments to be responsible for not legally promoting car sharing and its benefits through constitutional actions while showing their intentions for improving their citizen's overall quality of life. A typical example as a proof of people's dissatisfaction towards the government's policies regarding Car Sharing support comes from a survey conducted by the momo Car-Sharing project out of all Car Sharing providers within Europe. According to its findings Car Sharing providers rated the political and legal settings supporting Car Sharing services as barely fair. The responders specifically mentioned also the political and legal conditions being in need of change for the evolution of Car Sharing services, with the most important of them being the ability of setting up on-street public parking spaces designated explicitly for Car Sharing vehicles and the recognition of the latter as a service promoting the public's prosperity. Therefore, it is the governments' turn now to work on this issue and adapt their policies to present trends and available innovative everyday mobility life solutions.

The related Deliverables that are based on the present one (D5.5, D6.5, D7.5 and D8.1) that will deliver the demonstrations and replications are expected to drive to more solid conclusions.

The optimal collaboration and communication between the local ecosystems and the horizontally involved partners contributed significantly to the competition of the deliverable's objectives and set the ground for achieving the project's overall goals.

D1.4 is the first step towards the creation of a detailed transition strategy for the smart renewables and closed-loop energy positive districts. This transition strategy will be further developed in the context of WP3, WP5, WP6, WP7 and WP8. These work packages include tasks that will present in detail the information provided by D1.4.

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[37] https://www.transportenvironment.org/news/public-privileges-car-sharing-enshrined-german-law

[38] Willi Loose, Porject Momo, The State of European Car-Sharing Final Report D 2.4 Work Package 2, Bundesverband CarSharing e. V., 2009

7. ANNEX for IRIS Solution IS-3.1: Smart Solar V2G EVs charging

7.1 Pre-pilot Areas description and Available Infrastructure

7.1.1 Utrecht Pre-Pilots

Pre-pilot: Smart solar charging

Pre-proposal cooperation of lighthouse partners LomboXnet and Stedin with Municipality of Utrecht led to the introduction of the first publicly accessible smart solar powered V2G car charger in Europe in 2015. In 2017 22 solar V2G charging systems were installed and interconnected in the residential Lombok district in Utrecht (see Figure 4 and Figure 5). The e-cars are 100% charged by solar PV coming from local PV-systems. Their functioning and impact on the low voltage district electricity grid is monitored 24/7. The pre-pilot smart solar charging has the objective to develop and evaluate algorithms for a smart grid system that can increase self-consumption of electricity produced by PV panels by storing electricity in electrical vehicles (EV) in the residential sector while meeting the demands for the usage of the EVs.

Figure 4 : Smart Solar Charging system in Lombok district, charging a Renault Zoe from the WeDriveSolar e-car sharing system

Figure 5 : Smart Solar Charging system DuraStation in Lombok

Pre-pilot: induction chargers for electric buses

The public transport system of Utrecht is gradually switching from combustion engines to electric buses. The province of Utrecht has the ambition of regional and local public transport to be fully climate neutral by 2020. Qbuzz, the Utrecht public transport operator and IRIS partner, started a pre-pilot with three induction chargers for electric buses in 2013. Three Optare busses were selected for this experiment, as this manufacturer had already produced electric busses with a plug-in charging system. The busses were charged through an Inductive Power Transport (IPT) system, which charges vehicles while in operation from a company named PROOV (www.proov.nl). With this technology, it's possible to charge at bus stops during the short period that passengers are getting off and on (see Figure 6).

Figure 6 : Pre-pilot with induction charging from Proov at Utrecht Central Station (launched in 2013, will not be replicated in the demonstration)

In 2017 Qbuzz introduced electric buses on a larger scale and currently operates line 1 with 10 electric busses. Qbuzz started with closely monitoring the performance of the busses on: actual energy use, load profiles of the battery, influence of the external temperature and driving behaviour on energy use. Qbuzz investigates "smart charging strategies" aimed at minimizing grid load.

Qbuzz applies opportunity charging. This ensures that line 1, without changing the timetable, can temporarily be recharged at the Vechtsebanen terminus. This is done with a so-called 'reversed pantograph': a current collector that drops down on the bus. For example, there is no need to place a pantograph on each bus, but only a current receiver is required. A very large battery in the bus is therefore not necessary, leaving more room for the passengers. At the bus depot the buses are loaded can be charged bi-directional, i.e. that bus batteries can also supply electricity in case of peak demand (e.g. in the evening) (see Figure 7).

Figure 7 : Pre-pilot charging systems for Qbuzz electric buses of bus line 1 (launched in 2017)

7.1.1.1 Pre-Pilot Area and Geographical Overview

Pre-pilot: Smart solar charging

The pre-pilot area for smart solar charging is the Lombok district. Lombok is known as a multicultural district, especially because of the many multicultural shops. The demographic composition of the neighbourhood has changed considerably in the past decade. The neighbourhood is popular for the young townspeople because of the characteristic streets and strategic location near the city centre. Due to the new influx in the neighbourhood the suburb of Lombok-west now has fewer non-Western immigrants than the Utrecht average.

In the Lombok district in 2015 40% of the households didn't own a car and 49% owned 1 car. Compared to 31% and 53% correspondingly for Utrecht as a whole. Furthermore, residents of Lombok walk or take the bike more often than the average Utrecht residents (81% versus 74%). Figure 8 provides an overview of the location of the 22 smart solar charging systems in Lombok.

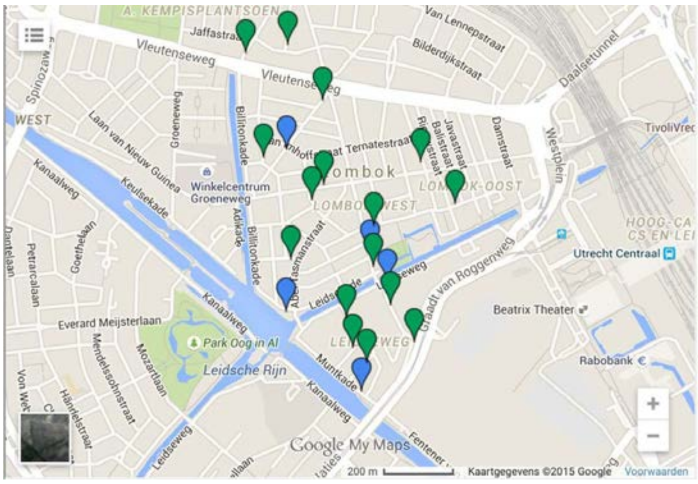


Figure 8 : Location of the 22 Smart Solar Charging systems in Lombok district in Utrecht

Pre-pilot: induction chargers for electric buses

As explained above the induction chargers for electric buses has been implemented in bus line no. 1 of Utrecht. The figure below presents its route along the city of Utrecht.

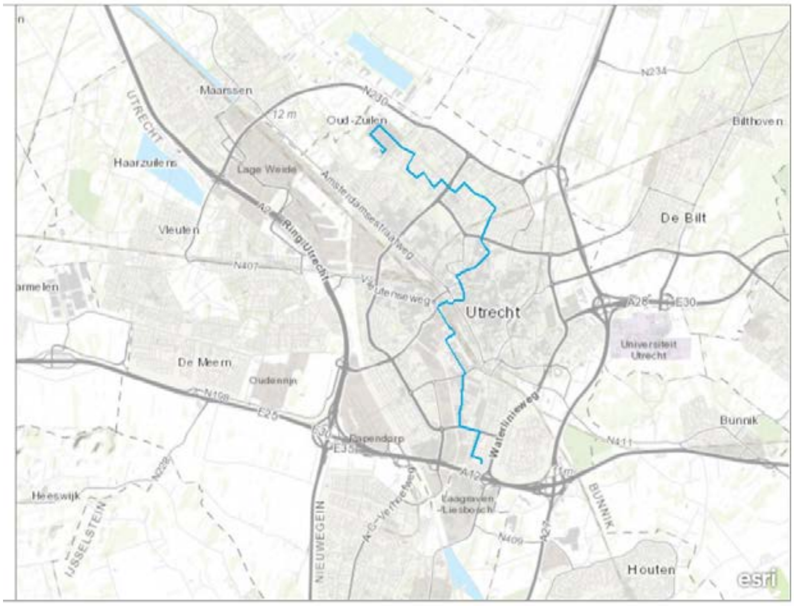


Figure 9 : Route of bus line No. 1

7.1.1.2 Innovative elements

Table 4 elaborates the currently available thorough information for each of the considered key innovative elements of the IRIS pre-piloted solutions. Whenever available, additional information along with more technical specification of the basic configured elements are as well provided, in order to allow a better understanding of the basic elements of the solutions:

Table 4 *Innovative elements of the Utrecht pre-pilot in IS3.1*

Main Component	Technical Specifications	Area of the pre-Pilot
Smart Solar Charging system	• DuraStation from GE Netherlands • 22 kW fast charging • 44 kW grid connection • AC charging	Residential area Lombok

Qbuzz: electric busses: batteries and charging	• Radius with full battery: ~ 200 km
	• Bus length: 12 meters
	• Bus width: 2.55 meters
	• Battery
	  o Type: LFP Lithium Ferro Phosphate
	  o Capacity 311 kWh.
	• Recharging peak 220 kW
	• Continuous recharging 50 kW
	• Charging pace Vechtse Banen: 300 kW
	• Charging pace bus depot: 75 kW
		Bus line 1: City Centre-Overvecht
		Bus-depot Kanaleneiland

7.1.1.3 Lessons Learnt by the implementation of the Solution in the Pre-Pilot

The experience from the induction chargers for electric buses pre-pilot made apparent that induction chargers (from company PROOV) were not the best choice. Bus drivers have difficulties in positioning the bus correctly resulting in not fully charged batteries and busses running out of battery before arriving at the bus depot.

7.1.2 Nice Cote D'Azur Pre-Pilot

5.1.2 Nice Cote D'Azur Metropole provides **charging infrastructure** composed of **340 charging stations.** This innovative infrastructure was designed taking into account Autobleue e-carsharing service (described in IS 3.2) as well as a new convenient charging service for private electric car owner.

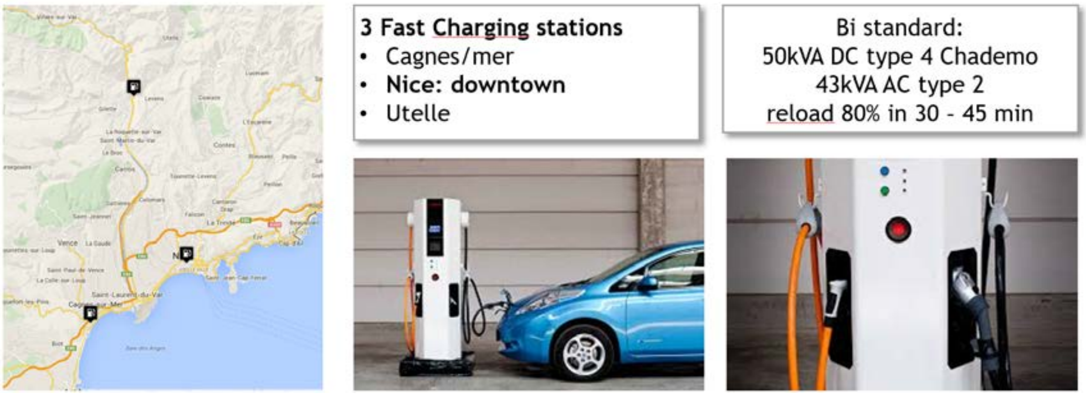


Figure 10 : NCA fast charging stations

The charging network is split into 2 schemes:

- 204 charging points are dedicated to car sharing
- 136 public charging spots are offering and open access to personal and commercial EVs.

In addition, 5.1.2 Nice Cote D'Azur Metropole has installed 3 fast charging stations in proximity of main circulation axis.

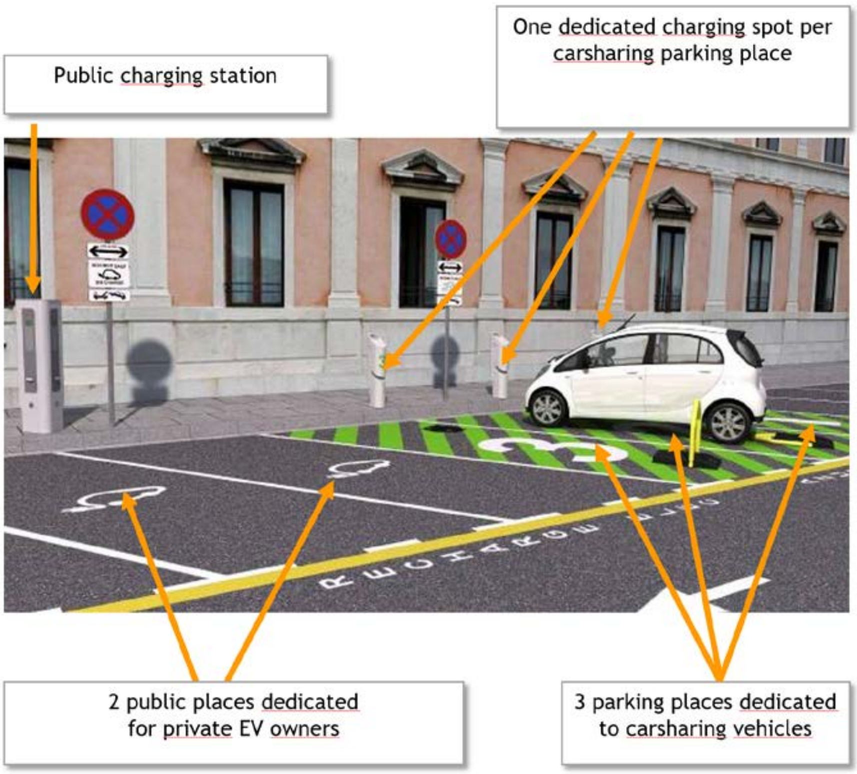


Figure 11 : Architecture of a charging station

7.1.2.1 Pre-Pilot Area and Geographical Overview

NCA charging infrastructure was launched in 2011. This service makes electric vehicles charging possible across nine towns of the Métropole Nice Côte d'Azur: Nice, Cagnes-sur-Mer, Saint Laurent-du-Var, Vence, Colomars, Carros, La Trinité, Beaulieu-surMer and Villefranche-sur-Mer as also presented in the map below.

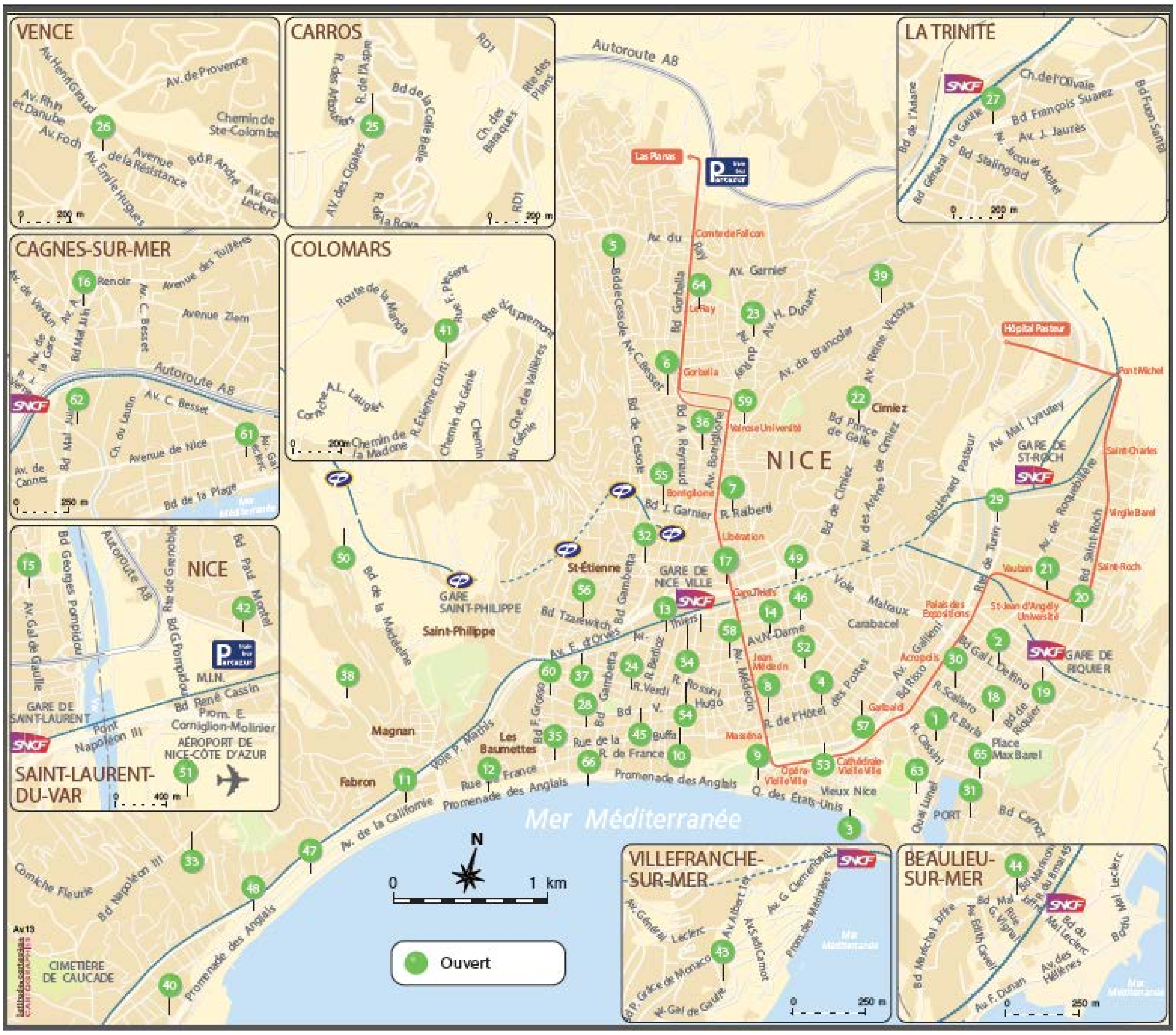


Figure 12 : Nice Cote D'Azur charging infrastructure network

7.1.2.2 Innovative elements

Table 5 elaborates the currently available thorough information for each of the considered key innovative elements of the IRIS pre-piloted solutions. Whenever available, additional information along with more technical specification of the basic configured elements are as well provided, in order to allow a better understanding of the basic elements of the solutions:

Table 5 *Innovative elements of the Nice pre-pilot in IS3.1*

Main Component	Technical Specifications	Area of the pre-Pilot
NCA Charging infrastructure	**340 charging spots grouped over 68 stations with 5 spots per station:** • **204** charging spots for dedicated to carsharing vehicle • **136** charging spots dedicated to private vehicle owners **3 Fast charging Bi Standard stations** • 50kVA DC type 4 Chademo • 43kVA AC type 2	*Global NCA coverage* *(AUTOBLEUE)*
NCA Charging service - subscriptions	The service is open to each private electric car owner. **Registration fees:** 25 € per vehicle. **Charging fees from 2011 to 2014:** Charging fees were free from 2011 to 2014 **Charging fees Since 2014** Standard charging stations fees: From de 8h to 20h, the first 2 hours are free and from the third hour: 2,50 € per hour (with no limit). From 20PM to 8AM :2,5€ per hour with a maximum of 5€. Fast charging fees: • 2.50€ for the first 15 minutes • 2.50€ for the next 15 minutes • 5€ for the third and fourth period of 15 minutes • 10€ per 15 minutes over 1 hour (in order to allow a good shift rate)	*Global NCA coverage* *(AUTOBLEUE)*

7.1.2.3 Lessons Learnt by the implementation of the Solution in the Pre-Pilot

A significant achievement of the Autobleue project is the deployment of a fine mesh of charging stations within the city with a multi-port station every 500 meters in the context of serving the needs of a car sharing system while at the same time providing the opportunity for private EVs charging.

7.1.3 Gothenburg Pre-Pilot

ElectriCity[1] has been underway in Gothenburg since the spring of 2013. It is a collaborative, cross-functional partnership in which cities, regions, businesses and academic institutions develop working methods for research and demonstration projects and produce new scalable business models for sustainable transport in cities.

Helping to achieve sustainable transportation, ElectriCity is a cooperative venture testing new solutions for sustainable public transportation. It is a partnership between 15 different partners, including Västtrafik, the local public transportation provider; Keolis, an operator for Västtrafik; and The Volvo Group, the manufacturer of the vehicles, and brings together industry, research and society.

ElectriCity consists of:

- A new bus route – route 55 – with electric buses operating in the center of Gothenburg.
- A demo arena for new bus stop solutions, transport management systems, safety concepts and networked technology and systems for energy supplies and storage, for example.
- A platform for research into urban planning and building, technological development and behavior patterns.
- A source of inspiration and motivation for future urban development.

The most visible part of ElectriCity is bus route 55, where electric buses began operating in June 2015. The route connects two campus areas and goes from Chalmers/Johanneberg Science Park to Lindholmen Science Park, a 4.7-mile route (8 km). Ten buses run on the route, three of which are all-electric and the remaining seven are electric-hybrid. The buses are quiet, exhaust-free, energy efficient, and 100% powered by renewable energy. The electricity for the buses is exclusively renewable, coming from wind power and hydro power.

The all-electric bus is a concept vehicle, the first fully electric bus from Volvo. It is quiet, emission-free and 80 percent more energy-efficient than a conventional diesel-powered bus. The all-electric buses can carry 80 passengers. The electric-hybrids have the same capacity. As you don't have the heat from the engine like a conventionally fueled bus, there are supplemental heaters inside the bus for passenger comfort. To increase the overall efficiency, the doors are much wider to allow quick boarding. The vehicles and the stops have Wi-Fi so customers don't have a disruption in connection and the bus even has outlets for charging devices. The regular fixed-route service vehicles are blue, while Line 55 buses are green so they really stand out in the community.

[1] https://www.electricitygoteborg.se/sites/default/files/content/u2318/electricity_-_cooperation_for_sustainable_and_attractive_public_transport.pdf

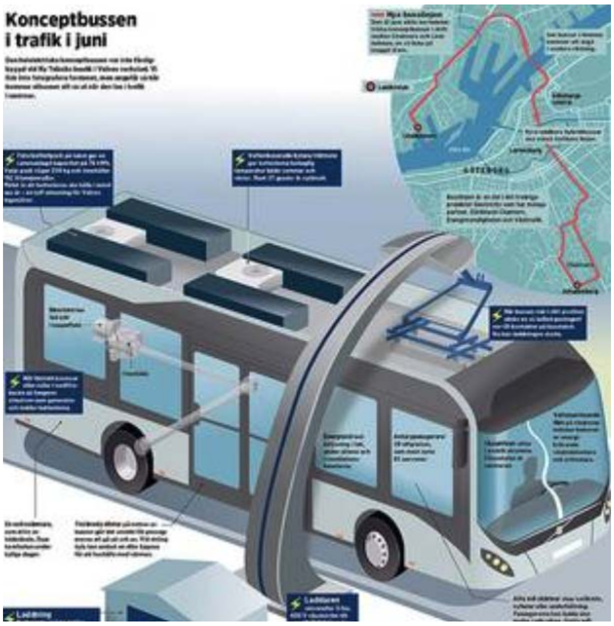


Figure 13 : All electric concept bus operating in bus line 55 since June 2015

Recharging takes place at the two end stops. Recharging takes about 6 minutes. The vehicles run 6.2 miles between charges but could run up to 18.6 miles.

Figure 14 : Buses top-up the battery at terminal stations

Currently, 100,000 passengers per month take the new route and test the new products and services, including Wi-Fi, touchscreens, and a unique indoor bus stop system that increases accessibility to transport as stations can be placed inside hospitals or supermarkets. The new concept of fast charging has been a breakthrough for electric buses. The automatic fast charging allows buses to top-up the battery at terminal stations. The life time of the battery is prolonged and the amount of battery required for the operation is reduced (www.goteborgelectricity.se).

- Environmental benefits: The electrified buses reduce CO2 emissions by 80% and produce no NOx emissions.
- Social benefits: User satisfaction along the route is extremely high, with 80% of passengers happy with the free Wi-Fi and 9 of 10 riders appreciative of indoor boarding.
- Economic benefits: Improved livability and reduced noise and air pollution generate public health savings and boost property values.

- Health benefits: The reduced noise and emissions translates into better health outcomes for the community

7.1.3.1 Pre-Pilot Area and Geographical Overview

As explained above the electric buses run in bus line no. 55 of Gothenburg. The figure below presents its route along the city of Gothenburg.

Figure 15 : Gothenburg bus line 55 route

7.1.3.2 Innovative elements

Table 6 elaborates the currently available thorough information for each of the considered key innovative elements of the IRIS pre-piloted solutions. Whenever available, additional information along with more technical specification of the basic configured elements are as well provided, in order to allow a better understanding of the basic elements of the solutions:

Table 6 *Innovative elements of the Gothenburg pre-pilot in IS3.1*

Main Component	Technical Specifications	Area of the pre-Pilot
3 fully electric buses	35 feet two-speed gearbox More technical specifications are available at: https://www.electricitygoteborg.se/sites/default/files/content/PDF/volvo_electric_concept_bus_en.pdf	Campus Johanneberg-Gothenburg City centre-Campus Lindholmen
7 electric hybrid buses	39 feet	Campus Johanneberg-Gothenburg City center-Campus Lindholmen
lithium ion batteries	4 batteries per bus =350 kg 4 batteries capacity 19 kWh	

7.1.3.3 Lessons Learnt by the implementation of the Solution in the Pre-Pilot

Training the driver to stop in the right position took about 2 days; there's about an 8 to 11-inch leeway for charging. Energy loss during the charge is very low due to the direct contact.

Volvo press officer Jessica Sandstorm said they went with in-route charging because they determined it could be problematic to charge a lot of buses on the grid at one time overnight, plus it puts restrictions on operating hours. She also said that studies by Chalmers University showed it's more cost-effective for the on-route charging because there's not a massive amount of charging infrastructure sitting unused for long periods of time. The charging infrastructure, which has the pantograph, is maintained by the electric company.

The energy consumption is very low from the buses. Even if all of the vehicles were all-electric, it would be about 1 percent of energy use.

- The vehicles are comfortable and easy to drive
- A calmer environment for the driver
- Less noise
- Lower vibrations
- The Zone Management feature helps drivers keep speed limits
- Great interest from the passengers
- Measurements show a significant difference at longer speeds between electric buses and diesel buses
- This applies to both noise level and frequency
- At startup the difference is 7dBm which is half experienced
- No noise at idle speed

7.2 Demonstration in the Lighthouse Cities

7.2.1 Utrecht demonstration

7.2.1.1 Use Case and Brief technical description

Solutions developed in small-scale pre-proposal pilots in the Lombok and Central Station area will be integrated and jointly demonstrated in the demo district Kanaleneiland Zuid. The demonstration will include:

- Installation of 14 solar powered V2G charging stations and distribution of 14 We Drive Solar e-car sharing systems that will be delivered by Renault;
- Deployment of 4 V2G e-vans;
- Deployment of e bus-fleet comprising 10 V2G buses that were deployed in May 2017 and which will be increased by 143 e-busses in December of 2019.

Solar charging is realized by the utilization of solar panels on the roofs of 12 apartment buildings that will be renovated by IRIS partner Bo-Ex and on the roofs of 3 schools. An optimal charging algorithm will be developed aimed at maximum utilization of solar electricity production by the electric vehicles taking into consideration the solar production peaks and peak in charging demand. A picture on the integration of the main components is provided in Figure below.

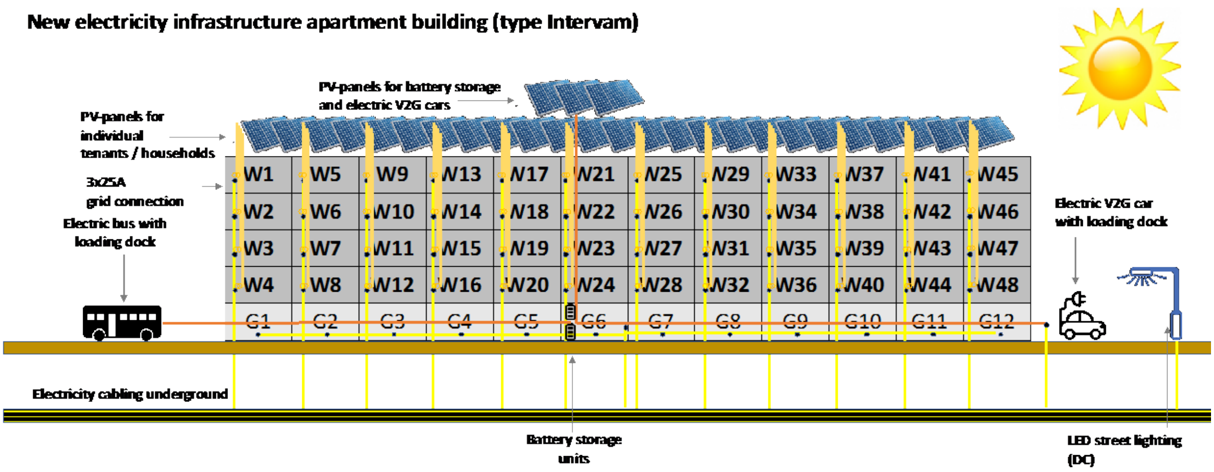


Figure 16 : Overview of the envisioned energy system for an apartment building

7.2.1.2 Demonstration Area and Geographical Overview

The smart solutions will be integrated and deployed in the district of Kanaleneiland Zuid. The V2G EV and charging station will be realised in district where Bo-Ex will be renovating 12 apartment buildings with in total 644 apartments to nearly zero energy buildings. The roofs of these apartment buildings will be covered with PV panels including the roofs of 3 schools that will produce the electricity to charge the e-vehicles (Figure 14). The first 2 V2G charging stations are planned close to the local innovation hub “Krachtstation” and the first apartment building that will be renovated at the Colombuslaan (Figure 15).

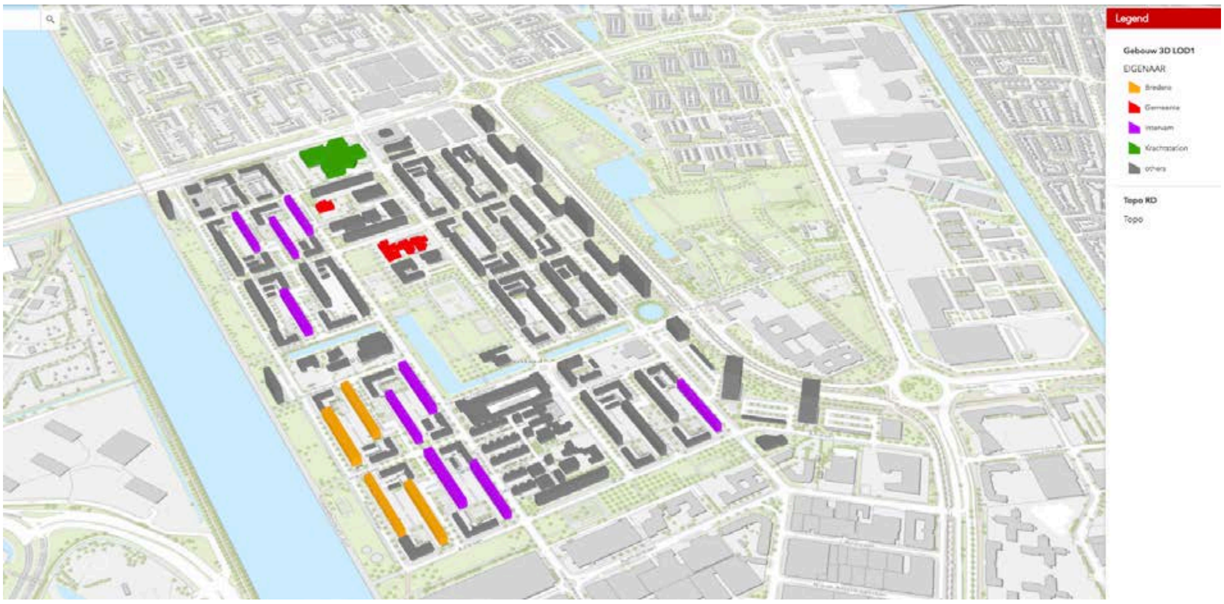


Figure 17 : Map of the demonstration district Kanaleneiland Zuid with overview of apartment blocks that will be renovated, involved schools and the local innovations hub Krachtstation

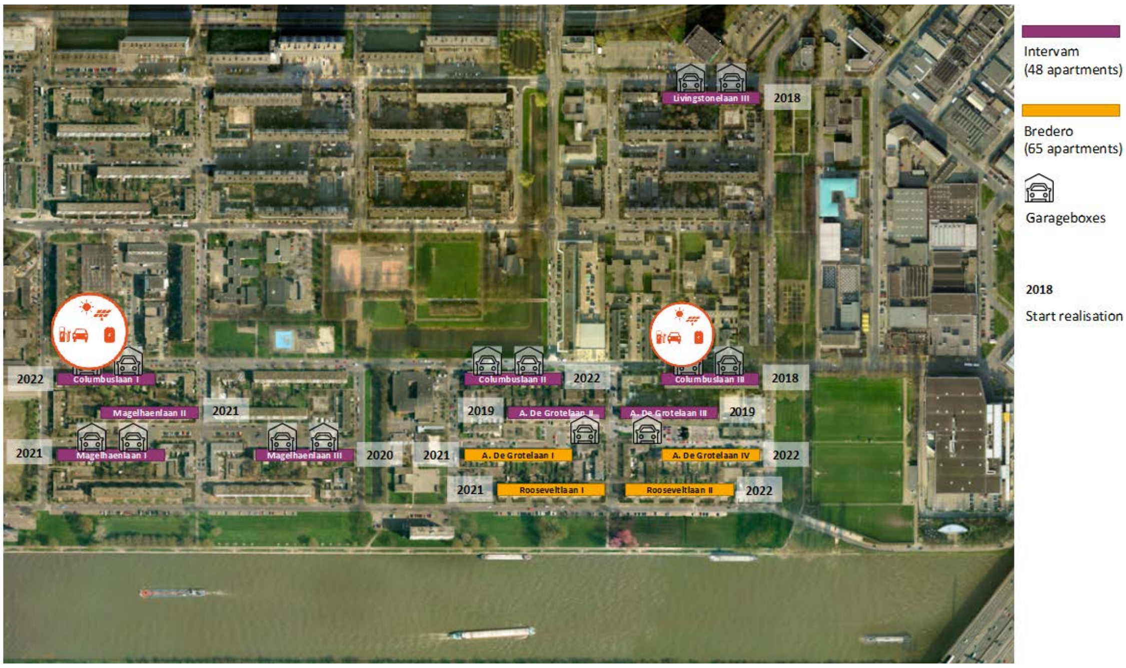


Figure 18 : Map of the demonstration district Kanaleneiland Zuid with overview of the location of the first 2 V2Grid charging stations.

7.2.1.3 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Demonstration

Table 7 *Objectives, Needs and Opportunities of the Utrecht demonstration in IS3.1*

Opportunities	Needs/objectives
Maximum self-consumption reducing grid stress and curtailment	A Near Zero Energy district amongst others requires an optimal distribution of renewables within the district by means of demand side solutions and storage for grid flexibility and cost-effective use of renewables. Therefore, the e-vehicles will (1) make optimal use of the electricity produced with the PV panels placed on the apartment buildings and three schools to charge their batteries, and (2) be deployed to provide flexibility for the electricity grid by delivering energy in case of peak demand and storage energy in case of high production peaks.

7.2.1.4 Key technical components

See 1.2.1.1. The key technical components are identical to the components utilized in the pre-pilots.

7.2.2 Nice Cote D' Azur Demonstration

7.2.2.1 Use Case and Brief technical description

"Smart Management of Pollution Peaks" solution is aimed at reducing the pollution peaks through information and incentive supplied to drivers of personal vehicles by means of the Urban Pulse application. In terms of components, the solution is based on "low cost" air quality sensors that can complete information given by precision sensors and improve air quality maps. In addition, the development of a dynamic charge plan and car/charger interface is under study by edf and is aimed at being deployed during IRIS lifetime.

Figure 19 : Low cost air quality sensors of the system

7.2.2.2 Demonstration Area and Geographical Overview

"Urban Pulse" app was tested several years ago by the transport company Transdev in order to reduce the use of its own float of vehicles and to promote alternative mobility solution. Within IRIS the solution will be experimented in the Plaine du Var area using air quality sensors that have been implemented.

7.2.2.3 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Demonstration

The objective of the solution is to reduce air pollution and noise and the expected impacts are: 7% reduction of N02 emissions, 6% reduction of PM10 emissions, and 6% reduction of PM2.5 emissions.

On a second level, the solution will test a business model based on the improvement of quality of life for the population and reduction of health costs. This very innovative business model will be an important part of the project.

7.2.2.4 Key technical components

The key components of the solution are described in detail in IS3.2.

7.3 Replication Planning in the Lighthouse and Follower Cities

7.3.1 Utrecht Replication

The region of Utrecht has a strong ambition regarding Smart Solar Charging and in replacing combustion busses by electric solar powered V2G buses. It ambitions to realize 1.000 solar V2G e-cars in sharing systems, 10.00 PV systems and 1.000 smart solar V2G charging stations in 2025 in the province of Utrecht and deploy 143 V2G e-busses in 2019, and 350 in 2023.

7.3.1.1 Replication Area and Geographical Overview

See map with replication area with solution 3.2.

7.3.1.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

Table 8 *Objectives, Needs and Opportunities of the Gothenburg demonstration in IS3.1*

Opportunities	Needs/objectives
Maximum self-consumption reducing grid stress and curtailment	A Near Zero Energy district amongst others requires an optimal distribution of renewables within the district by means of demand side solutions and storage for grid flexibility and cost-effective use of renewables. Therefore the e-vehicles will (1) make optimal use of the electricity produced with the PV panels placed on the apartment buildings and three schools to charge their batteries, and (2) be deployed to provide flexibility for the electricity grid by delivering energy in case of peak demand and storage energy in case of high production peaks.

7.3.2 Nice Cote D' Azur Replication

Nice will study the demonstration in additional NCA areas. The smart management of pollution peaks will be proposed to other cities where Urban Pulse is already available in France, through a business offer of service including low cost air quality sensors.

The solution will be proposed to other cities where Urban Pulse is already available in France, through a business offer of service including low cost air quality sensors which will be designed during the project.

7.3.3 Gothenburg Replication

The charging station for electrical buses in Johanneberg and the planned vehicle pool in Riksbyggens Positive Energy Buildings does not include V2G solutions, but Solar PV will be added to the houses. The charging infrastructure in Gothenburg will therefore be an acceptor of the Utrecht V2G-solutions.

7.3.3.1 Replication Area and Geographical Overview

At Riksbyggen's housing complex Brf Viva, currently under construction and previously described in IRIS project, there are plans for a car sharing pool with electrical vehicles, connected to the solar panels. These vehicles could be included in a V2G solution and thus take advantage from experience gained in the Utrecht demonstration case.

A second possible replication area in the Gothenburg vicinity, is the Forsåker area in Mölndal, close to Gothenburg. Forsåker is a new district with housing, schools, shops, offices and business premises at a former industry site. In total, there will be housing for around 6 000 persons and office premises for at least 3 000 people. The land was purchased by Mölndal Municipality in 2009 and the municipal company MölnDala Fastighet oversees the exploitation of the whole area. High sustainability ambitions permeate the work and various energy and mobility solutions are currently under discussion. Local renewable energy could be combined with electric car pool, with Utrecht as a model.

Forsåker is the former site of a paper mill in central Mölndal, a municipality bordering to Gothenburg in the south-east. After the paper mill was shut down, the area has been acquired by the municipality and will be exploited with housing and offices. Construction work is expected to begin 2020.

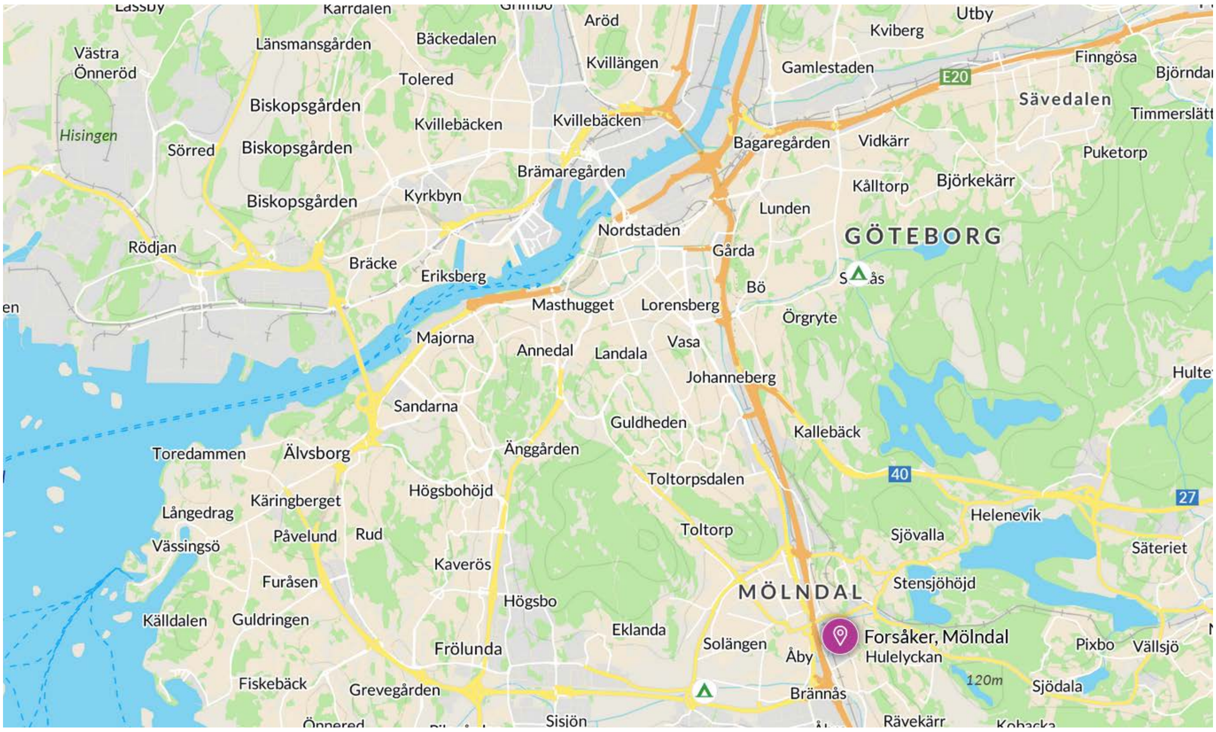


Figure 20 : Location of Forsåker district in Mölndal, close to Gothenburg

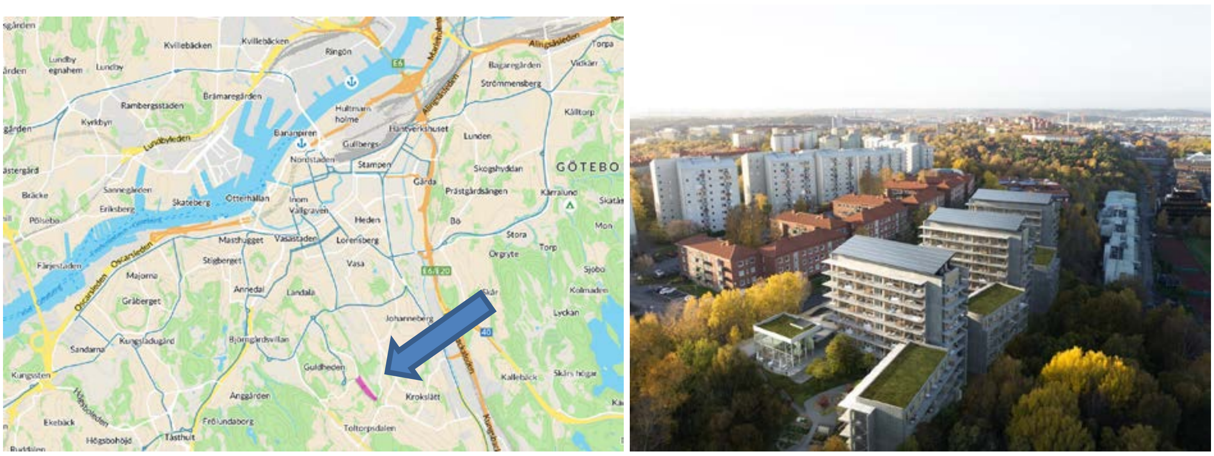


Figure 21 : a) Location and b) bird's view of the Viva housing association in Gothenburg

7.3.4 Vaasa Replication

The main innovations that City of Vaasa is interested are 1) to best deploy district-scale storage, combining V2G batteries as primary storage and stationary batteries in the apartment buildings as secondary storage, supported by open ICT for interconnection, performance monitoring and new information services (Transition Track #4, #5) for aggregators, grid operators, municipality and

citizens, 2) the smart control of these charging stations and their periodic maintenance for the management of pollution peaks. In addition, the impact of incentives supplied to mobility drivers, when citizens accept to change their behavior is one of the interest areas.
Additional innovative elements that City of Vaasa is interested are 1) the use of solar charging for e-buses (TRL7->8), which can be discharged at the time that energy demand and prices are high; 3) investigation of integrating the use of electric boats for implementation of Vaasa – Umeå line as an additional mobility track element which has a strong EU aspect.
Government of Finland has put in place a national strategy on increasing use of EVs and put in place also a funding scheme to increase public charging stations with smart solutions. Vaasa is interested to conduct studies on different solutions on smart solar charging systems and business models. Same business models could be also used in biogas stations that are planned in Vaasa.

7.3.4.1 Replication Area and Geographical Overview

A new mainly residential area, Ravilaakso will be constructed starting from 2020. Area is located within 1000 meters distance to the city center. Ravilaakso is an old trolling track with area about 30 ha. Ravilaakso will establish a vision for a future energy efficient and innovative neighborhood for about 2000 – 2500 inhabitants. Area includes blocks with both townhouses and apartment houses that are architecturally high level, interesting open public spaces and local business premises. Ravilaakso will create a city-like, lively, diverse and active city district next to the city center. The aim is that the area will act as a showcase and a living lab for energy-efficient and sustainable solutions where innovative companies can test their products and services in an enabling environment.

Use and charging of EVs will be included into detailed planning and construction of the area. For next generation of buses that will replace newly purchased biogas buses electric buses and hybrid models will be studied as well as possibility and development of automated vehicles.

As additional replication area can be University Campus which have most popular bus route. Area could provide also place to replicate V2G solution where additional research could be carried out related to smart grid solutions.

Figure 22 : Location of Ravilaakso and University Campus demonstration areas

7.3.5 Alexandroupolis Replication

According to Alexandroupolis' SEAP, mobility sector is characterized as an important sector for achieving the CO_2 emissions reduction target. Electric vehicles constitute an opportunity for the mobility sector of Alexandroupolis towards the ultimate objective of zero emissions mobility, considering the solar irradiation levels of the region. Alexandroupolis is interested in performing feasibility studies for integrating innovative solutions tested in the lighthouse cities in the urban mobility sector of the city. In particular, the city is interested in the solution of district-scale storage that combines V2G batteries as primary storage and stationary batteries in buildings as secondary storage, supported by open ICT, performance monitoring and new information services, the solution of smart control of EV charging stations, as well as the use of solar charging for e-buses, the electric boats utilization and results of the evaluation study of the impacts of incentives supplied to mobility drivers.

Alexandroupolis will perform feasibility studies for this solution, including the identification of most promising solar V2G stations.

7.3.5.1 Replication Area and Geographical Overview

The city centre of Alexandroupolis is mainly the replication area for the solutions of this transition track, as it is the case for the Innovative mobility services transition track of the project. Nevertheless, the feasibility of the solutions will be examined for the whole city of Alexandroupolis, since the size of the city is relatively small, as compared to the lighthouse cities. Therefore, the geographical bounds of the city can be considered as the geographical bounds of the replication area.

Figure 23 : City centre of Alexandroupolis (aerial photo and view from Google Earth)

As additional replication area can be Medical University Campus, which located about 5km west of the city center and have the most popular bus route. Area could provide also place to replicate V2G solution where additional research could be carried out related to smart grid solutions.

7.3.5.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

Table 9 *Objectives, Needs and Opportunities of the Alexandroupolis replication in IS3.1*

Opportunities	Needs/ Objectives
Reduce CO_2 emissions from mobility sector	Mobility sector is responsible for approx. 30% of the total CO_2 emissions of Alexandroupolis. Solar EV charging will result in increased use of environmental friendly EV cars within the city.

Utilize locally produced renewable energy	A Near Zero Energy district amongst others requires an optimal distribution of renewables within the district by means of demand side solutions and storage for grid flexibility and cost-effective use of renewables. Therefore the e-vehicles will (1) make optimal use of the electricity produced with the PV panels placed on the apartment buildings and three schools to charge their batteries, and (2) be deployed to provide flexibility for the electricity grid by delivering energy in case of peak demand and storage energy in case of high production peaks.

7.3.6 Focsani Replication

Focsani will study, develop and implement (near future) a charging infrastructure (20 stations) at city level. The technology that IRIS will propose is Smart Solar V2G EVs charging, both for e-cars and small-medium sized e-buses for public transportation.

7.3.6.1 Replication Area and Geographical Overview

The picture bellow shows the map of Municipality of Focsani with the main streets. The EVs charging stations shall be installed along the main streets in Focsani.

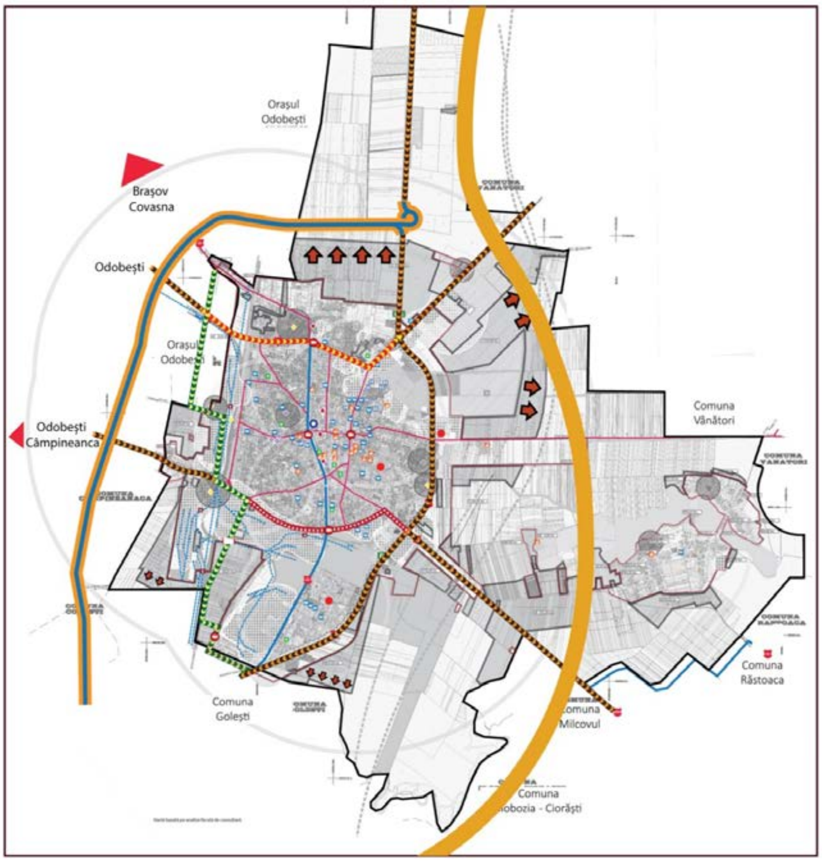


Figure 24 : Map with the main streets of the Municipality of Focsani

7.3.6.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

Implementation of the EVs charging stations in Focsani can lead to the increase of number of electric vehicles used by people in the city. This fact can contribute to reducing environmental pollution in the city especially in the most congested districts, since the EVs charging stations are to be installed on the main streets.

7.3.7 Santa Cruz de Tenerife Replication

Santa Cruz de Tenerife is interested in studying how the produce PV energy and use it smartly among public lighting and EVs. The main innovations that City of Santa Cruz de Tenerife is interested are 1) develop a wide network of charging V2G point across the city, 2) the smart control of charging stations and their periodic maintenance for the management. Furthermore, other innovative elements are 1) the use of solar charging for e-buses or hybrid buses, 2) investigation of integrating the use of electric bike for implementation of Santa Cruz.

A project about a 100% Sustainble Street is about to be started. The main goal is to provide 100% renewable energy for one the most important axis of the city. There will be PV panels with 337.5 kWp and mini-aerogenerators with 18 kW.

This energy will serve for public lighting as well as for 13 charging points of electric vehicles. 10 out 13 will provide semi-fast charge and 3 of fast charge using 50 kW (CHAdeMO, CSS Combo 2 type 2).

All the theses facilities will be monitored in real time to know energy consume, renewable energy generate and to let citizens know about the benefits of the project.

These facilities will save 489.176 kWh a year and 379,3 CO_2 tons, with a total cost of 1.5 million of euros.

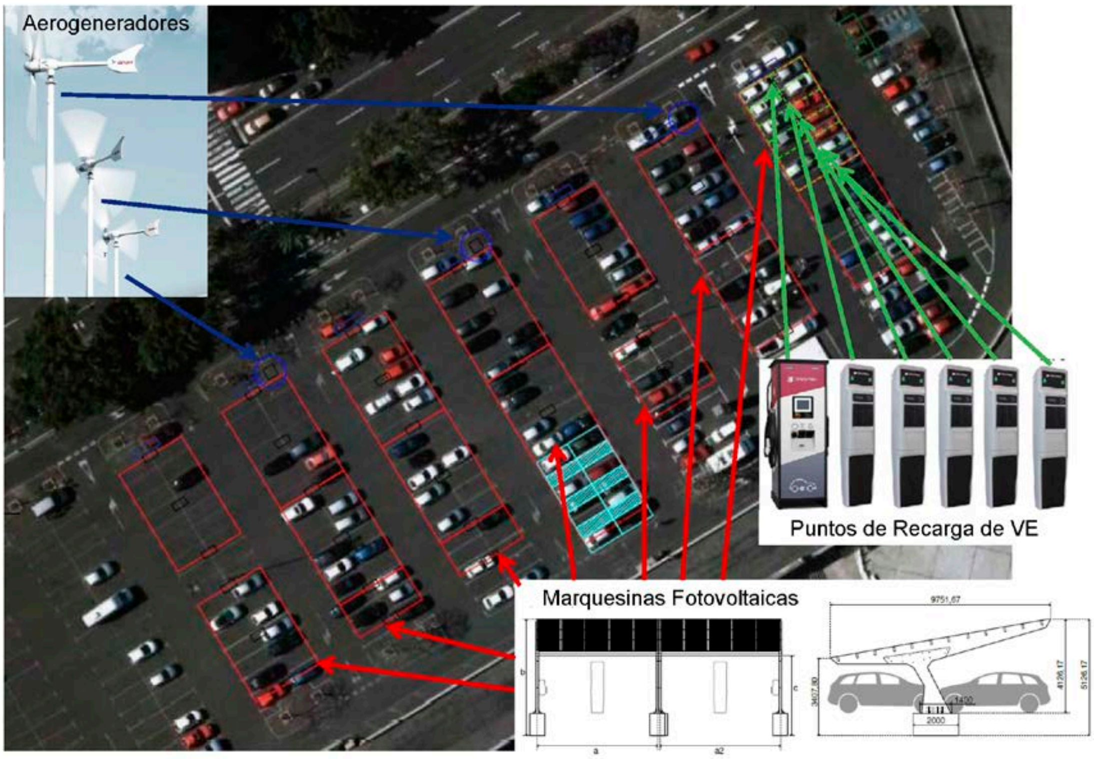


Figure 25 : Charging station for electric vehicles of the Municipality of Santa Cruz de Tenerife

7.4 Data Collection and Management

7.4.1 Utrecht

Data that will be collected within the demonstration area include:

- Usage of the e cars: number of km driven, efficiency, charging time. These data will be collected by the provider of the e-car sharing service
- Load profile of electric vehicle: utilization of solar electricity, utilization of battery for electricity delivery….
- Load profile electric e-buses. QBuzz will provide these data.

7.4.2 Nice Cote D' Azur

At Month 7 of the project, the data collection and management is being defined as part of WP4 "City Innovation Platform", and more specially the deliverables D4.1, D4.2, which final version is under review with both CERTH and UTR.

During CPB in Goteborg (March 2018), a working session dedicated to WP4 was held, with the following conclusions:

"After a general introduction of the City innovation platform architecture three sprints were done based on different "use cases", addressing economy, mobility and energy challenges.

The use cases were developed in design sprints which resulted in a better understanding of the specification of the data required from the digital services needed and of the role and benefits of the city innovation platform

The sprint method was highly appreciated by the participants. It is a motivating way to get input with people from different backgrounds. "

A "T6.6 preparatory workshop" dedicated to the set-up of the CIP was held on the 29th of May with Nice Ecosystem partners.

The "use case" approach enabled to address and anticipate the different transition tracks issues and challenges, whilst anticipating and covering potential technical constraints."

The up-coming 4.2 deliverable will provide more technical information and requirements.

7.5 Regulatory Framework per LH/FC

7.5.1 Utrecht

For the E-driver the institutional bottlenecks include:

- Current netting rules do not provide any incentive for optimization of storage in batteries behind the meter. (E-drivers with (their own) solar panels are not financially stimulated to optimally use the self- generated renewable electricity and the storage capacity from the car for their own electricity (peak) demand)
- Double energy tax discourages bidirectional charging. (Each charging and discharging cycle (bi-directional charging), energy tax need to be paid on either the stored or consumed kWh. Private charging points at low-volume consumers are currently exempted from this rule. It is currently, however, unclear which regime applies to (semi-) public charge points.)

Uncertainty about the possible use of smart charging for the grid operator's congestion management. The Electricity Act currently prohibits regional grid operators to own/operated storage capacity themselves. It is unclear whether they may use the flexibility that can be accessed using storage in batteries.

7.5.2 Nice Cote D' Azur

Concerning NCA, the "Energy transition for green growth act" (national law 17/08/2015 - dedicated website: http://www.gouvernement.fr/en/energy-transition) leads French local authorities to define a local "Territorial Energy and Climate Plan", with different level of objectives and expectations according to the size of the local authorities.

The Metropole of Nice Cote d'Azur, totalizing more than 500.000 inhabitants, has therefore its local action plan (http://planclimat.nice.fr/public/accueil.html).

Also, ADEME (French Agency for Environment and Energy Management - http://www.ademe.fr/en) is an industrial and commercial public institution placed under the joint supervision of Ministry of Ecology and Sustainable Planning and Development and the Ministry of Higher Education and Research.
ADEME aims to be the point of reference and privileged partner for the general public, companies and local authorities, acting as the State's tool to generalize the best practices designed to protect the environment and energy saving.

ADEME is involved in the following sectors: air pollution, noise, waste, energy (energy management and renewable energies), environmental management, polluted sites and soils, transports. Within the framework of public policies defined by the government, the Agency's mission is to stimulate, animate, coordinate, facilitate and perform operations aiming at the environment protection and energy management.
Also, ADEME regularly launches call for proposals to foster innovation projects.

7.5.3 Gothenburg

Since both described cases of replication are at very early, conceptual stages, no such information is available.

7.5.4 Vaasa

Government of Finland has put in place a national strategy including e-mobility. Regulatory framework is under development. The Government is facilitating transition to renew current stork of vehicles with low emission vehicles. A subsidy is provided when changing an old vehicle to new low emission vehicle and also taxation on low emission vehicles is lower than other vehicles.

7.5.5 Alexandroupolis

Charging Stations (Law 4233/2014, Art.15):

Allowance for installation of EVs' Charging Stations at Automotive Workshops and Vehicle Technical Inspection Centers ("*KTEO*") as well as specific parking lots, yet unspecified for public places and problematic as it implies extra costs for the private individuals.

In action as of January 2015.

7.5.6 Focsani

The Romanian regulatory framework regarding e-mobility is still under development. However, there should be mentioned that presently there is a Government program for stimulating electric vehicle purchase. This program subsidizes any purchase of electric vehicle with 10000 Euros.

Nevertheless, there can be mentioned some local (Focsani Municipality) action plans and national legislation, which includes the following:

- Sustainable Urban Mobility Plan of Focsani Municipality, 2016;
- Sustainable Development Strategy of Focsani Municipality 2014-2020;
- Environment Report, General Urban Plan Update, Focsani Municipality, July 2012 - Rev. 5;
- Government Decision no. 529/2013 for the approval of Romania's National Strategy on Climate Change, 2013-2020;
- Government Decision no. 1460/12.11.2008 for the approval of the National Strategy for Sustainable Development - Horizons 2013-2020-2030;
- Government Decision no. 1069/05.09.2007 - Energy Strategy of Romania for 2007-2020;
- Government Decision no. 1535/2003 Strategy for the Recovery of Renewable Energy Sources;
- Ordinance 22/2008 on Energy Efficiency and Promotion of the Use of Renewable Energy Sources by Final Users.

7.5.7 Santa Cruz de Tenerife

This information will be included in the next deliverables of the project.

7.6 Bounds and Drivers per LH/FC

7.6.1 Utrecht

Technical Bounds & Drivers: Technical barriers are not anticipated because the technology applied in the demonstration area is already applied in another district in Utrecht.

Legal: Current regulations in the Netherlands are not providing incentives for optimal operations of EV for storage of locally produced electricity because of: (1) double charging of energy taxes, (2) lack of financial incentives for storage behind the meter, (3) restricted rules regarding the role of grid operators in energy storage.

Financial: Financial incentives to stimulate smart solar charging are not yet in place.

7.6.2 Nice Cote D' Azur

Technical Bounds & Drivers: The main driver for Nice Cote D' Azur is to reduce the use of vehicles and promote alternative mobility solutions.

7.6.3 Gothenburg

Since both described cases of replication are at very early, conceptual stages, no such information is available.

7.6.4 Vaasa

Existing house networks are not sufficient for large number of charging EVs. Also, if one owner in the housing association objects investment for a charging system that will prevent investment or even charging an e-vehicle.

There are no local of national framework in place yet. City of Vaasa is planning how EVs should be included into parking norms, building public infra and changing traffic planning and rules within the city.

7.6.5 Alexandroupolis

Technical. There technical barriers related to the Grid structure of Alexandroupolis for large scale implementation of V2G charging stations. In addition, electrical power of households may usually not be sufficient for EV charging that may result in Grid upgrade requirements that is both technical and economical barrier

Legal. The is no regulatory framework for V2G charging stations in Greece at the moment. The adaptation of the Greek legislation is considered as a barrier for the implementation of solutions included in this transition track.

Social. Electric vehicles are gaining ground in respect to public perspective and therefore their adoption is not considered as a social barrier. In contrast, the increased acceptance of EVs may act as a driver for the development of smart solar V2G EV charging infrastructure.

Financial. Funding of such projects constitutes a significant barrier due to increased capital cost. In addition, the lack of EVs in the area of Alexandroupolis acts negatively in any potential private investment.

Environmental. It goes without saying that solar EV charging results in CO_2 reduction and supports the ultimate target of zero emissions mobility.

7.6.6 Focsani

The main driver for implementation of this project is that there is in place the Government subsidy for purchasing an electric vehicle of 10000 Euros. The main bounds for this project are as follows:

- The lack of infrastructure;
- High price of electric vehicles compared to fossil fuels ones;
- Low social awareness concerning this issue.

7.6.7 Santa Cruz de Tenerife

The main driver for implementation of this actions is the social demand regarding new mobility alternatives. On the bounds side there are two main ones:

- Lack of regulatory framework on sharing economy for some potential solutions.

- Very strong dependency of the population on private vehicles due to the highly scatter population distribution.

7.7 Business Models

7.7.1 Utrecht

The value of the demonstration is three-fold: 1) generating the highest value out of 15.000 m2 solar panels and their surplus of solar power, 2) develop charging and discharging algorithms that make it possible that 143 electric buses are charged and can be operated all day at the lowest prices (night time); 3) develop charging and discharging algorithms that result in the highest value of 2nd life batteries for e-buses of the QBUzz partner and for Renault e-cars.

7.7.2 Nice Cote D' Azur

Smart management of pollution peaks (NCA) - The business model will be based on the improvement of quality of life for the population and a reduction of health costs. This is a very innovative business model.
Bonus and incentive are considered.

Concerning the dynamic charge plan, business models need to be adapted on-demand according to the site considered.

7.7.3 Gothenburg

E-mobility service driven by property owners (GOT) - EC2B has a unique business model that integrates a range of mobility services, connected to accommodation live. Furthermore, the connection to accommodation creates a value to property developers and save money through reducing the number of parking spots needed.

Second life batteries (GOT, UTR) - The project will develop business models whereby second-life (former automotive) batteries may profitably be used for stationary energy storage in a building or district. The project will also examine depreciation against longevity of these specific batteries and potential extended use of stationary battery storage.

7.7.4 Vaasa

E-mobility service could be driven by property owners directly and they will invest for the system as required. There are also commercial operators providing EVs but model the use V2G need is not in place in that case. The unique business model of EC2B that integrates a range of mobility services, connected to accommodation will be studied if suitable for Vaasa. Connection to accommodation creates a value to property developers and save money through reducing the number of parking spots needed. Unsolved at the moment is how property owners will be committed to use shared EVs and renew the EV when required.

7.7.5 Alexandroupolis

E-mobility service driven by property owners - The unique business model of EC2B that integrates a range of mobility services, connected to accommodation live will examined in Alexandroupolis. The connection to accommodation creates a value to property developers and save money through reducing the number of parking spots needed.

Value of Grid Flexibility - Electricity grids get stressed by peaks in offer on sunny and windy days and by peaks in demand when EVs are charged. Extensive flexibility in our energy system is crucial, enabling selling solar and wind power at high prices and preventing curtailment. For that, smart energy management and district wide storage are necessary, provided either by V2G batteries in a district-wide EV car sharing system, or by additional stationary storage integrated in the urban energy system. The Universal Smart Energy Framework (USEF) offers a new business model unlocking the value of flexibility in the energy grid.

7.7.6 Focsani

This information will be included in the next deliverables of the project.

7.7.7 Santa Cruz de Tenerife

EV2G is a business model by itself regarding private users, since generates savings to face the higher initial costs. Promoting the charging points in the city will help to boost the demand of electrical vehicles together with national and regional subsides.

Alternatives vehicles, like e-bikes will help to change the mobility patter of the city and this will help to create a new economy branch regarding e-bikes and other electrical mobility devices.

Furthermore, smart phones accordingly with creative solutions considering the electrical mobility utilities of the city might create the space for innovation with new unexpected business models.

7.8 Replicability/Impact of the Pilot/ Demonstration/Replication Areas

Utrecht

The demonstrated solution had a huge potential for replication in the region of Utrecht due to its strong ambition regarding Smart Solar Charging and in replacing combustion busses by electric solar powered V2G buses. It ambitions 1.000 solar V2G e-cars in sharing systems, 10.00 PV systems and 1.000 smart solar V2G charging stations in 2025 and the addition of 143 V2G e-busses in 2019, and 350 in 2023.

Vaasa

There are some property developers that are interested to include shared EVs in the project. It is foreseen that in Vaasa first project will take part soon and most likely in retrofitting projects improved grids will be included. Companies providing EVs are interested to enter Vaasa business area.

8. ANNEX for IRIS Solution IS-3.2: Innovative Mobility Services for the Citizens

8.1 Pre-pilot Areas description and Available Infrastructure

8.1.1 Utrecht Pre-Pilot

Utrecht is a frontrunner in the Netherlands in the number of cars that are shared. Between 2015 and 2016 the number of shared cars has almost doubled. By the end of 2015, a total of 1,294 shared cars were in operation in Utrecht; in 2016 this was a total of 2,010. Utrecht is furthermore one of the EU frontrunners in e-mobility, regarding the number of e-cars (4,035) and charging stations (260) in the city by the end of 2015. Moreover, Utrecht introduced the first European solar powered V2G pilot for public use in Europe in June 2015, called *Smart Solar Charging*. Building upon this small-scale pre-pilot, a district wide V2G e-car sharing system is currently being installed.

The Pre-pilot area includes the district of Lombok where the "WeDriveSolar" car sharing system was first introduced (see Figure 27). The concept is currently replicated in other districts and will be rolled-out in the demonstration district of Kanaleneiland Zuid. Consumers or companies wanting to make use of the "WeDriveSolar" services have the option to select between various subscriptions, starting at 99 euro/month. With a subscription the participants are signing up for a lease of 15.000 km/year. As soon as there are sufficient registrations for subscriptions in a neighbourhood, a car can be supplied (typically a group of 5-6 subscriptions is sufficient for one car). Participants can reserve a car through an app as well as open one with the app.

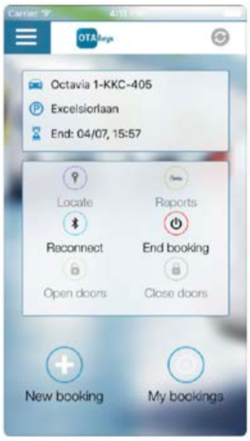


Figure 26: WeDriveSolar Reservation app

At this point it should be considerable enough for the different subscription packages offered by *WeDriveSolar* to be mentioned. Therefore, apart from the aforementioned one, there also exist:

- **Solar**: € 99/month (+€ 12.50/month advance electricity payment) including
  - 1 day/week of driving
  - 2.500 km/year driving bundle
- **Solar Gold:** €147,90/month (+€ 18.75/month advance electricity payment) including
  - 1,5 day/week of driving
  - 3.750 km/year driving bundle
- **Solar Max**: € 196,25/month (+€ 25/month advance electricity payment) including
  - 2 days/week of driving
  - 5.000 km/year driving bundle
- **Solar Mega** € 295,25/month (+€ 37.50/month advance electricity payment) including
  - 3 days/week of driving
  - 7.500 km/year driving bundle
- **Solar Ultra**: € 392,50 /month 37.50/month advance electricity payment) including

- 4 days/week of driving
- 10.000 km/year driving bundle

Figure 27: WeDriveSolar e-car sharing system, launched 2016 in Utrecht district Lombok

Jedlix[2] is the company offering a service to manage smart charging of the cars. It charges electric cars based on the balance between production and consumption of renewable energy. By selecting the optimal charging moments (in terms of cost), Jedlix aims to increase the share of renewables in the energy mix. They charge a car with renewable energy when the prices are at their lowest and the financial rewards go to the drivers.

8.1.1.1 Pre-Pilot Area and Geographical Overview

The pre-pilot area for smart solar charging started in the Lombok district (more details are provided under solution 3.1). Smart solar charging is currently further rolled out in the city and the province of Utrecht.

[2] https://jedlix.com/

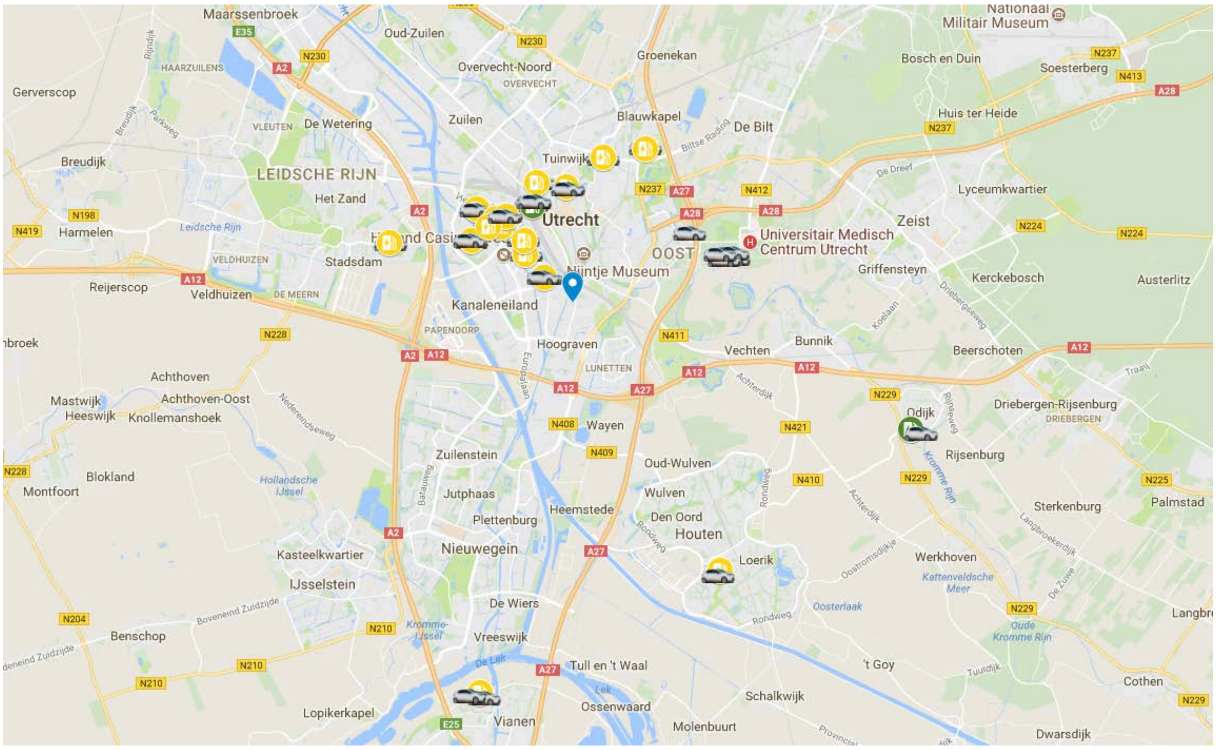


Figure 28: Current location of WeDriveSolar EV in the province of Utrecht

8.1.1.2 Innovative elements

Table 10 elaborates the currently available information for each of the considered key innovative elements of the IRIS pre-piloted solutions. Whenever available, additional information along with more technical specification of the basic configured elements are as well provided, in order to allow for a better understanding of the basic elements of the solutions:

Table 10 *Innovative elements of the Utrecht pre-pilot in IS3.2*

Main Component	Technical Specifications	Area of the pre-Pilot
WeDriveSolar: e-car	Renault Zoe 300 km range	Utrecht area
WeDriveSolar: Reservation app	Kiwy App is used to make car reservations	Utrecht area
WeDriveSolar: subscriptions options	WeDriveSolar provides various subscription options: **Solar**: € 99 /month **Solar Gold**€ 147,90/ month **Solar Max**: € 196,25/month **Solar Mega** € 295,25 /month **Solar Ultra**: € 392,50 /month	Utrecht area

8.1.1.3 Lessons Learnt by the implementation of the Solution in the Pre-Pilot

First results show that smart storage of (solar) electricity in EVs can increase self-generation/consumption of electricity produced with PV panels by 23% to 38%, reduce energy sent to the main grid by 3 to 9 MWh per year and reduce peaks by 27% to 67%[3].

[3] Van Sark W (2017) Smart Solar Charging to support widespread deployment of photovoltaic systems and electric mobility. Presentation at the International Conference on Renewable Energy and Resources Vancouver, 25 July 2017.

8.1.2 Nice Cote D'Azur Pre-Pilot

Pre-pilot: Autobleue carsharing service

NCA Metropole provides an **electric car sharing service under the trademark name *Autobleue*** with a fleet of over **140 EVs available both** in **round-trip** and **one-way** modes. This mobility service relies on NCA global charging infrastructure (described in IS 3.1) for the charging process as well as the places to pick up and deliver cars.

Triggering events causing the initiation of this innovative service lie on the increased parking congestion and the scarce parking availability within the city. Most importantly though, equipping the fleet with purely EVs turned out to be one of the most important aspects of Autobleue since owing to these the financial support of the service has been undertaken by the government.

Key factor guaranteeing viability and maximum performance of the service is the strategic selection of the locations for the stations. Therefore, the team behind Autobleue followed a scientific approach by using a mathematical model through which they first identified the locations of potential drivers of the Autobleue system and then used these locations to optimize the selection of the planned stations. The mathematical approach used was a Linear Regression Model using socio-economic variables (population density, modal split, profession, demographic…).

Figure 29: Autobleue fleet vehicle models

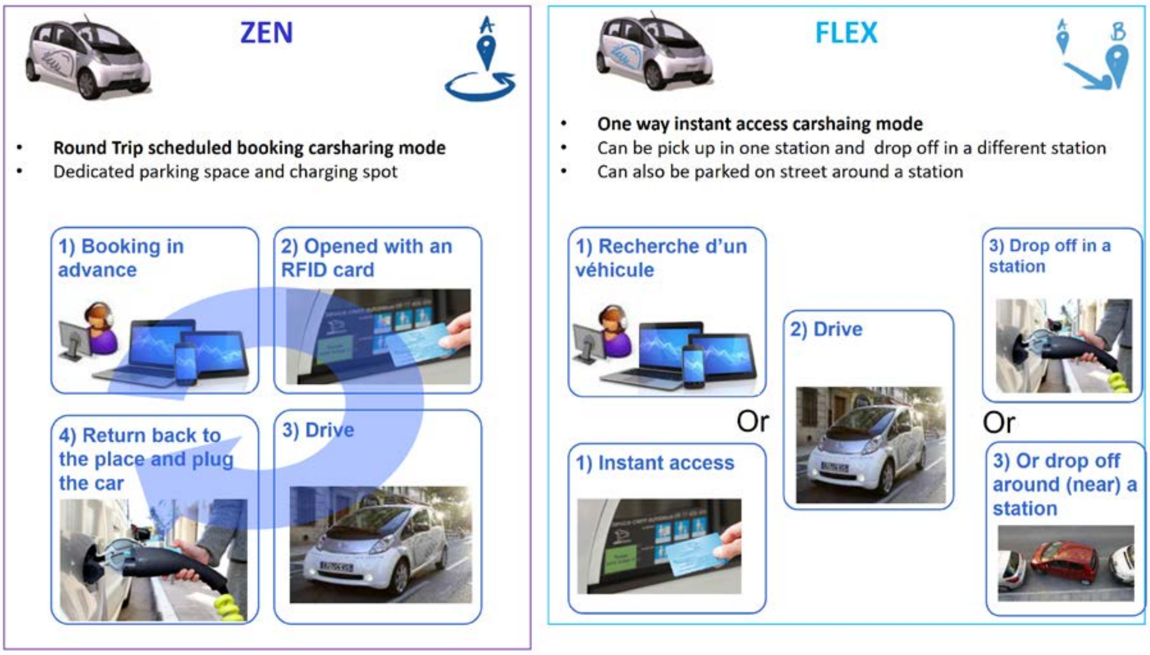


Figure 30: Exploitation models (Roundtrip and one-way rentals)

Pre-pilot: Urban Pulse for the first real time pollen alert in Europe, Metropollen

Pollens allergy is a dramatic public health issue, as 10 to 20% of European population is concerned. It affects the quality of life and absenteeism, with an estimated cost of 1100 €/child and 1600€/adult. Pollens emission are increasing with climate change, and air pollution is reinforcing the impacts.
In the framework of the Environmental Urban Monitoring, “low cost” sensors were developed in order to complete information given by precision sensors and improve air quality maps. The Urban Pulse application that was developed several years ago by the transport company Transdev in order to reduce the use of vehicles and promote alternative mobility solutions is already available in the Nice area. Urban Pulse is a mobile application that brings together information about a city via an ecosystem of more than 200 partners in order to:

- Bring together all information in real time to help residents get the most out of their city,
- Encourage citizens to get more involved in their city and raises their awareness of environmental issues,
- Support local ecosystems.

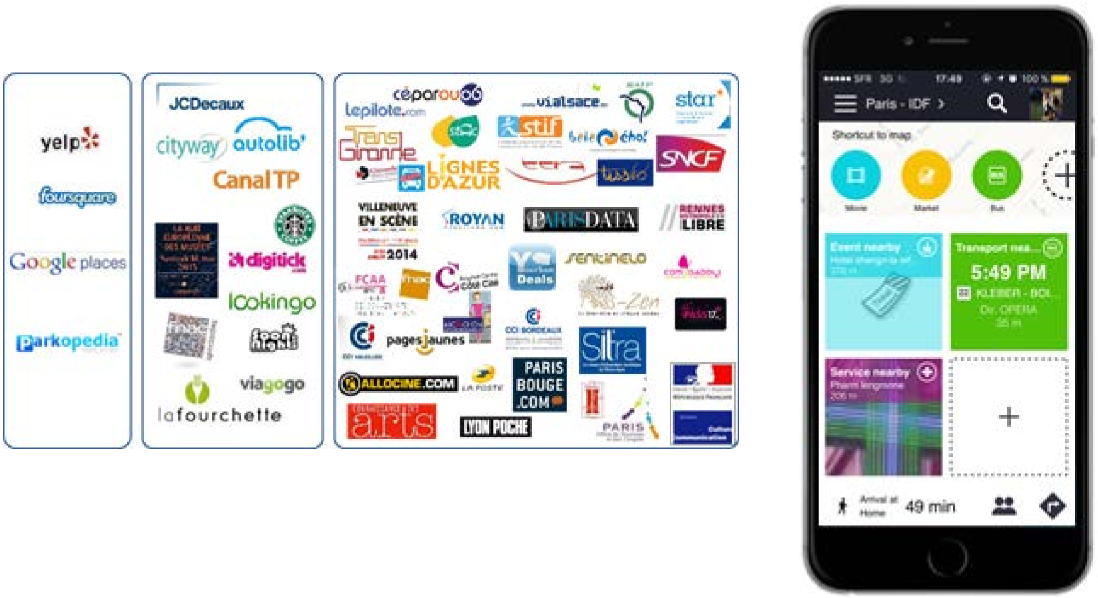


Figure 31: Urban pulse eco-system (left) and application (right)

Since 2013 urban pulse has been evolving to become a complete, practical and real-time guide to the city. The guide was improved in 2016 and can now be customized to suit individual cities and residents providing:

- Information about one’s home (e.g. recycling and energy consumption)
- Services for environmentally responsible communities (e.g. incident reporting)
- A platform that allows the municipality to communicate with residents (e.g. push notifications about events on the homepage and a section dedicated to the municipality)
- Environmental information (e.g. air quality and pollen levels)

8.1.2.1 Pre-Pilot Area and Geographical Overview

Car sharing service

Auto Bleue service was launched in 2011 as the first large size electric carsharing worldwide. The service makes shared electric vehicles available across nine towns of the Métropole Nice Côte d’Azur: Nice, Cagnes-sur-Mer, Saint Laurent-du-Var, Vence, Colomars, Carros, La Trinité, Beaulieu-surMer and Villefranche-sur-Mer. As of today, a total of 140 vehicles shared among 68 stations are available to a mere 8,100 members.

Figure 32: Autobleue carsharing service stations coverage

Pre-pilot: Urban Pulse for the first real time pollen alert in Europe, Metropollen

In the framework of the Urban environmental monitoring demonstrator, the first real time pollen alert in Europe was implemented in Nice:

- Current bulletin alerts based on 7 to 10 days data collection
- Real time alerts aim to better prevention
- Nice area strongly concerned by allergies to pollens

A FIDAS-200 particules sensor was modified in order to measure pollens. Data is analysed by RNSA and VEOLIA in order to edit a daily bulletin with forecast, advises and notifications through Urban Pulse. The area of the pre-pilot is the Nice region.

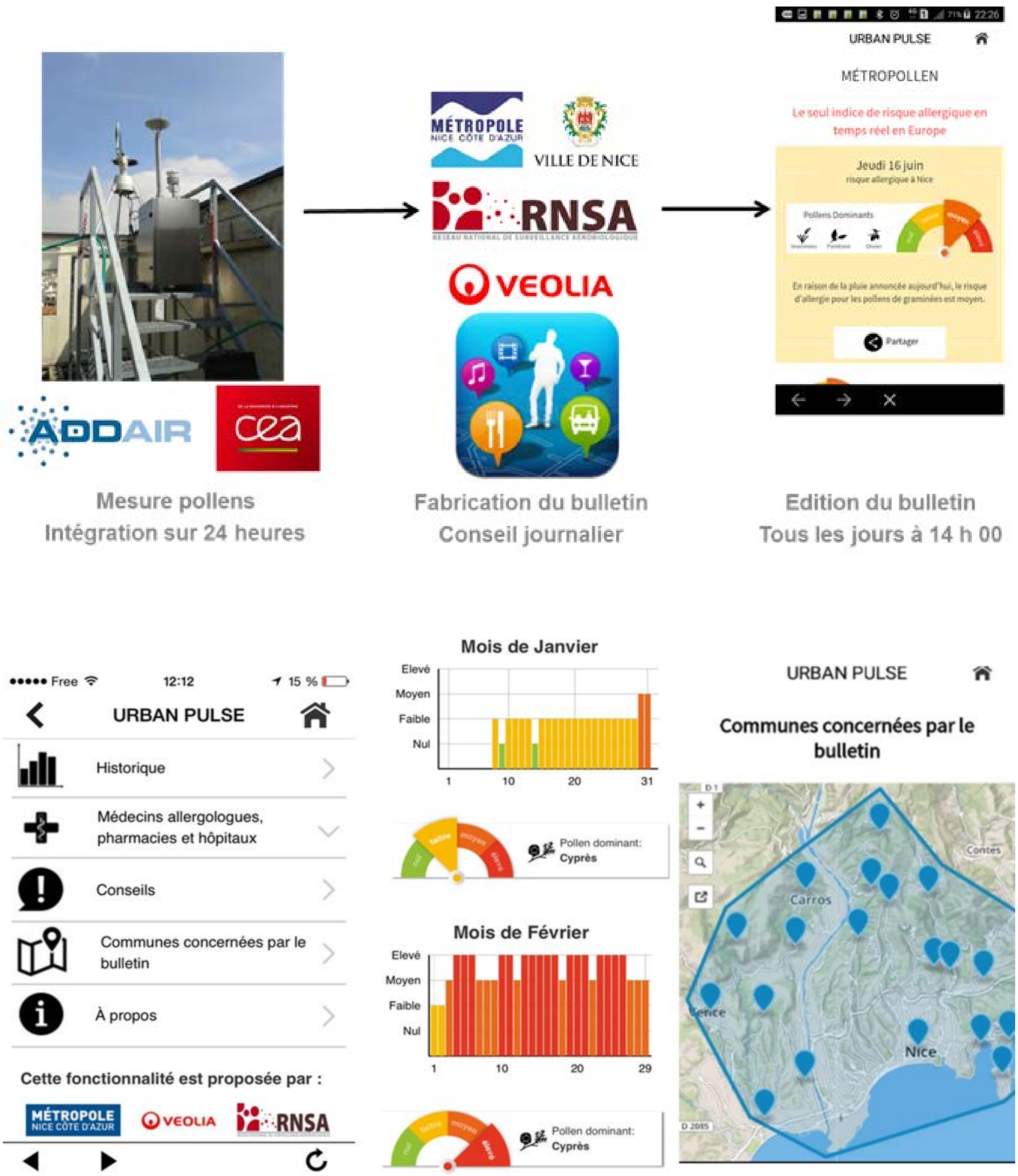


Figure 33: Urban pulse app

8.1.2.2 Innovative elements

Table 11 indicates the currently available thorough information for each of the considered key innovative elements of the IRIS pre-piloted solutions. Whenever available, additional information along with more technical specification of the basic configured elements are as well provided, in order to allow a better understanding of the basic elements of the solutions:

Table 11 *Innovative elements of the Nice pre-pilot in IS3.2*

Main Component	Technical Specifications	Area of the pre-Pilot
Autobleue carsharing fleet	140 Electric vehicles **3 vehicle models** **RENAULT ZOE:** Range: 130 km, Seats: 5 **PEUGEON ION:** Range: 100 km, Seats: 4	*Global NCA coverage (AUTOBLEUE)*

	RENAULT KANGOO: Range: 80 km, Seats: 2, Capacity: $3m^3$	
Autobleue carsharing scheme	**2 main carsharing modes** **ZEN:** round trip carsharing (station A to same station A) with scheduled booking. **FLEX:** one-way carsharing (station A to station B) pre-booking for 30 minutes or instant access	*Global NCA coverage (AUTOBLEUE)*
Carsharing on board unit	Each vehicle is equipped with a **carsharing kit**: • VUBOX carsharing module wired to the car (CAN Bus and others signals) • Multi-standard RFID Card reader • Multi-standard to be used with any type of RFID cards (includes public transit cards). NFC compatible. 3 LEDs on the RFID reader to guide the user (e.g. green (available), orange (reserved), red (not in service)). • TouchScreen for additional carsharing services (stopover, damage report navigation, SOS call button) • Microphone (call center)	*Global NCA coverage (AUTOBLEUE)*

8.1.2.3 Lessons Learnt by the implementation of the Solution in the Pre-Pilot

Car sharing service

When launching Autobleue EV-based carsharing service in 2011, Nice city was a pioneer and leader in the rising electromobility landscape and thus, gained a considerable experience in the day to day operations of a carsharing EV-based service. Autobleue provides a convenient way for about 10,000 citizens and professionals to move inside and outside the city as an alternative to private car ownership. Another significant achievement of the Autobleue project is the deployment of a fine mesh of charging stations within the city with a multi-port station every 500 meters.

Nice is going to leverage this first experience and the existing high-density network of charging stations to go one step further by moving from roundtrip/one-way carsharing schemes to a completely new experience: the free-floating scheme with cars available everywhere without the need to be returned to a station based, without booking and without constraining the choice of a destination with a station for EV drop-off.

Round trip only carsharing is presenting some limitations related to the number of available stations as cars are linked to them. Free floating scheme and technologies should provide the way to boost the number of shares per vehicle, the adoption rate and the flexibility of use for both the user and the car sharing system operator.

Within the context of IRIS, demonstrating free floating in Nice city and the introduction of novel services related to this new sharing mode should enable a fast deployment shared mobility solution, replicable in any smart city center and prove a higher efficiency in terms of sharing rate per vehicle.

Pre-pilot: Urban Pulse for the first real time pollen alert in Europe, Metropollen

Metropollen was launched in March 2016 by Métropole NCA and VEOLIA, through social networks but also newspapers and flyers distribution to drugstores and allergists. It reached 300 consultations per day due to the notifications.

In order to assess the impacts which is essential to build the business model:

- a panel of 97 persons was followed up with 3 allergists in 2016,
- the results of online questionnaires though Urban Pulse were analysed in 2016 and 2017.

The inquiries showed that 80% of the users indicated that Metropollen was useful, it helped 50% of them to modify their treatment and helped 40% to improve their quality of life.

Possible business models are currently explored: end-users subscription and/or insurance companies (reduction of health expenses).

8.1.3 Gothenburg Pre-Pilot

Pre-pilot: Ubigo

For half a year 70 households in Gothenburg have been using an innovative mobility service in reality, subscribing to a fully integrated mobility service called UbiGo. The service combines Public Transport, car-sharing, rental car service, taxi and a bicycle system integrated into an all-in-one app, all on one invoice, with 24/7 support and bonus for sustainable choices. It may be compared to a charter service for everyday travel (instead of vacation trips) or Spotify® for everyday travel. The business idea is simple: Procuring everyday travel in volume, repackage and deliver it in a simple way, offering an easy everyday life without having to own a car.

UbiGo was developed and tested as part of the two-year project Go:smart, headed by Lindholmen Science Park, involving a dozen partners from the industry, academia and public sector and co-funded by Vinnova (the Swedish Agency for Innovation Systems). The focus was not on testing the technology, but the viability of the business model, which also includes a rewarding scheme for sustainable choices of transport modes. This can only be done by real households paying real money for real services.

Building on previous experiences, the project defined the concept, signed agreements with suppliers, developed the IT-platform including the app, recruited the households through real marketing, PR and sales-meetings, built up administration and support processes – all in just one year.

Figure 34 Mobile Phone Interface of UbiGo

The UbiGo households subscribe to their prepaid monthly need of public transport (as days to use in one or more zones) and car (as hours that can be translated on to days or longer). These digital punch cards are stored in the cloud and are accessible to all members of the households through the UbiGo-app. If the cards run empty, extra days or hours will be registered and billed afterwards, as will taxi-trips, waivers etc. Un-used days or hours will be saved for later use.

There is a 24/7 support service, and if there is a long delay in the public transport, UbiGo-customers will get a taxi without any paperwork afterwards. For every CO2 saved kg (compared to the case of the trip being made by private car), users get bonus points that can be used to buy services or products from UbiGo partner organisations (bike service, home delivery, health clubs, concerts etc).

Pre-pilot: Cost-effective and reliable soft public transport priority and tram switch operation combined technologies (Soft Prio)

The public transport priority system was upgraded within the framework of the OPTICITIES, replacing the loops by RFID tags and GPS signals for trams and buses respectively.

Former system: The traffic light prioritisation and switch operation for public transport (trams and buses) in Gothenburg was formerly carried out through ground loop sensors buried in the ground. About 80 km of tram tracks, 250 trams and 500 buses were operating this system with about 1,000 active ground loop connectors installed for positioning, switch direction requests and signal priority requests. This system was installed in the 80s and had exceeded its technical life span. This system had several drawbacks, including low flexibility and high maintenance costs due to its physical location, cable drawing, and proprietary hardware / software.

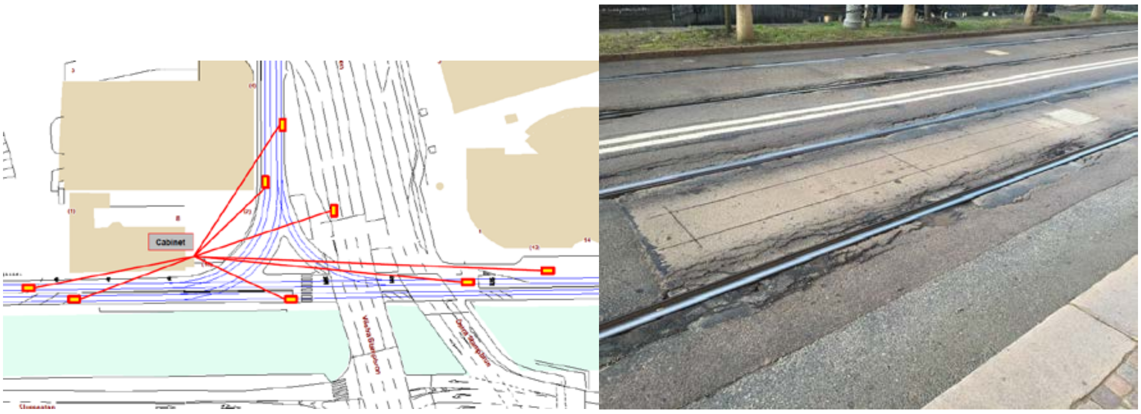


Figure 35 Ground loop system, a) Schematic, b) Ground installation

Upgraded system: Within the FP7 project OPTICITIES (2013-2016), Gothenburg City's Urban Transport Authority, designed and installed a novel system for switch and signal priority requests. For trams, the ground loop detector was replaced by passive RFID tags in the ground and communication was carried out by means of an on-board tram UHF link.

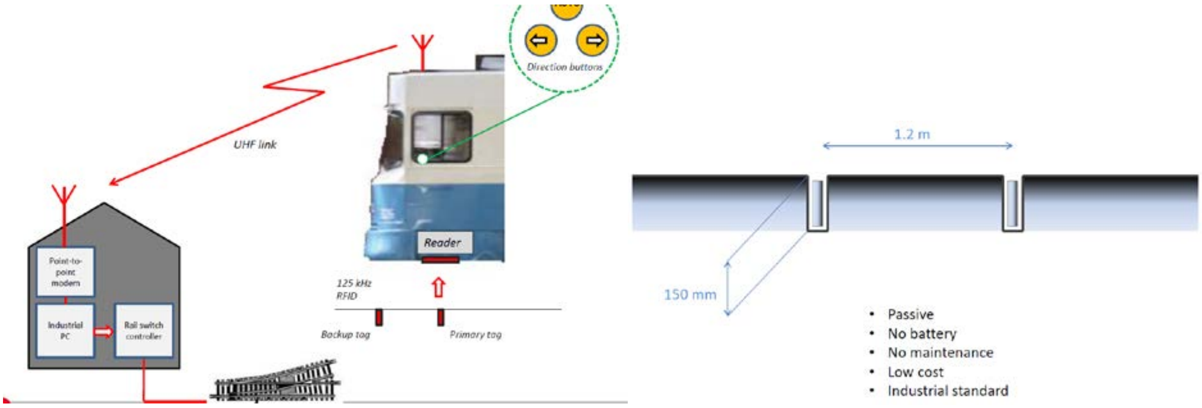


Figure 36 Novel system, a) schematic, b) close-up of ground installation

For signal priority requests from buses, a GPS-based system was designed. Since there are 2,500 buses in the Västra Götaland, operated by several different companies and the traffic signals being individually operated by each of the 49 municipalities, there was a need to devise a solution that fits in all vehicles and all traffic signals regardless of operator. The on-board GPS on the bus communicates the position to a cloud-based system that uses virtual detectors to determine when a bus is nearing a traffic signal. A request for priority is sent to a local computer in a cabinet close to the traffic light. The computer determines what level of priority the call has compared to other ongoing events and sends a signal to the traffic light. The communication link uses the Swedish emergency communication system RAKEL, based on the European TETRA standard. The system can be centrally configured through a web interface.

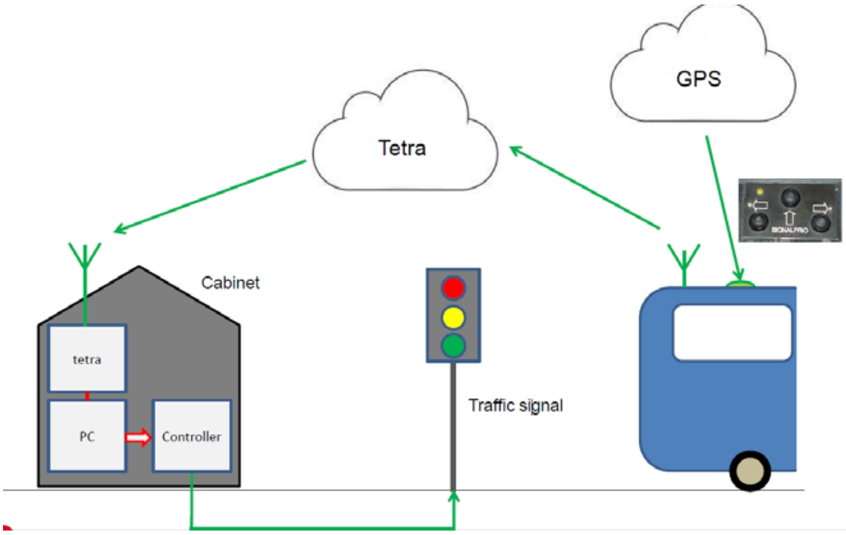


Figure 37 Schematic of bus signal priority system

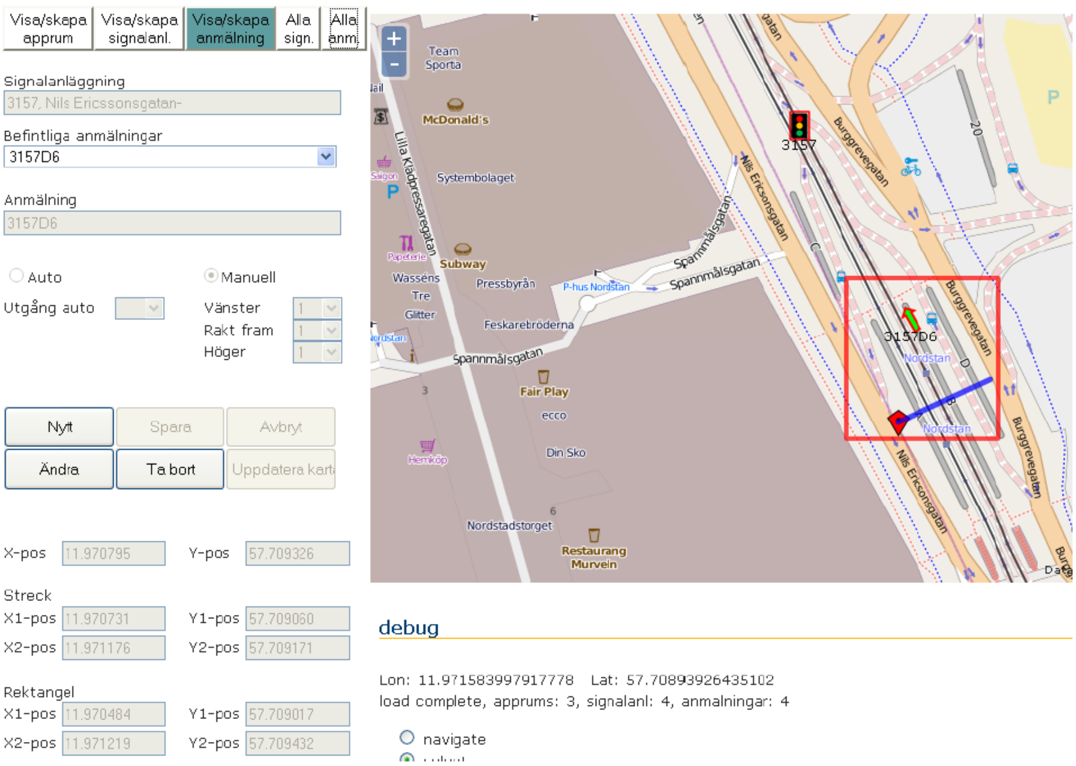


Figure 38 Central software configuration of signal priority system

8.1.3.1 Pre-Pilot Area and Geographical Overview

Pre-pilot: Ubigo

UbiGo was tested on 70 households primarily in three districts in Gothenburg; Kvillebäcken, Masthugget and Olskroken/Härlanda (see Figure X). The districts were chosen for their central location and their position outside of the road toll area (to encourage non-private car travel).

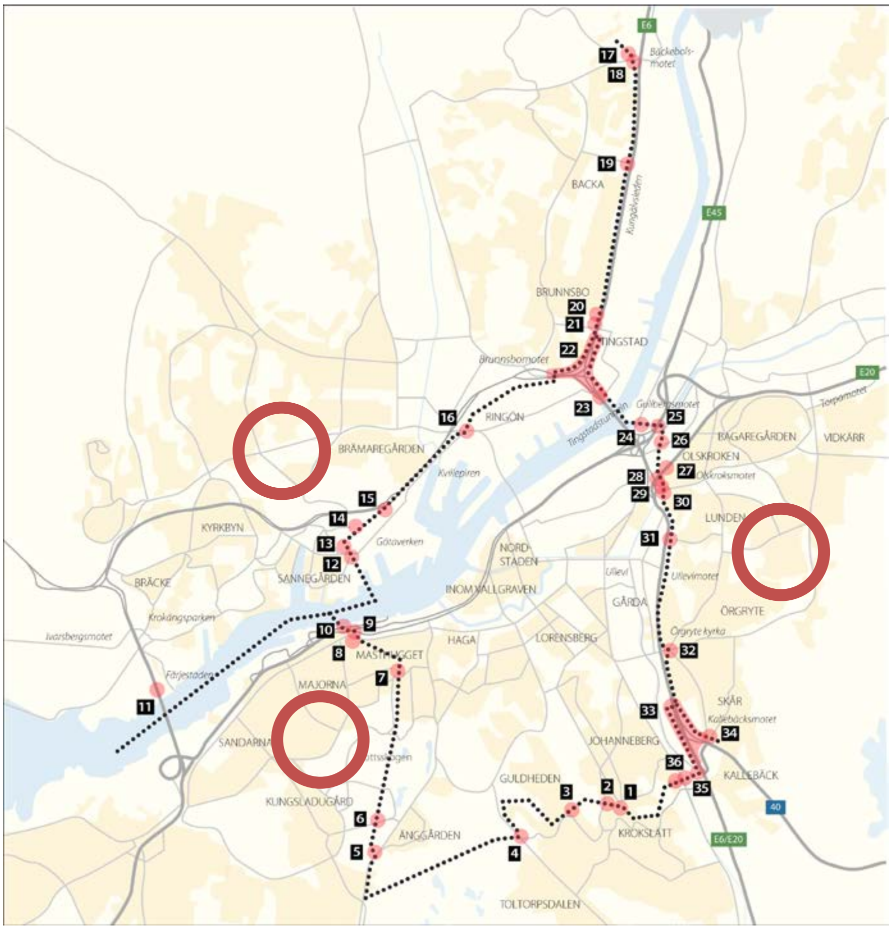


Figure 39 Three districts chosen for UbiGo trial, in comparison with road toll zone in Gothenburg

Pre-pilot: Cost-effective and reliable soft public transport priority and tram switch operation combined technologies (Soft Prio)

The system is in operation throughout the Gothenburg public transport network and is gradually replacing the older ground loop-based system.

8.1.3.2 Innovative elements

Table 12 elaborates the currently available thorough information for each of the considered key innovative elements of the IRIS pre-piloted solutions. Whenever available, additional information along with more technical specification of the basic configured elements are as well provided, in order to allow for a better understanding of the basic elements of the solutions:

Table 12 *Innovative elements of the Gothenburg pre-pilot in IS3.2*

Main Component	Technical Specifications	Area of the pre-Pilot
App for accessing Public Transport, car-sharing, rental car service, taxi and a bicycle system.	HTML 5 Smartphone app	Kvillebäcken, Masthugget, Olskroken/Härlanda

Smartcard	Used to check out a bicycle or unlock a booked car, but also charged with extra credit for the public transportation system in case there was any problem using the UbiGo service	Kvillebäcken, Masthugget, Olskroken/Härlanda
Mobility Suppliers	Hertz (car rental), Sunfleet (car pool), Västtrafik (public transport), Taxi Göteborg (taxi) och JCDecaux (bike pool service)	Kvillebäcken, Masthugget, Olskroken/Härlanda
Detection and identification system for tram switch request	125 kHz RFID	Gothenburg
Communication system between tram and switch	UHF link	Gothenburg
Bus priority request	GPS and UHF link TETRA standard	Gothenburg

8.1.3.3 Lessons Learnt by the implementation of the Solution in the Pre-Pilot

Pre-pilot: Ubigo

An extensive evaluation was made after the trial period covering a total of 195 persons. The following main conclusions were made:

- The UbiGo test attracted digitally mature and technology-interested persons
- Test persons moved from "Curiosity" (before) to "Convenience/Flexibility" (after) as primary motivator of using the service
- The associated web app was not deemed to be stable and convenient enough
- A lack of personalized decision support was perceived (e. g. a travel planner)
- There was a desire to have the service extended to a larger geographical area – i.e. other cities
- It was considered important that the service remain economically advantageous, i.e. costs less than using each subservice individually.
- 79% of the participants in the test stated that they definitely wanted to continue using the service
- Test persons stated that they used private car less and public transportation, walking, and cycling more often than before; 42.5 % reported a change in their mode of travel

The service will undergo a second Field Operational Test 2018-2019 in Stockholm.

Pre-pilot: Cost-effective and reliable soft public transport priority and tram switch operation combined technologies (Soft Prio)

Soft Prio has proven to be a very flexible and reliable system, which means major savings and creates the prerequisites for a well-functioning public transport. Soft Prio is a system solution that keeps track of where public transport vehicles are located, giving priority to traffic lights and ensuring that the trams take the correct track in switches. The new system does not require the installation of loops and cables in the street and tracks (like the old solution), which makes it cheaper to establish and maintain. The solution means that it will be more flexible to adapt the system during traffic change. The system is fully developed by the Urban Transport Authority with funding from

OPTICITIES and built on open source code, which also means that the solution is open to all. The solution has attracted great interest from other Swedish cities, including Skövde, Norrköping and Stockholm.

8.2 Demonstration in the Lighthouse Cities

8.2.1 Utrecht demonstration

8.2.1.1 Use Case and Brief technical description

The “We Drive Solar” solar powered V2G e-car sharing system will be demonstrated in Kanaleneiland as well as in the adjacent Lombok and Central Station areas. Demonstration of “We Drive Solar” by connecting 46 V2G electric vehicles to the DE grid, all interconnected by means of district EMS, will allow its connection with the new City Innovation system, giving the city the capacity to provide more information services for citizens, municipality and other stakeholders as the mobility and the grid operator. The MaaS “We Drive Solar” will be demonstrated in the LH demo district by means of 14 solar powered V2G e-cars in a solar powered car-sharing system delivered by Renault (the main components of the “We Drive Solar” concept are described in the pre-pilot section (see 1.2.1.2)). The V2G batteries reduce grid stress of the district low voltage grid thanks to prevention of solar peaks and charging peaks.

8.2.1.2 Demonstration Area and Geographical Overview

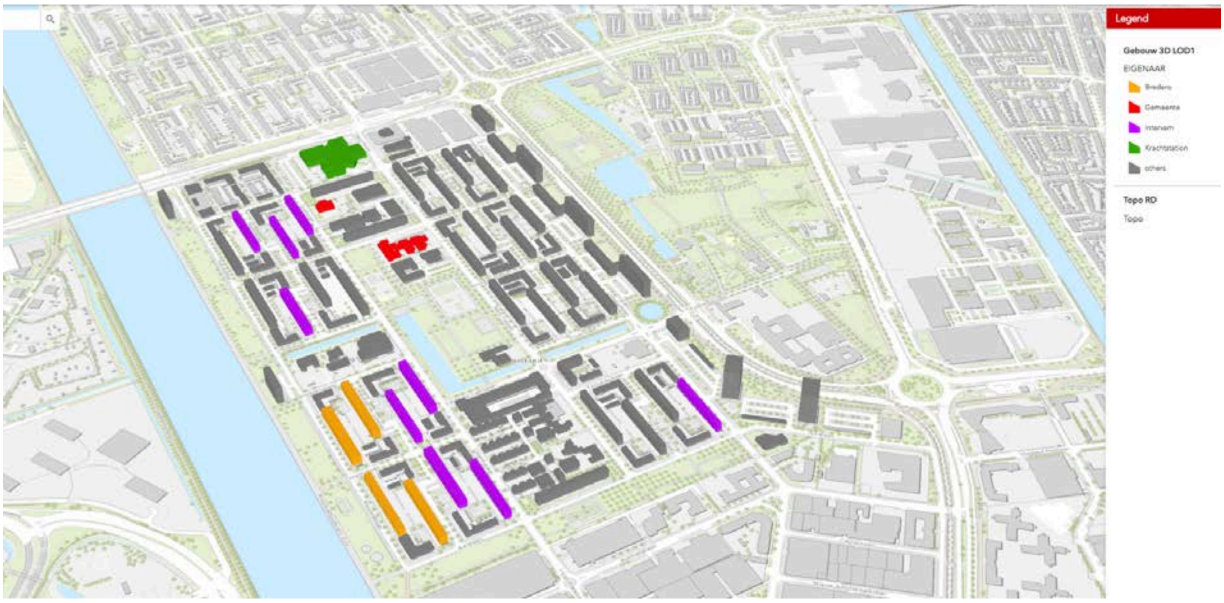


Figure 40 Map of the demonstration district Kanaleneiland Zuid with overview of apartment blocks that will be renovated, involved schools and the local innovations hub Krachtstation

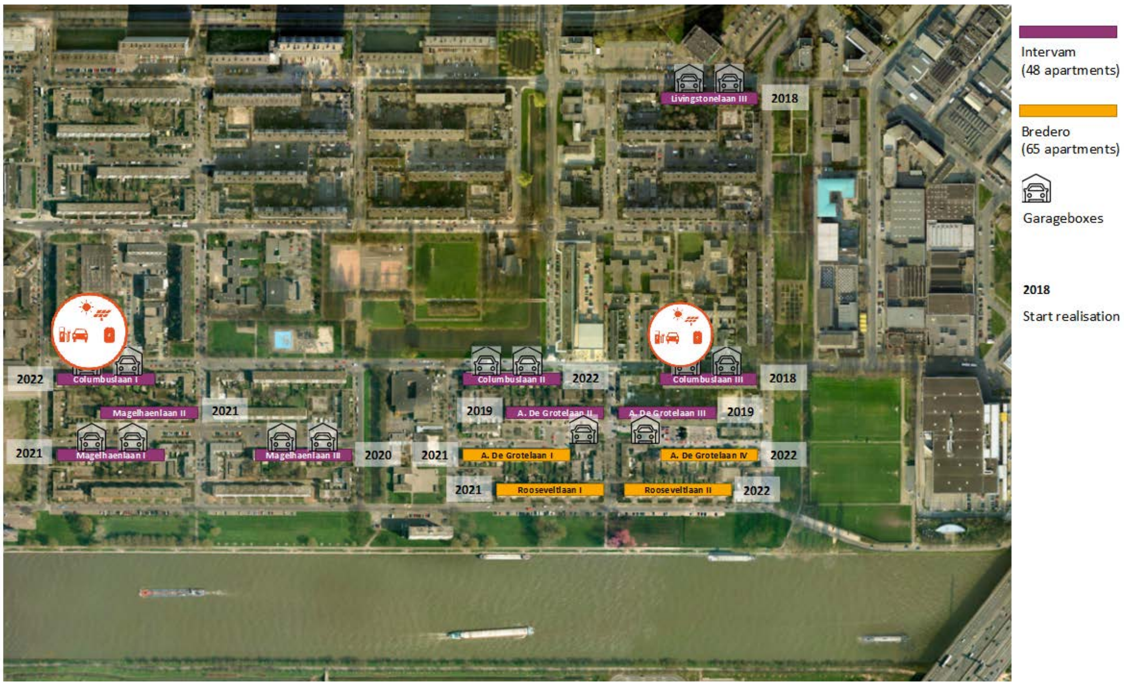


Figure 41 Map of the demonstration district Kanaleneiland Zuid with overview of the location of the first 2 V2Grid charging stations.

8.2.1.3 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Demonstration

Table 13 *Objectives, Needs and Opportunities of the Utrecht demonstration in IS3.2*

Opportunities	Needs/objectives
Lowering grid stress	Household income in the demo district Kanaleneiland Zuid is below the average for Utrecht. A lot of households struggle to make ends meet. Offering car sharing services provides households with the opportunity to lower their mobility costs compared to owning a car themselves.
Reduce the number of cars in public space	Utrecht stimulates car sharing systems with the aim to reduce the number of cars in public space and reduce the number of km driven. This contributes to reduction of local air pollution and reduction in noise disturbance. Offering car sharing system can contribute to this objective.

8.2.1.4 Key technical components

See 8.1.1.2. The main component will be similar to the ones applied in the pre-pilot area.

8.2.2 Nice Cote D' Azour Demonstration

8.2.2.1 Use Case and Brief technical description

The Métropole of Nice Côte d'Azur aims at developing new mobility services and promote amongst them car-sharing system. During the demonstration phase of IRIS, VULOG/UNS/NCA aims at developing a new scheme for mobility services based on free-floating car-sharing mode. As a memo, free-floating car-sharing mode facilitates the user experience and offers a new set of services:

- Book a car instantaneously (versus the actual offer that lead users to book their trip from one week in advance to be sure that a car is available)
- Users can park their car out of a charging point, in every public car-park (service include the price of the car park and the energy)

VULOG/UNS/NCA have defined a provisional scenario which will not only aim at testing free-floating but also being transversal to other tasks within the WP6.

The scenario is based on user needs and is as follow:

- People living in cities will own less cars in the next years and public charging stations are not common in the streets.
- Let's imagine a citizen coming to Nice Meridia with an IZZIE car. He parks the car in the street. If he finds a charging point he plugs the car. If there is no charging point available and the car battery is empty, the operator put the car out of service for users and plugs the car in a private car park (a convention may be required), this can be IMREDD car park, or alternatively another private car park.
- Battery charging has a cost and it depends of:
  - The availability of the energy in the building (T6.3)
  - The availability of the energy in the district (T6.4)
  - Operator's needs
  - Users needs (a quick charge maybe be required but will cost a lot)

Notes:

- IMREDD staff members will have a specific offer

Scenario will be according to the charge plan:

- Free for slow recharge or for recharge monitored by the building or the district energy plan
- Pay for quick charge or for a charge out of the monitoring strategy
- Operator pays for the recharge but it could be the user
- Operators costs will be reduced as the charging points wil be installed in the buildings and won't have to be supported by the operator during the deployment of the car sharing service

The demonstration activity for free-floating is planned to be implemented as follows:

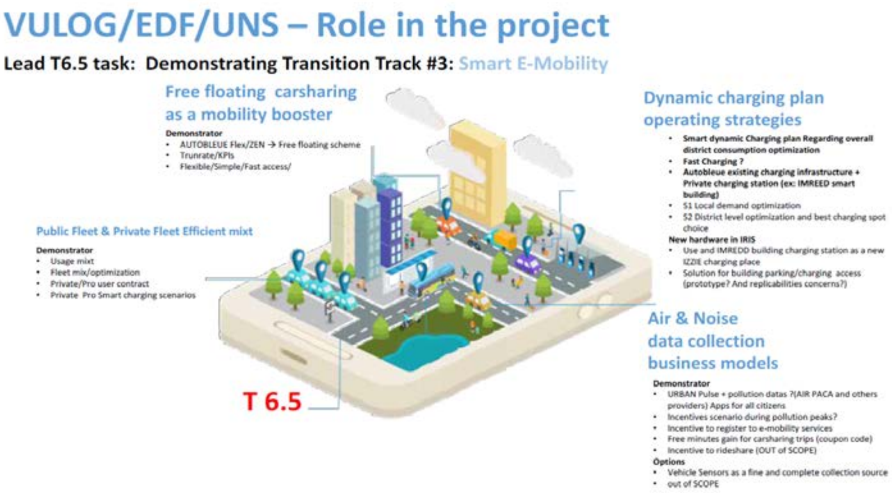


Figure 42 Nice demonstration activities

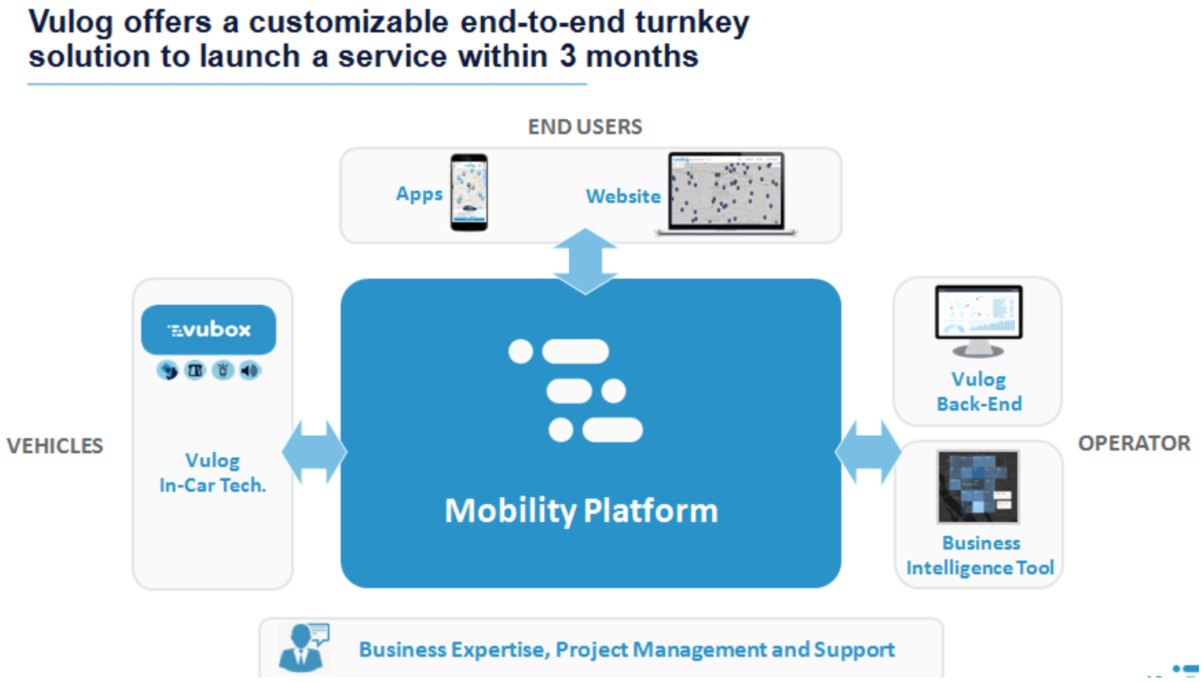


Figure 43 High-level description

8.2.2.2 Demonstration Area and Geographical Overview

Concerning the localisation of the demonstration activities, free-floating will be tested in the homezone of Nice Méridia Area. In order to increase the number of users (and the data associated), the cars can be dropped in every charging points of Auto-bleu service.

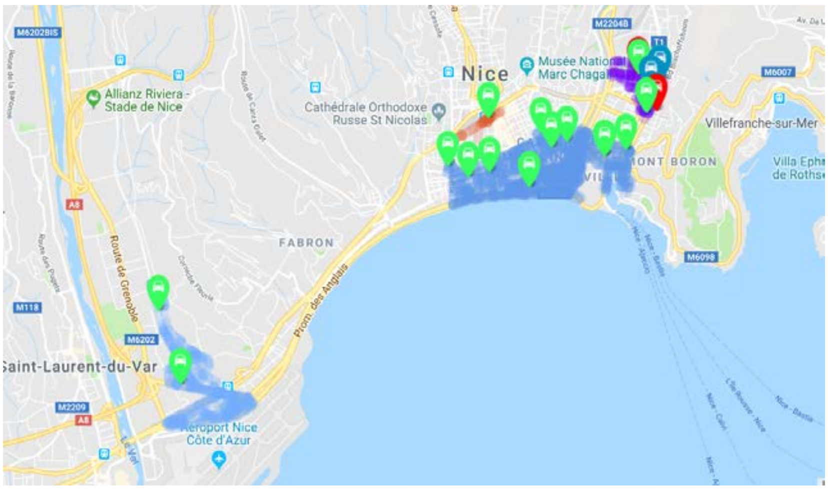


Figure 44 Nice demonstration activities area

Besides, the preparation sessions with Nice Ecosystem have enabled to envisages an alternative scenario, that is not yet fully validated but could be developed in addition during the project lifetime-to be defined. This scenario would consist in equipping the float of the Metropole of NCA for free-floating. Indeed, NCA envisages to use its own float to increase the number of cars available because the more cars are available, the more trips are done, the best the user-experience is, and the more data will be collected in the CIP. This scenario is based on the experience gained through a

partnership established in 2015 with VENAP (the operator of Auto-bleue) and the Municipality of Nice (the biggest city of the 49 cities that counts the Métropole of Nice Côte d'Azur).
As part of this partnership, Vulog has equipped a part of the float of the Municipality of Nice with 40 cars spreaded out in 5 stations (Arenas, Canta Gallet, Corvésy, Tonduti). This running partnership enables the staff of the Municipality to access (after a free subscription, currently 1800 users) to a float of electric (or hybrid) car-sharing system with a maximum trip of 50km (no maximum when hybrid car). For this service, users need to book their trip in advance on a dedicated web-platform. NB: Average km per use in Nice = 18km, for 180min (3hours). The alternative scenario would be to enlarge the scope of this partnership by integrating free-floating.

The "Smart Management of Pollution Peaks" solution will be deployed in the Nice Ecosystem. This solution addresses two kind of innovations and therefore answers to both IS3.1 and IS3.2. In IS3.1, the technical aspects will be documented (see below) when in IS3.2 the innovative services for citizen will be document (see IS3.2). The novelty in terms of mobility services for the citizen is to provide them information and incentive supplied to drivers of personal vehicles by means of the Urban Pulse application.

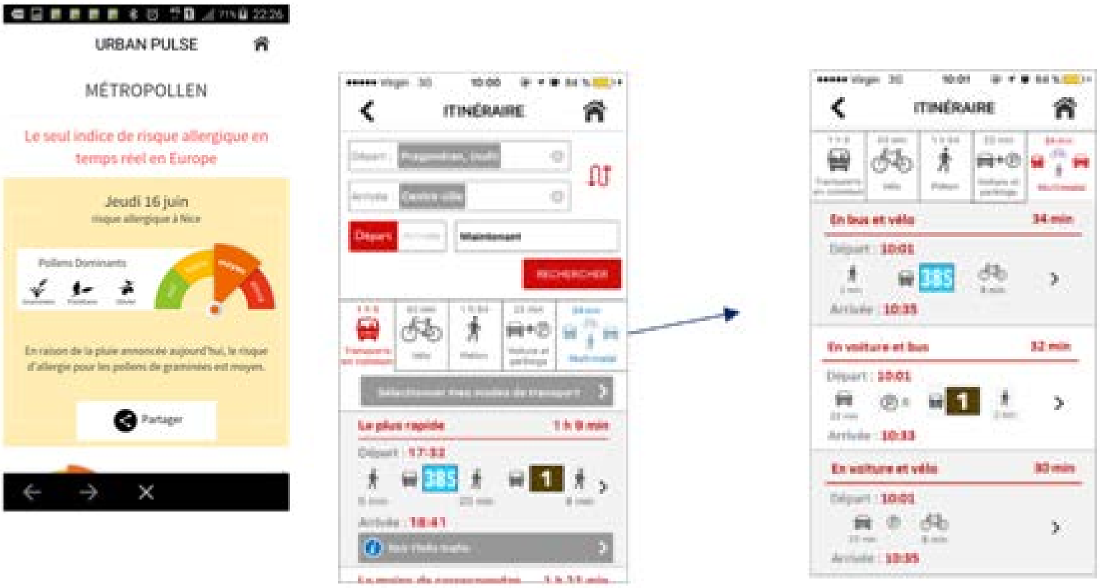


Figure 45 Nice demonstration activities regarding the urban pulse application

8.2.2.3 *Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Demonstration*

Table 14 *Objectives, Needs and Opportunities of the Nice demonstration in IS3.2*

Opportunities	Needs/objectives
Increase the utilization rate of a car	A personal car is parked 95% of the time (5% of use then), when car-sharing permit to an average of 5hours/day (23% of use)
Decrease the number of cars in the street	Car-sharing is reputated to permit to replace 6to8 individual cars with 1 car in car-sharing
Reduce traffic and pollution in the city	

8.2.2.4 Key technical components

Hardware:

Table 15 *Key technical components (hardware) of the Nice demonstration in IS3.2*

Main Component	Technical Specifications	Area / Positioning	IRIS partner
Vubox is placed in tha car in order to communicate with Vulog server. This allows the car to give data to the server and allow mobility server to control the car.	System will work between 5-24 volt. Power consumption strategy permit to swith the Vubow in stand-by mode after 15 minutes of non-use. Vubox can be adapted to any kind of cars. Vubox provisional life duration is 10 years (2years guarantee). No maintenance required. In case of problem, Vulog replace it ith a new Vubox. Vubox functions with Bluetooth + 2G/3G.		Vulog

Software:

Table 16 *Key technical components (software) of the Nice demonstration in IS3.2*

Main Component	Technical Specifications	Area / Positioning	IRIS partner
Mobility platform	The mobility plateform is developed using “java” and “.net” The apps are available in “ios” and “android”		Vulog

8.2.3 Gothenburg Demonstration

8.2.3.1 Use Case and Brief technical description

In district Johanneberg, the e-mobility service EC2B, developed by Trivector, will be demonstrated. The concept EC2B – “easy to B” or “easy to be” – takes accommodation as its starting point. Instead of owning a car, customers pay for transport as a service. Customized transport packages are delivered to the customers based on their needs, including a mix of services such as public transport, shared bicycles and shared cars. Information, booking and payment is handled through a digital platform which is currently being developed. EC2B offers customers an attractive alternative to owning a car, allowing easy access to a variety of transport modes in connection to accommodation, while also “nudging” users towards sustainability. The service is introduced to residents through general information meetings combined with personal meetings, using insights from “personal travel planning”, which has been demonstrated to change travel patterns in earlier projects. Users also have access to a digital community where they can exchange information, tips and tricks, and potentially also borrow vehicles from one another.

Figure 46 Components of the EC2B

Within IRIS, the service will in a first step be offered to the residents of the 132 apartments in Riksbyggen’s Brf Viva in Johanneberg, which is being built with no residential parking lots. Through EC2B residents will instead have access to 4 electric cars, 5 electric cargo bikes, and 2 light e-vehicles, most likely e-scooters. They will also have access to public transport through the EC2B platform. In addition to the introductory information meetings, several information campaigns will be arranged to inspire residents to use the mobility services included in EC2B, try new vehicles etc.

In a second step, another version of the EC2B service will be developed, focusing on employees rather than residents. This version will be demonstrated with the other property owners in the Johanneberg campus area (HSB and AH who are also IRIS partners, and potentially also Chalmersfastigheter, the landlord of Chalmers technical university) who will offer this service to their tenants and their students and employees. A number of transport providers already active in the area will provide the transport services, and users will get access to the service through the EC2B platform. The Johanneberg Campus area is continuously becoming denser, with new buildings being added whereas parking is being reduced. One example is the new building of Johanneberg Science Park, A working lab, which will be occupied from August 2019.

8.2.3.2 Demonstration Area and Geographical Overview

Within IRIS, the EC2B service will in a first step be offered to the residents of the 132 apartments in Riksbyggen's Brf Viva in Johanneberg, and in a second step to employees and students, and potentially also residents, in the Johanneberg campus area, through the landlords in the area. See photo on next page.

Figure 47 Johanneberg Campus area, where the EC2B service will be implemented within IRIS T7.5

8.2.3.3 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Demonstration

EC2B is unique in linking its mobility services to the place where most trips start: where people live. Through EC2B users will get an attractive alternative to owning a car, where they get access to a broad range of vehicles tailored at their different needs, while they avoid the hazzle and high costs spurred by car ownership. Not only travellers benefit from EC2B. We expect that the service moreover will create value for property developers, who can reduce the number of parking spots they need to provide in connection to their properties; the city, which reduces the number of cars on the streets; and transport operators, who may reach out to new customers. The environment will benefit both from the reduction in number of vehicles in circulation (less resources being consumed), the shift from fossil fuel to e-vehicles, the shift of transport mode for some trips from car to public transport, cycling or walking, and a reduction in the number of kilometres travelled, which we know from other projects is a common outcome when people go from owning a car to relying on shared modes.

If the service is successful in creating value for customers, we expect that a new market is created where EC2B can deliver its service in many more new housing projects.

Table 17 *Objectives, Needs and Opportunities of the Gothenburg demonstration in IS3.2*

Objectives	Needs/opportunities
Reduce demand for parking	Reduce need to build expensive underground parking garages
Shift from fossil to e-vehicles	Reduce CO2 emissions
Reduce number of vehicles in operation	Reduce resource use, optimize land use
Offer good value for money transport packages	Reduce costs for users
Attract new customers to existing public transport and shared vehicle services	Increase revenues for mobility service providers

8.2.3.4 Key technical components

Hardware:

Table 18 *Key technical components (hardware) of the Nice demonstration in IS3.2*

Main Component	Technical Specifications	Area / Positioning	IRIS partner
Pool of shared vehicles at Riksbyggen's Brf Viva: 4 e-cars 5 electric bicycles 4 electric cargo bikes 2 light e-vehicles, most likely e-scooters	Not yet specified	Riksbyggen's Brf Viva, Johanneberg	Riksbyggen will own the smaller vehicles, and carsharing company Sunfleet will own the cars
Charging infrastructure	4 charging polls, 22kW for e-cars + 55 ordinary charging polls for e-bikes and light e-vehicles	Riksbyggen's Brf Viva, Johanneberg	Riksbyggen
Indoor bicycle garage with workshop for self-service	309 spaces for bikes	Riksbyggen's Brf Viva, Johanneberg	Riksbyggen

Software:

Table 19 *Key technical components (software) of the Nice demonstration in IS3.2*

Main Component	Technical Specifications	Area / Positioning	IRIS partner
EC2B digital platform enabling booking, ticketing, payment and information on all transport modes that are included in the service	Not yet specified. Most likely a responsive webpage with links to services that are included in EC2B	Developed for Campus Johanneberg area but possible to upscale and spread	Trivector/EC2B linked third party
Booking system for local vehicle pool, including locking system	Not yet specified	Riksbyggen's Brf Viva, Johanneberg	Riksbyggen

8.3 Replication Planning in the Lighthouse and Follower Cities

8.3.1 Utrecht Replication

The solution is and will be replicated through the whole city of Utrecht, currently by IRIS partner LomboXnet (see Figure 28 for the current locations). LomboXnet deploys an approach that when there is sufficient interest in an specific neighbourhood (a minimum number of 5-6 households and/or companies) a car will placed in this neighbourhood.

8.3.1.1 Replication Area and Geographical Overview

In principle the solution can be replicated in the whole city of Utrecht.

8.3.1.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

See objectives for the demonstration

8.3.2 Nice Cote D' Azour Replication

Vulog is a worldwide scale-up companies with 80 staff-members including a sale force. This sale force is dedicated to qualify the need and demand of potential constumers.

Vulog counts a total of 5.000 cars with 30 partners worldwide

Any city interested in replication can join the sale force on the Vulog Website.

With regards to the Smart Management of Pollution peaks, the solution will be proposed to other cities where Urban Pulse is already available in France, through a business offer of service including low cost air quality sensors which will be designed during the project.

8.3.3 Gothenburg Replication

The municipality of Gothenburg have in their recently updated parking policy opened up for negotiating the parking requirements in new developments with property developers, indicating the possibility for them to lower the number of parking lots to be provided given that other measures are implemented in exchange. Measures such as car and bike sharing facilities are mentioned, but also new innovative concepts such as "Mobility as a Service", which is very much in line with the EC2B concept. New areas to be developed within the city (such as Frihamnen and Lindholmen) could be very interesting for replicating and upscaling the EC2B service given that property developers, providers of mobility services and ultimately end users see the value of the service.

Regarding replication of the EC2B solution, there are new housing developments as the primary market, but offices are another possible future market. Furthermore, the counselling part of the EC2B concept (drawing upon elements from mobility management and personal travel planning) could also be interesting to replicate in other contexts, e.g. in collaboration with carsharing companies or together with employers who would like to spur more sustainable travel habits among their employees.

8.3.3.1 Replication Area and Geographical Overview

New areas to be developed in the city (such as Frihamnen and Lindholmen) could be very interesting for the MaaS while the on-demand transport schemes will be tested at the Campus Johanneberg.

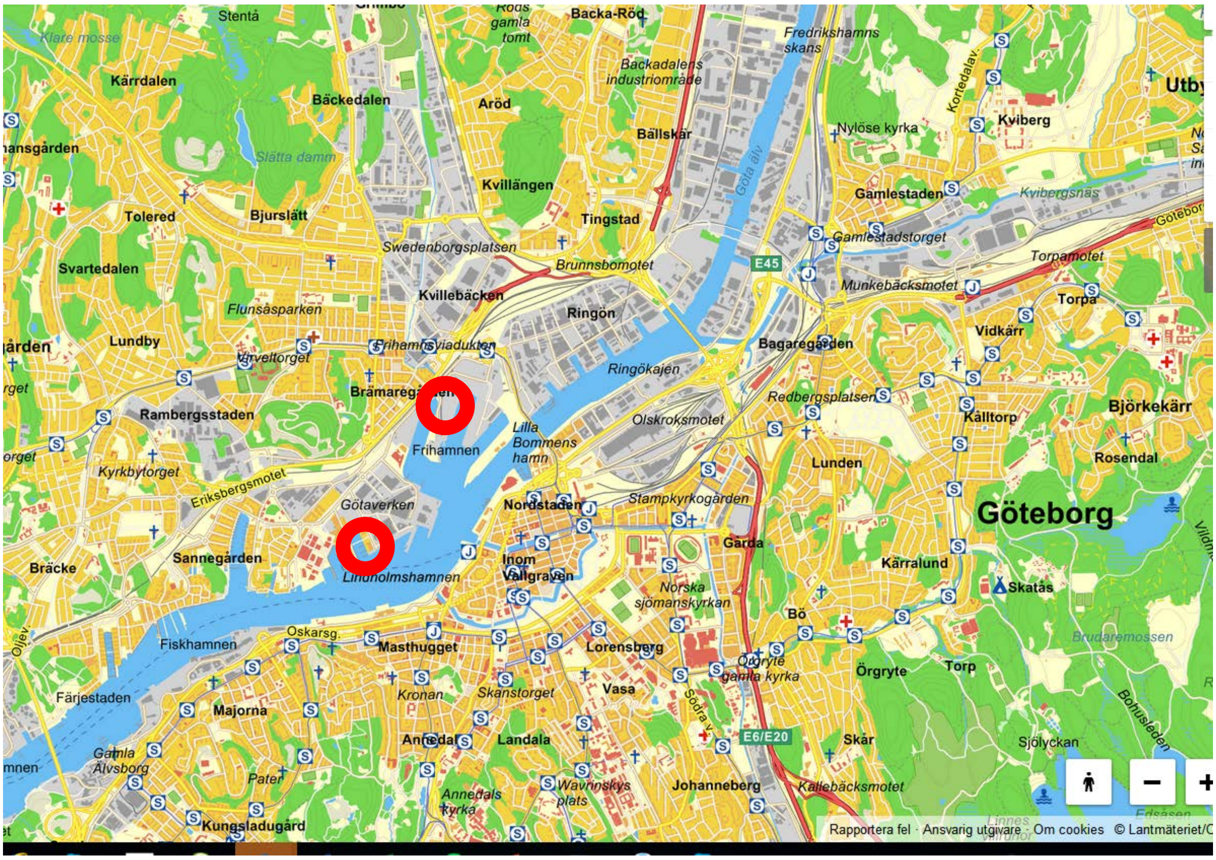


Figure 48. Location of Frihamnen and Lindholmshamnen areas in Gothenburg

8.3.3.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

Exactly the same ones included in 1.3.3.3

8.3.4 Vaasa Replication

Vaasa is interested to improve mobility services as required by the new government policy and use it as well one intervention to decrease CO2 emission related to transportation.

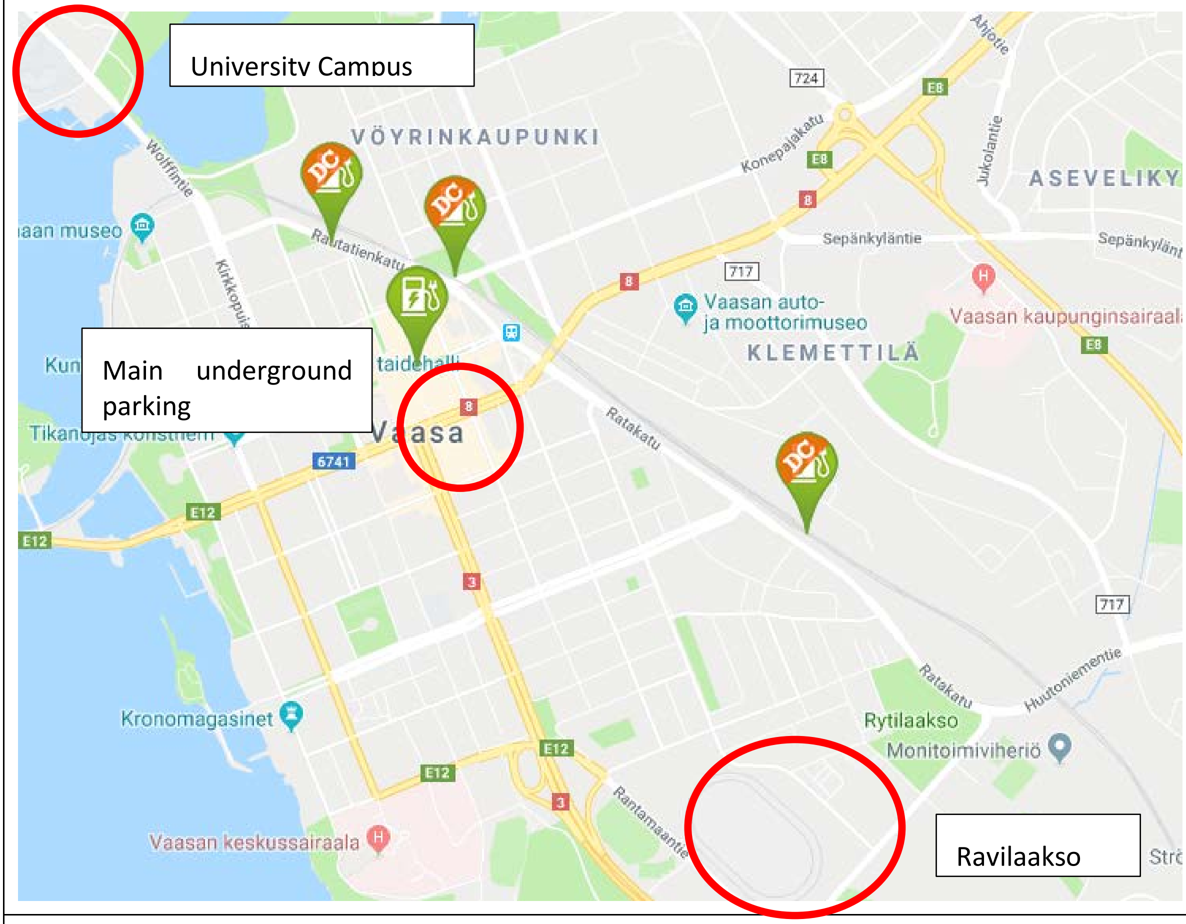
From developed systems within IRIS; #1 Solar V2G car sharing scheme (UTR), #2 Free floating scheme (NCA), #3 EC2B scheme (GOT) most feasible solution or a combination of solutions will be selected for replication.

8.3.4.1 Replication Area and Geographical Overview

As service solutions should work in whole City area but if any new infrastructure is required Ravilaakso will be replication are for solutions.

A new mainly residential area, Ravilaakso will be constructed starting from 2020. Area is located within 1000 meters distance to the city centre. Ravilaakso is an old trolling track with area about 30 ha. Ravilaakso will establish a vision for a future energy efficient and innovative neighbourhood for about 2000 – 2500 inhabitants. Area includes blocks with both townhouses and apartment houses that are architecturally high level, interesting open public spaces and local business premises. Ravilaakso will create a city-like, lively, diverse and active city district next to the city centre. The aim is that the area will act as a showcase and a living lab for energy-efficient and sustainable solutions where innovative companies can test their products and services in an enabling environment.

It is also foreseen that University campus area will be interested to develop required infrastructure.



Location of possible demonstration area and existing public charging stations in City

Figure 49 Area of the replication activities in Vaasa.

8.3.4.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

Transition towards e-vehicles has already started even transition is slow in the beginning. Situation will most likely change prior to 2030 and before 2050 and impact of the e-vehicles for reduction of CO2 emission will become bigger. Cities need to prepare themselves already now for transition by taking into consideration e-vehicles charging and developing required infrastructure for smart charging.

The Finnish government has put in place a policy to develop mobility as a service. At the same time mobility is in transition towards service where solutions focus on customers. Different mobility services shall function seamlessly based on customer’s needs. New services will be provided through open markets and a customer can plan and order service from one location. Developed new mobility service should become a real alternative for private vehicles.

Table 20 *Objectives, Needs and Opportunities of the Vaasa replication in IS3.2*

Opportunities	Needs/ Objectives
Improve services for mobility	Reduce use of private vehicles and develop new customer oriented services
Decrease CO2 emissions and increase use of renewable energy	To achieve targets within energy and climate programme. Reduction in use of fossil fuels.
Create new market based services.	Decrease cost of mobility for citizens

8.3.5 Alexandroupolis Replication

Municipality of Alexandroupolis targets to replicate solutions demonstrated in the lighthouse cities of the project towards local zero-emissions mobility utilizing innovative electric car sharing schemes. In particular, Alexandroupolis is interested in examining the feasibility of replicating these innovative services and technologies taking into consideration the local people behavioural characteristics. The Municipality of Alexandroupolis has already developed a solar PV electric vehicle charging station and currently two small municipal electric vehicles are under procurement. Additionally, the sustainable urban action plan of the city of Alexandroupolis is under development and along with the already developed sustainable energy action plan will constitute the strategy of the municipality towards zero-emissions urban mobility.

8.3.5.1 Replication Area and Geographical Overview

The city centre of Alexandroupolis is mainly the replication area for the solutions of innovative mobility services. Nevertheless, the feasibility of the solutions will be examined for the whole city of Alexandroupolis, since the size of the city is relatively small, compared to the lighthouse cities. Therefore, the geographical bounds of the city can be considered as the geographical bounds of the replication area.

City centre of Alexandroupolis

View of city centre from Google Earth

Figure 50 The city of Alexandroupoli.

The already developed solar PV charging station is located within the city bounds, very close to the city centre and has been installed in a municipal building. The municipal buildings will be examined in terms of their utilisation for solar PV installations that will provide the EV charging stations with renewable electricity.

Besides city centre, the northern part of the city of Alexandroupolis, called “YEB”, is selected as a replication area for the feasibility assessment of the innovative mobility services demonstrated in the lighthouse cities. The district is selected since it has very limited public transport services and it is outside the walking distance from the city centre that results in high usage of private vehicles. The district is also expected to be connected to the bicycles’ network of the city in the near future.

	
Photovoltaics of the EV charging station	The EV charging station

	
City bicycle network to be developed	View of “YEB” district from Google Earth

Figure 51 Components and area of the replication activities in Alexandroupoli.

8.3.5.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

Table 21 *Objectives, Needs and Opportunities of the Alexandroupolis replication in IS3.2*

Opportunities	Needs/ Objectives
Lower household mobility costs	Location of "YEB" district, lack of public transport and lower household constitute a need for improved and low cost mobility services. Car sharing schemes and other innovative solutions are expected to lower the mobility costs.
Reduced number of cars in the city centre	The small city centre of Alexandroupolis and the low quality public transport services result in high number of private cars entering and parking in the city centre. The replication of solutions demonstrated is expected to result in reduction of number of cars in the city centre and improvement of mobility services for the citizens.
Reduce CO_2 emissions from mobility sector	Mobility sector is responsible for approx. 30% of the total CO_2 emissions of Alexandroupolis. The replication of innovative mobility services is expected to result in significant CO_2 reductions through the reduction of private vehicle usage.

8.3.6 Focsani Replication

Regarding innovative mobility services for citizens Focsani Municipality is interested in replicating/implementing the following pilot projects:

- Development of the infrastructure for public transportation, including special lanes for busses
- Introduction of electric busses, including PV solar charging stations at the end of the lines
- Further development of infrastructure for bicycle use
- Implementation of a traffic management system that shall facilitate public transportation traffic
- Stimulating the use of public transportation by citizens through limitation of access to Focsani central area of cars
- Expanding parking areas in the city

8.3.6.1 Replication Area and Geographical Overview

The map bellow shows the public transportation network in Focsani city. Some of them shall be used for electric busses.

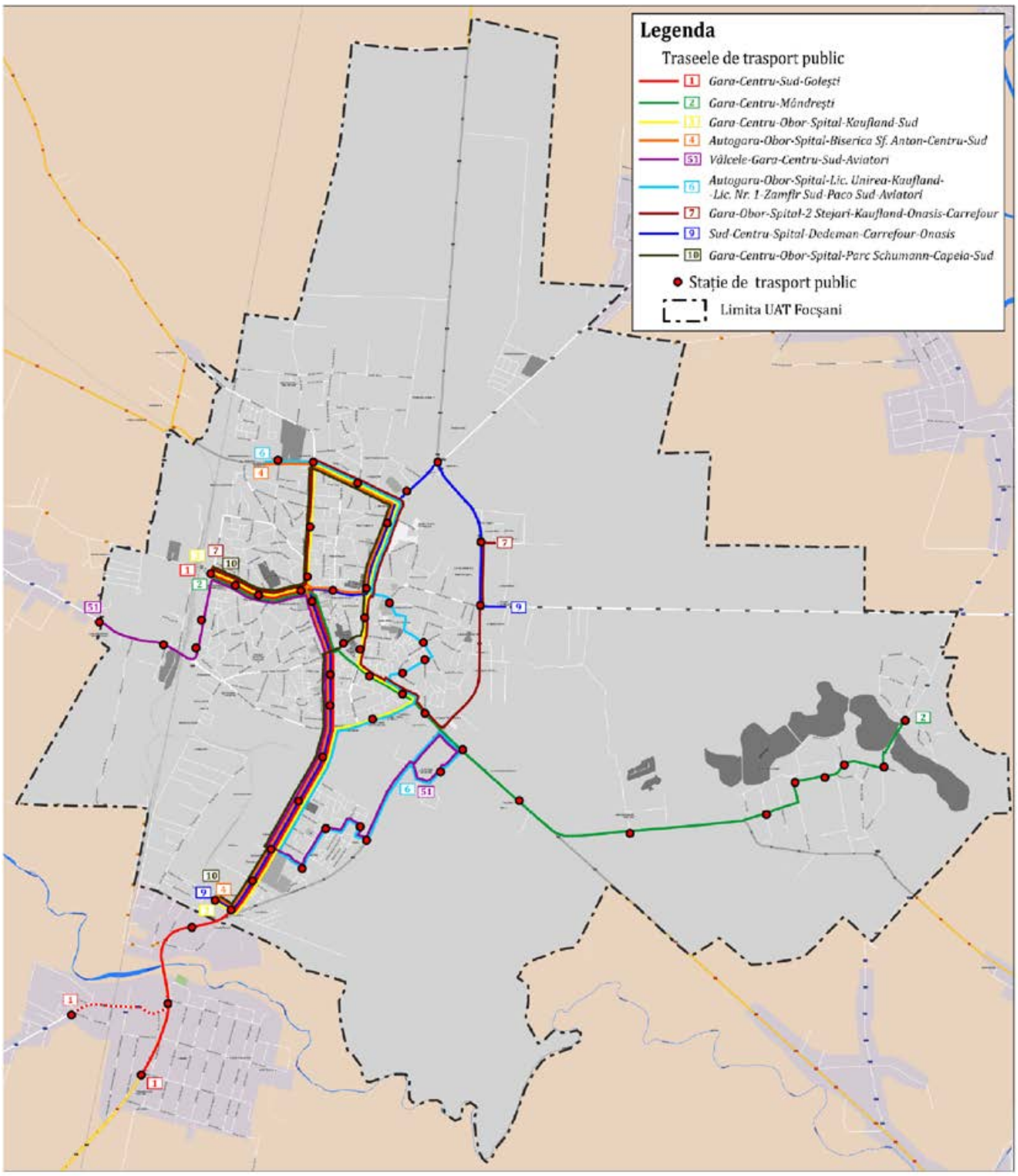


Figure 52 Area of the replication activities in Focsani.

The map bellow shows the existing infrastructure for bicycle use. This infrastructure shall be further developed and improved in the entire city.

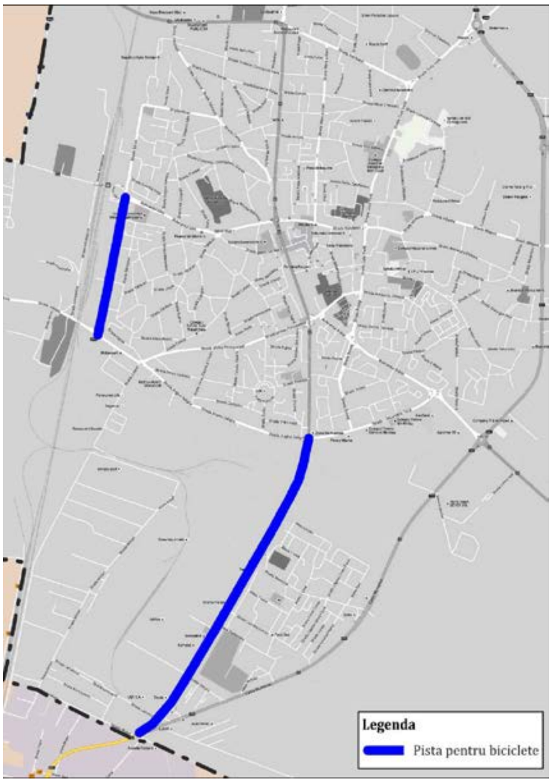


Figure 53 Bicycle infrastructure in Focsani.

8.3.6.2 Objectives, Needs and Opportunities to be served by the implementation of the Solution in the Replication

The implementation of this pilot project can lead to the following achievements at the Municipality of Focsani:

- A better mobility service for citizens of Focsani
- Reduction the use of fossil fuels for public transportation due to utilization of renewable energy sources through PV panels for electric busses charging stations
- Increase in bicycle use by citizens as public transportation
- Fluidizing traffic in the city due to the implementation of the traffic management system;
- Improvement the air quality in the city
- Improvement of quality of life in the city

8.3.7 Santa Cruz de Tenerife Replication

This information will be included in the next deliverables of the project.

8.4 Data Collection and Management

8.4.1 Utrecht

Data will be collected on amongst others number of subscriptions, frequency of the e-car use, amount of km driven. These data will be collected and stored by the service provider "We Drive Solar".

8.4.2 Nice Cote D' Azour

At Month-7, the data collection and management is being defined as part of WP4 "City Innovation Platform", and more specially the deliverables D4.1, D4.2, which final version is under review with both CERTH and UTR.

During CPB in Goteborg (March 2018), a working session dedicated to WP4 was held, with the following conclusions:

"After a general introduction of the City innovation platform architecture three sprints were done based on different "use cases", addressing economy, mobility and energy challenges.

The use cases were developed in design sprints which resulted in a better understanding of the specification of the data required from the digital services needed and of the role and benefits of the city innovation platform

The sprint method was highly appreciated by the participants. It is a motivating way to get input with people from different backgrounds. "

A "T6.6 preparatory workshop" dedicated to the set-up of the CIP was held on the 29th of May with Nice Ecosystem partners.

The "use case" approach enabled to address and anticipate the different transition tracks issues and challenges, whilst anticipating and covering potential technical constraints."

The up-coming 4.2 deliverable will provide more technical information and requirements.

8.4.3 Gothenburg

For the e-mobility demonstrator in Gothenburg, data will be collected through several different channels. Data on user behaviour and customer satisfaction will be collected through surveys, one shortly after launching the service, and one towards the end of the project, looking into factors such as car ownership, experiences with electric vehicles etc. Additionally, data on user behaviour will be collected (but not made open access due to integrity reasons) through the digital platform.

For the car-sharing cars we hope to be able to collect data on the following parameters:

- Degree of utilisation of each vehicle (time, mileage, etc)
- Availability of each vehicle
- Total mileage
- Number of trips
- Length of trips
- Duration and time of day of trips

If possible, the following data will be collected on the use of the bikes and light e-vehicles in the local vehicle-sharing scheme:

- Degree of utilisation of each vehicle
- Availability of each vehicle
- Number of trips
- Duration and time of day of trips

For public transport, data will be collected on number of trips booked through the digital platform.

All data will be handled according to regulations in GDPR. A collaboration has been established with several researchers at Chalmers technical university in Gothenburg, who are interested in following the implementation of the demonstrator, and who will be involved in the collection and evaluation of data (without IRIS funding).

8.5 Regulatory Framework per LH/FC

8.5.1 Utrecht

The city of Utrecht incentivizes the use car sharing systems. The municipality e.g. provides incentives offers the opportunity to apply for a double-parking license (in districts with paid parking) for one car for households sharing in car in adjacent districts. News construction districts in Utrecht have a high density. In these districts the municipality applies lower parking norm (parking-space that needs to be reserved per dwelling) and actively stimulated the development of MaaS concepts.

8.5.2 Nice Cote D' Azour

The French Government over the last 10 years has made a remarkable effort not only on promoting the use of electric vehicles but also on forcing the development of these. The targets France has set for the EV market are rather ambitious, looking forward to an overall introduction of 4.5 million EVs by 2025. These actions can be looked as defensive ones against climate change, while reorganizing a whole economic sector in order to adopt to new technological trends.

Concerning NCA, The "energy transition for green growth act" (national law 17/08/2015 - dedicated website: http://www.gouvernement.fr/en/energy-transition) leads French local authorities to define a local "Territorial Energy and Climat Plan", with different level of objectifs and expectations according to the size of the local authorities.

The Metropole of Nice Cote d'Azur, totalizing more than 500.000 inhabitants,has therefore its local action plan (http://planclimat.nice.fr/public/accueil.html).

Also, ADEME (French Agency for Environment and Energy Management - http://www.ademe.fr/en) is an industrial and commercial public institution placed under the joint supervision of Ministry of Ecology and Sustainable Planning and Development and the Ministry of Higher Education and Research.
ADEME aims to be the point of reference and privileged partner for the general public, companies and local authorities, acting as the State's tool to generalise the best practices designed to protect the environment and energy saving.

ADEME is involved in the following sectors: air pollution, noise, waste, energy (energy management and renewable energies), environmental management, polluted sites and soils, transports. Within the framework of public policies defined by the government, the Agency's mission is to stimulate, animate, coordinate, facilitate and perform operations aiming at the environment protection and energy management.
Also, ADEME regularly launches call for proposals to foster innovation projects.

In addition, the supply of applicable recharging infrastructure in France has been guaranteed through the release of laws by which all new buildings equipped with parking spaces should be connected to electricity supply no later than 2012. Together with this law, a further financial package of EUR 60 million was made accessible intended for the installation of 1,250 public recharging points with a future view to the installation of 9.9 million public and private charging spots by 2025.

Finally, the French Government examined the application of free parking spaces for electric vehicles along with the necessary equipment for charging the former ones.

8.5.3 Gothenburg

Sweden, being indeed one of the leading countries of adapting new technological and advanced trends, has undergone a series of actions in order to support the use of hybrids (HEVs), plug-in hybrids (PHEVs) and battery electric vehicles (BEVs), such as the Super Green Car rebate "Supermiljöbilspremie".

In addition, Sweden has adopted a taxation for new passenger cars relating to their climate impact, resulting in either a "bonus" (tax reduction) for environmentally "friendly" cars such as electrical vehicles and biogas vehicles or a "malus" (tax increase) for cars with high climate impact). The Region has adopted a "Fossil-independent 2030" programme that works to reduce emissions from transportation by shift to fossil-free means of transport and public transport.

Furthermore, in almost half of the cities in Sweden, EVs park for free or are granted a reduction of parking fee, while EVs as well as PHEVs are exempted from the congestion charging fee which was applied in central Stockholm in August 2007 during increased traffic situations.

For the e-mobility demonstrator in Gothenburg, the main regulatory issues are the following:

- A pre-condition for the EC2B service to be viable is that property developers are able to negotiate the parking requirement with the city authorities and get a reduction in the number of parking lots to provide, in exchange for implementing other measures that reduce the need for private car ownership (e.g. implementing EC2B). This policy change has been implemented in Gothenburg, but not in all Swedish cities as this is a decision on municipal level. It is important that the municipality does not only reduce the parking requirement, but puts clear demands on property developers on what kinds of measures to implement in exchange.
- Commuting by car is today stimulated through the possibility to make a tax deduction for the costs related to commuting by car if travel time is reduced by at least 2 hours compared to commuting by public transport. This legislation should be changed to reduce the incentives to commute by car.

8.5.4 Vaasa

As of today, the current government policies of Finland are directed towards their aim on reducing the greenhouse gas (GHG) leaving aside subsidies and incentives for electric vehicles. However, the need for EV use to aid their targets will become inevitable, therefore the Finnish government foresaw this issue and announced the release of EUR 6 million annually for a time frame starting from 2018 and ending in 2021 designated for the purchase of electric vehicles and other eco-friendly driving solutions.

Moreover, despite the fact of the inexistence of a proper regulatory framework regarding electro-mobility use, Finland among other European countries (e.g. the UK, the Netherlands, Italy) has well established a legal framework for the installation of Car-Sharing stations in public streets as well as the easy access – and in some cases free – parking of vehicles registered to car sharing companies within the urban area of the city.

Finally, the Finnish Government has put in place a new policy for transition for "Mobility as Service". Cities should start prepare local regulatory framework for developing infrastructure for smart charging and how charging required for e-vehicles are taking into account in housing construction.

8.5.5 Alexandroupolis

The regulatory framework regarding incentives for promoting the use of car sharing scheme within the city of Alexandroupolis and Greece in general is quite vague for now. Unlike the rest of Europe, Greece is still in an initial stage concerning the passing of legislative laws for smart mobility specifically, reinforcing the end users to use the former. Nevertheless, there exist certain legislations, which boost the market of eco-friendly and electric vehicles, creating thus, the foundations of a future regulatory framework for the development of car sharing in Greece. These can be briefly seen below:

Charging Stations (Law 4233/2014, Art.15):

Allowance for installation of EVs' Charging Stations at Automotive Workshops and Vehicle Technical Inspection Centers ("KTEO") as well as specific parking lots, yet uspecified for public places and problematic as it implies extra costs for the private individuals.

In action as of January 2015.

Road Tax Law:

Electric Vehicles and Vehicles (Hybrid & non-hybrid) classified in Greece or in the EU from 1/11/2010 and onwards with CO2 emissions lower than 90g/km are discharged from road taxes as an incentive to force purchase of eco-friendly vehicles nation-wide.

Special Registration Tax

EVs, HEVs, PHEVs and E-REVs are freed from paying the Specific Registration Tax (or reduced by 50%), which is paid for all vehicles upon entering and registration within the country.

Eco-friendly Vehicles for the Public sector (Law 3855/2010, Art.8, Par.3)

Foreseeing of a joint ministerial decision for the procurement of eco-friendly vehicles, such as the EVs and hybrids.

8.5.6 Focsani

Romania despite a minor delay compared to the European trend, follows an innovation strategy towards the country's growth in favor of the citizen's greater good. There can be mentioned some local (Focsani Municipality) action plans and national legislation, which includes the following:

- Sustainable Urban Mobility Plan of Focsani Municipality, 2016;
- Sustainable Development Strategy of Focsani Municipality 2014-2020;
- Environment Report, General Urban Plan Update, Focsani Municipality, July 2012 - Rev. 5;
- Government Decision no. 529/2013 for the approval of Romania's National Strategy on Climate Change, 2013-2020;
- Government Decision no. 1460/12.11.2008 for the approval of the National Strategy for Sustainable Development - Horizons 2013-2020-2030;
- Government Decision no. 1069/05.09.2007 - Energy Strategy of Romania for 2007-2020;
- Government Decision no. 1535/2003 Strategy for the Recovery of Renewable Energy Sources;
- Ordinance 22/2008 on Energy Efficiency and Promotion of the Use of Renewable Energy Sources by Final Users.

Regarding the environmental sector and the adoption of EV use, strong actions were taken in their pursuit of achieving the targets set for air pollution reduction. The rapid increase of EV sales proves right the government for its actions as seen below.

- "Rabla Plus" , EV Market

As of April 2011, citizens of Romania are eligible of being financially supported through the government on their purchase of a new electric vehicle. More specifically, the Rabla program released in 2011 offered up to a 25% reduction of the initial price with a maximum of EUR 5,000 for the purchase of a new electric vehicle. In addition, a well design Scrappage program was released in parallel in order to persuade buyers who want to get rid of their old vehicle in exchange for a new electric one by receiving a voucher of over EUR 5,000. For hybrid vehicles a EUR 550 grant was offered plus a further EUR 160 grant for hybrid vehicles with less than 100g/km CO2 emissions.

The Romanian government seeing the positive results of their actions and the rapid growth in sales of electric vehicles renewed in 2017 - for an additional 2 year's frame - this program under the code name "Rabla Plus" and doubled the incentive with the potential buyers now being offered a EUR 10,000 grant for their purchase on a new plug-in electric vehicle, plus EUR 1,500 for the deregistration of their older than eight years vehicle. Hybrid vehicles with or without plug-in capabilities were also subsidized with a EUR 4,500 grant.

- Charging Stations

In 2017, announced the launching of a new program supporting the installation of charging stations within several public institutions with an eventual target of 20,000 charging spots by 2020.

- Taxation

Electric vehicles are discharged from the environmental tax and as of March 2015 they are also excluded from the annual-ownership tax; whereas hybrid vehicles are exempt from the environmental tax and are entitled for a 95% reduction from the annual tax.

8.5.7 Santa Cruz de Tenerife

The government of Spain not wanting to fall behind in comparison to other European countries regarding electric mobility issues set out a strong strategy with a view to promoting the growth of electro-mobility use. In addition to the benefits the end users would enjoy, the reduction of carbon emissions and the country's dependency on energy imports would be achieved.

- "Movele Project"

The Spanish government in 2009 declared the investment of EUR 10 million through the so-called Movele project. Main objective of this 2-year-lasting project was to trigger the use of EVs by introducing a total of 2,000 EVs together with the respective set up of charging spots into a broad range of companies and institutions as well as private individuals.

- EVs Market

In 2010, Spain ubandtantly promoted the purchase of electric vehicles refunding the buyers with a 15% to 20% reduction from the retail price and a maximum allowance of 6,000€.

8.6 Bounds and Drivers per LH/FC

8.6.1 Utrecht

Applied technologies are well known and tested in the pre-pilots areas and can easily be replicated to the demonstration area.

Legal: There are no legal barriers for offering mobility services.

Social: The main challenge is to stimulate citizens in the demonstration and change their habits of using private cars and subscribe to the We Drive Solar car sharing system instead. The population in the pre-pilot area is highly educated, environmentally aware and has above average income. While in the demonstration the population has a relatively low education, income levels are below average and people are less environmentally aware.

Environmental: In case an electric car replaces a fossil fuel driven car, this leads to reduction of the CO2 emissions, improvement of local air quality and reduction of noise levels.

8.6.2 Nice Cote D' Azour

Technical driver: better user-experience

Legal: N/A

Social: 80 employments created in Nice by Vulog.

Financial: N/A

Environmental: free-floating increase green mobility + use of EV that decreases air & noise pollution.

8.6.3 Gothenburg

Technical:

Drivers – New digital technology opens new possibilities for shared mobility: it has never been so easy to find information, book and pay for public transport, car sharing and bike sharing. Charging infrastructure for e-vehicles is rolled out at scale and many cities invest in bike sharing schemes. These are all drivers for the development of Mobility as a Service, MaaS.

Barriers – In a MaaS solution, API:s from many different sources need to be integrated, which might be difficult if these API:s do not follow the same standard.

Legal:

Drivers – In Sweden, more and more municipalities open up for flexible parking norms, where property developers can negotiate to reduce the number of parking lots they provide for each apartment if they instead implement other measures which reduce car ownership among the residents. This opens a new market for MaaS connected to accommodation.

Barriers – Swedish legislation is not clear on what role public transport can take in relation to MaaS, as public transport is publicly subsidized. This has made public transport a bit reluctant to engage with private MaaS providers.

Social:

Drivers – There is a strong societal trend where more and more people are concerned about their environmental footprint. Changing one's mobility pattern is not easy, but experience shows that moving into a new apartment is a window of opportunity for behavioural change.

Barriers – As the service to be developed here is primarily aimed at newly built housing projects, it is mainly offered to economically priviliged groups.

Financial:

Drivers – MaaS connected to accommodation can reduce costs for property developers as it might reduce the number of parking lots they need to provide. It can also lower mobility costs for users if they are able to get rid of their car. For mobility service providers, it might attract new customers.

Barriers – It is difficult to find a business model that works for all actors involved in a MaaS solution. Developing and maintaining the digital platform costs money, and most mobility service providers usually have very low margins, so it is hard to find the additional money to fund this new layer.

Environmental:

Drivers – The environment will benefit both from the reduction in number of vehicles in circulation (less resources being consumed), the shift from fossil fuel to e-vehicles, the shift of transport mode for some trips from car to public transport, cycling or walking, and a reduction in the number of kilometres travelled, which we know from other projects is a common outcome when people go from owning a car to relying on shared modes.

Barriers – Mobility packages that include public transport might shift some journeys from walking and cycling to public transport. Similarly, users who did not previously have access to a car might increase the number of car trips when they get access to a car sharing service in connection to accommodation. The production of batteries for e-vehicles has a considerable environmental impact, especially before recycling of batteries has been widely implemented.

8.6.4 Vaasa

Transition towards e-vehicles has already started even transition is slow in the beginning. Situation will most likely change prior to 2030. Vaasa aims to reduce traffic on City center area and will reduce number of parking lots on the main streets and improve conditions for bikes and pedestrians. Parking inside City center will be based on underground parking and parking lots in main streets could be used only for low emission vehicles or e-vehicles.

At the moment rules for private housing companies and association makes it complicated to improve grids to be suitable for load required to invest charging infrastructure. One person can stop improvement when objecting required investment. Most likely charging infrastructure will be put in place for new housing construction projects. For construction companies this will be additional cost but when market will demand charging possibilities those will be implemented.

There are already some private companies in the market (MaaS, EcoRent) which can provide different services mainly in Helsinki area. Challenge will be how to make business function on medium and small scale cities.

In Finland long distances between cities and large countryside will also create a challenge for e-vehicles. In rural areas hybrid solutions are also required.

8.6.5 Alexandroupolis

Technical: There is no technical barrier recognised for the solutions to be examined. The availability of technologies and particularly of digital solutions is a driver towards the implementation of innovative mobility services.

Legal: The lack of clear regulatory framework on sharing economy may act as a barrier to innovative mobility services. Legal reformation is required to support the ultimate target of zero-emissions urban mobility.

Social: The use of alternative means of transport is not popular in Greece. In particular, Alexandroupolis is characterized by the extensive use of private vehicles. The implementation of innovative mobility services could have limited public acceptance and therefore, careful communication and information is required.

Financial: Lower costs for mobility services are a motive for the implementation of such solutions in Alexandroupolis, where private car use is very high.

Environmental: The implemented measures provide the opportunity to achieve a substantial reduction in CO2 emissions and the improvement of the city’s air quality.

8.6.6 Focsani

Different technical bounds regarding integration and efficient operation of the electric busses are examined here. All proposed measures can lead to a better mobility service for citizens of Focsani.

Legal: There can be still a need to enlarge the national or local legal framework.

Social: The project implementation can lead to improving the quality of life in Focsani city.

Financial: On the local/national level there is a bound regarding the available financing from the Government. On the other hand, there is available financing through different EU funded programs.

Environmental: Project implementation can lead to improving air quality in Focsani city and reducing the utilization of fossil fuels for transportation due to the use of renewable energy sources.

8.6.7 Santa Cruz de Tenerife

Technical: There is no technical barrier recognised for the solutions regarding PV EV2G tecnologies. The availability of technologies and particularly of digital solutions is a driver towards the implementation of innovative mobility services. On the other hand there are technical developments to be mature in terms of market penetration regarding mobile solutions for mobility services; which are dependent on social acceptability.

Legal: The lack of clear regulatory framework on sharing economy may act as a barrier to innovative mobility services. Legal reformation is required to support the ultimate target of zero-emissions urban mobility.

Social: The use of alternative means of transport is not popular in Tenerife. In particular, Santa Cruz de Tenerife is characterized by the extensive use of private vehicles but the public transportantion services and facilities are making more attractive this option. The implementation of innovative mobility services could have limited public acceptance and therefore, careful communication and information is required.

Financial: Lower costs for mobility services are a motive for the implementation of such solutions in Santa Cruz de Tenerife.

Environmental: The implemented measures provide the opportunity to achieve a substantial reduction in CO_2 emissions and the improvement of the city's air quality.

8.7 Business Models

8.7.1 Utrecht

The inhabitants' mobility bills can be reduced by means of a cost-effective car sharing system. A district-wide car sharing system deploying V2G e-cars is seen as a major opportunity, providing affordable mobility, offering grid flexibility thanks to the storage capacity of the V2G-batteries, as well as resulting in low emission and noise levels in the city. In the IRIS project the emerging business model Smart Renewable V2G Charging (see further details with description on solution 3.1) will be further developed and evaluated for replication in other cities, including the following business opportunities: tracking use of car sharing systems at city level; tracking misuse of charging stations for parking only; tracking mobility patterns at district level for planning V2G charging spots and car sharing systems

8.7.2 Nice Cote D' Azour

Vulog used to be a start-up (using innovation public funds – BPI/ Regional Council, PACA Investment and EU funuds) and is now a scale-up (developed with the support of private investor (INV, ETF and Frog capital).

A fundrising of 20 million € has been operated mid-2017.

Business model is based on a licence/month/vehicle.

Pricing reduces according to the number of cars.

8.7.3 Gothenburg

EC2B (GOT) - Key to the business model of EC2B is that a transport agent is created that acts as intermediary, which is a new role in the eco-system of mobility. EC2B's customers are not only the end-users of the transport services, but also the providers of mobility services, as well as the property owners who include EC2B as a part of an attractive and innovative accommodation concept. Since EC2B potentially reduces car ownership it also reduces demand for parking space, which is interesting for property developers as building parking lots and underground garages are very expensive.

Through using accommodation as a base for the business model, the possibility for a long-lived relationship with the users is created. EC2B is built so that it can be developed over time both through service providers and other supporting systems in the platform. A combination of subscriptions of transport services and user-demanded additional services gives a stable financing base and good opportunities for add-on sales.

Within the IRIS project, we will also pilot another verion of EC2B with employers in the Johanneberg campus area and Science Park. The business model for this version will look slightly different, as employers in most cases will be added as a layer between property owner and end user. For employers, EC2B can help make business travel more efficient and more sustainable, as well as reducing the number of parking lots they need to provide for their employees.

8.7.4 Vaasa

All business models that will be tested in LCs seems to be according to the Finnish Government policy as “Mobility as Service”. Vaasa will study IRIS business model that fits best for medium and small size cities or as a regional solution. If market is created different business models can be implemented based on customer needs.

8.7.5 Alexandroupolis

The citizens’ mobility expanses can be reduced through the use of a cost-effective car sharing system. A district-wide car sharing system equipped with V2G e-cars is considered as a dominant solution to make affordable mobility possible, offering grid flexibility as a result of the V2G-batteries’ storage capacity, along with low emission and noise levels in the city. Evaluation of the arising business model *Smart Renewable V2G Charging* will take place within the IRIS project aiming to its replication in Alexandroupolis, including the following business opportunities: a) tracking use of car sharing systems at a city level, b) tracking misuse of charging stations for parking only and c) tracking mobility patterns at a district level for planning V2G charging spots and car sharing systems.

8.7.6 Focsani

The implementation of the innovative mobility services for citizens in Focsani Municipality, which includes electric busses, bicycle lanes, etc., can be then used as a business model for other Romanian cities.

8.7.7 Santa Cruz de Tenerife

The implementation of news business models regarding mobility might result in introducing successful experiences with the right adaptation to local need and idiosyncrasy.

Car sharing, carpooling, rental e-bike are the most promising business models which might need to be helped by complementary actions by the municipality of Santa Cruz de Tenerife, after well analyzed.

8.8 Replicability/Impact of the Pilot/ Demonstration/Replication Areas

Utrecht

There is a huge potential for replication of this solution in the city and the region of Utrecht as the Utrecht 2016 SEAP favours electric vehicles, including public transport. Keyword is “Mobility as a Service” opposed to possessing individual cars. This is in line with the current Sustainable Urban Mobility Plan and the ambitions relating to healthy air quality. The Energy Plan envisages a city centre free from all but electric vehicles (or entirely car-free) by 2030. The mobility strategies of both the city and the region of Utrecht emphasize electric vehicles, since they provide fewer emissions and less noise, which is extremely important to keep the region and city accessible and liveable. Their ambition is to accommodate 10.000 e-cars and 1.000 V2G smart solar charging stations in Utrecht region in 2020, which implies massive regional replication potential for this solution.