IMPLEMENTATION ROADMAP

D8.5: Implementation roadmap

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Abstract

This document provides the implementation roadmap for each replicator city of USER-CHI project: Florence (Italy) and Murcia (Spain). These implementation roadmaps set-up the steps towards replication of selected measures from the project already being implemented by demonstrator cities (Berlin, Budapest, Barcelona, Turku and Rome).

Keywords

Replication, implementation, peer-to-peer exchange, transferability, Turku, Barcelona, Berlin, Murcia, Florence, Budapest, Rome.

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Executive summary

As a follow-up to the peer learning visits, the replicator cities drafted implementation roadmaps specifying the solutions they intend to replicate, the timeline and the steps they need to undertake. The implementation roadmaps translate the replication plans into concrete actions and are therefore detailed enough to monitor progress over time.

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1. Introduction

1.1 Purpose of the document and target groups

Since large scale replication and transferability of USER-CHI results is one of the cornerstones of the project strategy, a replication city has been included in each of the TEN-T corridors involved in the project: Murcia (Spain) in the Mediterranean corridor and Florence (Italy) in the Scandinavian-Mediterranean corridor. This document provides an overview of the replication activities carried out in USER-CHI and the implementation roadmaps carried out by the two replicator cities to transfer USER-CHI solutions to their own city. This document will serve as a source of inspiration for the organization of similar replication activities within different EU-funded projects, or for the establishment of inter-city cooperation based on replication. The target groups of this document therefore include local practitioners, project experts in charge of replication activities and the CIVITAS community.

1.2 Scope of the document

This document provides an overview of the replication activities carried out in USER-CHI. These replication activities helped replicator cities to draft a replication plan to transfer USER-CHI solutions to their own city. The implementation roadmaps specify the solutions they intend to replicate, the timeline and the steps they need to undertake.

Replication is not limited to the technical solutions, but it touches upon the broader context that paved the way, in each city, to deploy a specific solution. Therefore, replication looks at the approaches applied to the technical solutions, but also those related to collaboration, engagement, legal, business and governance models. The implementation roadmaps do not focus on INSOC and CLICK as these solutions will be fully tested by the replicator cities during the project.

1.3 Structure of the document

After providing an overview of the solutions implemented in demonstrator cities of USER-CHI, this document describes the methodology applied to develop replication plans and implementation roadmap, resulting from the replication strategy set out at the beginning of the project. It then presents a summary of the replication activities carried out and how they contributed to the drafting of the implementation roadmaps. The implementation roadmaps from Florence and Murcia present the selected measures, a transferability assessment of these measures and an action plan specifying the timeline, steps and key indicators to monitor the implementation.

2.USER-CHI solutions

2.1 USER-CHI products

In USER-CHI, eight innovative products are designed, developed, and tested in the demonstration cities. The eight USER-CHI products are:

CLICK- Charging location and holistic planning kit

An online tool for the location planning of new charging infrastructure in cities and TEN-T corridors.

Stations of the future handbook

Guidelines and recommendations to design the perfect user-centric charging station of the future.

eMoBest – e-Mobility replication and best practice cluster

A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.

INFRA – Interoperability framework

A package of rules, guidelines and recommendations that supports highly interoperable processes among the electromobility stakeholders.

INCAR – Interoperability, charging and parking platform.

A platform providing roaming and barrier-free access to EV charging points and offering related innovative integrated services for the EV drivers.

SMAC – Smart Charging tool

A tool providing smart grid integration and demand management services for slow, medium, fast, and ultrafast charging.

INSOC – Integrated solar DC charging for Light Electric Vehicles (LEVs)

A solution combining charging, onsite production of renewable energy with integrated theft-proof recharging system.

INDUCAR – Inductive charging for e-cars

A wireless and highly automated charging solution for e-cars.

2.2 Demonstrator cities

2.2.1 USER-CHI solutions in Turku

In the framework of USER-CHI project, the City of Turku is deploying a city-wide charging infrastructure adapted to different user needs, facilitated through a public-private partnership with local entities. This partnership includes TVT and VASO (housing companies), as well as Turku Energia (an energy company), creating a collaborative effort to integrate USER-CHI's innovative charging solutions—INCAR, SMAC, and INSOC—across various scenarios. These scenarios range from public charging stations to dedicated facilities for residents of new housing developments, and specialized charging options for both private and professional users in the harbour area. This collaborative effort allows to explore the INCAR app's functionality with a focus on private and professional users.

With the introduction of SMAC, both VASO housing company and Turku Energia are testing the intelligent and dynamic management of energy demand. This also involves a comprehensive analysis of the technical and economic aspects of efficiently managing the power distributed to Charging Point Operators (CPOs).

The City of Turku set up a bicycle garage that combines secure parking for bicycles with a repair and service station, decorated with art installations on the outside walls, and equipped with an inductive charging facility for light electric vehicles (INSOC).

The City of Turku will use the results of CLICK planning tool to develop a charging masterplan. The plan is city wide and will be implemented between 2024 and 2030.

Basic demo facts	
USER-CHI product	INSOC (TURKU)
Location of demo site	Joukahaisenkatu 6, on publicly accessible space, owned by private land-owner.
Basic Use Case	New bike garage for bikes, maintenance point, surveillance, new e-charging place
EV-Usage	Private e-bikes, e-kick scooters
End Users profile	Private users (e-bike riders, e-kick scooters riders)
Business model	Charging for free for all users
Charging Infrastructure	PV panels, battery storage, 6 e-charging points
Partners involved	ETRA, Enel X Way, -City of Turku + subcontractors
Situation – January 2024	Friendly user tests running

Table 1 – INSOC demo factsheet 1 – Turku

Basic demo facts	
USER-CHI product	INSOC (TVT)
Location of demo site	Kunnallissairaalantie 36, Turku. E-bike charger on publicly accessible space in front of the apartment building. Battery charging cabinet inside the building, not accessible publicly.
Basic Use Case	Testing INCAR-app and new ways to charge e-bikes/e-kick scooters.
EV-Usage	Private e-bikes, e-kick scooters
End Users profile	Private users (e-bike riders, e-kick scooter riders)
Business model	Charging for free
Charging Infrastructure	12 kWp solar panels + battery storage, 6 charging points and battery charging cabinet for e-bikes/e-kick scooters
Partners involved	ETRA, Enel X Way, TVT + subcontractors
Situation – January 2024	Friendly user tests running

Table 2 – INSOC demo factsheet 2 – Turku

Basic demo facts	
USER-CHI product	INCAR (Satama)
Location of demo site	Linnankatu 90. Chargers are placed in front of the office building on a publicly accessible space
Basic Use Case	Testing the use of INCAR-app with private and professional users; reservation, starting the charging process and payment
EV-Usage	Mainly private vehicles and company fleet
End Users profile	Private and professional users (EV-drivers, employees)
Business model	Encouraging people to use the INCAR-app by offering charging possibility during their boat cruise.
Charging Infrastructure	20 pcs 22kW chargers + equipment: PV system, battery storage and inverter. Features: demand management, smart power control
Partners involved	IGL, Turku Energia + subcontractors, ETRA, VMZ
Situation – January 2024	Demo running, usage through INCAR app still needs verifications

Table 3 – INCAR demo factsheet 1 – Turku

Basic demo facts	
USER-CHI product	INCAR (TE)
Location of demo site	Teollisuuskatu 40. Chargers are placed in front of the office building on a publicly accessible space
Basic Use Case	Testing the use of INCAR-app with private and professional users; reservation, starting the charging process and payment
EV-Usage	Private vehicles and company fleet
End Users profile	Private and professional users (EV-drivers, employees)
Business model	Encouraging people to use the INCAR-app by offering free parking space during charging.
Charging Infrastructure	6 pcs 22kW chargers & one V2G charger + equipment: PV system, battery storage and inverter. Features: demand management, smart power control
Partners involved	IGL, Turku Energia + subcontractors, ETRA, VMZ
Situation – January 2024	Demo running, usage through INCAR app still needs verifications

Table 4 – INCAR demo factsheet 2 – Turku

Basic demo facts	
USER-CHI product	INCAR (VASO)
Location of demo site	Pääskysillankatu 3 + chargers are on the buildings' premises inside the parking hall
Basic Use Case	Testing the usage of INCAR-app with private and professional users; reservation, starting the charging process and payment, opening parking barrier
EV-Usage	Private vehicles and shared vehicles
End Users profile	Private and professional users (EV-drivers)
Business model	Encouraging people to use the INCAR-app by offering free parking space for a month.
Charging Infrastructure	6+2 22kW chargers. + equipment: PV panels, battery storage and inverter. Features: demand management, smart power control
Partners involved	IGL, VASO + subcontractors, ETRA, VMZ
Situation – January 2024	Demo running, usage through INCAR app still needs verifications

Table 5 – INCAR demo factsheet 3 – Turku

Basic demo facts	
USER-CHI product	SMAC (TE)
Location of demo site	Teollisuuskatu 40. Chargers are placed in front of the office building on a publicly accessible space
Basic Use Case	Testing intelligent and dynamic management of demand brought by the SMAC tool. Analysing – from both a technical and economic point of view – the efficiency of managing the energy supplied to CPOs. at the same time, improving the service to the end-user.
EV-Usage	Private vehicles and company fleet
End Users profile	Private and professional users (EV-drivers, employees)
Business model	Enable CPO to optimize energy-related costs and enhance the utilization of renewable energy sources.
Charging Infrastructure	6 pcs 22kW chargers & one V2G charger + equipment: PV system, battery storage and inverter. Features: demand management, smart power control
Partners involved	IGL, Turku Energia + subcontractors, ETRA
Situation – January 2024	Demo running, some developing by ETRA still needed

Table 6 – SMAC demo factsheet 1 – Turku

Basic demo facts	
USER-CHI product	SMAC (VASO)
Location of demo site	Pääskysillankatu 3 + chargers are on the buildings' premises inside the parking hall
Basic Use Case	Testing intelligent and dynamic management of demand brought by the SMAC tool. Analysing – from both a technical and economic point of view – the efficiency of managing the energy supplied to CPOs. at the same time, improving the service to the end-user.
EV-Usage	Private vehicles and shared vehicles
End Users profile	CPO's (Charging Point Operators)
Business model	Enable CPO to optimize energy-related costs and enhance the utilization of renewable energy sources.
Charging Infrastructure	6+2 22kW chargers. + equipment: PV panels, battery storage and inverter. Features: demand management, smart power control
Partners involved	IGL, VASO + subconctractors, ETRA
Situation – January 2024	Demo fully running

Table 7 – SMAC demo factsheet 2 – Turku

CLICK factsheet - Turku	
Do you already have your own planning tool for the location of charging infrastructure?	No, we don´t. We are using CLICK and surveys to determine optimal charging locations.
Who is testing CLICK? Which departments of your municipality/organization?	Urban Mobility solutions department (2 staff members)
How will you use the results – if any use?	We will use the results in our charging masterplan. The plan is city wide and will be implemented 2024-2030. TVT will use it also in their planning process. Finnish municipalities are introduced to the tool through webinar.
Partners involved -	City of Turku, TVT

Table 8 – CLICK demo factsheet - Turku

2.2.2 USER-CHI solutions in Berlin

The goal of the Berlin demo is to provide advanced e-charge parking services designed to meet the needs of different user segments with the INCAR-app. Private and commercial users in densely populated areas are provided with easy and convenient access to charging and parking infrastructure with services such as availability, reservation, booking and billing of charging and parking. The pilot locations are managed by Gewobag AG, the municipal housing company. Both locations have great potential to become new hubs of electric charging.

Basic demo facts	
USER-CHI product	INCAR
Location of demo site	• Prinzenstraße 98, 10969 Berlin - Publicly accessible private car park • Paul-Junius-Straße 70, 10369 Berlin - Publicly accessible private car park (secured by a parking barrier)
Basic Use Case	Testing publicly accessible, innovative and user-friendly e-charge parking solutions on private car parks in two urban neighbourhoods.
EV-Usage	Private and professional e-cars drivers
End Users profile	Private users (EV drivers): residents, transient users, tourists Professional (EV drivers): e-taxi drivers, professional vans drivers, employees of shared mobility services
Business model	Provision of Semi-Private property for Charging The charging process is paid by the user. A fee of 2 cents per minute is charged for parking during the process.
Charging Infrastructure	6 innovative and user-friendly AC chargers, each 11kW.
Partners involved	VMZ, Gewobag, IKEM, Qwello
Situation – January 2024	Demo is fully running

Table 9 – INCAR demo factsheet - Berlin

CLICK factsheet	
Do you already have your own planning tool for the location of charging infrastructure?	No, not yet.
Who is testing CLICK? Which departments of your municipality/organization?	Department Planning and Consultancy
How will you use the results – if any use?	Comparison to current plannings
Partners involved -	VMZ, Gewobag

Table 10 – CLICK demo factsheet – Berlin

2.2.3 USER-CHI solutions in Budapest

Under the USER-CHI project, the Municipality of Budapest is committed to transforming public spaces into more liveable and multifunctional areas. This transformation is envisioned through the integration of various e-mobility functions—including e-car, e-scooter, and e-bike chargers—alongside additional services such as tablet chargers, public lighting equipped with sensors, and car-sharing docking stations. The aim is for these elements to not only coexist but also to complement one another, creating an interoperable smart city ecosystem.

Currently, Budapest is piloting its first e-mobility points and stations, which are conceptualized within a mobility point network framework. This framework is structured around a three-level service system: at the small level, the micromobility points offer fundamental services to bicycle, roller, cargo bicycle; at the mid-level, the mobility points offer services to micromobility vehicles, dedicated car sharing, e-scooter/e-car parking; at the highest level, the e-mobility stations provide a comprehensive range of services at major mobility hubs.

Basic demo facts	
USER-CHI product	INCAR / SMAC
Location of demo site	INCAR e-charging points, located in public spaces: - Budapest, Etele tér - Budapest, Jászai Mari tér - Budapest, Oktogon - Budapest, Széna tér SMAC installation to be located at a private site of Budapest Waterworks Plc. (Location: 1044 Budapest, Külső-Váci út 102.)
Basic Use Case	INCAR: Budapest is testing its first e-mobility points and station based on the mobility point network concept, consisting of a 3-level-service, where micromobility point is the smallest level and e-mobility station is the most complete service level at the biggest mobility hubs. The city intends to upscale each level, e-mobility are to be extended to a 25-element system in 2024-25. E-mobility points and stations with USER-CHI chargers are equipped with INCAR to be used by car-sharing companies and private EV users. SMAC: at the moment demand management is not permitted (by law) on public spaces, therefore the city is testing the smart charging tool at its utility company's premise. Successful pilot can contribute to a larger scale implementation affecting e-vehicle fleets of the City and 27k employee of Budapest and its institutions, companies.

<table>
<tr><td>EV-Usage</td><td>The Municipality is preparing its e-mobility strategy, where the EV user database will be created both on private and public users. EV usage is growing exponentially in Budapest.</td></tr>
<tr><td>End Users profile</td><td>EV-drivers: private and professional (utilities, carsharing, logistics, carriage of passengers etc.)</td></tr>
<tr><td>Business model</td><td>Public incentives are decreasing, USER-CHI e-charging stations offer free of charge service during the project lifetime. After-project life is under preparation.

Home and office charging are increasing, incentives for home charging, EV purchase for for-profit users have recently launched by the government as well as PV installation complementary funding opportunities.</td></tr>
<tr><td>Charging Infrastructure</td><td>Single and double AC chargers with 2 x 22kW capacity in each location. These chargers have Type2 connectors / cables (cable ones only at Jászai Mari tér and Etele tér locations).

<table>
<tr><th>Manufacturer / Model</th><th>Type of charging</th><th>Location</th></tr>
<tr><td>Innogy eStation smart 2x22 kW</td><td>AC</td><td>Budapest, Oktogon 2, 1061</td></tr>
<tr><td>Innogy eStation smart 2x22 kW</td><td>AC</td><td>Budapest, Széna tér 2, 1015</td></tr>
<tr><td>Alfen Eve Single Pro-line 3 PH T2 RFID 22kW</td><td>AC</td><td>Budapest, Jászai Mari tér 6, 1137</td></tr>
<tr><td>Alfen Eve Single Pro-line 3 PH Cable RFID 22kW</td><td>AC</td><td>Budapest, Jászai Mari tér 6, 1137</td></tr>
<tr><td>Alfen Eve Single Pro-line 3 PH T2 RFID 22kW</td><td>AC</td><td>Budapest, Etele tér, 1115 (Hrsz. 2860/1)</td></tr>
<tr><td>Alfen Eve Single Pro-line 3 PH Cable RFID 22kW</td><td>AC</td><td>Budapest, Etele tér, 1115 (Hrsz. 2860/1)</td></tr>
</table></td></tr>
<tr><td>Partners involved</td><td>DSO (E.ON), Carsharing (MOL LIMO, wigo, GreenGO), Logistic companies (GLS, DHL, DPD, Foxpost etc.),</td></tr>
<tr><td>Situation – January 2024</td><td>INCAR – not running (infrastructure completed in Oct. 2023, waiting for app integration), operation planned start Feb 2024.

SMAC – not running, infrastructure and service for testing under procurement process, planned start: March.</td></tr>
</table>

Table 11 – INCAR and SMAC demo factsheet – Budapest

CLICK factsheet	
Do you already have your own planning tool for the location of charging infrastructure?	We were able to plan the implementation of new charging infrastructure based on some preset criteria, but we did not have a tool similar to CLICK.
Who is testing CLICK? Which departments of your municipality/organization?	Both the Municipality of Budapest and BKK tested CLICK. In BKK, mainly the Strategy and the Mobility Planning Directorates. As for the Municipality of Budapest, the Climate and Environmental Affairs Directorate.
How will you use the results – if any use?	Within the project scope, we will use and integrate its recommendations into our e-mobility strategy (which is currently in the making). In the long run, we aim to use it as a supporting planning tool for future charging infrastructure.
Partners involved -	BKK, Municipality of Budapest

Table 12 – CLICK demo factsheet - Budapest

2.2.4 USER-CHI solutions in Rome

Rome aims at promoting private-public investments and innovative solutions, with overarching goal of offering several charging solutions together with other associated services and in environments able to offer multi-modal transport systems. This strategy is part of Rome's vision to create e-mobility hubs that serve as integrated platforms for different modes of transportation. INSOC and INCAR solutions are integrated into this e-mobility hub approach.

Basic demo facts	
USER-CHI product	INSOC
Location of demo site	Via Ostiense 131L, private area publicly accessible 24/7
Basic Use Case	INSOC product improves the management of electric light vehicles parking and fleet through a single hub as collection point in Ostiense area where they can be recharged and made available to end users. In this area, there is a huge number of commuters and citizens that work and live. The charger is using renewable energy developed on site though the photovoltaic canopy present in the INSOC charger.
EV-Usage	Private light electric vehicles, company fleet
End Users profile	e-bike riders, e-kick scooters riders
Business model	Revenues from selling charging services through the INSOC charger
Charging Infrastructure	INSOC is an integrated Solar DC-Charging for 6 LEVs, easily replicable and scalable, with integrated theft-proof parking thanks to an integrated mechanical rack for personal locking, payment services and on-site produced RES through DC wireless charging mode for retrofitted e-kick scooters.
Partners involved	Enel X Way
Situation – January 2024	Demo under construction

Table 13 – INSOC demo factsheet - Rome

Basic demo facts	
USER-CHI product	SMAC
Location of demo site	Via Flaminia 871, private area not publicly accessible
Basic Use Case	Testing V2G functionalities through SMAC
EV-Usage	Enel company fleet
End Users profile	Electric passenger car driver
Business model	No revenues
Charging Infrastructure	3 charging infrastructure bi-directional, DC 15 kW CHADEMO
Partners involved	ENEL X Way, ETRA
Situation – January 2024	Demo under construction

Table 14 – INCAR demo factsheet - Rome

Basic demo facts	
USER-CHI product	INCAR
Location of demo site	Whole network of ENELX in Rome (around 100 chargers)
Basic Use Case	Test interoperability and the automation of processes and payments between the CPO (ENEL) and eMSP (ETRA) through the INCAR platform.
EV-Usage	Private ev-drivers
End Users profile	CPO's, eMSP, EV-Drivers
Business model	Increase revenues through the promotion of the CPO charging infrastructure to other potential clients (through interoperability with eMSP)
Charging Infrastructure	Around 100 charging points in Rome (slow, medium and fast)
Partners involved	ENEL X Way, ETRA
Situation – January 2024	Demo is running

CLICK factsheet	
Do you already have your own planning tool for the location of charging infrastructure?	Roma Servizi per la Mobilità (RSM), in cooperation with the Municipality of Rome, has set up a model for planning the areas where the city needs electric charging points. These areas will be put out to tender among the operators of the charging points. According to this model, the location of the charging points depends on the density of residents and employees and is connected to the electricity distribution network.
Who is testing CLICK? Which departments of your municipality/organization?	CLICK was tested by RSM technicians, who are directly involved in the planning of the charging points and the drafting of the Electric Mobility Plan.
How will you use the results – if any use?	The tests performed allowed us to match our model with the output provided by CLICK.
Partners involved -	RSM carries on an ongoing dialogue with the Department of Mobility on the topic of electric mobility, also through planning tools such as CLICK

Table 15 – CLICK demo factsheet - Rome

2.2.5 USER-CHI solutions in Barcelona metropolitan area (AMB)

The Barcelona metropolitan area is showcasing the most extensive demonstration within the project, featuring INCAR, SMAC, INDUCAR, INSOC, and CLICK.

INCAR technology has been integrated into the metropolitan charging network, specifically targeting private EV users. This allows for the testing and analysis of interoperability among various Charging Point Operators (CPOs), facilitating a seamless charging experience across different service providers.

Additionally, the innovative inductive charging solution, INDUCAR, is being tested by AMB's employees using two specially retrofitted vehicles. This trial aims to assess the viability and efficiency of wireless charging technology in a real-world urban setting.

Basic demo facts	
USER-CHI product	INCAR and SMAC
Location of demo site	Location 1: Carrer E cantonads Carrer C, Pl Molí dels Frares – Sant Vicenç dels Horts – *INCAR, SMAC to be tested* Location 2: Avinguda Torres i Bages, aparcament estació FGC – Sant Boi de Llobregat - *INCAR* Location 3: Aparcament carrer Sevilla, cantonda Caretera d'Espluges – Cornellà de Llobregat – *both INCAR and SMAC* The chargers are on public space, publicly accessible 24h a day
Basic Use Case	INCAR: Use of different charging stations with same App located in different countries and different operators. SMAC: tested at the end of 2023 the Cornellà de Llobregat chargers (Baltasar Oriol) by ETRA I+D with AMB's electrical cars. The scope of the tests was somewhat limited. Nevertheless, SMAC was working for a couple of months for users until the entire AMB charging network migrated to a new management system of a new service provider from AMB. This new platform was not integrated with INCAR. In august 2023, AMB integrated a charging station St Vicenç dels Horts – PAE Molí dels Frares in INCAR platform. In this location AMB will find a moment to do a controlled test with ETRA I+D and AMB's electric cars to validate the applicability of SMAC in more places, and with chargers of different characteristics and manufacturers.

	In both cases, the use case to be tested was to demonstrate how SMAC could program the loads to supply the requested energy, but reducing the necessary power. In the case of Cornellà, the 2 chargers (4 connectors) were configured with a global power limit of 120kW when usually is 170 kW.
EV-Usage	Mostly private vehicles and professionals (taxis, delivery) as public service
End Users profile	Private users (EV drivers, e-bike riders, e-kick scooters riders) and professional (e-taxi drivers, professional vans drivers) as public service)
Business model	Charging for free
Charging Infrastructure	Location 1: 3 standard connectors (Mennekes, CHAdeMO and Combo) and capacity for 2 vehicles simultaneously. High Power and Low Power Locations 2 and 3: 2 standard connectors (Mennekes and Shucko) for low-power charging
Partners involved	AMB + subcontractors, ETRA
Situation – January 2024	Demo fully running in location 1. Technical difficulties to start in Location 2 and 3 that may lead to change locations.

Table 16 – INCAR and SMAC demo factsheet – AMB

Basic demo facts	
USER-CHI product	INDUCAR
Location of demo site	AMB Premises
Basic Use Case	Wireless Charing station
EV-Usage	company fleet
End Users profile	AMB employees
Business model	Flexibility on booking company fleet, flexibility of use, compared to rigid fleet rules for other cars
Charging Infrastructure	2 chargers for 2 vehicles retrofitted for inductive charging
Partners involved	AMB, ENRX (IPT Technology)
Situation – January 2024	Demo fully running

Table 17 – INDUCAR demo factsheet - AMB

Basic demo facts	
USER-CHI product	INSOC
Location of demo site	FUNDESPLAI Youth Hostel, El Prat de Llobregat
Basic Use Case	Use of shared e-light vehicles
EV-Usage	Private and shared light-vehicles
End Users profile	Employees of hostel
Business model	charging for free, and use of vehicles for free
Charging Infrastructure	6 chargers with low-power
Partners involved	AMB, FUNDESPLAI Youth Hostel
Situation – January 2024	not running: start February 2024 when shared fleet is ready.

Table 18 – INSOC demo factsheet - AMB

CLICK factsheet	
Do you already have your own planning tool for the location of charging infrastructure?	Yes, AMB used a study for recommendation of locations. In addition, AMB depends on metropolitan municipalities, so despite the objective data, we need to take their input and preferences into account.
Who is testing CLICK? Which departments of your municipality/organization?	CLICK is being used in the Geographic Information System (GIS) department of AMB, but also with collaborators that supported AMB with the implementation of the current network
How will you use the results – if any use?	The results will be used internally for comparison with the current locations decided. Nevertheless, if the results different significantly, AMB may include the Click criteria for future tenders in a new extension of the charging stations network
Partners involved -	AMB + external collaborators

Table 19 – CLICK demo factsheet - AMB

2.3 Replicator cities

2.3.1 Florence

The city of Florence is testing CLICK and INSOC.

Basic demo facts	
USER-CHI product	INSOC
Location of demo site	Ponte a Greve park and ride
Basic Use Case	Integration of LEV charging infrastructure in the multimodal transport system
EV-Usage	e-bikes
End Users profile	Private users of e-bikes
Business model	Not yet defined. Will be defined once the connection is finalised.
Charging Infrastructure	6 sockets for inductive charging and 6 sockets for capacitive charging PV panels
Partners involved	City of Florence
Situation – January 2024	INSOC installed but connection still ongoing (to allow testing)

Table 20 – INSOC demo factsheet - Florence

The city of Florence took part in the testing of the CLICK tool and was able to compare CLICK features with the planning tool currently in use in Florence.

2.3.2 Murcia

The city of Murcia is testing CLICK and INSOC.

Basic demo facts	
USER-CHI product	INSOC
Location of demo site	Police Station in La Alberca
Basic Use Case	Integration of LEV charging infrastructure in the multimodal transport system
EV-Usage	e-kick scooters
End Users profile	private users (municipal employees), citizens visiting the police station
Business model	Murcia INSOC is free for all users, no payment is required to use it or to access the charger
Charging Infrastructure	6 sockets for inductive charging and 6 sockets for capacitive charging PV panels
Partners involved	City of Murcia
Situation – January 2024	INSOC installed

Table 21 – INSOC demo factsheet - Murcia

The city of Murcia took part in the testing of the CLICK tool.

The results of the testing were considered limited by Murcia. Murcia's electromobility plan needs to provide at least one charging point to each neighbourhood, which was not the case when using the CLICK tool. The testing staff was unsure on how to introduce their requests into the planning algorithm and they have a suspicion that there was some mistake made when entering the data. However, they found CLICK quite easy to use.

3. Methodology

3.1 Objectives

Replication and scaling up are important objectives in USER-CHI: it is essential that other cities benefit from the demonstrator cities' experience, challenges, and practices. The purpose of the replication and peer-learning activities is to establish a 'community of practice' to support demonstrator sites, replicator cities, industry partners, project experts and interested cities to address common challenges. This 'community of practices' was established through:

- Setting up an online **collaboration platform** to facilitate the transfer of best practices among the demonstrator, replicator and interested cities. The **eMoBest** platform – e-Mobility replication and best practice cluster, is one of USER-CHI products.
- **Replication webinars** organised before the peer-learning visits, to get the participants aware of the content of the visit and its background, exchange on status of solutions and agree on the themes to be covered.
- **Peer-learning visits** organised by each of the five demonstrator cities of the project in their own site, in which they invite the other demonstrator cities, the replicator cities and fellow cities to discuss selected themes and to showcase demo-sites.
- **Peer-learning webinars** organised after the visits and opened for interested cities, to share the experience of the demonstrator and replicator cities and give guidance to external participants on how to replicate the different solutions.
- **Replication workshops** bringing together the demonstrator, replicator and external cities to get feedback and find solutions to the encountered barriers to replication.

Replication in the context of USER-CHI is intended as the path towards the exploitation of the solutions by a wide range of cities. However, replication is not limited to the technical solutions, but touches upon the broader context that paved the way to deploy a specific solution in each city. Replication looks at the approaches applied for the technical solutions, but also those related to collaboration, engagement, legislation, business and governance models.

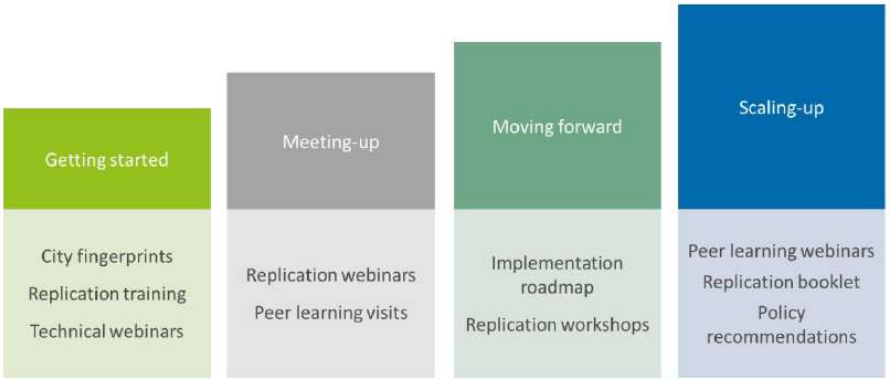

Figure 1 - The four dimensions of replication and related activities

3.2 Replication activities

3.2.1 City fingerprints

City fingerprints (Annex 1) for each demonstrator and replicator city have been prepared at the beginning of the project to analyse the state of the art of electromobility in each city, collect best practices and investigate the initial plans for demonstration and replication. They represent a first very important tool for getting started, know each other better and learn from each other's experience. The city fingerprints helped and will continue to help replicator cities in developing the replication plans as they present the state of the art of e-Mobility in each city and highlight the potential for replication, including existing e-Mobility targets and goals, e-Mobility measures, and infrastructure.

3.2.2 Replication training

A replication training was organised with the demonstrator and replicator cities to present and discuss the USER-CHI replication approach, have a mutual understanding of the planned solutions in each city, as well as collect replication plans by the replicator cities. It equipped cities with the peer learning methodology that will be applied in the project. The replication training took place in M11. Due to the COVID-19 pandemic, the training took place online.

3.2.3 Technical webinars

Five technical webinars are organised - with the input of the relevant product leaders and demonstrator cities - to present the products and other technical solutions being implemented in the project, as well as challenges encountered. Besides offering a learning and knowledge exchanging opportunity within the USER-CHI community, these webinars also target interested cities and particularly urban nodes on the different TEN-T corridors outside of the project.

Topic	Date
Optimal location planning of new charging infrastructure – CLICK tool	27/05/2020
Stations of the Future Handbook	12/12/2022
Inductive charging - INDUCAR	19/10/2023
Interoperability - INCAR	February 2024
Smart charging	TBD 2024

Table 22: USER-CHI technical webinars

3.2.4 Replication webinars

Replication webinars (called ElectriCity webinars) were organised before each peer-learning visit to refine with the participants the content of the visit and get familiar with each other's background, collect specific requests, and agree on the agenda.

City	Date
Berlin	20/09/2021
AMB	29/10/2021
Budapest	17/11/2021
Turku	7/12/2021
Rome	17/01/2022

Table 23 – Replication webinars

3.2.5 Peer learning visits

Peer learning visits are at the very heart of the USER-CHI replication approach as they give a strong impulse to the replication process.

Each demonstrator city hosted a peer learning visit for the other demonstrator cities, replicator cities, and interested cities as well. These were the occasion of showcasing the existing measures and ongoing activities and an opportunity for the visiting cities to learn first-hand and ask specific questions. A transferability session to analyse the transferability potential of the analysed measures was organised at the end of each peer-learning visit. The peer learning visits

took place between M28 and M44. Although the demonstration activities in the demonstration cities were not completed by then, we considered it important for the visiting cities to already get acquainted with the preparatory work and the existing demonstrations, measures and solutions that paved the way to the deployment of the USER-CHI solutions.

The outcomes of the peer-learning visits can be found in D8.2 Peer-learning visits and replication workshops published in November 2023.

Host city	Dates
Berlin	18-19 May 2022
Barcelona	8-9 November 2022
Rome	17-18 January 2023
Turku	26-27 April 2023
Budapest	25 - 26 September 2023

Table 24 – Peer-learning visits planning

3.2.6 Implementation roadmaps

The implementation roadmaps have been completed by participants to the replication programme from each replicator cities (Florence and Murcia). These roadmaps were developed through active engagement in replication webinars and peer-learning visits, offering participants a direct insight into the innovative solutions deployed by demonstrator cities. This process underscores the project's aim to encourage the widespread adoption of these solutions across a broad spectrum of cities, extending beyond technical replication to encompass the comprehensive frameworks that facilitate the deployment of each solution, including collaboration, engagement, legislation, business, and governance models.

Following the peer-learning visits, Florence and Murcia were tasked with drafting detailed implementation roadmaps. These documents outline the specific solutions each city plans to adopt, along with a timeline and the necessary steps for execution. By translating the replication plans into actionable strategies, these roadmaps serve as crucial tools for monitoring progress over time. A template for the implementation roadmap was provided to the replicator cities (Annex 2).

3.2.7 Peer-learning webinars

Five peer learning webinars are organised to share the most interesting and promising solutions stemming out of USER-CHI with external cities. These webinars focus on the replication potential and are theme based. External speakers from other cities, stakeholders advisory group members and linked initiatives (such as the USER-CHI sister projects eCharge4Drivers and INCIT-EV) are invited to contribute to the peer learning webinars.

Topic	Date
Accompanying the electromobility transition in cities	08/03/2022
Accessibility of charging infrastructure: solutions and recommendations	20/06/2020
Electrifying urban buses - Lessons from European cities	12/12/2023
SUMP and electromobility strategies	TBD 2024
LEVs in the cities	TBD 2024

Table 25: USER-CHI peer-learning webinars

3.2.8 Replication workshops

Two replication workshops were organised to complement and act as a follow-up to the peer-learning visits to further guide demonstrator and replicator cities in the implementation of their measures, support them with the definition of the key enablers, barriers, solutions, issues, and strategies to overcomes them. They took place in M34 and M41. The outcomes of the replication workshops can be found in D8.2 Peer-learning visits and replication workshops published in November 2023.

3.2.9 Replication booklet

A replication booklet will be prepared in M53 to provide an overview of the different technologies and strategies that have been tested by the demonstrator cities and to offer technical and strategic guidelines to other cities on how to successfully transfer these solutions. It will have a digital format to increase its accessibility.

3.2.10 Policy recommendations

Policy recommendations will be drafted for the EU, national and local decision makers with a view to address the technical user-centric issues, optimise the deployment of charging infrastructure, strengthen the interoperability of the network, support smart grid integration and advance sustainable business and market models. The policy recommendations will rely on the outcomes of the project (users research analysis, legal and technical requirements analysis, etc..), as well as input from the USER-CHI stakeholders' advisory group, and other feedback from experts from the Eurocities working groups and panels. They are produced along the whole duration of the project, and they will be summarised in a final publication in M51.

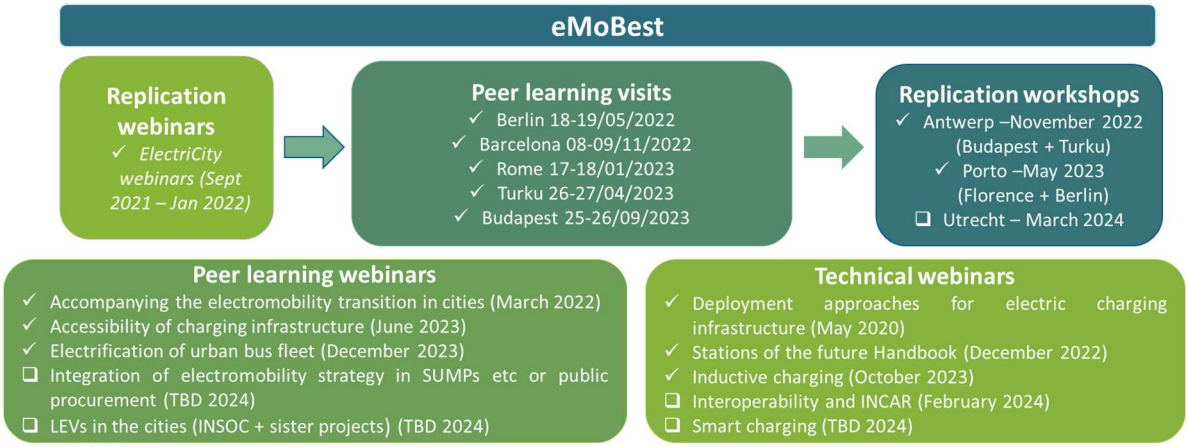

Figure 3 - Overview of USER-CHI replication activities

4. Florence implementation roadmap

4.1 Measures selected

Measure name and description	Topic	Related demonstrator city
INCAR: App, interoperability, charging and parking platform providing roaming and barrier-free access to EV charging points and offering related innovative integrated services for the EV drivers.	App	Berlin, Barcelona, Rome
Jelbi/Jelbi Station: mobility app with all sharing services + dedicated space for charging/parking of e-vehicles and sharing vehicles	App/hub	Berlin
Low Emission Zone (LEZ)	Legal norms	Barcelona
(Mobility Center /Open data): mobility and traffic management center, as well as the approach to open data and Intelligent Transport System (ITS)	Legislative framework/data collecting and sharing	Rome

4.2 Measure 1 – INCAR

4.2.1 Analysis

Objective of the measure	**With this app users can find, manage, book a charging point and also pay with a single account for all the CPOs who will join the service**	
Conditions	**Description**	**Transferability potential (1 to 4)***
Time needed for the implementation	In progress	-
Technical conditions required	Adhesion of different subjects (CPO), scalable solutions, funding support	2
Desirable governance of the measure	CPO competition and controlled prices	1
Legislative/regulatory framework needed	Implementation of European Directives, climate laws, incentives, regulations about the Charging infrastructure	2
Additional success factors	Coordination among the public/private owner in public spaces of the recharging stations	2
Budget required	In progress	-
Overall rating of transferability potential		2

Please notice that we already have a mobility app (IF) but it could be interesting the opportunity to pay with a single account for all the CPOs who will join the service

* 1 being low transferability potential and 4 high transferability potential in your specific context.

4.2.2 Implementation roadmap

Based on the measures' analysis carried out above, please complete the following action plan for the selected measure(s) with the highest degree of transferability.

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*
Test the integration of INSOC into INCAR app	2024	Direzione Infrastrutture di Viabilità e Mobilità	Evaluating the system through testing community and feedback from the users of INSOC solution (as application needed for recharging through INSOC pilot solution)

4.3 Measure 2 – Jelbi station and app

4.3.1 Analysis

Objective of the measure	**All mobility services (e-car sharing, e-bike sharing, bike-sharing) integrated in one station next to a multi-modal hub (metro station, train station), to be used through one app (Jelbi app).**

Conditions	Description	Transferability potential (1 to 4)*
Time needed for the implementation	Since 2019	-
Technical conditions required	Availability of public space, adhesion of different subjects, scalable solutions, funding support, permissions	1
Desirable governance of the measure	Cooperation and uniformity	2
Legislative/regulatory framework needed	Implementation of European Directives, climate laws, incentives, regulations about the context and public space	2
Additional success factors	User friendly, visible and easily recognizable logo	3
Budget required		-
Overall rating of transferability potential		2

* 1 being low transferability potential and 4 high transferability potential in your specific context

4.3.2 Implementation roadmap

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*

Please notice that the city of Florence already have an application with similar features and functionalities.

4.4 Measure 3 - Low Emission Zone (LEZ)

4.4.1 Analysis

Objective of the measure	the goal is to encourage use of decarbonized and low-emission vehicles and reduce traffic	
Conditions	**Description**	**Transferability potential (1 to 4)***
Time needed for the implementation	Since 2020	-
Technical conditions required	120 telematic gates, system is connected to the civil motorization via API/web service	4
Desirable governance of the measure	more investment in public transport	2
Legislative/regulatory framework needed	Implementation of European Directives, climate laws, incentives to scrap the most polluting vehicles	4
Additional success factors	efficient public transport, changing people's habits	1
Budget required		-
Overall rating of transferability potential		2

* 1 being low transferability potential and 4 high transferability potential in your specific context

4.4.2 Implementation roadmap

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*
Installation of telematic gates	2024	Direzione Infrastrutture di Viabilità e Mobilità	We are closing to start (phase 1) the *Green shield*. The policy of the system is to forbid the access to most polluting vehicles, heavy-duty vehicles, with O/D outside the new LEZ and activate a congestion charge for touristic buses and for other vehicle categories (phase 2)

5. Murcia implementation roadmap

5.1 Measures selected

Measure name and description	Topic	Related demonstrator city
JELBI: entire public transport and sharing services in just one app for bus, train, e-moped, e-scooter, bike, car, taxi and ridesharing	Mobility management-citizens	Berlin
Pacification of urban space and “Superblock”	Mobility energy and climate in urban space, social cohesion	Barcelona
EV Master Plan	e-charging	Turku
Data-based mobility planning: data-driven decision-making plays a key role in traffic and mobility management.	Urban Mobility Management	Budapest

5.2 Measure 1 – JELBI

5.2.1 Analysis

Objective of the measure	All mobility services (e-car sharing, e-bike sharing, bike-sharing) integrated in one station next to a multi-modal hub (metro station, train station), to be used through one app (Jelbi app).	
Conditions	**Description**	**Transferability potential (1 to 4)***
Time needed for the implementation	2 years	4
Technical conditions required	Digital requirements, negotiation with companies, look for a software developer	4
Desirable governance of the measure		4
Legislative/regulatory framework needed	Some kind of covenant with companies and also a mandatory requirement during tender process	4
Additional success factors		4
Budget required	400.000 €	4
Overall rating of transferability potential	Murcia is looking for this kind of app. We are working on this project	4

* 1 being low transferability potential and 4 high transferability potential in your specific context

5.2.2 Implementation roadmap

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*
Description of the desirable requirement of the app	1 year	Smart City and Mobility	Having a document with the requirements
Legal study of the implementation	6 months	Legal	Having a document with all legal aspects
Requirement to be included for all public contracts in the area of mobility	2 year	Mobility	Inclusion in all contracts / covenants
Communication campaign	1 year	Communication and Press	Number of action carried out

5.3 Measure 2 – Pacification of urban space and "Superblock"

5.3.1 Analysis

Objective of the measure	**Superblock approach, a concept developed to improve quality of life in cities through infrastructural and tactical urbanism methods.**	
Conditions	**Description**	**Transferability potential (1 to 4)***
Time needed for the implementation	2 years (to carry out the plan and a pilot project)	3
Technical conditions required	It is necessary to carry out a complete study at the urban level of the city of Murcia to determine in which neighborhoods or areas this measure could best fit and propose a pilot project to test it.	2
Desirable governance of the measure	The measure must have political support and social neighbourhood appreciation. In fact, political interest in these issues has recently grown but we need a participatory governance tool.	4
Legislative/regulatory framework needed	Murcia's General Urban Plan, accessibility legislation, the mandatory requirement during tender process, Spanish Law on climate change and energy transition and climate change adaptation and mitigation strategies	4
Additional success factors	Good communication with the neighbors and the proposal of alternatives to the eliminated parking spaces and report to the climate table as a local government body.	4
Budget required	500.000 € (approximately for the project and pilot in just one superblock)	3

Overall rating of transferability potential	Murcia is working on getting more friendly spaces for pedestrians and better livable neighborhood. Also, we are studying more Nature based Solutions (NbS) in order to fight climate change.	3

* 1 being low transferability potential and 4 high transferability potential in your specific context

5.3.2 Implementation roadmap

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*
Data collection and meetings with all stakeholders for the development of the plan for the humanization of urban space in the city of Murcia with traffic pacification and Nature based Solutions.	6 months	Departments of: urban planning, mobility, environment, parks and gardens and health.	Data collection and meetings with all stakeholders for the development of the plan for the humanization of urban space in the city of Murcia with traffic pacification and Nature based Solutions.
Development an urban plan for the humanization of urban space in the city of Murcia and select a superblock pilot.	1 year	Departments of: urban planning, mobility, environment, parks and gardens and health.	Orientation of the study to the real concerns of citizens and environmental and climate challenges
Superblock pilot implementation	6 months	Departments of: architecture, mobility, environment, parks and gardens and health.	Increase in green areas and NbS, improvement in accessibility, reduction of the heat island effect and

			noise in order to fight climate change.
Communication campaign	6 months	Communication, Press department and Local NGOs	Number of action carried out as interviews, talks, conferences, etc.

5.4 Measure 3 – EV Master plan

5.4.1 Analysis

Objective of the measure	Master plan for the deployment of charging infrastructure (objectives, stakeholders, timeline, procurement rules etc...)	
Conditions	**Description**	**Transferability potential (1 to 4)***
Time needed for the implementation	2-3 years (to carry out the plan and the first public tender)	3
Technical conditions required	It is necessary to carry out a complete study at the urban level of the city of Murcia to determine the number of charger points, for this action you can use the CLICK tool.	2
Desirable governance of the measure	The EV Master Plan must have political support and social appreciation. In fact, political interest in these issues has recently grown but we need a participatory governance tool.	4
Legislative/regulatory framework needed	Murcia's General Urban Plan, accessibility legislation, the mandatory requirement during tender process, Spanish Law on climate change and energy transition and climate change adaptation and mitigation strategies	2
Additional success factors	Good communication with citizens and proposal of alternatives to planning, being able to ask citizens through the climate table as a local government body.	4
Budget required	40.000 € (Approximately, in concept of various dissemination actions and specific studies, although the main expense will be the expense of the salaries of own workers)	3

Overall rating of transferability potential	We are already planning the tendering process for the charging infrastructure on public streets	3

* 1 being low transferability potential and 4 high transferability potential in your specific context

5.4.2 Implementation roadmap

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*
Data collection and meetings with all stakeholders for the development of the plan	6 months	*Departments of: mobility and environment.* *Politicians, Neighborhood associations, Local Businesses.*	*Take into account all the conditions such as: population density, green areas, parking spaces, accessibility, traffic, noise.*
Development of the EV Master Plan and the documents for tendering process	1 year	*Departments of: mobility, environment and engineering office.*	*Orientation of the plan to the real concerns of citizens*
Implementation of public charging infrastructure	1 year	*Departments of: mobility, environment and engineering office.*	*That the infrastructure is in accordance with what was projected, and that accessibility for the entire population is not affected*
Communication campaign	1 year	*Communication, Press department and Local NGOs*	*Number of action carried out as interviews, talks, conferences, etc.*

5.5 Measure 4 - Data-based mobility planning

5.5.1 Analysis

Objective of the measure	

Conditions	Description	Transferability potential (1 to 4)*
Time needed for the implementation	2 years	4
Technical conditions required	It is necessary to define the study locations and to have the necessary sensors and cameras and dedicated software	4
Desirable governance of the measure	Good relationship with the transport service providers. Furthermore, in Murcia City collaboration between several municipal departments will be necessary, mainly the traffic and transportation department and the smart city office.	3
Legislative/regulatory framework needed	/	/
Additional success factors	An unique public company managing mobility and the underlying practical experience.	2
Budget required	It depends on the size of the study areas	4
Overall rating of transferability potential	Currently Murcia is updating its Sustainable Urban Mobility Plan and Data-driven decision-making could play a key role in it.	4

5.5.2 Implementation roadmap

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*
Definition of the type of data and the method of data collection, as well as the goals for which to use the collected data. Also, connections with the MiMurcia project: integration into the city management platform (Smart platform) and the single monitoring center (CEUS).	2 years	Traffic and transportation department and the smart city office.	Having a document with the specifications
Legal study of the data collection	6 months	Legal	Having a document with all legal aspects
Tendering process for the necessary infrastructure (sensors, cameras, software) that does not exist	1 year	Smart city office	Specifications
Communication campaign	3 months	Communication and Press	Number of action carried out

6. Conclusion

Reflecting on the journey from initial objectives to the realities faced by demonstrator cities as of January 2024, it's evident that the USER-CHI project has navigated a path rich with insights and learning opportunities. The adaptability of replication activities and strategies has proven essential, highlighting the dynamic nature of urban innovation and sustainability efforts. The experiences shared and challenges encountered have laid down a blueprint for other cities aiming to replicate these solutions.

The focus is now to assess the long-term impact of the peer-learning programme. This involves evaluating the acquired knowledge and monitoring the concrete measures and actions implemented by the replicator cities following their involvement in the programme. This will be done through follow-up surveys to be shared at the end of the project (M52) to feed into the replication manual (D8.7). These surveys will serve as a crucial tool in gauging the impact and effectiveness of the peer-learning programme, providing valuable insights for future initiatives and improvements. This is essential to ensure an actual community of good practices is created and will be active in the future, beyond the lifetime of the project.

List of abbreviations and acronyms

Acronym	Meaning
AMB	Area Metropolitana de Barcelona – Barcelona Metropolitan Area
CLICK	Charging infrastructure Location and Holistic Planning Kit (product of the project)
CP	Charge Point
CPO	Charge Point Operator
D	Deliverable
DC	Direct Current
DoA	Description of Action
EC	European Commission
eMoBest	e-Mobility replication and best practice cluster
EV	Electric Vehicle
GA	Grant Agreement
IBV	Instituto de Biomecanica de Valencia
IKEM	Institut fur Klimaschutz Energie und Mobilitat-recht, Okonomie und Politik Ev
INCAR	Interoperability, Charging and Parking Platform (USER-CHI product)
INDUCAR	Inductive charging for e-cars (USER-CHI product)
IPT	IPT Technology
LEV	Light Electric Vehicle
M	Month
PV	Photovoltaic
RSM	Roma Servizi per la Mobilita
SMAC	Smart Charging Tool (USER-CHI product)
VMZ	VMZ Berlin Betreibergesellschaft mbH (project partner)
WP	Work Package

List of annexes

Annex 1 - Cities fingerprint

Annex 2 - Implementation roadmap template

CITY BASELINE FINGERPRINTS

D 8.3: City baseline fingerprints

Date: **17/06/2020**
Author(s): **Matilde Chinellato, Anne-Charlotte Trapp**

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City baseline fingerprints	WP 8	1.0

Contractual delivery date	Actual delivery date	Delivery type*
July 2020 (M6)	July 2020 (M6)	R

*Delivery type: **R**: Document, report; **DEM**: Demonstrator, pilot, prototype; **DEC**: Websites, patent fillings, videos, etc; **OTHER**; **ETHICS**: Ethics requirement; **ORDP**: Open Research Data Pilot.

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Dissemination Level: **PU: Public; **CO**: Confidential, only for members of the consortium (including the Commission Services); **EU-RES** Classified Information - restraint UE; **EU-CON**: Classified Information - confidential UE; **EU-SEC**: Classified Information - secret UE

Abstract

The deliverable D8.3 “city baseline fingerprints” offers an overview of the main characteristics of the seven USER-CHI cities, summarises the state of play in relation to electric mobility and gathers information on the solutions that will be tested and implemented during the USER-CHI project. This document will form the basis of the replication strategy, that will be developed by M12. D8.3 will serve to all USER-CHI cities to get acquainted with the status of electromobility practices in the other cities and will be the basis for replicator cities (Florence and Murcia) to select the solutions they will replicate from the demonstrator cities (Barcelona, Berlin, Budapest, Rome and Turku).

Keywords

Fingerprints, baseline, demonstration cities, replicator cities, replication, state of play, electromobility.

Copyright statement

Executive summary

The deliverable D8.3 “city baseline fingerprints” offers an overview of the main characteristics of the seven USER-CHI cities, summarises the state of play in relation to electric mobility and gathers information on the solutions that will be tested and implemented during the USER-CHI project. This document will form the basis of the replication strategy, that will be developed by M12.

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1. Introduction

The deliverable D8.3 “city baseline fingerprints” offers an overview of the main characteristics of the seven USER-CHI cities, summarises the state of play in relation to electric mobility and gathers information on the solutions that will be tested and implemented during the USER-CHI project. This document will form the basis of the replication strategy that will be developed by month 12 of the project. D8.3 will serve to all USER-CHI cities to get acquainted with the status of electromobility practices in the other cities and will be the basis for replicator cities (Florence and Murcia) to select the solutions they will replicate from the demonstrator cities (Barcelona, Berlin, Budapest, Rome and Turku).

The document is divided in seven chapters, one per each USER-CHI city in alphabetical order: Barcelona, Berlin, Budapest, Florence, Murcia, Rome and Turku.

For each city, the following features are described: the local context, including the city size, geography, modal split, and number of electric vehicles; charge points characteristics, including information on payment options and use of renewable energy sources. This is followed by a section on electromobility strategies and initiatives at local, as well as at regional and national level when available. The deployment approaches are also described, good practices that can be beneficial to other cities, as well as the remaining challenges and barriers that could be addressed through targeted capacity building activities. For the demonstrator cities, a section on the planned USER-CHI solutions is added. One replicator city, Florence, has already identified the solution that intends to replicate, and thus a correspondent section is included.

This document is not to be intended exhaustive or complete, but rather as a living document. As a matter of fact, it will be regularly updated to capture the developments that will happen in the USER-CHI cities during the duration of the project, to adjust the replication activities and learning opportunities accordingly, and it will be complemented with results from the big data analysis carried out in WP1, as soon as they become available.

2. Barcelona metropolitan area

2.1 Local context

2.1.1 City size and context

Barcelona metropolitan area (AMB) counts 3,2 million people and is one of the largest metropolitan areas in Europe in terms of population. In Spain, the metropolitan area of Barcelona is second only to the metropolitan area of Madrid.

AMB is the global administration, and it comprises Barcelona city and 35 municipalities.

The metropolitan system of linked cities around the city of Barcelona -surrounded by open spaces- brings with it benefits for the environment, the economy and leisure, making it a liveable, efficient, and healthy city.

Barcelona is considered an attractive place to work, as well as a good place for investing and developing new business projects. The metropolitan city is perceived as an innovative and creative metropolis, linked to the areas of culture, fashion, architecture, art, modernity, and sport.

KEY FIGURES

Population: 3,239.337

Area: 636 km^2

Density: 5,093.30 people/km^2

Average density in urban areas: 10,611.04 people/km^2

NUTS level: NUTS-3

TEN-T corridor(s): Barcelona, and its metropolitan area, is an urban node of the Mediterranean corridor, with a first level port and airport also included in the TEN-T.

USER-CHI role: demonstrator city

The metropolitan area of Barcelona is one of southern Europe's chief economic engines, a hub for logistics and a magnet for talent, a place that is open to business.

2.1.2 Geography

The metropolitan area of Barcelona is located at the northeast of the Iberian Peninsula. It is composed by a central plain fully urbanised (including big cities as Barcelona, l'Hospitalet de Llobregat, Badalona or Santa Coloma de Gramenet), one river in each side (Llobregat river and Besòs river), agricultural areas along the Llobregat river, and 25 km of Mediterranean beaches in front. The large green areas of Garraf, Collserola and the Marina mountains are placed in the middle, between the central plain and an interior plain called Vallès.

2.1.3 Modal split

The modal split in Barcelona city and in the Metropolitan area of Barcelona (labour day, 2018) is summarised in Figures 1 and 2. Public transport includes bus, metro, tramway and taxis.

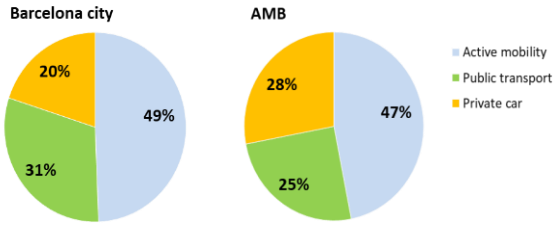

FIGURE 1: MODAL SPLIT IN BARCELONA AND AMB. SOURCE: ENQUESTA DE MOBILITAT EN DIA FEINER- EMEF 2018

Shared mobility represents an important element in the AMB landscape. Taxi services as UBER or CABIFY are legally limited, however, they count for 6-7% of total taxi services (in green in Figures 1 and 2). Car sharing services count for 2% of total car trips. Moto sharing services (only available in Barcelona city) count for 2% of total motorcycle trips. Bicing -the public bike system of the city of Barcelona- counts for 18% of total bike trips in the city. As of today, the shared fleets are very concentrated in Barcelona city centre.

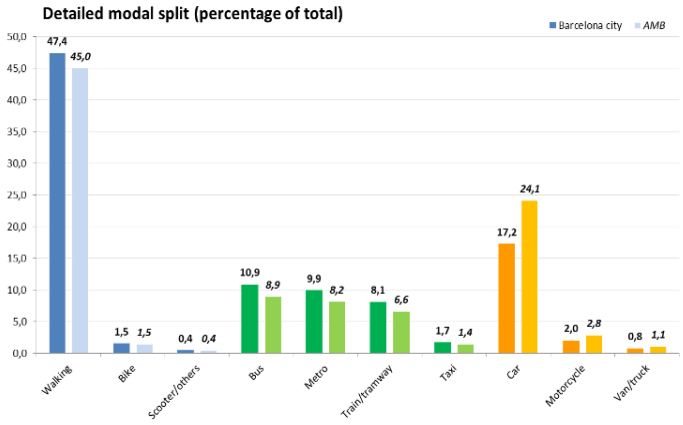

FIGURE 2: DETAILED MODAL SPLIT (% OF TOTAL). SOURCE: ENQUESTA DE MOBILITAT EN DEINER – EMEF 2018

2.1.4 Electric vehicles

The number and type of electric vehicles in AMB are shown in table 1. The data below refers to the AMB territory in 2018 and it is approximated.

TABLE 1: SOURCE: ESTIMATED FIGURES FOR 2018 BASED ON DGT, ICAEN AND AMB DATA

2018	TOTAL	EVs	Light Electric Vehicles (LEVs)				Light duty vehicles (LDV)		Heavy duty vehicles (HDVs)	
		Private cars	e-bikes	scooters	Motor-cycles	Four-wheeler	Vans	Trucks (light)	Trucks (heavy)	Buses
BEVs	**8,205**	2,350	11,600	no data	5,400	20	220	200	-	15
PHEVs	**12,600**	1,000		-	-	-	-	-	-	-
HEVs	**19,950**	19,600	-	-	-	-	-	-	-	350
TOTAL	**40,755**	**22,950**	**11,600**	no data	**5,400**	**20**	**220**	**200**	**-**	**365**

2.2 Charge point characteristics

2.2.1 Payment options

At present, the on street public charging points are free of charge -after registration via web or app-, to promote electromobility. The next step will be to charge the users for the energy consumption via payment via credit card registered and validated when the user signs up in the database of the service.

Charging points in car parks apply an additional rate (according to the energy consumption or a fixed amount by service) to the hourly rate. The payment is done at the cash desk by cash or credit card. Often, users need to ask previously the cash desk to switch on the charging point.

When it comes to charging points in shopping centres, it is not unusual to find free charging in their car park.

Finally, for charging points in gas stations an energy consumption rate or a fixed amount by service is applied. The payment is done at the cash desk by cash or credit card. Some gas station networks have an app to register the users and provide them with pre and post payment via credit card.

2.2.2 Total RES supplied

At present, the renewable energy supplied in the public charging points (quick chargers) located in AMB territory is not significant, but it is foreseen to switch to renewable sources in the very near future. Nevertheless, a limited number of public charging points (normal chargers) are connected to solar panels, although the renewable energy sources share supplied to the electric vehicles is limited.

2.3 Electromobility strategies and initiatives

2.2.3 State of play

Modern electromobility was introduced in Barcelona by the former MOVELE project (2011-2012), a partnership between the Barcelona City Council, the IDAE (Instituto para la Diversificación y Ahorro de Energía, linked to the Spanish central government) and ENDESA (the main electric power supplier in the metropolitan area of Barcelona). The project foresaw the instalment of more than 70 normal charging points in the streets (the first ones in the city) for electric motorcycles and cars.

The MOVELE project aimed to reduce pollution, however, did not reach its scope due to the lack of electric vehicles and users, the lack of technical maintenance and as an effect of vandalism.

The next step was then the creation of the LIVE Consortium in 2011, a public-private partnership open to all the bodies and organizations in the area of Barcelona and Catalonia region related to electromobility promotion. In the last years, LIVE has clearly worked as a network for knowledge sharing, dissemination and information related to electric cars.

Thanks to the relationship established in the LIVE consortium between the Barcelona City Council, AMB and the electric car makers NISSAN, RENAULT and BMW, a new project was launched to introduce public quick charging points in the whole metropolitan area.

More than 20 quick charging points were introduced in the streets of the city of Barcelona since then. This public-private funded project coincided in time with the launch of the NISSAN LEAF car, the NISSAN e-NV200 van (made in Barcelona in the NISSAN factory), the RENAULT KANGOO van and the BMW i3 car.

After the completion of the quick charging network, the local administrations (including AMB and the city of Barcelona) implemented several initiatives to promote electric cars, such as car purchase subsidies, reduced car taxes, reduced parking hourly rates, reduced fares in toll roads, etc... As a result, electromobility began to take-up in Barcelona.

In 2020, before the COVID-19 crisis, even though the public administration continues to expand the public charging network and to ban the petrol or diesel cars in city centres as a manner to reduce pollution, there is the need to transfer leadership to the private sector (car makers, energy suppliers, charging point operators, investors, etc....) to scale-up electromobility.

2.2.4 Supporting policies for zero emission vehicles

From 2011 to 2020, several supporting policies have been implemented in the metropolitan area of Barcelona to promote electric vehicles.

Private electric cars

Several incentives are provided to foster private electric cars, including: purchase subsidies (around 5,000 € per car, through a Spanish central government call); reduced annual local taxes (75%-100% for BEV cars); reduced fares in toll roads (only in toll motorways managed by the regional government); reduced parking hourly rates (100% free for BEV cars, only for regulated on street parking lots); subsidies for public and private investors for the extension of the charging network (through a Spanish central government call and a regional government call); free energy in public charging points managed by the local administrations, such as AMB.

During 2020 a low emission zone - called ZBE[1] – will be created in the city of Barcelona. The ZBE bans the entrance to all the most pollutant cars and vans, encouraging the use of electric vehicles.

Light electric vehicles

Financial incentives for LEVs include for instance subsidies to the citizens for the purchase of an electric bike (250 € per e-bike). More than 4,000 e-bikes were subsidised during the last six years. There are also purchase subsidies for municipalities to buy electric motorcycles for officials (around 3,000 € per motorcycle, through an AMB call).

AMB has distributed almost 500 e-bikes to the metropolitan municipalities. These electric bikes have become part of the public fleet available for officials and local students.

Moreover, AMB has also distributed e-bikes to the workers in the metropolitan area, in a free temporary rental to encourage them to go to work by bike.

In 2019, AMB has open a call to assist small logistic companies to purchase electric cargo bikes (up to a maximum 50% of the purchase price).

Light duty electric vehicles

The majority of supporting policies to electric private cars also apply to light duty electric vehicles (vans), including purchase subsidies for municipalities to buy electric vans to be dedicated to public works (around 10,000 € per van, through an AMB call).

In 2021, AMB expects to open a new call to assist small logistic and transport companies to renew old diesel vans with new electric, hybrid, or gas vans (2,000-4,000 € per van).

Heavy duty electric vehicles

AMB has worked very closely with public transport operators to renew progressively the traditional diesel buses with modern hybrid (petrol and electric) and fully electric buses.

[1] For more information: https://zbe.barcelona

2.2.4.1 Regional and national frameworks

Before the COVID-19 crisis, the Spanish central government was working on a new law called *Ley de Cambio Climático y Transición Energética*. This law (and some existing technical regulations) could be considered the first electromobility framework for Spanish cities.

In this law[2], the responsibility to guarantee a charging network for electric vehicles in Spain is assigned mainly to the private sector, especially the one dedicated to fossils fuels distribution. For instance, the law fixes a minimum number of quick chargers in the new or in the busiest petrol stations.

At regional level, there is another strategic framework for electric mobility: the Catalan law about climate change (*Llei 16/2017, de l'1 d'agost*) and the new one called *Llei de Transcició Energètica de Catalunya*, also under discussion. However, what is relevant at regional level is the PIRVEC programme: *Pla estratègic per al desplegament d'infraestructura de recàrrega per al vehicle elèctric a Catalunya 2016-2019* (an updated version is in progress).

The PIRVEC programme seeks the collaboration between public (regional and local administrations) and private agents with the aim to advance towards a sustainable mobility based on electric cars. Therefore, the main PIRVEC goal is to achieve a regional charging network with more than 100 quick chargers spread throughout the region (by 2019)[3].

Despite the new legal frameworks, the effective initiative in electromobility remains as of today with the local administration (city councils of medium and big cities). This is especially true in the innovative metropolitan area of Barcelona. However, the economic resources are limited at local level, and the central and regional governments will keep the power to adjust the local investments in electromobility with the different specific subsidy calls.

This kind of collaboration arrangement between central and regional government (granting the economic resources) and the local administrations (deciding on the best initiatives in each territory) has been a good scenario for the development of electromobility in the metropolitan area of Barcelona. Electric car makers present in the area accepted this formula and joined their efforts with the administrations.

2.2.5 Deployment approaches

The deployment approach adopted in the AMB is centred around a basic network developed and managed by AMB and other local administration in the metropolitan territory (the city of Barcelona and other big municipalities). In addition, private companies, in concertation with the main energy providers in the area, could complete the network in the future.

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[2] Not yet approved at the time of writing

[3]According to the 2020 PIRVEC INDICATORS, at the end of 2019 second semester, the goal of 100 quick chargers at regional level has been achieved: today, there are 85 public quick chargers and 19 private quick chargers. All of them with public access.

The public charging network in the streets of Barcelona, formed by more than twenty quick chargers, is owned by City of Barcelona, working as CPO and EMP.

The public charging network in the metropolitan area of Barcelona is a twin network to the Barcelona one. In other words, they use the same equipment, same conditions, and same instructions, but different apps. The AMB network is constituted by quick chargers (10) as well, and AMB acts as CPO and EMP. In 2019, this network delivered more than 380,000 kWh.

Both charging networks have ambitious expansion programs for the next years. For the AMB network, the expansion program is a measure approved in the *PMMU-Pla Metropolità de Mobilitat Urbana 2019-2024*.

Private charging points could be installed in the metropolitan area of Barcelona but, as of today, the electric fleet is not enough developed for a large charging points offer. Consequently, the public networks, with free energy, absorb all the demand and prevent business opportunities for the private sector.

2.2.6 Good practices

The metropolitan area of Barcelona accumulated a few best practices and solutions related to the deployment of electromobility, especially in respect to dissemination, communication and user-friendliness.

A regional Memorandum of Understanding

At regional level (Catalonia), it was created a Memorandum of Understanding (MoU) between municipalities acting as CPOs to make all the municipal RFID[4] cards interoperable in any charging point. The RFID cards are the most used means of service authorization in a charging point. This MoU avoids the users have to carry a set of cards when travelling around Catalonia with an electric car.

An app to get access to the charging services.

The AMB and the Barcelona charging point networks are now available through an app (or with the aforementioned RFID card). Unfortunately, at this first stage, each network has a different app (*AMB Electrolineres* for the AMB, *SMOU* for Barcelona), but they will converge in the future. The apps give on-line information about the availability of chargers, allow user registration, facilitate user authentication for service at a charging point, allow starting and stopping the charging operations, and give the user information about invoicing, historical data, personal preferences, etc.

Communication strategy

As EMP, AMB and Barcelona have put in place a big communication effort in the last years to promote electromobility to the public: conferences, participation processes, local exhibitions and

[4] Radio frequency identification uses electromagnetic fields to automatically identify and track tags attached to objects.

publications have been carried out. Furthermore, a name and a brand image have been designed for them: *AMB Electrolineres* in one case, and *Barcelona endolla't* in the other case, and when the charging networks have been fully implemented, the service instructions have been deeply communicated.

Free charging at public charging points.

Finally, the impact of free charging in the public charging networks must be recognized. A lot of new electric cars (BEV and PHEV) have been purchased with the incentive of a low travel cost in comparison with diesel or petrol cars.

2.2.7 Challenges and barriers

Despite the great progress, some barriers to electromobility remain however in the Barcelona metropolitan area. For example, socioeconomic conditions are still too low to expect a wide take-up of electric cars in the market. High prices and low range of battery electric vehicles make them still not enough attractive to users, who prefer hybrid cars. Similarly, the available electric vans on the market are expensive and have a low range, which make them less attractive than diesel and petrol vans to private companies.

Finally, having a parking place with a domestic charging point continues to be the most convenient option for recharging. However, in some metropolitan municipalities the use of on streets charging points remains the only possibility, but the number of normal on street charging points is today very low or zero and thus not ready to accommodate a demand increase.

The number of public charging points in the metropolitan area of Barcelona increases very slowly due to the current economic trends, but it is expected that the electric car sales will grow after the current car makers' promotion campaigns. That could cause a collapse of the public charging networks.

However, the area of Barcelona offers some opportunities for the further deployment of electromobility. For example, Barcelona can count on a significant segment of young people with high environmental awareness -due to the chronic pollution problems in the city centre- and thus very favourable to electromobility. In addition, Barcelona is home to a high share of tech passionate and high-income people open to innovation, sometimes organized in active clusters, associations, and platforms.

The presence of electric car, and van (NISSAN), as well as electric motorcycle (SCUTUM) makers in the area creates the conditions for fruitful partnerships and public-private collaborations. Furthermore, the presence of such industrial segments fosters periodic exhibitions and demonstrations of e-bikes, electric motorcycles, electric cars and vans, which help promoting electromobility to potential users.

Finally, the close cooperation between administrations has proven a success in the past and continues to be an important asset for further development of electromobility.

2.2.8 Learning needs

In line with the open issues in the metropolitan charging networks, there are some topics where further learning and knowledge sharing is needed:

- Payment methods and rates applied.
- Enforcement, or how to control the charging time, how to disincentivise electric cars parking in the charging point after the recharge operation is completed.
- Positive discrimination: in a charging point, how to give preference to BEV cars over PHEV cars.
- Ultrafast charging (up to 150 kW) technology and feasibility.
- Charging points for shared services with electric cars or motorcycles.

2.4 USER-CHI solutions

In Barcelona, all the eight USER-CHI products will be demonstrated. The USER-CHI products are the following:

- **CLICK- Charging location and holistic planning kit**: An online tool for the location planning of new charging infrastructure in cities and TEN-T corridors.
- **Stations of the future handbook**: Guidelines and recommendations to design the perfect user-centric charging station of the future.
- **eMoBest – e-Mobility replication and best practice cluster**: A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.
- **INFRA – Interoperability framework**: A package of rules, guidelines and recommendations that will support highly interoperable processes among the electromobility stakeholders.
- **INCAR – Interoperability, charging and parking platform**: A platform providing roaming and barrier-free access to EV charging points and offering related innovative integrated services for the EV drivers.
- **SMAC – Smart Charging tool:** A tool providing smart grid integration and demand management services for slow, medium, fast and ultrafast charging.
- **INSOC – Integrated solar DC charging for Light Electric Vehicles (LEVs):** A solution combining charging, onsite production of renewable energy and theft-proof parking for Light Electric Vehicles.
- **INDUCAR – Inductive charging for e-cars:** A wireless and highly automated charging solution for e-cars.

At this stage, 3 main areas of intervention have been identified in Barcelona (or around Barcelona) as USER-CHI demonstration city:

Demo site solution 1: solar DC charging for e-bikes

The solar DC charging for e-bikes solution foresees the installation of a DC charging equipment for e-bikes fed with solar energy in a theft-proof parking or dock. The e-bikes will be part of an existing public sharing service in selected municipalities around Barcelona.

Stakeholders involved

A local e-bike maker, Digital System Integrator (DSI) as RES specialist, and AMB as manager of the public sharing service e-Bicibox.

Objectives

To facilitate the recharging of empty e-bike batteries, without removing the bike or the battery, and using renewable energy.

Timing

The technical definition of the solution will be carried out in 2021, followed by implementation and testing in Barcelona in 2022.

Demo site solution 2: inductive charging for EV fleets

This solution foresees the installation of inductive charging equipment for a corporative fleet to facilitate overnight charging.

Stakeholders involved

IPT technology as technical specialist, and AMB as manager of a corporative EV fleet.

Objectives

To show the advantages and the feasibility of inductive charging for EV fleets.

Timing

The definition of the technical solution will happen in 2021, while the implementation and testing will be carried out in 2022.

Demo site solution 3: ultrafast charging for EV long travellers

This solution plans the installation of an ultrafast charging point (up to 150 kW) in the Barcelona area as a node of the TEN-T Mediterranean Corridor.

Stakeholder involved

Local electric works company, AMB as CPO and EMP of the public charging network with points on the TEN-T Mediterranean Corridor.

Objectives

To offer an ultrafast charging point to the EV long travellers and test some user centric products developed in the USER-CHI project.

Timing

The definition of the technical solution will happen in 2021, while the implementation and testing will be carried out in 2022.

3. Berlin

3.1 Local context

3.1.1 City size and context

Berlin is the capital and one of the 16 federal states of Germany. With an area of 891.1 km² the city is divided into 12 districts. Berlin is the largest German city and ranked as the 7th most populous city in the European Union.[5]

3.1.2 Geography

Located in the north-eastern region, Berlin is one of three cities states in Germany and is surrounded by the Federal State of Brandenburg. Both Berlin and Brandenburg are referred to as the Berlin-Brandenburg

KEY FIGURES

Population: 3,700,000 (6,000,000 in the Berlin-Brandenburg Metropolitan Area)

Area: 891.1 km²

Density: 4,206 people/km²

NUTS level: NUTS -1 and NUTS-2

TEN-T corridor(s): Berlin is an urban node of the North Sea - Baltic corridor connecting the capital with various cities via railway and highways

USER-CHI role: demonstrator city

5https://worldpopulationreview.com/world-cities/berlin-population/

metropolitan region. Though, Berlin's agglomeration is not equal to the Berlin-Brandenburg metropolitan area and needs to be distinguished, accordingly. The agglomeration of Berlin consists of 18 additional city centres, that are part of the Federal State of Brandenburg.

3.1.3 Modal split

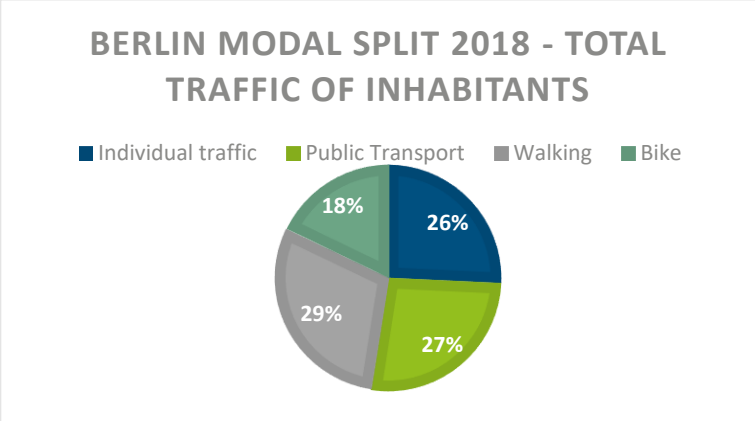

FIGURE 3: BERLIN MODAL SPLIT 2018 – TOTAL TRAFFIC OF INHABITANTS. SOURCE: SRV 2018

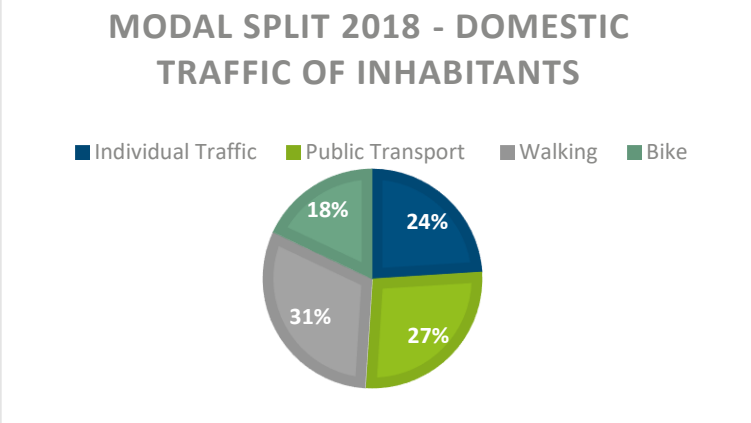

FIGURE 4: BERLIN MODAL SPLIT 2018 – DOMESTIC TRAFFIC OF INHABITANTS. SOURCE: SRV 2018

The given diagram visualises the modal split of 2018 for the total traffic of inhabitants. According to the SrV 2018[6], the system of representative traffic surveys, 29% of the traffic is by foot, 27% by public transport, 26% is individual traffic and 18% by bike.

The modal split of the domestic traffic of inhabitants shows very similar results, the share of pedestrians being slightly higher -31%-, and the number of individual traffic lower -with 24%. The percentages of residents using public transport and biking remain the same in both diagrams.

3.1.4 Electric vehicles

According to statistics of the Federal Department of Motor Vehicles (KBA) from 1st January 2020, the total number of registered passenger vehicles in Berlin is 1,221,433.[7] The total number of registered BEVs in Berlin is 4,868 (December 2019).

6https://www.berlin.de/senuvk/verkehr/politik_planung/zahlen_fakten/mobilitaet_2018/index.shtml

[7]https://www.kba.de/DE/Presse/Pressemitteilungen/2020/Fahrzeugbestand/pm06_fz_bestand_pm_komplett.html?nn=2562744

Furthermore, there are 3,474 registered PHEVs.

TABLE 2: REGISTERED [ASSENGER EV IN BERLIN. SOURCE: KBA

2019	TOTAL
BEVs	4,868
PHEVs	3,474

3.2 Charge point characteristics

The city of Berlin was the first city in Germany to implement a harmonized public, non-discriminatory charging infrastructure network in the urban streets to foster electric mobility.

The first charging stations in Berlin in semi-public space were installed back in 2009. However, the citywide expansion of publicly funded charging infrastructure started only in April 2015, after a Europe-wide tender was conducted by the city government, which foresaw the installation of around 1,000 publicly funded charging points by the end of 2020.

Currently (January 2020), Berlin has in total 287 publicly funded charging stations (with 539 charging points) on public ground. In addition, there are 104 privately funded charging stations (with 208 charging points) from Vattenfall and Innogy, and all of them are publicly available. There are also lots of privately-owned charging stations around the city.

With the implementation of the so-called “Berlin model”, the city of Berlin follows a unique approach. It obliges every private charging infrastructure operator, wanting to install charging stations on public ground, to close a contract with the city of Berlin. This contract determines strict rules for installation and operation of charging infrastructure. This approach safeguards that every mobility provider can offer its services at every public charging station.

3.2.1 Payment options

The main payment method available at the Berlin charging stations is through a contract with a MSP. MSPs offer mobility products and services, like a charging subscription, which is operated with a charging card and/or app. The charging processes are billed via the provider.

Another way of payment is the direct payment with debit or credit card, which is possible at some charging stations, but needs an authentication or log in at the station. Ad hoc payment without prior registration at a CPO/EMSP, for example at a parking machine, are rarely possible.

3.2.2 Total RES supplied

Regarding the use of electric energy from renewable resources, it can be noted that the publicly funded charging stations from the city of Berlin “be emobil” purely use energy from renewable

sources. The total RES supplied per year for those charging points amounts to approximately 470 and 550 MWh (cf. years 2017 and 2018)[8].

3.3 Electromobility strategies and initiatives

3.3.1 State of play

The overall approach of the "Berlin model" towards electromobility intended to give easy and non-discriminatory access to charging infrastructure on public streets to every EV driver. To achieve this, the city started the project "be emobil" in 2012, launching a European tender, for the installation of 250 charging stations in the public street network. Since the beginning of the project, a multitude of charging possibilities were created (e.g. electric vehicle charging stations, fast charging points and streetlight chargers). Now Berlin is raising e-mobility to the next level by bringing more standardised and easy-to-use charging points to its streets.

From charging with AC at 3.7 kW, 7 kW, 11 kW, to DC at up to 43 kW, or co-current flow up to 50 kW, all current standards and all connector types will be served. This will ensure that in the future all electric vehicles will be able to charge.

The Berlin Senate department for the environment, transport, and climate protection (SenUVK) currently works on the further development of the public charging infrastructure. This includes for instance the revision of the current "Berlin model" by including existing developments in the field of electromobility and charging infrastructure. The approach consists of several revision rounds, internally, with other municipalities, and within the city with other Senate Departments and city districts.

3.3.2 Supporting policies for zero emission vehicles

3.3.2.1 Regional level policies (Berlin)

Welmo – Program for commercial users[9]:

The Federal State of Berlin has introduced the support program "Welmo" in July 2018, which stands for "economy friendly electric-mobility". The goal of the initiative is to support the transformation of commercial fleets into e-fleets. The program includes both, an advisory service, as well as financial support. In 2020, the subsidies (6 million euros) available for the whole year have been exhausted by March already, which shows the success of the program.

Self-employed workers, as well as small and medium-sized enterprises which require motorised vehicles for their daily business are entitled to receive the program's support. Amongst others,

8 cf. ANS Project – Analyse der Nachfragereaktionen und der Stellplatzbelegung bei Variation des Preismodells für die Nutzung von Ladeinfrastruktur (ANS) im Berliner Modell

9 https://www.welmo.de

this includes taxi businesses, craft enterprises, carsharing businesses, care and social services, as well as delivery services.

To be eligible to receive support, the company's branch must be located in Berlin and 50% of the electric car journeys must happen within the city area.

"be emobil" – approach to create a multitude of charging possibilities[10]

As mentioned above, the project's goal is that all electric vehicles in Berlin can be charged without problems. Therefore, "be emobil" introduces standardised and easy to use charging points to the streets of Berlin.

The "be emobil" approach is rolled out in three installation periods: the first phase from 15.01.2015 – 30.09.2016, the second phase from 01.01.2016 – 30.06.2020, and the third phase from 01.05.2019 – 30.09.2020. The city of Berlin is working with several partners within "be emobil" to promote its success. The Senate department for the environment, transport, and climate protection has established an office for charging infrastructure as an interface with the appropriate district government departments for the coordination and management of the project's development.

Financial support for electric cargo bikes for enterprises and private users[11]**:**

In 2018, this funding program was first introduced with a budget of 200,000 euros and was exhausted within hours. The funding programme will be extended in 2020 for the second time with a bigger budget of 500,000 euros. For cargo bikes, a financial support for up to 33% of the purchase price, with a maximum of 1,000 euro is applicable.

Urban development plan 2025 – Transport (Stadtentwicklungsplan Verkehr)[12]**:**

The urban transport development plan also includes a strategy on traffic, which fosters the goal of sustainability on the road. It also comprises the expansion of electric mobility within an overall concept stating that the current results from science and research need to be implemented and that individual electromobility traffic needs to be linked with other transport modes.

InfraLab – Challenge 6: smart eFleets[13]**:**

"Smart eFleets" is a project run by the Berlin state-owned companies BVG, BSR and Berliner Wasserbetriebe, as well as DLR, Carano GmbH and In GmbH. The project is supported by the federal ministry of transport and digital infrastructure.

The InfraLab develops solutions for cross-company car and infrastructure sharing. Important aspects of use and scaling of the electric vehicles are addressed. Through the cross-company approach the use of the cars increases, which brings economic and ecologic advantages.

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10 http://www.be-emobil.de/en/background/

11https://www.lastenfahrrad-zentrum.de/förderung-kaufprämie/berlin/

12https://www.berlin.de/senuvk/verkehr/politik_planung/step_verkehr/

13https://infralab.berlin/challenges/challenge-6-smart-efleets/

Moreover, the development of an app and the implementation of an energy-management-system guarantee that the carsharing runs smoothly and peak demands are not increased.

3.3.2.2 Federal level policies (Germany)

A measure to promote electric cars has been implemented by the German law with the so-called *Umweltbonus*. *Umweltbonus*, which translates to environmental bonus, applies retrospectively to all vehicles that were registered from November 5, 2019 and until December 31, 2025. The environmental bonus is a joint contribution by the federal government and the industry to support and strengthen the sales of new and used electric vehicles. The eligible categories are battery electric vehicles, plug-in hybrids and fuel cell vehicles, as well as vehicles that have no local CO_2 emissions and cause a maximum of 50 g CO_2 emissions per kilometre. Private persons, as well as enterprises, corporate bodies, foundations, and associations can apply for the *Umweltbonus*.

Tax reductions[14]:

Since October 2012, new EVs have been exempted from the motor vehicle tax (*Verkehrssteueränderungsgesetzt*). This exemption was originally introduced for the period between 2012 and 2015 but has been extended by the federal parliament until the end of 2020. Moreover, the exemption is now applicable to conversions of cars into merely electric vehicles.

In addition, tax incentives have been introduced in 2017 for employees who can charge their e-car at their workplace. The benefit offered by the employer is exempt of income taxes. However, the incentive is phasing out by the end of 2020.

Förderrichtlinie Elektromobilität – BMVI[15]:

The *Förderrichtlinie Elektromobilität*, or funding guidelines for electromobility, were introduced in 2017 and support municipalities and enterprises in a municipal context. In February 2020, cheques with a total amount of more than 90 million euros have been issued to 168 beneficiaries. The goal of the financial support is to electrify municipal fleets in Germany. The cheques will be used for the purchase of more than 3,800 electric vehicles (with more than 3,000 electric cars) and 2,000 charging points.

3.3.3 Deployment strategy

All charging point operators who want to become active in the city must sign an agreement with the city of Berlin to comply with the regulatory framework of the city.

To deploy the charging infrastructure in Berlin, the city worked on an overall location concept for charging infrastructure in public space since 2011.

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[14]https://www.bmu.de/themen/luft-laerm-verkehr/verkehr/elektromobilitaet/bmu-foerderprogramm/massnahmenpaket-der-bundesregierung/

[15]https://www.bmvi.de/SharedDocs/DE/Artikel/G/168-zukunftschecks-elektromobilitaet.html

Based on this location concept, the city started the project “be emobil” -as explained above- in 2012 launching a European-wide tender for the setup and operation of 250 charging points in the public street network. Based on the solutions collected through the tender, several partners are helping to guarantee the success of “be emobil”.

- Allego GmbH is installing and operating the charging points.
- The mobility service providers NewMotion, Plugsurfing and ladenetz.de are offering a RFID card.
- The Berlin Senate department for the environment, transport, and climate protection has established the office for charging infrastructure (LIB), which manages and coordinates the process of charging infrastructure deployment with the appropriate district government departments.
- VMZ is the operator of the Berlin authentication platform, that provides easy and non-discriminatory (provider specific contract independent) access to public charging infrastructure for all EV-drivers.

3.3.4 Challenges and barriers

Jointly coordinating the implementation of future e-mobility strategies is a big challenge the city of Berlin and its districts face. Although it is not a Berlin specific problem, the lack of standardisation at national and European level constitutes a barrier, which has led to a situation in which different charging technologies, access media and vehicle standards that are not interoperable exist. Thus, one of the main goals of the Berlin city administration is to connect and harmonise the current patchwork of technologies by regulatory measures.

Another limiting factor in Berlin is the strained situation regarding the use of public space. Especially in the dense inner-city areas, which are also focus areas for the implementation of e-mobility concepts and infrastructure, there are high-demands on public space from various stakeholders. This leads to a situation of competition between different modes of transport that cannot always be solved. Thus, the processes to implement the necessary infrastructure for e-mobility, such as dedicated spaces for electric vehicles or charging infrastructure, sometimes take longer than desired for this innovative technology.

3.3.5 Learning needs

Berlin has not identified at this stage specific learning needs. Those will be further defined based on the complete overview of the USER-CHI solutions. This paragraph will be updated accordingly.

3.4 USER-CHI solutions

In Berlin, six USER-CHI products will be demonstrated. The USER-CHI products that will be demonstrated in Berlin are the following:

- **CLICK- Charging location and holistic planning kit**: An online tool for the location planning of new charging infrastructure in cities and TEN-T corridors.
- **Stations of the future handbook**: Guidelines and recommendations to design the perfect user-centric charging station of the future.
- **eMoBest – e-Mobility replication and best practice cluster**: A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.
- **INFRA – Interoperability framework**: A package of rules, guidelines and recommendations that will support highly interoperable processes among the electromobility stakeholders.
- **INCAR – Interoperability, charging and parking platform**: A platform providing roaming and barrier-free access to EV charging points and offering related innovative integrated services for the EV drivers.
- **SMAC – Smart Charging tool:** A tool providing smart grid integration and demand management services for slow, medium, fast and ultrafast charging.

At this stage, 2 main areas of intervention have been identified in Berlin as USER-CHI demonstration city:

Demo site solution 1: CLICK

CLICK will be an easy to use question-and-answer online tool for the top-down location planning of charging infrastructure, whose purpose is to optimise the location and planning of new charging infrastructure in cities and TEN-T corridors, matching the users' needs, preferences and habits, with the existing charging technologies and typologies available in the market.

The development of CLICK is based on the support of all project partners of the USER-CHI project, bringing together a variety of knowledge and experience in the field of charging infrastructure. The five USER-CHI cities Barcelona, Berlin, Budapest, Rome and Turku will take advantage of the tool during demonstration and testing phase.

Objectives

As output, CLICK will estimate the optimum charging infrastructure to be deployed in the city and along TEN-T corridors: number of charging points, proposed locations, preferred technologies and connectors, power of the points, etc.

Furthermore, CLICK will offer interfaces to be fed with actual utilisation data of charging infrastructure within the cities and planning areas. This will enable a post-planning process of monitoring utilisation and enable the demand-oriented expansion of the charging infrastructure network taking actual usage into account.

Stakeholders involved

The development of CLICK is based on the support of all project partners of the USER-CHI project, bringing together a variety of knowledge and experience in the field of charging infrastructure. The five USER-CHI cities Barcelona, Berlin, Budapest, Rome and Turku will take advantage of the tool during demonstration and testing phase.

Timing

CLICK will be specified and developed taking advantage of the knowledge and expertise of all project partners until mid-2022. Testing and demonstration in the pilots will take place in Berlin and the other demonstration cities until mid-2023.

Demo site solution 2: E-charge-parking

Providing an optimal user-centric charging infrastructure in densely populated urban areas has to face the challenge of

- High and predictable availability of charging stations in public and semi-public space
- Charging infrastructure technologies that meet user group specific requirements
- Easy access to charging and parking infrastructure

The Berlin pilot e-charge-parking targets to solve the above-mentioned challenges by providing user group centric e-charge parking solutions in urban neighborhoods.

Objectives

Based on the analysis of the use of existing charging infrastructure (AC, DC) as well as user group specific demand for e-mobility charging and parking, an overall location concept for charging technologies and e-charge-parking solutions in neighborhoods will be worked out.

For piloting the e-charge-parking solution the required charging technologies will be installed and the corresponding e-charge-parking platforms and services will be implemented. Access to the services will be provided via Web-GUIs and smartphone apps to private and commercial end users.

Stakeholders involved

The e-charge-parking solution(s) will be demonstrated in pilot locations that are managed by Gewobag AG. The municipal housing company manages 60.000 apartments with more than 100.000 people in different districts of Berlin. Gewobag provides energy supply services, parking facilities and charging infrastructure as well as multimodal mobility hubs to foster sustainable mobility.

Timing

According to the overall project timeline, the testing of the solution e-charge-parking is planned to start in July 2022 and will be executed until Nov. 2023.

4. Budapest

4.1 Local context

4.1.1 City size and context

Budapest is the capital and the largest city of Hungary and the country's main political, cultural, commercial, industrial, and transportation centre. The city is situated along the Danube, in the heart of the Carpathian basin and is home to 1,736 million people.

Budapest consists of twenty-three districts. The Hungarian capital city has a peculiar dual self-government system. This means that in addition to the Budapest municipality, the local government of Budapest, each of the twenty-three districts has their own government, the so-called district governments, with elected mayors and a body of representatives. Both the city and the districts are local governments, not subordinated to one another, each having specific duties and powers, specified by law.

KEY FIGURES

Population: 1,753,000 (2017)

Area: 525 km^2

Density: 3,339 people/km^2

Average density in urban areas:

NUTS level: NUTS-2

TEN-T corridor(s): Budapest is an urban node at the intersection of the Orient/East-Med and Baltic-Adriatic corridors.

USER-CHI role: demonstrator city

Budapest is not developing in the European regional space as a stand-alone entity, but together with its surrounding urban agglomeration. The latter almost extends to the entire area of Hungary. Owing to Budapest's role as a capital, the city has quite a powerful impact in this region.

Budapest's economic area and functional municipal area are larger than its urban political agglomeration, where the city has an established day-to-day task division.

4.1.2 Geography

Budapest is at the crossroads of the European continent. Thanks to its location, Budapest benefits from several unique features that are decisive elements of the city's macro-regional role. The Carpathian Basin lies at the border of different landscapes and cultures, where transportation roads of structural significance meet. In Budapest, the waterways of the Danube cross the traditional transportation routes leading from Western Europe eastbound (towards Asia) to the Southeast (towards the Balkans). These routes are "market corridors" connecting the economies and potential energy flows of the European Union with the Middle Eastern markets. This position is strengthened by the development of the TEN-T network, where Budapest is located at the intersection of the Orient/East-Med and Baltic-Adriatic corridors.

With slight extension, we can say that the London–Budapest– Istanbul–Baghdad (M1-M5) and Moscow–Kiev– Budapest–Trieste (M3-M7) motorways cross each other in Budapest. The former motorway connects the member states of the European Union with Middle Eastern markets and its large population, while the latter connects the former Soviet Union states and the significant markets along the Adriatic.

In a geographical sense, the basin enables Hungary and the Budapest area to fulfil additional organisational roles. A plain surrounded by mountain ridges is a feature that Budapest and the urban agglomeration can convert into an excellent organisational opportunity, thanks to their hub position. These characteristics both constitute serious challenges and offer development opportunities for the city and its urban agglomeration.

Although Budapest is divided into two parts (Buda and Pest), where one part is hilly (Buda) and the other is flat (Pest) the charging infrastructure deployment is even on both sides

4.1.3 Modal split

Figure 5 below shows the modal split -trip based- for Budapest in 2014 and the modal split objective for 2030.

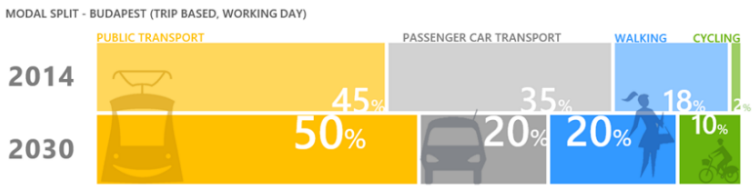

FIGURE 5: BUDAPEST MODAL SPLIT. SOURCE: BKK

4.1.4 Electric vehicles

Table 3 below shows the approximate share of electric vehicles currently in Budapest.

TABLE 3: BUDAPEST EVS SPLIT. SOURCE: BKK

	Total	Light Electric Vehicles (LEVs)	Light duty vehicles (LDV)	Heavy duty vehicles (HDVs)
BEVs		Cars: ~7,500 fully electric in Hungary (~50%, 4,000 in Budapest) Cars: ~5,300 range extension e-cars[16] (~50%, 2,700 in Budapest) E-kick scooter: ~2,000 shared e-motorbike: ~200 shared	~200 BEV, 0 plugin	~less than 5, experimental BEV
PHEVs		~4,100 Plug-in hybrid in Hungary (~50%, 2,100 in Budapest)		

4.2 Charge point characteristics

4.2.1 Payment options

Budapest's charging infrastructure is both public and private. On the state-owned public charging points charging is for free. On private charging points fees are applied. The payment of

[16] A range-extended electric vehicle (REEV), or an extended-range electric vehicle (E-REV), is a battery electric vehicle that runs on electricity but includes an auxiliary power unit known as a 'range extender'. The range extender (usually a small petrol engine) drives an electric generator which charges a battery that supplies the vehicle's electric motor rather than driving the wheels. This allows for an increased range from the vehicle. Source: https://www.greencarguide.co.uk/

private chargers on public ground are done via a mobile application. Prices are determined in three ways: either HUF/kW or HUF/minute or a combination of both.

4.2.2 Total RES supplied

Only general data is available on the energy production sources in Hungary (51,4% hydrocarbon, 13,1% coal, 22,7% nuclear, 4,3% biomass, 3,8% wind, 3,8% solar, 0,6% hydro, 0,4% waste). No further data on RES supplied in the charging system is available at this stage.

4.3 Electromobility strategies and initiatives

4.3.1 State of play

Budapest Mobility Plan -BMT- (2015)

The Budapest Mobility Plan also known as *Balázs Mór Plan* (BMT)[17], is the city's transport development strategy for 2014-2030 and the first overall SUMP of Budapest. The plan underwent public consultation and was then approved by the General Assembly of Budapest in 2014. The results of the wide institutional and public consultation that followed were integrated into the final version of the plan's objectives that was finalised in 2015.

The BMT lays down the strategy of short- and medium-term transport development in Budapest for the period between 2014 and 2030. In that vision transport must serve the implementation of the wider future vision laid down in the Budapest urban development concept.

The BMT supports environmentally friendly, zero emission transport. Measures directly address the topics of procurement of zero emission vehicles, support of environmentally friendly public transport technologies, support of environmentally friendly public transport technologies, environmentally friendly technologies in freight transport.

For electromobility and environmentally friendly public transport and taxis, the BMT foresees their deployment and promotion through the introduction of tax and fee discounts together with the mitigation of the access restrictions imposed for environmental protection reasons, and the wide development of electric charging stations. The BMT acknowledges that electric vehicles may not become widespread without the required infrastructure, thus the installation of integrated electric charging stations at further taxi stations is set as objective. Finally, according to the BMT, freight traffic in the city should be operated by low emissions freight vehicles. The application of electric, hydrogen, and hybrid technologies or the use of human-powered transport are the options considered to decrease not only pollutant emissions, but also noise pollution.

[17] http://www.sump-challenges.eu/sites/www.sump-challenges.eu/files/bmt2016_eng_v3.pdf

Integrated e-mobility concept (2017)

The integrated e-mobility concept was prepared in 2016-2017 and includes strategic and legal background, good practices, analysis of the demand and supply side, and forecasts. The municipality of Budapest is committed to give priority to sustainable mobility including electric drive and zero/low emission vehicles to curb the use of internal combustion engine cars that are responsible for air pollution.
The integrated e-mobility concept sets e-mobility goals at societal level, based on the basic sustainability principles, and at transport system level. The concept foresees a three-phased intervention starting with the introduction phase, followed by the growth phase, and the dominance phase. The concept is used as an internal document; therefore, it has not been published. During the USER-CHI project Budapest aims at reviewing this document.

Climate strategy of Budapest (2018-2030)

The municipality of Budapest published the Budapest climate strategy in April 2018, which focuses on objectives in terms of climate mitigation, adaptation and awareness raising. The mitigation objective aims to foster the usage of electric or low emission vehicles both on public and private sides.

4.3.2 Supporting policies for zero emission vehicles

4.3.2.1 Regional or national frameworks

National e-mobility laws set the legal framework of intervention. The law on e-mobility service (243/2019. (X. 22.) Korm. rendelet az elektromobilitás szolgáltatás egyes kérdéseiről[18]) sets the basic rules and conditions of public charging service and defines terms to be used. The general tasks and role of the state in spreading e-mobility, as well as appointing a public owned company for those tasks, are defined in the law on spreading e-mobility in Hungary (443/2017. (XII. 27.) Korm. rendelet az elektromobilitás hazai elterjesztésével kapcsolatos egyes állami feladatokról[19]).

For what regards electricity, the law on electricity (2007. évi LXXXVI. Törvény (VET.) a villamos energiáról[20]) sets the general rules of the use of electric power and provided public service in Hungary. It is complemented by the law on actions in connection with the electricity law (273/2007. (X.19.) Korm. rendelet (Vhr.) a villamos energiáról szóló 2007. évi LXXXVI. Törvény egyes rendelkezéseinek végrehajtásáról[21]).

[18] https://net.jogtar.hu/jogszabaly?docid=A1900243.KOR
[19] https://net.jogtar.hu/jogszabaly?docid=A1700443.KOR
[20] https://net.jogtar.hu/jogszabaly?docid=a0700086.tv
[21] https://net.jogtar.hu/jogszabaly?docid=a0700273.kor

The Hungarian e-mobility strategy (Hazai Elektromobilitási Stratégia Jedlik Ányos Terv 2.0[22]) is the comprehensive background document on the circumstances, aims, plans and actions in connections with e-mobility.

4.3.3 Deployment approaches

According to the Hungarian electromobility strategy, e-charging points are to be deployed where people spend typically more time (home, workplace, P+R parking, mall, touristic areas, and in areas with special needs: highways, main roads). At the local level, the Budapest's integrated e-mobility concept (2017) is the key planning tool for the deployment of e-mobility infrastructure.
Charging infrastructure is currently deployed with financial support from the state. Yet, there is unclarity on the temporality of this support as well as on potentially altered procedures depending on changing economic priorities. Hence, both political situation and financial support have a major impact on the deployment. Areas which experience active political support and benefit from professional transport expertise to take informed decisions may see a greater deployment.
Currently the deployment approach adopted by the municipality must be coordinated with the regional grid operators (DSOs) and sees private companies (e.g. MOL, ELMÚ, MVM, EON, ÖMV) as best placed to further expand the network.
As mentioned above, despite being Budapest divided in two parts, geographically different, the charging infrastructure deployment is even on both sides. An interactive map, the *Villanyautósok* map (see further below), shows the current availability of charging points in Budapest[23].

4.3.4 Good practices

Big Buyers Initiative

In terms of procurement Budapest is improving its strategic public procurement practices in the frame of the Big Buyers Initiative. This last is a European funded platform for promoting collaboration between big public buyers in implementing strategic public procurement. The initiative aims to work together with existing networks and organisations active in this area. Budapest is part of the working group on e-vehicles, focusing on electric duty vehicles.

Villanyautósok map

As abovementioned, to strengthen the user-friendliness a charging point map has been developed, which allows a straightforward provision of information on the location of the different charging points[24]. To further facilitate the payment on private charging points located on public space, a mobile application can be downloaded by the users.

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[22] https://www.kormany.hu/download/f/a9/a1000/Hazai%20elektromobilit%C3%A1si%20strat%C3%A9gia.pdf
[23] https://villanyautosok.hu/elektromos-toltoallomasok-magyarorszagon/
[24] https://villanyautosok.hu/elektromos-toltoallomasok-magyarorszagon/

Cities-4-people project

More generally, the Cities-4-People project -which looks at electric mobility among the different types of shared mobility- promotes a people-oriented transport and mobility (POTM) approach, which provides new ways to deliver innovative, sustainable and targeted solutions that address the needs of the public. Budapest co-created the mobility points with its key stakeholders, including citizens.

Smart poles on the Lechner Fasor street

Finally, Budapest is testing smart poles on the Lechner Fasor street, in the 9th district of the city, in cooperation with BDK, the Budapest public lighting company, and the Budapest's electricity network operator ELMÜ-ÉMÁSZ. The chosen location combines commercial, institutional, and residential zones. The project was initiated to gather different functions (lighting post, electric vehicle charger, parking ticket machine, public transport ticket machine) in one spot to increase accessibility and functionality of the public space.

The test project features five different smart poles with varying functions including EV-charging, Wi-Fi, security cameras, LED display, environmental sensors, and an emergency button[25].

4.3.5 Challenges and barriers

Budapest faces some challenges and barriers that prevent the full deployment of e-mobility in the city and its functional urban area. Currently there are no municipal e-bike sharing or e-scooter/motorbikes system, yet a boost of private e-bike sharing services is expected in the upcoming months as well as an e-scooter boom.

In terms of governance, public space usage is managed on two levels, namely on the districts and the municipal level which makes the implementation more challenging.

From a legal perspective, several legal gaps around e-mobility must still be determined and addressed. These include, for instance, energy supply, parking, grid integration, RES, public space.

The lack of standardized charging solutions and payment systems for LEVs constitutes another challenging aspect together with the complex stakeholder group.

4.3.6 Learning needs

In line with the open issues mentioned above, there are some topics where further learning and knowledge sharing is needed:

- local, regional, and national legislation on e-charging, RES integration, parking, etc.

[25] https://www.youtube.com/watch?v=sLLI1khOB48

- system integration
- user acceptance
- technical integration of renewables
- public space use optimisation and public space legislation

4.4 USER-CHI solution

In Budapest, seven USER-CHI products will be demonstrated. The USER-CHI products that will be demonstrated in Budapest are the following:

- **CLICK- Charging location and holistic planning kit**: An online tool for the location planning of new charging infrastructure in cities and TEN-T corridors.
- **Stations of the future handbook**: Guidelines and recommendations to design the perfect user-centric charging station of the future.
- **eMoBest – e-Mobility replication and best practice cluster**: A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.
- **INFRA – Interoperability framework**: A package of rules, guidelines and recommendations that will support highly interoperable processes among the electromobility stakeholders.
- **INCAR – Interoperability, charging and parking platform**: A platform providing roaming and barrier-free access to EV charging points and offering related innovative integrated services for the EV drivers.
- **SMAC – Smart Charging tool:** A tool providing smart grid integration and demand management services for slow, medium, fast and ultrafast charging.
- **INSOC – Integrated solar DC charging for Light Electric Vehicles (LEVs):** A solution combining charging, onsite production of renewable energy and theft-proof parking for Light Electric Vehicles.

At this stage, 1 main area of intervention has been identified in Budapest as USER-CHI demonstration city:

Demo site solution: e-mobility stations

The solution foresees the setup of e-mobility points (e-mobility stations) in order to concentrate services related to e-mobility and provide better use of public spaces.

Objectives

The main objective is creating a more liveable and multifunctional public space where different e-mobility functions (such as e-car, e-scooter, e-bike chargers) and other services (tablet charger, public lighting with sensors, car sharing docking station) are available and complement (interoperability) each other in terms of a smart city system. Budapest would like to develop urban e-mobility charging packages where real-life solutions for slow charging in densely populated areas in cities are provided.

Regarding the e-mobility station, the city would like to test different types in different urban context. The functions to be tested are:

- smart posts with e-charging facilities and other services
- integration of renewables
- billing system
- street furniture
- car-sharing docking stations

The solution should address the following city challenges:

- air pollution issues from transport
- increased light electric vehicles usage
- urban parking issues in densely populated areas
- RES integration
- user involvement, community engagement
- promote e-micro mobility solutions

Besides this, the city's aim is to develop a common e-mobility regulation for the city of Budapest, where the followings must be defined:

- e-charging infrastructures development, installation and operation
- LEV regulation (incl. operation, public space usage etc.)
- sharing service regulation (car, bike, e-scooter, motorbike, Segway etc.)

Stakeholders to be involved

- BKK Budapest Transport Centre
- BKV Budapest Transport Company
- Budapest Közút (Road operator of Budapest)
- BDK Budapest Public Lighting Company
- Budapest's electricity network operator ELMÜ-ÉMÁSZ
- E-mobility service providers (sharing services)
- District municipalities
- TEN-T actors (Budapest Airport, Magyar Közút, NIF Zrt.)
- NGOs
- Academic partners

Timing

The preparation phase will kick off from mid-2021, while the implementation will start in early 2022.

5. Florence

5.1 Local context

5.1.1 City size and context

Florence is the eighth biggest Italian city, chief town of Tuscany in the centre of Italy. Considered the birthplace of the Renaissance, Florence is one of the most popular Italian touristic destination and its historical centre was declared a World Heritage Site by UNESCO in 1982. Its economy is characterised by a strong manufacturing and tertiary sector (with tourism as top income item).

Florence has a huge number of daily city users, mostly tourists, staying for an average of slightly more than 3 days.

Rated as the 2nd Smart City in Italy according to the 2019 ICity rank[26], Florence can be

KEY FIGURES

Population: 372,905

Area: 102.4 km^2

Density: 3,641.3 people/km^2

NUTS level: NUTS-3

TEN-T corridor(s): Florence is an urban node of the TEN-T Scandinavian-Mediterranean corridor. The closest core Railroad Terminal (RRT) is Prato, 20 km away from Florence.

USER-CHI role: replicator city

[26] https://d110erj175o600.cloudfront.net/wp-content/uploads/2019/11/I-City-Rank-2019.pdf

considered as the most compact and global city in Italy, focusing on transport network modernisation.

The municipality of Florence has a strong cooperation in place with the Metropolitan City in terms of mobility policies.

The high vulnerability of the historical centre and its architectural constraints are key points for the city that must be considered in the deployment of the charging infrastructure.

5.1.2 Geography

Florence is located in the central part of Italy. It lies in a basin formed by several hills and crossed by the Arno river, 100 km from the west coast. The city centre is small and flat except for several low hills in the surroundings.

5.1.3 Modal split

Modal split data available refers to the 2011 national census. Up-to-date modal split data is not yet available. It must be considered that the opening of two tramway lines in 2018 and 2019, that connect the city centre to two main city destinations (hospital area and airport), produced a strong shift from private to public transport that is not visible in this data and will be only measured with the future surveys. Table 5 summarises the number of daily trips from or to Florence per mode of transport. Figure 6: Hourly tot. trips school day (red) and no school day (bleu) during a working day (2017). Source: city of Florence shows the impact of school trips on total hourly trips on a sample in 2017, and Figure 7: Daily presences composition (2017). Source: city of Florence gives an indication of the daily composition of trips in 2017.

TABLE 4: HOME-WORK/HOME-SCHOOL MODE OF TRANSPORT FROM/TO FLORENCE (DAILY VALUES 2011). SOURCE: ISTAT

Mode	N.	%
Train	5,235	2.5
Tram	7,207	3.4
Urban bus	23,362	11.0
Suburban bus	1,521	0.7
Company or school bus	1,580	0.7
Private car (as driver)	68,595	32.3
Private car (as passenger)	17,444	8.2
Motorcycle or scooter	38,465	18.1
Bicycle	14,040	6.6
Other	342	0.2

Mode	N.	%
Walking	34,376	16.02
Missing	503	0.2
TOTAL	212,670	100

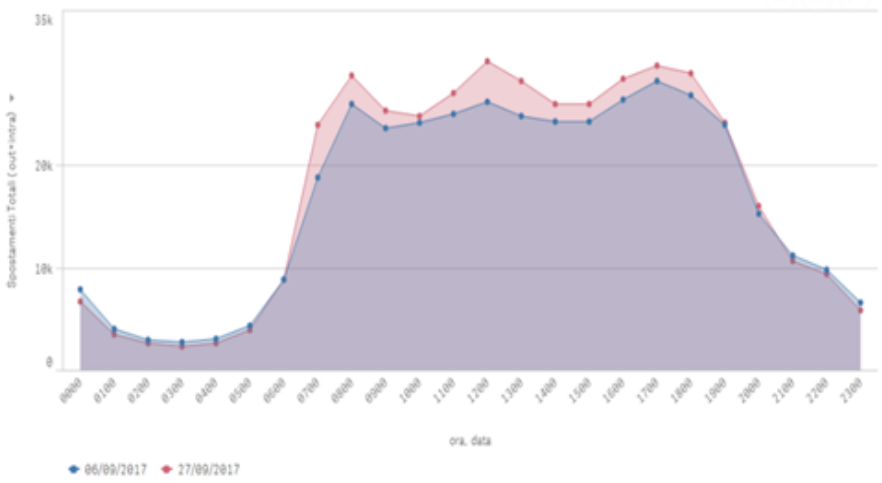

FIGURE 6: HOURLY TOT. TRIPS SCHOOL DAY (RED) AND NO SCHOOL DAY (BLEU) DURING A WORKING DAY (2017).
SOURCE: CITY OF FLORENCE

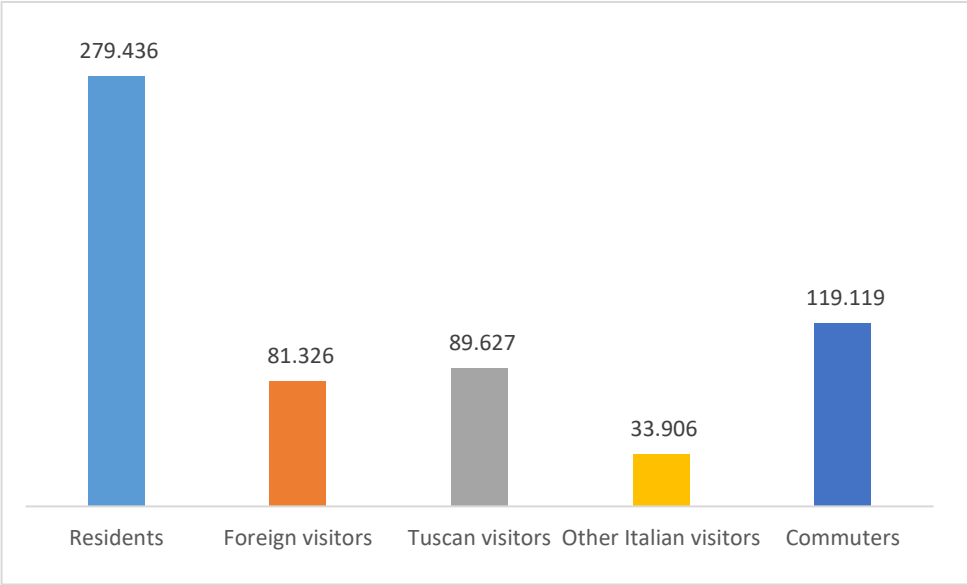

FIGURE 7: DAILY PRESENCES COMPOSITION (2017). SOURCE: CITY OF FLORENCE

5.1.4 Electric vehicles

The data below refers to Florence territory in 2018. Hybrid vehicles represent 75% of the total of electric vehicles in Florence in 2018, with almost the total (99%) being LEVs. When it comes to BEVs, LEVs and LDVs represent 40,3% and 38,6% of the total respectively.

TABLE 5: REGISTERED VEHICLES IN FLORENCE (2018). SOURCE: MUNICIPALITY OF FLORENCE

Registered vehicles (2018)	Total	Light Electric Vehicles (LEVs)	Light duty vehicles (LDV)	Heavy duty vehicles (HDVs)
BEVs	640	258	247	135
PHEVs	1,949 (hybrid both plug in and not)	9 (hybrid both plug in and not)	1,931 (hybrid both plug in and not)	9 (hybrid both plug in and not)

5.2 Charge point characteristics

The charging points available on the whole city road network and other parameters connected to e-mobility are summarised in the Table 6 below. 52% of the charging points in Florence are slow (3-7 kW) and 43% are semi fast (11-22 kW).

TABLE 6: CHARGING POINTS TYPES. SOURCE: MUNICIPALITY OF FLORENCE

Slow EVSE (3-7 kW)	95 (2 plugs 3kw) available for users plus 90 available for the municipality staff only
Semi-fast EVSE (11-22 kW)	78 (2 plugs, 1 plug 22kw and 1 plug 3kw)
Fast EVSE (50 kW):	8 (of which 6 reserved to taxis) (3 plugs)
Ultrafast EVSE:	0
Total electricity supplied by the points (kWh/year):	439,948 (2018)

5.2.1 Payment options

The payment was initially available only through a user card released by the municipality and linked to an energy provider account (chosen by the user).

Thanks to the interoperability of the charging network, this mode continues to be available but is complemented by several mobile apps through which the user can access the charging point and pay with prepaid card, credit card or PayPal. There are both mobile apps developed by other operators (e.g. Enel X) and app developed by EMSP.

5.2.2 Total RES supplied

No renewable energy sources are supplied for vehicles charging at present.

5.3 Electromobility strategies and initiatives

5.3.1 State of play

Florence is active in collaborative networks (New Covenant of Mayors, Global Covenant of Mayors, Conference of Parties COP21) created to face social, environmental and sustainability challenges. The city is working on a comprehensive project, integrating technologies and “info mobility”, to ultimately transform Florence into an environment-friendly and compact city.

Since the 90’s, Florence strongly invested in e-mobility thanks to the development of charging infrastructure for EVs focusing on both private and shared cars and taxis, the latter being served by six ultra-fast recharging station reserved to them. Nowadays, Florence counts with nearly 200 public multivendor charging stations. This network uses open protocols for communication, availability data are published as open data on the city web portal. Two e-car sharing companies operate in the city with a total of 220 e-vehicles while the licensed e-taxi fleet counts 74 units.

The most relevant projects in the domain of e-mobility are summarised below.

Public charging stations network deployment (completed)

Through a project funded by the Tuscany region with Regional Operational Programme (ROP) funds, 173 public multivendor charging stations were installed on the municipal road network with a total of 350 plugs available.

EVA+ (completed)

EVA+ (Electric Vehicles Arteries in Italy and Austria)[27] is a project co-financed by the European Union's Connecting Europe Facility programme which aimed at building a comprehensive, cross-border network of public fast charging stations for electric cars in Italy and Austria. This network is based on multi-standard chargers and include innovative ICT solutions to provide easy access and service to all vehicles and customers. Florence is one of the cities that is taking part as pilot location. Two stations were installed in this framework.

REPLICATE (REnaissance of Places with Innovative Citizenship and TEchnolgy) (installed but not already active, almost completed)

REPLICATE[28] is a European Union research and development project funded by the Horizon 2020 Programme that aims to deploy integrated energy, mobility, and ICT solutions in city districts. Florence is one of the lighthouse cities alongside San Sebastian (ES) and Bristol (UK). The project is focused on increasing the quality of life for citizens across Europe by demonstrating the impact of innovative technologies used to co-create smart city services with citizens and prove the optimal process for replicating successes within cities and across cities. One of the main objectives is the implementation of e-mobility with regards to taxi fleet, recharge points and implementing the mobility services. 6 fast recharge stations for taxi drivers, a booking app for taxis for fast recharge stations, e-mobility info-point managed by the taxi associations to raise awareness among their members about the opportunities given by choosing electric vehicles, 27 multivendor recharging stations in the city, are four of the project outputs.

Municipal e-car sharing (completed)

A municipal e-car sharing project was funded by the regional local council in the framework of the air pollution reduction plan. The municipal fleet has been renewed by replacing 85 vehicles with electric vehicles and 60 reserved charging stations have been installed.

Municipal e-bike sharing – partnership with Ducati Energia spa (completed)

This is a pilot project for a corporate e-bike sharing system, promoted by the Ministry of the Environment in partnership with Ducati Energia spa, to encourage the use of alternative and ecological means of transport for the journeys necessary to carry out the work activities of the municipality. The Ministry has provided the municipality of Florence with 50 e-bikes, equipped with recharging racks that have been placed in parking areas of the municipal offices. The project

[27] https://www.evaplus.eu/
[28] https://replicate-project.eu/

involved the deployment of a data acquisition system for monitoring the parameters of use and consumption of the bikes.

Ele.C.Tra project, funded by IEE programme. (completed)

The overall objective of the Electric City Transport (Ele.C.Tra.)[29] project was promoting a new urban mobility model. The EleCTra project's goal was to give useful solutions to accessibility needs of citizens (house-work, house-school, house-keeping transfers, etc..) that cannot be fully solved by public transport local systems.

5.3.2 Supporting policies for zero emission vehicles

The municipality supported the introduction of electric vehicles by paying the cost of the recharge for its citizens for the first period (more than 10 years). Moreover, a specific call for 70 e-taxi licences has been published by the Municipality of Florence with special conditions (around 30% cheaper than the traditional conditions) to increment the number of electric fleet and public services in the city. There are not specific city regulations regarding the deployment of public charging infrastructure. Regarding private charging infrastructures development, the municipality allows to deduct the cost incurred for the infrastructure from the due infrastructure costs.

5.3.2.1 Regional and national frameworks

The national electric mobility framework is the PNIRE (*Piano nazionale infrastrutturale per la ricarica dei veicoli alimentati a energia elettrica* – E-vehicles charging infrastructure National plan) released in June 2016.

The regional council is committed to support municipal authorities, for example, Florence received funding (through the ERDF) for the deployment of a big part of the operating charging network (173 charging points), as explained above.

5.3.3 Deployment approaches

Up until today, the municipality of Florence tendered out the deployment of interoperable networks while operates and maintains it through an in-house company.

The largest part of the network (173 charging points) has been deployed in response to a public tender totally funded by the Tuscany region through ERDF funds. The municipality asked for a multivendor system and kept the ownership of the stations, due to the type of funding. Charging was initially free for users and the only energy provider was identified by the municipality, while today the user can choose to buy energy from the providers available on the market.

The municipality manages and maintains the charging stations through an in-house company.

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[29] http://www.electraproject.eu/

Several other groups of charging stations have been installed by projects partners in the framework of EU Projects as explained above. REPLICATE, for example, installed 6 fast recharge points for taxis and 27 non-fast available to every user (the latter are not yet operational); EVA+ installed 2 ultrafast points.

5.3.4 Good practices

The municipality has always put great attention on having a multivendor approach with regard to energy providers and to Mobility Service Providers (MSPs) in order to avoid any monopoly position.

Furthermore, providing for the maintenance of the infrastructure has been a strategy to keep the charging price to user as low as possible.

Since 2017, Florence is a success story for free-flow bike sharing. The municipality has invited market operators to provide a free-flow bike sharing service by authorising the deployment of a fleet of maximum 8,000 bikes within the municipal area, with no charge for the municipality. Today, there are about 4,000 bikes in use, with a daily average of 4,700 journeys.

5.3.5 Challenges and barriers

Florence has strongly invested in the development of the charging infrastructure that today covers the city road network with a density that seems to respond to the actual charging demand.

It seems that a further increase in the use of e-cars is strictly connected to their accessibility in terms of cost of the car itself. National supporting policies could be an answer to this challenge, while the city is ready to adopt soft policies such as rewarding schemes to e-vehicles users, and to zero-emission vehicles users in general to foster electromobility.

Moreover, the optimisation of the location of charging sites, to assure their availability maximising their usage and according to the smart grid capability, could be an issue.

Data from the monitoring indicates that the average trips length is quite low compared to the city size and trips are very dense in the historical centre while scattered outside and in the, even lightly, steep roads. Fostering the use of LEVs has been identified as one of the strategies to increase the average length of trips and to assure the covering of non-flat roads around the city centre.

5.3.6 Learning needs

In the framework of abovementioned strategy to support the use of e-bike, Florence is interested in understanding how to best promote private e-bike mobility particularly for commuters (charging and parking solutions at public transport terminals) and to non-resident people (mainly tourists) that could be interested in using and recharging the bike they rented from the sharing service without any loan of the battery.

5.4 USER-CHI solution

In Florence, four USER-CHI products will be demonstrated. The USER-CHI products that will be demonstrated in Florence are the following:

- **Stations of the future handbook**: Guidelines and recommendations to design the perfect user-centric charging station of the future.
- **eMoBest – e-Mobility replication and best practice cluster**: A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.
- **INFRA – Interoperability framework**: A package of rules, guidelines and recommendations that will support highly interoperable processes among the electromobility stakeholders.
- **INSOC – Integrated solar DC charging for Light Electric Vehicles (LEVs):** A solution combining charging, onsite production of renewable energy and theft-proof parking for Light Electric Vehicles.

At this stage, 1 main area of intervention has been identified in Florence as USER-CHI replication city:

Replicator site solution: Solar DC charging for e-bikes

The solar DC charging for e-bikes solution foresees the installation of a DC charging equipment for e-bikes fed with solar energy in a theft-proof parking or dock. The e-bikes will be part of an existing public sharing service in Florence identified through a public tendering process.

Stakeholders involved

Municipality, e-bike sharing operator.

Objectives

Delivering charging solutions for e-bike sharing schemes that support users that have no access to home recharge options (i.e. tourists or daily city users).

Increasing the use of e-bikes in home to work and school to work trips and particularly in first mile transfers toward modal interchange nodes.

Offering commuters a convenient parking solution in terms of charging availability and anti-theft parking that will attract new potential private e-bike users.

Facilitating the recharging of empty e-bike batteries, without removing the bike or the battery, and using renewable energy.

Timing

The preparatory phase will be carried out in 2020-2021, followed by implementation in 2022.

6. Murcia

6.1 Local context

6.1.1 City size and context

Murcia is the seventh largest city in Spain with a population of 453,238 inhabitants and the capital of the Murcia region located in the southeast of the Iberia peninsula.

The city has all modern facilities one can expect from a regional capital, two universities, university hospitals, public transport (busses, trams and public bicycles), as well as tourist attractions. The principal economy is based on services, (residential) tourism and agriculture (exporting all over Europe fruit, vegetables and wine) being important.

Tourism plays a major role in the local economy, the city's historical sights and local gastronomy are the main attractions for the visitors, mostly domestic tourists. While historical monuments such as baroque churches, convents and

KEY FIGURES

Population: 453,238

Area: 8,822 km^2

Density: 497.75 people/km^2

NUTS level: NUT-3

TEN-T corridor(s): Murcia is an urban node of the Mediterranean corridor

USER-CHI role: replicator city

museums are located in the city centre, most tourists stay at the seaside, in resorts, apartments and hotels densely built along the coast. Future cultural offers should move out visitors from this thin costal line, which suffers the drawbacks of over tourism, having little connections with the urban or rural areas of Murcia.

This scenario could have an impact on charging infrastructure deployment, in view of promoting light public electric vehicles, such as e-bikes and e-motorbikes and scooters.

6.1.2 Geography

Located in south-eastern part of Spain close to the Mediterranean coast, the municipality of Murcia has an ample geographical dispersion of districts (only 40% of the population lives in the city centre, composed of 28 neighbourhoods, the remaining 60% of the population lives in the 54 surrounding rural districts).

6.1.3 Modal split

The modal split of the city of Murcia is summarised in Figure 8. Remarkably, public transport as well as cycling are more popular among the people aged between 14 and 29 years, as shown in Figure 9.

For what regards the travel reasons, 33% of all commutes are done for working and up to 35,5% for study reasons, as shown in Figure 10.

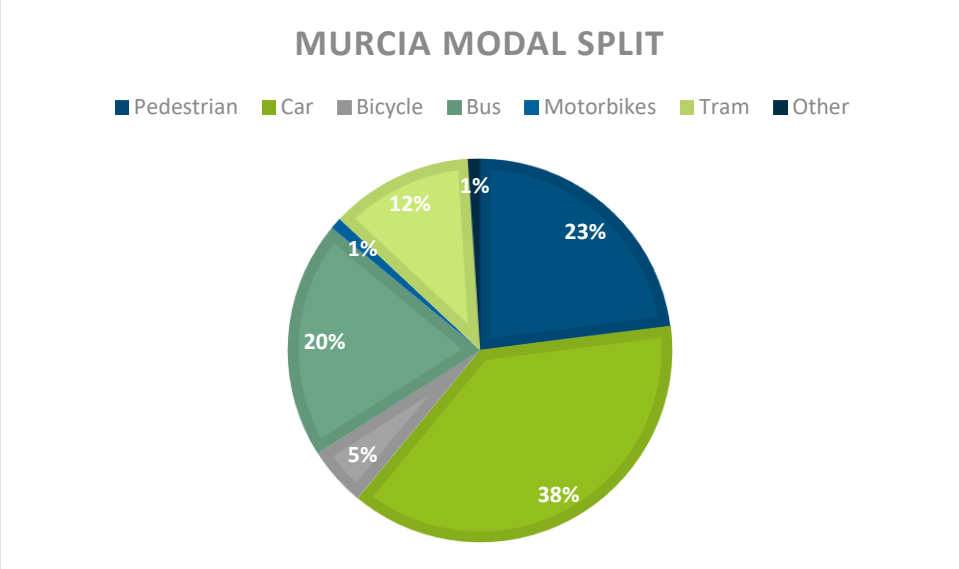

FIGURE 8: GENERAL MODAL SPLIT FOR THE WHOLE MUNICIPALITY. SOURCE: CITY OF MURCIA

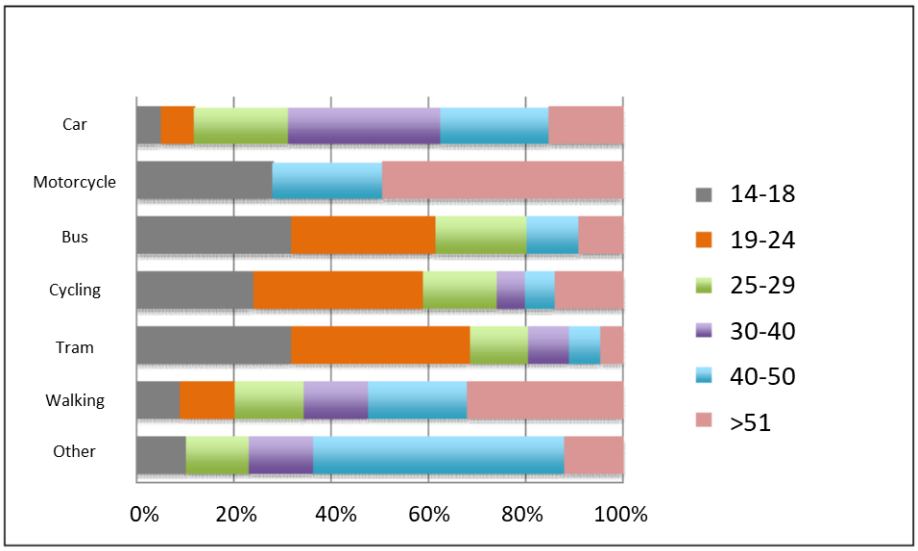

FIGURE 9: MURCIA'S MODAL SPLIT BY AGE. SOURCE: CITY OF MURCIA

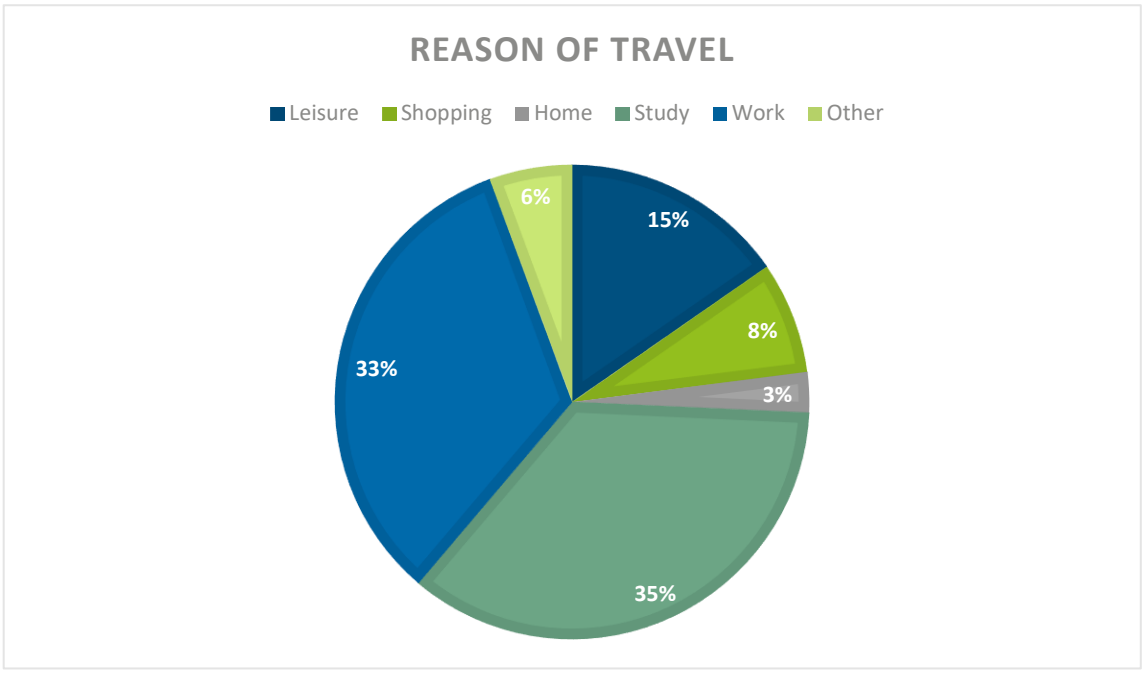

FIGURE 10: MURCIA'S REASONS OF TRAVEL. SOURCE: CITY OF MURCIA

6.1.4 Electric vehicles

In Murcia, electric vehicles data is available for battery electric vehicles and plug-in hybrid electric vehicles combined only. Out of 689 electric vehicles in total, 58% are e-motorbikes and 32% are cars, as shown in Table 7 below.

TABLE 7: SPLIT OF REGISTERED E-VEHICLES. SOURCE: MUNICIPALITY OF MURCIA

Type of e-vehicle (BEVs+PHEVs)	Total
Trucks < 3500kg	2
Trucks > 3500kg	2
Vans	16
Motorbikes	401
Others	43
Cars	225

6.2 Charge point characteristics

6.2.1 Payment options

Murcia has a public and free of charge electric charging network for EVs that at present offers 6 charging stations. The charging on this municipal public network is accessible via a user card (provided by the municipality on demand) and also using a specific app (Fenie Recarga) of the operator aimed at managing and monitoring the network's functioning and usage. Likewise, an online platform[30] is also available to check the availability of the charging stations and have a record of the user's charging.

Murcia also counts several private developments in shopping centres and on parking lots. In total there are additional 54 electric charging points, where citizens can charge e-vehicle in a pre-paid way.

6.2.2 Total RES supplied

The total renewable energy source supplied is 32,425 kWh/year.

[30] https://recarga.fenieenergia.es

6.3 Electromobility strategies and initiatives

6.3.1 State of play

The municipal climate change mitigation strategy 2030 (SECAP) establishes the strategic lines, actions and tools necessary to achieve energy use, consumption and production in a sustainable way. Its ultimate objective is to increase the protection of the environment and leads the municipality to a better quality of life, through the planning of a series of measures that entail an improvement in the areas of action where the City Council is competent. Electric transport and sustainable mobility are fundamental parts of this strategy.

To give a significant impulse to sustainable mobility in the city, the council has designed a specific local strategy to encourage the use of electric vehicles in Murcia, which is a fundamental step in the process of converting and converging towards a smart city model.

Murcia has elaborated a local strategy for the use of electric vehicles (*Estrategia local del vehículo electrico de Murcia)*[31] in 2017, which sets a clear political commitment in favour of sustainable mobility and the progressive decarbonisation of transport means.

According to the local strategy for the use of electric vehicles, an essential requisite for achieving smart and sustainable mobility is the creation of a broad network of charging points which ensure users of electric vehicles a greater accessibility. One envisaged option would be to connect those charging points to the existing infrastructure created around MUyBICI, the city shared biking scheme.

6.3.2 Supporting policies for zero emission vehicles

The local strategy for the use of electric vehicles sets initial proposals to encourage the purchase of e-vehicles and rewards users of this type of vehicles through tax reductions, exemption from parking fees, or reserving exclusive parking spaces.

Similarly, the city of Murcia is intensifying its commitment to gradually transform its administrative fleet of vehicles into electrical vehicles, providing the municipal buildings with charging infrastructure, and favouring service subcontracts that foresee and increment their use.

E-fast car initiative

In 2018 Murcia also launched the e-fast car initiative that aims to foster e-mobility in Murcia through offering 50 EV exclusively parking spaces in the most valued spots of the city (as a result of a car park distribution study) and monitoring the availability and occupancy of these spaces through an app called “FAstpark. This app, linked to embedded sensors on the ground within these parking spaces, enables e-vehicle drivers to check which places are available and easily plan their trips to different places of Murcia.

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[31] https://www.energiamurcia.es/movilidad-electrica/

Comparte moto

The municipality of Murcia is also operating an e-moto sharing for civil servants called "*Comparte moto*". A parking lot for 10 electric motorcycles has been defined at the largest municipal building and e-motorcycles under a shared scheme are provided to the municipal staff in order to give them the opportunity to shift from the old combustion-engine fleet to a clean and agile mean of transport.

Murcia has also worked on several European projects, which fostered the trend towards a greater e-vehicle friendly city.

Horizon 2020 Cirve (2016-2020)[32]

The action takes place on the Atlantic and Mediterranean Core Network Corridors in Spain and Portugal. Its objective is to increase the use of electric vehicles in Spain, Portugal and France under a fully interoperable cross-border framework that allows electric vehicle users to transit from the North of Europe to the Iberian Peninsula, ensuring a link between the southern and northern parts of the EU.

ELECTRA- Electric City Transport (2013-2015)[33]

The objective of the project is to promote a new urban mobility model and support the development of the electric scooter market in urban areas.

MOBISEC - Mobility Initiatives for Sustainable European Communities (2012-2015)

Murcia coordinates this projects whose objective is to promote the use of the bicycle as a daily transport mean; guarantee the safety of users in public roads and especially cyclists and pedestrians; it includes strategies to promote the inter-modality of bicycles with other transport modes and citizen participation. Electric bikes are part of the scope.

6.3.2.1 Regional or national frameworks

The municipality contributes to the national strategy defined under the National electric vehicle strategy which sets the objective to reach by 2030 the target of 5,000,000 of e-cars and 11,000 charging points. No specific frameworks are defined at the regional level.

6.3.3 Deployment approaches

Murcia's development approach combines the development of a municipal basic network which is complemented by infrastructure developed by private companies.
Murcia has a public and free of charge electric charging network for EVs that at present offers 6 charging stations that were determined through a study carried out by the University. This

[32] http://cirveproject.com/es/
[33] http://www.electraproject.eu/project-info/partners/24-city-of-murcia

network uses open protocols for communications (OCP) and is running under a single operator, which makes charging convenient and easy.

6.3.4 Good practices

Murcia counts several good practices in terms of e-mobility development.

In terms of procurement the municipality of Murcia foresees that any new contract with utilities must include a minimum number of electric vehicles.

Furthermore, every year, the municipality supports the purchase of electric vehicles (bikes, scooters, charging point, cars, etc.) through a dedicated call. The latest call was budgeted at 130,000 euros.

Additionally, Murcia has been working on several European projects, explained in detail above, which fostered the trend towards a greater e-vehicle friendly city.

6.3.5 Challenges and barriers

The main barriers that Murcia faces towards a full roll-out of electric mobility include the lack of infrastructure, the timing of the charging, the prices of electric vehicles, the lack of grants to support the purchase of electric vehicle and the technological development.

6.3.6 Learning needs

Murcia would be interested in learning about other European cities' approaches and strategies on electromobility. It is particularly important to have an exchange on the overall implementation process, including the drawbacks and barriers that other cities faced and how they tackled them.

6.4 USER-CHI solution

In Murcia, four USER-CHI products will be demonstrated. The USER-CHI products that will be demonstrated in Murcia are the following:

- **Stations of the future handbook**: Guidelines and recommendations to design the perfect user-centric charging station of the future.
- **eMoBest – e-Mobility replication and best practice cluster**: A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.
- **INFRA – Interoperability framework**: A package of rules, guidelines and recommendations that will support highly interoperable processes among the electromobility stakeholders.

- **INSOC – Integrated solar DC charging for Light Electric Vehicles (LEVs):** A solution combining charging, onsite production of renewable energy and theft-proof parking for Light Electric Vehicles.

7.Rome

7.1 Local context

7.1.1 City size and context

Rome is the capital city of Italy, of the homonymous metropolitan city, and of the Lazio region. With 2,9 million residents, it is also the country's largest and most populated municipality and the fourth most populous city in the European Union by population within city limits. The municipality of Rome is composed of 15 boroughs, each of them with more than 100 thousand inhabitants, while its metropolitan area is composed of 120 municipalities, and counts 4,4 million of inhabitants, a greater number compared to other major European metropolitan areas.

KEY FIGURES

Population: 2,900,000 (city); 4,400,000 (metropolitan area)

Area: 1,285 km^2

Density: 2,256.8 people/km^2

NUTS level: NUT-3

TEN-T corridor(s): Rome is an urban node of the TEN-T Scandinavian-Mediterranean corridor.

USER-CHI role: demonstrator city

Retail and professional activities characterize the city's economic sector.

In Rome, the road network is typically radio-centric with a structure that still recalls the classic radial pattern that dates back to the times of ancient Rome: a set of roads which originally ensured the connection with every corner of the empire and that today constitute the backbone of the road network in Rome's metropolitan area.

7.1.2 Geography

The city is located in the central-western portion of the Italian peninsula, within the Lazio region, along the shores of Tiber river.

Vatican City is an independent country within the city boundaries of Rome, the only existing example of a country within a city: for this reason, Rome has been often defined as the capital of two states.

Rome is located along the Scandinavian-Mediterranean Corridor of the TEN-T network and represents an urban node of this corridor. Rome has been also granted financing as an urban node of the core network by the CEF facility. The location of the city and its role of capital would grant a very relevant impact in the deployment of the charging infrastructure in Italy.

7.1.3 Modal split

The available modal split data refers to the latest SUMP of Rome and is summarised in Figure 11. The weekday mobility of Rome's residents is equal to 6,1 million journeys. 59% of people use private vehicles - car and/or motorbike (3,75 million total trips)-, 1,3 millions of journeys -or 21.5% of the total- are made by public transport (also in combination with other means), 1.1 million (18%) are the estimated journeys on foot, and around 90,000 journeys are made by bicycle (1.4% of total trips).

As for journey reason, Figure 12 shows that more than a third of the trips made (37%) are unsystematic, 21% are systematic (regardless of frequency), the remaining part constitutes the journey back home.

Finally, Figure 13 shows that 55% of the trips are short in duration (less than 30 min.); the two morning peak hours (7.30-9.30) count for almost 20% of the mobility generated during the whole day.

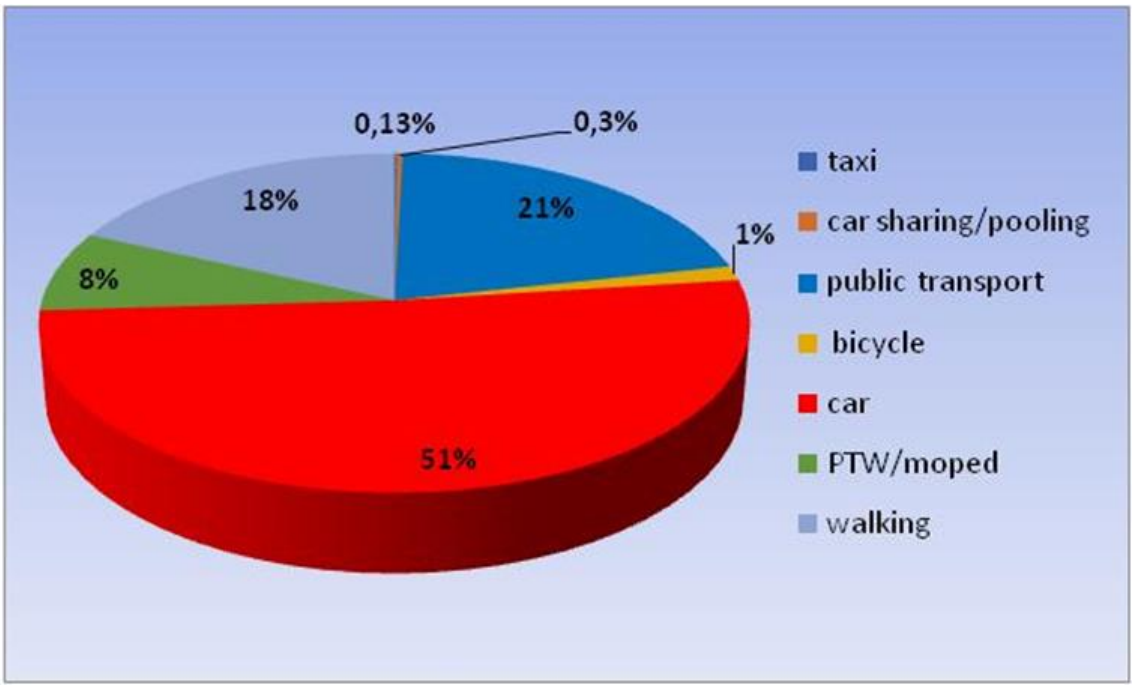

FIGURE 11: MODAL SPLIT (DAILY TRIPS). SOURCE: PUMS DI ROMA

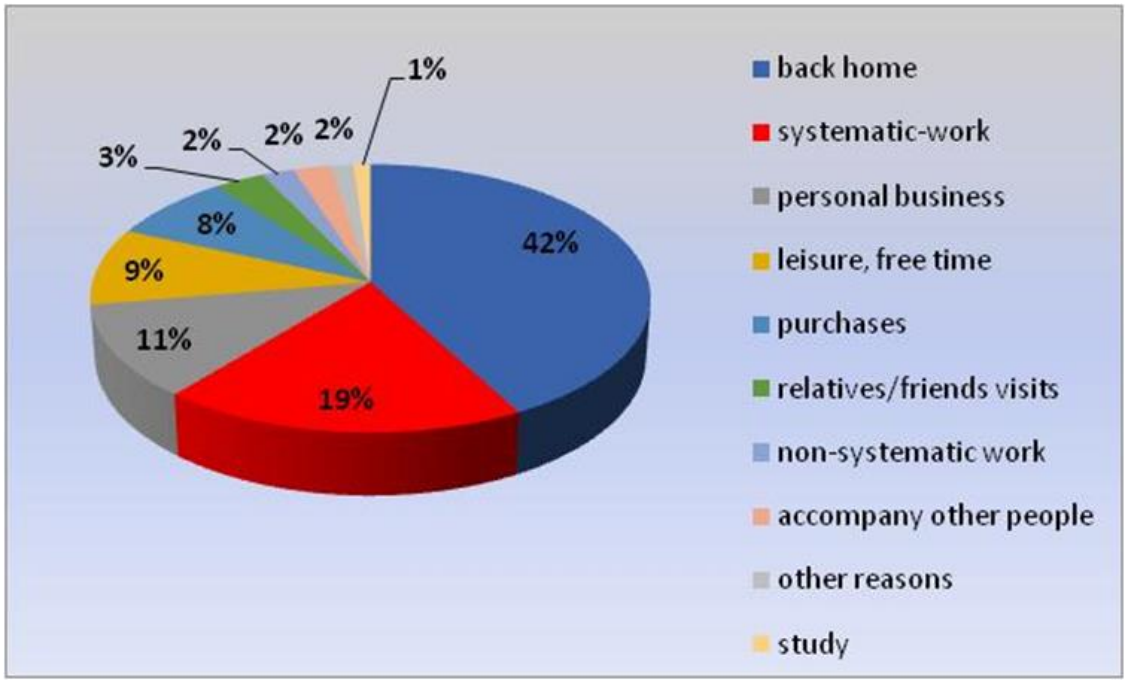

FIGURE 12: MOTIVE OF THE JOURNEY. SOURCE: PUMS DI ROMA

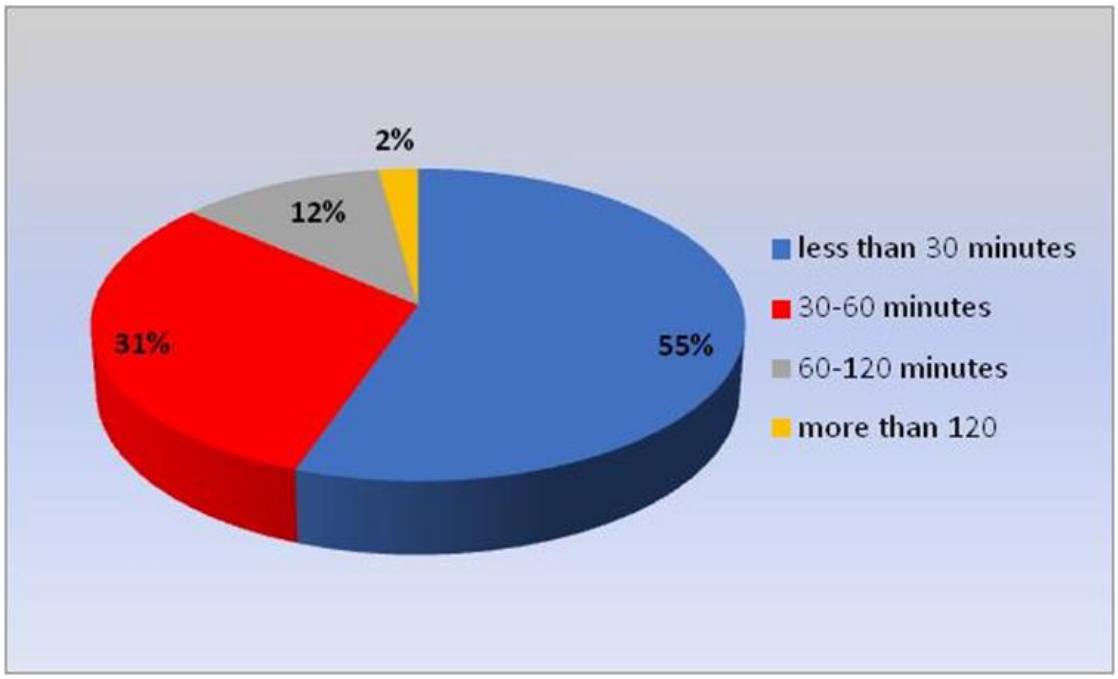

FIGURE 13: DURATION OF THE JOURNEY. SOURCE: PUMS DI ROMA

7.1.4 Electric vehicles

Rome counts 1,7 million cars, with a motorisation rate of 616 cars for every thousand inhabitants; motorcycles (mopeds excluded) are 388 thousand, 136 for every thousand inhabitants (source: ACI – 2018).

TABLE 8: REGISTERED VEHICLES IN ROME (2018). SOURCE: ACI

	Total	Light Electric Vehicles (LEVs)PTWs	Light Electric vehicles (LDV) three wheelers and quadricycles	Light duty vehicles (LDV) Cars	Heavy duty vehicles (HDVs) Freight fleet	Heavy duty vehicles (HDVs) Buses	Heavy duty vehicles (HDVs) Other vehicles
BEVs	2,684	383	744	1,125	338	81	13
PHEVs	23,813	18	1	23,752	41		1

7.2 Charge point characteristics

7.2.1 Payment options

Enel X

Enel X Mobility acts as CPO and enters into interoperability agreements with companies acting as MS that offer charging services to final customers.

Enel X Italia S.r.l., part of Enel Group, is one of these MSPs, which provides charging services on Enel X Mobility infrastructure and on infrastructure owned and/or managed by third parties (through interoperability agreements) on the basis of a formal signed contract. As MSP, Enel X Italia S.r.l. is completely neutral in terms of interoperability protocol supported.

Enel X Italia S.r.l. offers charging services, including booking options, through Enel X JuicePass App/card; its market mission is to guarantee a seamless charging experience to every EV users, with no limits in terms of technology and geography. Depending on the customer segmentation, JuicePass offers different tariffs:

A. "Privato" profile (Business To Consumer). Users can set up one out of the following fees:

   i. Flat Large, monthly fee. 120kWh per month at 45€ VAT Included. "Pay per Use" fare for any additional kWh used.

   ii. Flat Small, monthly fee. 60kWh per month at 25€ VAT Included. "Pay per Use" fare for any additional kWh used.

   iii. Premium Pay per Use fee. 0.45€/kWh for charging session on slow and quick (up to 43 kW) stations and 0.50€/kWh on fast stations (up to 350 kW). This fare includes the reservation service at 25€/year VAT Included.

   iv. Pay per Use fee. 0.45€/kWh for charging session on slow and quick stations and 0.50€/kWh on fast stations.

B. "Corporate" profile (Business To Business). Companies can set up a public and private charging service at their own employees' disposal at the commercial fare selected during the order (PayPerUse/Small/Medium/Large). Service fee is 20€ "una tantum", VAT included, and allows the access to the JuiceNet Manager in order to enable RFID cards and "Corporate" profiles for the Public/Private Charging and permit the Private Charging sessions monitoring. Fees settled for this offer are:

   i. Pay per Use fee. 0.45€/kWh for charging session on slow and quick pole stations and 0.50€/kWh on fast pole stations. No additional fare for private charging session.

ii. Flat Small fee. 80kWh per month at 32€ VAT Included. “Pay per Use” fare for any additional kWh used. Public plug's reservation included.

iii. Flat Medium fee. 150kWh per month at 56€ VAT Included. “Pay per Use” fare for any additional kWh used. Public plug's reservation included.

iv. Flat Large fee. 500kWh per month at 175€ VAT Included. “Pay per Use” fare for any additional kWh used. Public plug's reservation included.

C. “Corporate” profile (Business To Government). Public Administrations can buy through MEPA[34] two main public fares including the following services:

i. All Inclusive Fare. 1,550/2,250/3,000/7,500/11,250/15,000 kWh per year with 3 or 5 RFID Cards and the access to the JuiceNet Manager in order to enable RFID cards and “Corporate” profiles for the Public Charging and allow the Private charging sessions monitoring. Public plug's reservation included.

ii. Standard Fare. 1,550/2,250/3,000/7,500/11,250/15,000 kWh per year and the access to the JuiceNet Manager in order to enable RFID cards and “Corporate” profiles for the Public Charging and allow the Private charging sessions monitoring. Public plug's reservation included.

D. “Automotive” profile (Business To Business To Consumer). The offer is based on the agreement signed with automotive companies and usually includes, for each end user, domestic charging infrastructure (turn-key solution) and a coupon of kWh for the public charging sessions.

E. “Special” profile. Offering is based on a special framework agreement with a partner and includes a dedicated fare that allows the end user to run-up the charging session to the public network including dedicated infrastructures.

Be Charge

Be Charge is both a CPO and MSP. The Be Charge recharging service does not include any activation cost and foresees two different pricing plans:

A. Flat: with a single and fixed monthly fee until the kW / h month threshold is exhausted, on all types of power supplies. In particular:

[34]Mercato Elettronico per la Pubblica Amministrazione; a program for the rationalization of public spending of the Public Administration

i. BE SUPER 100: 38.00 euros per month per 100 kWh

ii. BE HAPPY 50: 21 euros per month for 50 kWh

B. Consumer rate: with a single cost per kWh based on the energy supplied, equal to 0.45 euros per kWh with VAT included.

7.2.2 Total RES supplied

Enel X declares that 100% of its purchased energy comes from renewable sources (certified by the energy vendor).

7.3 Electromobility strategies and initiatives

7.3.1 State of play

At present, 257 charging systems have been installed throughout Rome. 122 of them were installed before the approval of the Electric Mobility Plan in 2018 (see below), including:

- 105 POLE type (22 KW AC) for vehicles charging
- 4 FAST type (50KW DC) for fast vehicles charging
- 12 for motorcycles charging
- 1 for van sharing charging

135 charging points have been implemented since the approval of the Electric Mobility Plan, divided as follows:

- 124 POLE type (22 KW AC) for vehicle charging
- 11 FAST type (50KW DC) for fast vehicle charging

These recharging systems are currently located in 12 boroughs out of the 15 that compose Rome's municipality, as summarised in Table 9 here below.

TABLE 9: DISTRIBUTION OF CHARGING POINTS IN ROME'S BOROUGHS. SOURCE: ROMA MOBILITÁ

Context	Type	B. 1	B. 2	B. 3	B. 4	B. 5	B. 7	B. 8	B. 9	B. 10	B. 11	B. 13	B. 15
Pre-Plan	POLE	42	29	2			9	10	12		2	6	2
	FAST								4				
Plan	POLE	9	3		4	6	25	10	45	22	4		
	FAST	2			1		3		5				
Total		**53**	**32**	**2**	**5**	**6**	**37**	**20**	**66**	**22**	**6**	**6**	**2**

Context	Type	B. 1	B. 2	B. 3	B. 4	B. 5	B. 7	B. 8	B. 9	B. 10	B. 11	B. 13	B. 15
%		21%	12%	12%	2%	2%	14%	8%	26%	9%	2%	2%	1%

The location of these charging systems can also be described in relation to the six areas indicated by the General Urban Traffic Plan (PGTU), as shown in Table 10.

TABLE 10: DISTRIBUTION OF CHARGING POINTS IN PGTU AREAS. SOURCE: ROMA MOBILITÁ

Context	Type	Zone 1 Mura Aureliane	Zone 2 Anello Ferroviario	Zone 3 Fascia Verde	Zone 4 GRA	Zone 5 Extra GRA	Zone 6 Cittá verso il mare
Pre-Plan	Pole	32	43	21	16	2	4
	Fast				4		
Plan	Pole	9	7	24	57	9	18
	Fast	2	1	2	5	1	
Total		**43**	**51**	**47**	**82**	**12**	**22**
%		**17%**	**20%**	**18%**	**32%**	**5%**	**9%**

From the information provided directly by Enel X, a vehicle takes 2 hours as the minimum charging time. There is no substantial difference in charging duration between daytime or night-time.

From the half-yearly reports of Enel X, the average power for each recharge is equal to 8.3 KW taking for example a typical month.

7.3.2 Supporting policies for zero emission vehicles

Piano capitolino della mobilitá elettrica

Rome approved in 2018 the Electric Mobility Plan for the city (Piano capitolino della mobilitá elettrica)[35], which defines the rules for the instalment of charging points in public areas. The plan

35 https://romamobilita.it/sites/default/files/PIANO%20MOB%20ELETTRICA%20ver%2023%20giugno%202017%20delibera.pdf

identifies 320 areas where each supplier can propose a project for an ECP of 22 kW. For the ECP of more than 50 kW, it is possible to propose a site along the main road network of the city.

The Electric Mobility Plan addresses the charging point need in the public areas and supports the private investments in the sector defining the rules, including technical and administrative regulations that include:

- How to submit applications.
- The technical specifications of charging points.
- Road signs of the parking lots.
- Technical requirements.
- Obligation and penalty.

The plan further identifies:

- A high-power charging point network (50 kW) along the main roads
- A set of medium power charging points (22 kW). The planning of these points is based on the most popular destinations in town. The plan defines 320 areas in the municipality of Rome where is possible to submit proposals to install electric charging points.

It is also included an action plan to support the private investments in:

- Freight vehicles
- Taxi
- Fuel distributors
- Parking lots and garages
- Private buildings

The high-power charging network will be realized along the main roads and in 2 rings:

- GRA (Outer highway ring) to intercept the traffic flow towards the city centre and the main tangential traffic flows
- Aurelian walls (Inner ring), with a network for the inner flows of the city

Limited traffic zone

In Rome there is a limited traffic zone (LTZ) covering an area of 5.5 km^2. To foster the use of electromobility, electric vehicles can enter this area free of charge. Dedicated parking slots are reserved to electric vehicles through specific horizontal and vertical signals.

7.3.2.1 Regional and national frameworks

The PNIRE -*Piano nazionale infrastrutturale per la ricarica dei veicoli alimentati a energia elettrica*– (E-vehicles charging infrastructure National plan), released in June 2016, defines the development strategic lines according to the European Directive 2014/94/EU.

The Electric Mobility Plan of Rome is planned according to these strategic lines and in accordance with the General Urban Traffic Plan (PGTU) of the city.

7.3.3 Deployment approaches

For the municipality of Rome, the private companies are best placed to develop the electromobility network.

The Rome Capital administration with Official Resolution 48/2018 approved the electric mobility plan and the regulation to promote the installation of electric vehicle charging systems on public land.

7.3.4 Good practices

Electric mobility plan

As explained above, the Rome electric mobility plan defines the areas in which companies offering electric charging systems will be able to request them.

The number of target charging points was calibrated on a forecast study on number of electric vehicles on the road. Consequently, areas with a radius of 300 m have been defined so as to cover all the territorial portions of the municipality of Rome which have a density of employees greater than 100 employees per hectare. The number of employees is an indicator of the area's ability to attract mobility. As the need for recharging occurs mainly at the journey destination, the number of employees seemed therefore the correct indicator to represent the need for charging points.

The plants can be offered in lots of 40 units, of which at least 20% must be high power (50 kW or higher).

The regulation defines:

- the rules for installing systems in terms of technology and location.
- the criteria for a correct distribution in the territory of Rome according to the constraints of the specific plan for electric mobility.
- management and penalties constraints.

Citizens consultation through web portal

Rome has set-up a web portal to better meet the electromobility offer with its demand. 1,150 users have indicated, at present, their desired electric charging point localisation through the web portal. 46% of the respondents are electric car owners, 56% are potential users.

This users' sample could be addressed in the future to carry out a survey that further investigates the services desired by final users[36].

[36] https://romamobilita.it/it/azienda/contatti/comunicazione-clienti

7.3.5 Challenges and barriers

The main challenge that Rome must tackle is to guide its own citizens towards more sustainable mobility, strengthening electric mobility, also through incentives. The main barriers to the full take-up of electromobility in the city are the purchase costs of the electric car. The city also faces the challenge of tackling illegal parking of non-electric cars in spots reserved to electric vehicles or charging point areas.

7.3.6 Learning needs

Rome has not identified at this stage specific learning needs. Those will be further defined based on the complete overview of the USER-CHI solutions. This paragraph will be updated accordingly.

7.4 USER-CHI solutions

In Rome, seven USER-CHI products will be demonstrated. The USER-CHI products demonstrated in Rome are the following:

- **CLICK- Charging location and holistic planning kit**: An online tool for the location planning of new charging infrastructure in cities and TEN-T corridors.
- **Stations of the future handbook**: Guidelines and recommendations to design the perfect user-centric charging station of the future.
- **eMoBest – e-Mobility replication and best practice cluster**: A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.
- **INFRA – Interoperability framework**: A package of rules, guidelines and recommendations that will support highly interoperable processes among the electromobility stakeholders.
- **INCAR – Interoperability, charging and parking platform**: A platform providing roaming and barrier-free access to EV charging points and offering related innovative integrated services for the EV drivers.
- **SMAC – Smart Charging tool:** A tool providing smart grid integration and demand management services for slow, medium, fast and ultrafast charging.
- **INSOC – Integrated solar DC charging for Light Electric Vehicles (LEVs):** A solution combining charging, onsite production of renewable energy and theft-proof parking for Light Electric Vehicles.

At this stage, 2 main areas of intervention have been identified in Rome as USER-CHI demonstration city:

Demo site solution 1: EUR piazzale dell'industria

The EUR borough, with its rationalist architecture, is included in the historic city perimeter and it has been chosen to host the Formula E Grand Prix since 2018. For Rome, this combination is the basis for a new vision of electric mobility: modern, smart and sporty, but with zero impact. To date, Enel X has implemented numerous charging points in the district, both 22 kW and 50 kW. For the 2020 edition of the Formula E Grand Prix, Enel X proposed the installation of a high-power charger (HPC) for public charging that could also be used during the aforementioned event by its participants and organisers. The COVID-19 crisis halted the plans which are currently in stand-by.

Stakeholders involved

Roma Mobilitá, Enel X as technical partner.

Objectives

Due to the strategic nature of the place, it has been proposed the construction of a hub on this site, at short distance from other charging stations already installed by Enel X.

The Piazzale dell' Industria site is optimal to test the multisource charging and some user centric solutions, because:

- 2 Enel X electric recharging stations already exist and by placing the high-power column next to the two existing ones, it would be possible to create a hub
- The large spaces allow the creation of a dedicated bike sharing station: Piazzale dell' Industria is close to the Via Tre Fontane-Laurentina-Colombo cycle path, ideal for a connection with the city centre
- Adjacent to the site there is a gym and some accommodation facilities with whom it would be possible to subscribe an agreement to test services for the person (smart working, fitness)
- The station is easily accessible from the Colombo, Ostiense, Pontina, Laurentina and Autostrada A12/Aeroporto access roads
- The site is very well served by the local public transport (metro and bus)
- Important commercial activities/restaurants nearby exist
- It would be possible to evaluate whether to create a photovoltaic roof and a storage of exhausted batteries in the Luneur area

Timing

With the current COVID-19 crisis there is no clarity about when the hub can be deployed, hence there is no fixed date for starting the testing.

Demo site solution 2: CORSO FRANCIA

An area owned by Enel X is proposed to test this solution. The area is less connected to the mobility systems and interest points as described in the demo site solution 1, even though it is quite close to the Auditorium Parco della Musica.

The site offers the opportunity to users of the northern basin of the city to test electromobility opportunities. Charging points will be installed here, next to an Enel X shop, it has been hypothesized to experiment mainly with Vehicle to Grid charging.

Objectives

Test Vehicle-to-Grid solutions providing added-value services to the grid. EV users may benefit from advantageous pricing schemes if they accept to use their EV(s) as power sources too. In this area a multi-source charging hub will be tested with the aim of testing the vehicle to grid.

Stakeholders involved

Roma Mobilitá, Enel X as technical partner.

Timing

With the current COVID-19 crisis there is no clarity of when the hub can be deployed, hence there is no fixed date for starting the testing.

8. Turku

8.1 Local context

8.1.1 City size and context

Turku is Finland's oldest city and was founded in 1229. Turku has a compact size, perfect for exploring the exciting mixture of old and new. With its reasonable living costs, multiple housing options, active student community, vivid cultural life and a variety of outdoor recreation possibilities, Turku ensures a good quality of life to its inhabitants and becomes a lucrative location also for skilled professionals.

Turku has always had a special role among Finnish cities. European art, science, religious and political movements have found their way to Finland through Turku since the 13th century. This history has given the city a distinctively civilized and cultural atmosphere. Turku is also multicultural, as evidenced by the myriad nationalities, languages and customs. The city is home to people of over

KEY FIGURES

Population: 193,000 inhabitants, (310,000 inhabitants in the entire region)

Area: 245 km^2

Density: 178 people/km^2

NUTS level: NUT-3

TEN-T corridor(s): Turku is an urban node of the Scandinavian Mediterranean TEN-T corridor

USER-CHI role: demonstrator city

130 nationalities, who speak over one hundred different languages. The archipelago outside the city has always been a crossroads for new cultures, ideas, doctrines and commodities, and its tides have swept far into the inland areas of Finland.

8.1.2 Geography

Located in the region of Southwest Finland, Turku is one of Finland's biggest cities. Turku archipelago is the largest in the world in terms of the number of islands. About 40,000 islands and islets form this natural wonder starting at the edge of Turku and continuing all the way out to Åland. The city also has a peculiar topography as it counts seven hills. Turku is easily accessible, both domestically and internationally by plane and by the sea. In the city itself, everything is close, which makes it perfect city for cycling. In fact, 90% of the inhabitants live less than ten kilometres from the city centre. In addition, getting around is easy thanks to a comprehensive local transport system.

8.1.3 Modal split

The National travel survey from 2016 shows the modal split for the city of Turku where the total share of sustainable travel modes in the region was 48%. The complete modal split is summarised in Figure 14: Turku's modal split (2016). Source: National travel survey below.

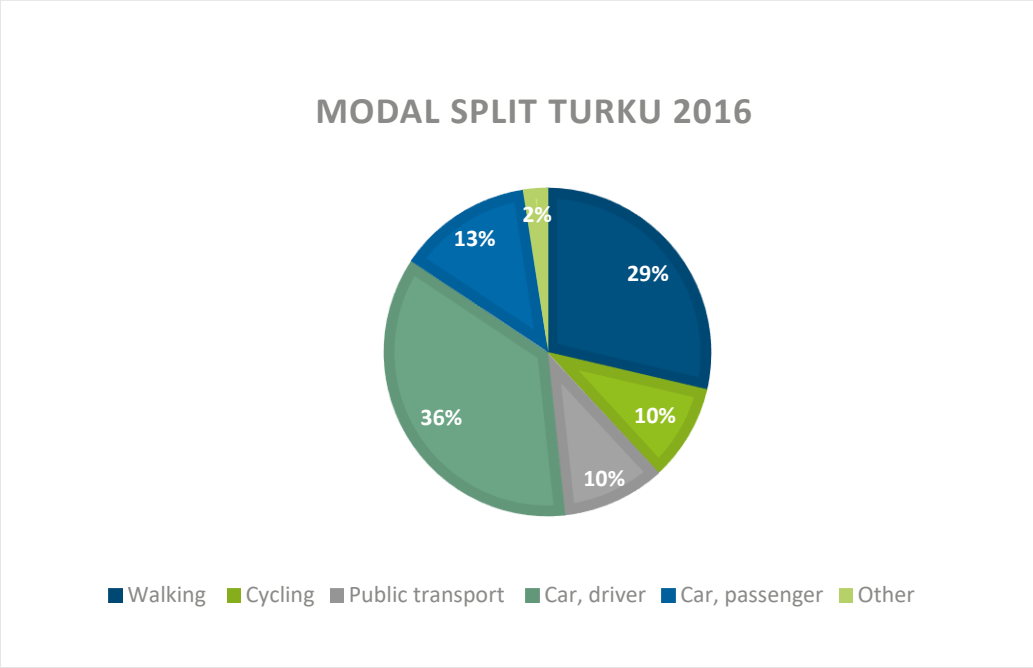

FIGURE 14: TURKU'S MODAL SPLIT (2016). SOURCE: NATIONAL TRAVEL SURVEY

8.1.4 Electric vehicles

Table 11 below shows the different vehicles categories registered in Turku in 2019. LEVs are not registered in Finland and thus do not appear in the table.

TABLE 11: CATEGORIES OF VEHICLES IN TURKU (2019). SOURCE: CITY OF TURKU

2019	Passenger car (M1)	Van (N1+N1G)	Truck (N2+N2G)	Bus (M2+M3)
Petrol	59,946	235	28	0
Petrol/hybrid	2,227	3	0	0
Petrol/plug-in hybrid	562	0	0	0
Diesel	15,237	5,653	1,971	522
Diesel/hybrid	49	0	0	4
Diesel/plug-in hybrid	38	1	0	0
Full electric	139	15	0	6

8.2 Charge point characteristics

8.2.1 Payment options

In the city of Turku different EMSPs are operating the payments of the public charging points. Each CPO chooses which EMSP to use. Each of the EMSPs provide a different set of payment options. The following EMSPs are active in Turku: Virta, K-lataus, Fortum. This list is however not exhaustive.

Virta, for example, provides the following payment options: through mobile application, RFID card, RFID key fob, all of them with registered user account. One-time payment options are also possible with credit card, having mobile application or website as user interface.

8.2.2 Total RES supplied

The public charging points are owned by different parties, i.e. not by the city. The public charging points which are operated by Turku Energia, USER-CHI partner, are supplying RES electricity about 35 000 kWh/year.

8.3 Electromobility strategies and initiatives

8.3.1 State of play

The city of Turku has set the objective to be climate neutral by 2029. The climate plan which was released in June 2018 also foresees to cut by half the travel-related emissions taking the current

state of emissions as baseline. To achieve these objectives the city aims at improving the cycling and walking conditions and to further develop a sustainable mobility culture. The public transport system will also be turned into a 100% carbon neutral service.[37]

Turku also wants to increase the e-vehicles fleet in services bought by the municipality (taxi services for disabled people, for instance). In addition, Turku currently develops innovative solutions for sustainable mobility of people and emission free freight logistics through a Horizon 2020 funded project: CIVITAS ECCENTRIC. Turku's e-mobility measures encompass different domains.

E-cars and parking

Downtown Turku counts 7 EVs charging stations in street parking zones where the parking is free of charge during the charging of the EVs for a maximum of 4 hours. These charging stations are operated by the national company Liikennevirta Oy under the brand name Virta, that has over 300 charging stations all over Finland and an app for the easy use and navigation to the charging stations.
Additionally, private actors such as gas stations, hypermarkets, and shopping centres, and restaurants have installed EVs charging points in their parking areas. At some of these stations (for example at IKEA) the charging is free of charge.
The city of Turku allowed to switch several street parking spaces into EVs charging stations.

Light Electric Vehicles

In 2019 following the trend of other European cities, light rentable E-scooters (or E-scoots) were introduced to major cities in Finland by several commercial operators. Many persons started using this new and flexible transport mode. However, a significant increase of accidents and injuries by e-scooters have been reported by the city hospitals in Helsinki, Tampere, and Turku[38].

CIVITAS ECCENTRIC

Finally, to achieve its carbon neutrality by 2029, Turku is investing heavily in clean transport solutions. One concrete example of this process is the CIVITAS ECCENTRIC project[39] which will develop electric transport, shared use of cars and bicycles, and the Mobility as a Service (MaaS) model. The focus area is Kupittaa. The project will, for example, pilot different e-vehicles to be used by city employees and will support the electrification of public transports.

Currently there are no other projects than USER- CHI ongoing in the city of Turku to develop the e-charging infrastructure.

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[37] See Reports from 2018 https://www.bsr-electric.eu/content/7-materials/3-stakeholder-analysis/bsr-electric_stakeholder-analysis-on-e-mobility-in-the-bsr.pdf and 2019 https://www.bsr-electric.eu/news/finnish-update-to-bsr-electric-stakeholder-report

[38] https://www.is.fi/kotimaa/art-2000006153079.html

[39] https://www.turku.fi/en/civitas-eccentric

8.3.1.1 Regional or national frameworks

In Finland the main principle for public charging points, and electromobility in general, is to encourage private companies to offer EV services and the needed charging services. Finnish cities or other public authorities have not started to invest in public charging points on a large scale yet.

The traffic infrastructure subsidy is the main form of financial support to stimulate the construction of public charging point for EVs. The National Energy Authority is taking care of the subsidy administration and processing the applications. The four categories that are competing for the same subsidy include: natural gas distribution stations, local public traffic charging systems, high-power charging systems for EVs and low-power charging systems for EVs. High-power charging stations can get up to 35% subsidy and low-power charging stations a maximum of 30% subsidy. The charging stations must be public charging stations in order to be eligible for the subsidy.

Apartment buildings owners can apply for a different subsidy via the Housing finance and development centre in Finland (ARA). The subsidy covers 35% or 50% of the eligible costs.

The limited subsidy of EUR 2,000 for new electric car purchases is running for the period between 01.01.2018 and 31.12.2021.

In June 2019, a new Finnish governmental program was released. It states that the government support for electrical car charging infrastructure will be continued with a 15 million euros budgeted for the period 2020-2022. In addition, the program foresees e-mobility related income tax reduction for employees. It states that charging of e-cars at workplaces as a part of salary will be free of tax. Further regulations to increasing the charging infrastructures in housing companies and service stations in Finland are additionally programmed. This will allow to reach scale as housing companies are numerous, since apartment blocks and rowhouses in Finland are often administered by them.

In 2018 a subsidy scheme for e-bike purchases was under discussion in Finland, but finally was not implemented. At present there is no financial support for e-bike purchases in Finland.

8.3.2 Deployment approaches

Turku's deployment approach builds on an ecosystem of private companies, best placed to develop the city's network. The growing costumer's demand for charging points makes it attractive for private companies to invest in infrastructure. Several public subsidies mentioned above further encourage this development.

8.3.3 Challenges and barriers

Turku is facing several challenges in the implementation of e-mobility. First of all, the Nordic weather conditions must be taken into account in the technological development and installation of public charging facilities. Furthermore, investments in charging points are still not considered as economically profitable.

In addition, public procurement rules limit the possibilities of the city authority and its daughter companies to purchase and develop the services connected to the charging points. This means that capabilities of testing new things dynamically with others are very limited.

8.3.4 Learning needs

Turku's learning needs regard exploring effectively working cooperation models with rental houses and the kind of interfaces chosen for the installed charging points. Finally, learning needs also encompass the specific equipment's used in other cities for LEV charging places.

8.4 USER-CHI solutions

In Turku, seven USER-CHI products will be demonstrated. The USER-CHI products demonstrated in Turku are the following:

- **CLICK- Charging location and holistic planning kit**: An online tool for the location planning of new charging infrastructure in cities and TEN-T corridors.
- **Stations of the future handbook**: Guidelines and recommendations to design the perfect user-centric charging station of the future.
- **eMoBest – e-Mobility replication and best practice cluster**: A collaboration platform to facilitate the transfer of best practices among the demonstration and replication cities.
- **INFRA – Interoperability framework**: A package of rules, guidelines and recommendations that will support highly interoperable processes among the electromobility stakeholders.
- **INCAR – Interoperability, charging and parking platform**: A platform providing roaming and barrier-free access to EV charging points and offering related innovative integrated services for the EV drivers.
- **SMAC – Smart Charging tool:** A tool providing smart grid integration and demand management services for slow, medium, fast and ultrafast charging.
- **INSOC – Integrated solar DC charging for Light Electric Vehicles (LEVs):** A solution combining charging, onsite production of renewable energy and theft-proof parking for Light Electric Vehicles.

At this stage, 4 main areas of intervention have been identified in Turku as USER-CHI demonstration city:

Demo site solution 1: Master plan for the charging infrastructure

Description

The City of Turku will produce a master plan for EV charging infrastructure and a specific roadmap for building electric charging points for at least 10 city-owned facilities through public-private partnership. The city's active role, the communication with key stakeholders, as well as the cooperation with parking companies and the exploitation of diverse products will result in a user-friendly charging infrastructure in the future.

Objectives

The main objective is the approval and the implementation of the Master plan for EV charging infrastructure in Turku. The second objective is the creation of a development plan for electric charging in city-owned facilities as well as a stakeholder campaign for electric charging stations carried out in year 2022.

Timing

The Master plan development will start in January 2021 and will be finalized in December 2022. The development plan for electric charging in city-owned facilities will be developed between September 2020 and December 2021.

The stakeholder campaign preparation will start in January 2021 and will run until summer 2023.

Demo site solution 2: Charging boxes for LEVs

Description

The city of Turku will carry out a demonstration of innovative RES-integrated charging boxes for LEVs in identified locations in the city.

Objectives

Demonstrate new solutions that combine RES energy, charging and safe LEV parking. Create safe parking possibilities for e-bikes.

Timing

Planning of the boxes starts September 2020
Demonstration starts in Spring 2022

Demo site solution 3: Pääskyvuorenrinne demo

Description

On the site of a new residential housing area in Pääskyvuori, where 2 apartment houses with 80 apartment units will be built by VASO, slow-charging solution equipped with standard demand management and on-site RES production and battery storage will be tested.

Stakeholders involved

The charging equipment will be implemented and operated by Turku Energia, all the other equipment by VASO.

Objectives

Create a low-charging solution equipped with standard demand management and on-site RES production and battery storage. Demonstrate how the solutions are taken up by the residents and how those can be scaled up.

Timing

Demonstration will happen in 2022-2023

Demo site solution 4: Mäntymäki demo

Description

TVT Asunnot Oy will develop a demo charging system for light e-vehicles and a master plan for charging infrastructure in the Mäntymäki area. The demo site will be attached to a new building which is the first of its kind in the area.

The innovative low-power DC-charging solutions for LEVs will be adapted to the specificities of social housing and elderly people. The plan is to fit some senior mobility parking places with charging system inside the building that will be constructed. Additional charging station for LEVs with removable batteries, such as e-bikes, e-scooters, and other devises will be installed. These charging stations are firesafe. Electricity for these charging systems will be supplied by solar panels installed on the roof or on the side of the building.

Stakeholders involved

The project requires a coordinated action between the construction company, which will construct the building, the electrical designer company, which will plan the building, a specialized electrical designer company which will design the solar powered charging and a company which will provide the ready-to-use battery charging rack.

Objectives

The objective of this demo site is to identify how to integrate this charging infrastructure in a building which has already been planned and designed. This shall allow to gain knowledge about how to implement these kind of charging stations in buildings that are already constructed. Another objective is also to find out which kind of charging stations are usable in the harsh winter of Northern Europe.

Timing

The public procurement procedure will start with the construction of the new housing units by TVT Asunnot Oy. The Housing Finance and Development Centre of Finland (ARA) is the governmental agency supervising the legal, financial and planning procedure. By late 2020 the planning phase (contractor planning, electrical planning, construction permit) will come to a term. The demo-site is planned to be ready for the infrastructural implementation by summer 2021. Some delays are to be expected due to the COVID-19 pandemic.

parking places with charging system inside the building that will be constructed. Additional charging station for LEVs with removable batteries, such as e-bikes, e-scooters, and other devises will be installed. These charging stations are firesafe. Electricity for these charging systems will be supplied by solar panels installed on the roof or on the side of the building.

Acronyms

Acronym	Description
AMB	Área Metropolitana de Barcelona
BEV	Battery Electric Vehicle
BMT	Balázs Mór Plan
CEF	Connecting Europe Facility
CLICK	Charging Location and Holistic Planning Kit
CPO	Charging Point Operator
D	Deliverable
DC	Direct Current
DSO	Distribution System Operator
ECP	Electric Charging Point
EMP	Electro Mobility Provider
EMSP	Electro Mobility Service Provider
ERDF	European Regional Development Fund
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
HDV	Heavy Duty Vehicle
LDV	Light Duty Vehicle
LEV	Light Electric Vehicle
MoU	Memorandum of Understanding
MSP	Mobility Service Provider
NUTS	Nomenclature of Territorial Units for Statistics
OCP	Open Protocols for Communications
PHEV	Plug-in Hybrid Electric Vehicle
RES	Renewable Energy Source
RFID	Radio-Frequency IDentification
SUMP	Sustainable Urban Mobility Planning
TEN-T	Trans European Transport Network

WP	Work Package
ZBE	Zona Bajas Emisiones (Low Emission Zone)

Implementation roadmap

Name of the replicator city

Pilot sites measures

Ahead of the peer learning visits, the replicator city selects the set of measures it is interested in in the various demonstrator cities and describes them shortly in the table below.

Measure name and description (10 lines max)	Topic	Related demonstrator city

Measures' analysis

The replicator city carries out a transferability assessment of each measure listed above based on the information collected during the peer learning visit. The replicator city reflects on the conditions that made the measure successful in the demonstrator city: time, resources, legal framework, etc.. It assesses whether those conditions can be replicated in their specific context with points ranging from 1 to 4, 1 standing for low transferability potential and 4 being high transferability potential.

Measure 1: name of the measure (please copy paste this table for each seleted measure)

Objective of the measure		
Conditions	**Description**	**Transferability potential (1 to 4)***
Time needed for the implementation		
Technical conditions required		
Desirable governance of the measure		
Legislative/regulatory framework needed		
Additional success factors		
Budget required		
Overall rating of transferability potential		

* 1 being low transferability potential and 4 high transferability potential in your specific context

Action plan

Based on the measures' analysis carried out above, please complete the following action plan for the selected measure(s) with the highest degree of transferability.

Measure 1: name of the measure (please copy paste this table for each seleted measure)

Action	Timeline	Responsible department/organisation	Key points to be monitored
Action description	*Timeline description*	*Department or stakeholder in charge of the action*	*How do you intend to monitor progress?*