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D.4.1 Local analysis review Report for Barcelona

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Abstract:

D.4.1 is the first deliverable of the contextualization phase (WP4), finalized to highlight a more in-depth analysis that will be carried out in order to choose and tune in all aspects suitable for every pilot context (Genoa, Florence and Barcelona). Thanks to D.4.1 it will be possible to create the basis for future implementation in non-pilot (and non-partner) cities.

D.4.1 contents will be completed, integrated and updated in D.4.4 “Operative plan of sustainable mobility model application”, that will include the final aspects about each implementation test.



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1. IDENTIFICATION OF PILOT CITY CHARACTERISTICS

The overall objective of the Ele.C.Tra project is to promote a new urban mobility model, characterized by:

- A standard structure with common characteristics to all project cities
- Specific characteristics, suitable for each city involved, highlighting demand mobility flows.

The Ele.C.Tra Project will test an innovative model, to give more visibility to alternative transport modes that are being implemented around Europe to decrease traffic congestion and build more sustainable mobility practices. For this reason, it is necessary to analyze every pilot city characteristics to underline positive elements already existing and prospective scenarios for improvement.

In the case of Barcelona first of all it's necessary to specify the **user categories/targets** on which to develop the pilot activity:

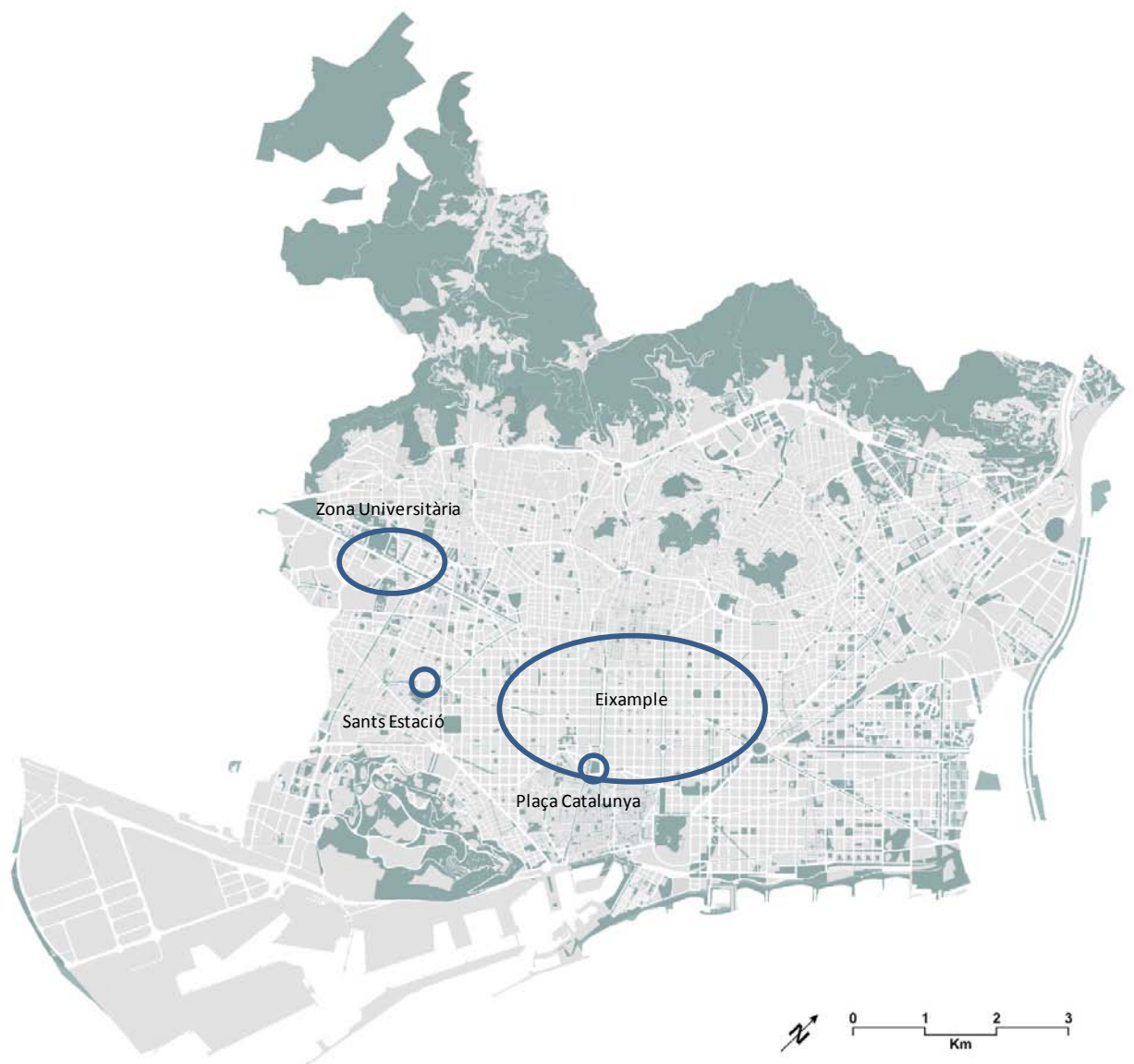
- User's needs with long trips that reach their destiny directly by **private vehicles**, car and specially motorbike users, without the use of other transport means.
- **Users needs** who use **other transport means**, promoting integration between private and public through interchange points (e.g. railway stations, main bus stops) and the e-charging points installation near stops and terminal stations.

In both cases the focus is on workers and students with daily trips to reach work/university.

Regarding the different scooter attracting points in Barcelona (not only the city centre), **the pilot area** involves the entire municipality, even when some other municipalities that form an urban continuous with Barcelona make possible intermunicipal scooter mobility without using major roads.

All the information provided in this point is being gathered cartographically and will be provided within WP4 in the corresponding format.





Main areas of scooter attraction in Barcelona

1.1. E-CHARGING POINTS

Currently there are **249 electric charging stations in Barcelona**. They are distributed on all its neighbourhoods, either on the street level or in public access underground parkings. Most of all are stations of conventional recharge but there are also two fast charge stations. Each station can have more than one recharging point (socket). They can be suitable for cars, motorcycles or both vehicles. Among them

GET AROUND BARCELONA WITH AN ELECTRIC VEHICLE

Map of charging points | Assistance and Incentives | Electric vehicle card



An online map is available on: <http://w41.bcn.cat/en/mou-te-mapa/>

For recharging points managed by the city council, the service is free of charge at the moment and activated with a card. Other private operators like public parking garages or shopping centres offer package rates (recharging + parking) but in some cases recharging is offered at no extra charge, with users only paying for the time the vehicle is parked.

1.2. ELE.C.TRA PARKING PLACES

There are 56.722 parking places for motorbikes in Barcelona. 97% are duly identified on the road, and the rest are in underground parkings, that are located in areas with a high demand of motorbike parking. Anyway parking in sidewalks is also allowed in all sidewalks that have more than 3m wide, which in Barcelona is a controversial issue, that raised up, for example in the first meeting of the Spanish NSG. In any case this gives a much higher number for motorbike parking places in the city.

Motorbike parking management policies in Barcelona aim to promote a more rational use of public space and get better distribution, with the objective of controlling indiscipline parking and ensure the priority of pedestrians and bicycles.

Due to the high use of motorbikes and scooters in the city, the municipality is working on the provision of more parking places for these vehicles, reducing the offer of road car parking places.

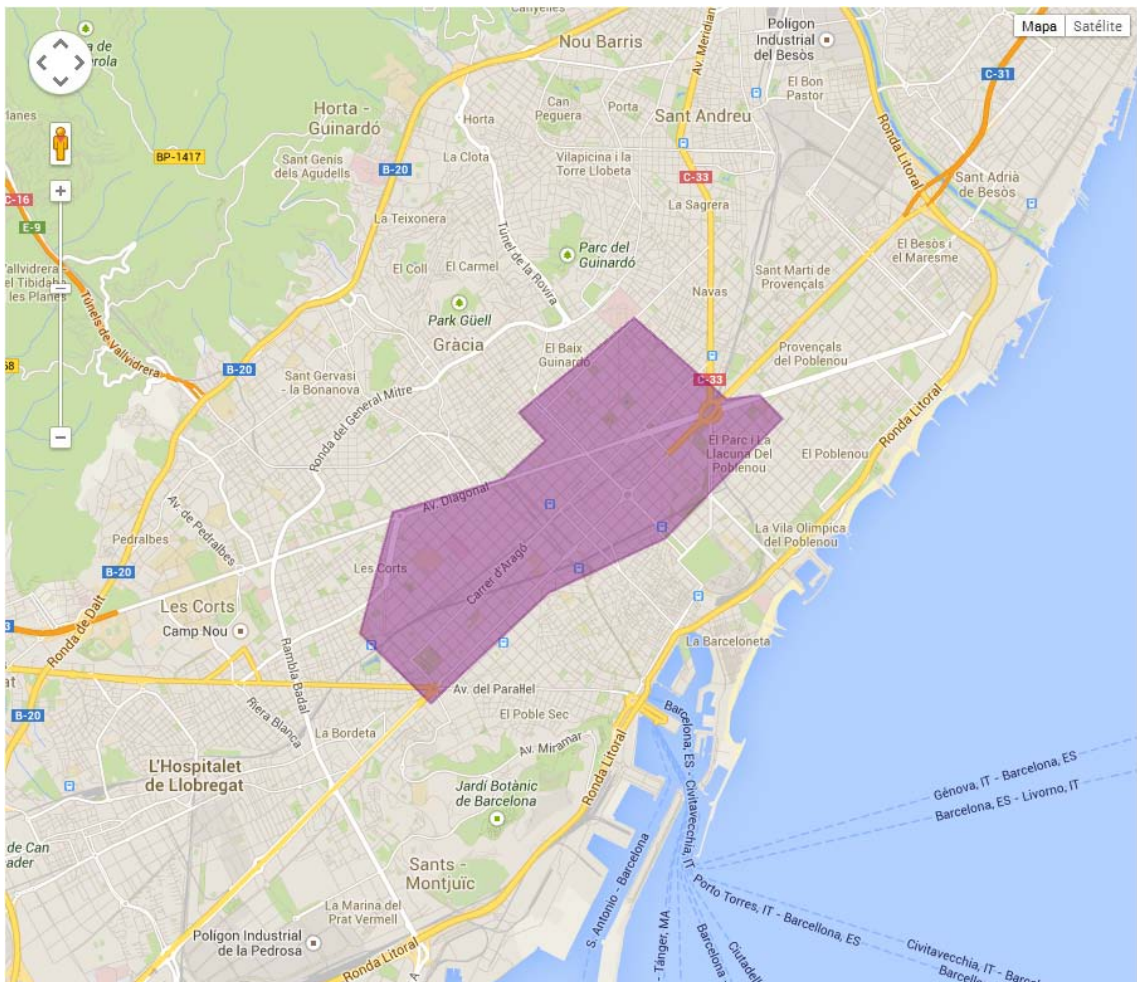
The areas with more parking offer are those that concentrate the highest number of motorbike destiny trips. According the characteristics set in D 3.1 for Barcelona those places are:

- Eixample neighbourhood
- Zona Universitària area (besides the university there is a high concentration of offices and malls also)
- Main commuting railway/metro stations:
 - Sants Estació
 - Plaça Catalunya

These areas have a high concentration of economic activity (manly offices) and also university areas, they are usually located on the city centre, near the main railway stations and also in touristic areas

1.3. PICK-UP AND DELIVERY POINTS

Our pilot experience will be focused on the Motit service, a scooter sharing service that is being operated privately with the collaboration of the municipality. Although Motit scooters can be used anywhere in the urban area (even outside Barcelona), they can only be returned and picked up in any point of a specific area, always following conventional parking rules in Barcelona. This area covers many of the points mentioned above and it is shown in the next map. Ele.C.Tra aim is to get more users of the service so this area, now covering the central part of the city, can be enlarged at the end of the project.



Motit pick up and delivery zone

1.4. OTHER FACILITATIONS

Some advantages for electric vehicles are being implemented in Spain and some are specific of the city of Barcelona. Ele.C.Tra project could benefit from many of them.

OFFICIAL SUBSIDIES

Subsidies can cover up to 25% of the price before taxes, but there are limits to the total subsidy depending on several variables.

TAX ADVANTAGES

Different towns or regions apply certain tax advantages when acquiring an electric vehicle. One example is a reduction of up to 75% on ITVM taxes.

INCENTIVES

In Barcelona, one of the incentives offered is free parking in regulated zones for city residents, which according to average calculations could lead to savings of roughly €1,500 per year. Free charge in municipal charging points is another incentive (see section 1.1)

More details are in the deliverable D.4.3 “Service and product networks”.



1.5. PUBLIC TRANSPORT

Public transport in Barcelona is highly developed as it corresponds to its role of European metropolis. The public transport system in Barcelona is operated by several companies, most of which are part of the Autoritat del Transport Metropolità, a transport authority managing services in the metropolitan area of Barcelona

The main public transport networks in Barcelona are:

- Train:
 - Local: operated by two companies: Rodalies and Ferrocarrils de la Generalitat
 - Regional
 - Long distance
- metro underground subway system
- Tramway: there are two lines, trambaix and trambesòs, that are projected to unite.
- Bus: local, intermunicipal and others (regional, long distance)
- Public Bicycle sharing system (Bicing)

In Barcelona, from the point of view of public transport, the main attractor places are:

- The main railway / underground intermodal stations: Sants, Plaça Catalunya, Diagonal, Plaça Espanya, and others like la Sagrera,
- The airport of El Prat (in a nearby municipality), only accessible by train in public transport.

Except the airport, which cannot be reached by scooters, all the intermodal stations are important points of scooter gathering, and are therefore important for Ele.C.Tra.

1.6. OTHER RELEVANT POINTS

The vehicles related with Ele.C.Tra project are shared electric vehicles, mainly Motit scooters, but also other electric scooters available to rent.

In Spain we follow the directive 2002/24/CE and we make distinction between:

- Moped (“ciclomotor” in Spanish), with max speed of 45 km/h and max power of 4 kW;
- Motorcycle (“motocicleta” in Spanish), with speed and power higher.



Even when they are not a part of the Ele.C.Tra project, electric bicycles are being object of special attention by the municipality, commercial firms and citizens. It is considered a way to spread bike mobility both for the parts of the city with more slope and the population that would need a great deal of effort to use a conventional bicycle. The first sharing service of electric bicycle is being started publicly by the municipality, and will come before the end of the year. The development of Ele.C.Tra project in Barcelona will be done in parallel to the development of the public electric bicycle sharing system.



2. STAKEHOLDERS INVOLVEMENT

The stakeholders involved in the Ele.C.Tra project give an important contribution to the model, by:

- Creation and management of the service in the pilot/pilots where their vehicle are implemented,
- Guidelines and administrative regulation for the implementation of Ele.C.Tra in the city
- Contextualization of Ele.C.Tra regarding the framework of sustainable mobility in the city
- Promotion of the EleCTra e-vehicle use both for working/studying day trips and for tourists;
- suggestion and notes about the several aspects linked to the Ele.C.Tra issues, mainly safety, promotion or environmental concerns.

The stakeholders are involved mainly by the National Support Groups, which allow them to exchange information and issues about Ele.C.Tra implementation.

The Ele.C.Tra project involves several types of stakeholders in order to allow them to obtain benefits:

- **Public administration**, taking into account subject as local authorities, public bodies, associations, universities and research institutes, etc.
- **business**, focusing on the e-vehicle and their components suppliers/distributors, ex. e-vehicle and technological suppliers, retailer and rental shop; and also in their infrastructure.
- **Civil society**, focusing on user needs transport associations, trade unions, etc.

The stakeholders interested in Ele.C.Tra in Barcelona are listed below. Most of them have participated in the National Support Group:

Public administration:

Barcelona municipality. Hàbitat urbà Department. Mobility department
ICAEN (Institut Català de l'Energia). Unitat d'Indústria i Transport
ALEM (Agencia Local de la Energía y Cambio Climático de Murcia
BCNecologia, Agència d'Ecologia Urbana de Barcelona



Civil society:

BACC-Bicicleta Club de Catalunya

CCOO (first trade union in Spain)

PTP-Associació per a la Promoció del Transport Públic

AMM-Asociación Mutua Motera | Ana Fernández

Bussiness

Going Green

Cooltra

RACC

IDIADA

URBAN RESILIENCE

Edenway



3. AREA MOBILITY MANAGEMENT OFFICE

The Area Mobility Management Office of Barcelona is the physical and virtual place with the following tasks to do during the whole implementation period:

- management and verification of incentives for users, with the support of the public body;
- management and monitoring of service implementation, having the role of the main “connector” between the offer, involving stakeholders, partners, etc, and the demand, paying attention to users’ needs and issues;
- focus on the citizens’ and tourists’ needs, involving them directly thanks to the project website and social platforms monitoring or public events or other. In this way, it’s possible to collect suggestions and improvements from users in order to improve the pilot service;
- focus on the project stakeholders, managing agreements and then monitoring the progress of implementation with the support of the Ele.C.Tra technical team leader;
- planning and carrying out of the dissemination and information campaigns, in order to raise citizens’ and tourists’ awareness of e-vehicle benefits and incentives.

In particular, Mr Francisco Cardenas, project coordinator of Ele.C.Tra is in charge of the implementation of the EleCTra Mobility Management actions from the Urban Ecology Agency of Barcelona, in close collaboration of the public bodies that regulate electromobility in the city: mobility area and urban habitat area.

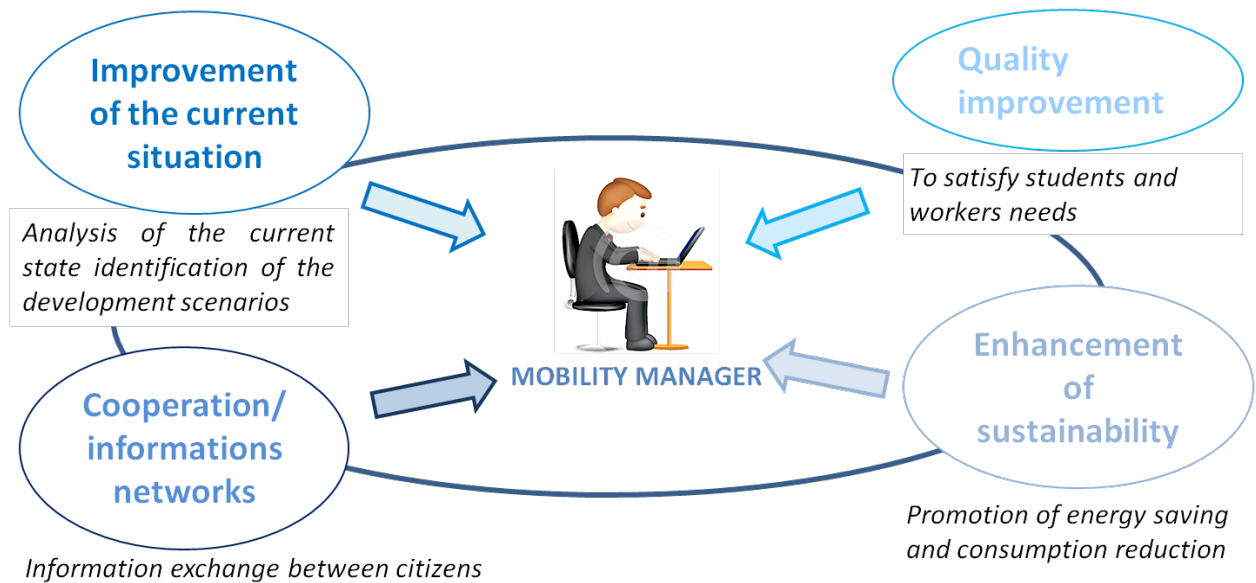
e-mail address: cardenas@bcnecologia.net

3.1. AREA MOBILITY: ACTIVITIES

Mobility Management is a new strategy to address the mobility behaviour of a whole community (of firms or municipalities/provinces) based on:

- improvement of the current situation
- cooperation/information networks
- quality improvement
- enhancement of sustainability

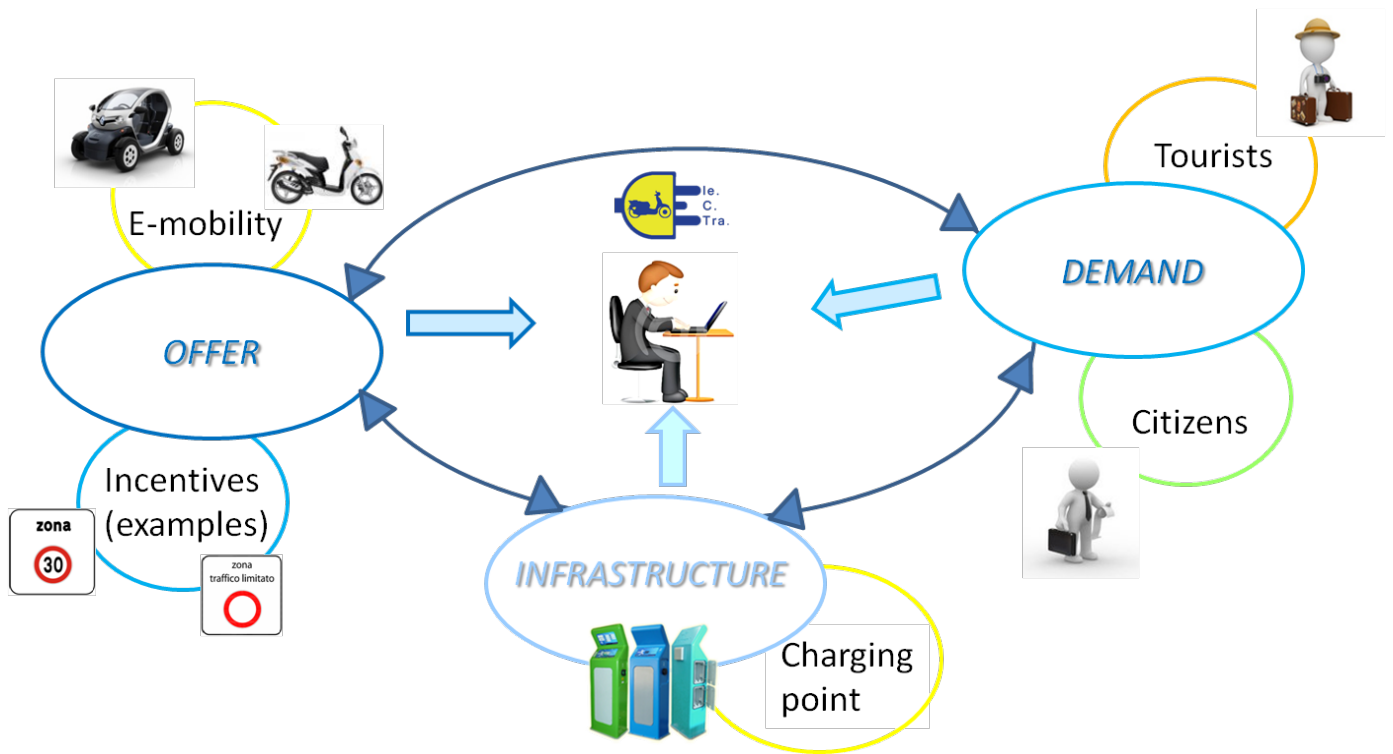




The most important activities are:

- to create and keep relationships with colleagues to obtain useful information for the description of house-work routes
- to summarize collected information to include actions to improve current situation
- to enhance and promote sustainable means of transport
- to establish and keep cooperation with other companies, public bodies and stakeholders
- to ease information exchange between companies and workers or companies and external subjects.

Mobility management is the “connector” between the Ele.C.Tra solutions/actions to implement and citizens/tourists, obviously, MM doesn’t manage infrastructure or e-vehicle provider activities but only coordinates them in order to maximise the ele.c.tra effectiveness.



4. OTHER ACTIVITIES

To strengthen the exchange of information, the dissemination and the stakeholders' involvement will be done through specific actions, including:

- Close collaboration with the municipality actions on sustainable mobility
- The participation of the Ele.C.Tra project in the Barcelona Mobility week, that will diffuse its activities among the general public
- Networking with other European projects regarding sustainable mobility and electromobility to reach a higher diffusion of both.
- firms and trade unions Mobility Management involvement, to optimize results in regard to workers' needs, through specific facilities and tools for e-scooter users
- University involvement in accordance with the user target that use scooters very much. How can the Ele.C.Tra model involve them?
 - by specific dissemination campaigns to be held in the different universities of Barcelona, with particular attention to technological device use (website, the Ele.C.Tra. app, social network, etc, developed by the WP7 tasks);
 - promoting e-charging points near universities, like the main supporting infrastructure available;
 - raising awareness in families, focusing on safety (topics already noted by interviewees);
- info web-based platform carrying out and promotion, in order to ease e-scooter users and linked to the Ele.C.Tra. website. In this way, the platform represents the main virtual info-point to inform oneself and then to use e-scooters by citizens and tourists, and the main communication link between users and the Mobility Manager and other stakeholders.



5. COORDINATION WITH INNOVATIVE ENERGY SYSTEMS

It is well known that, in terms of final energy consumption, electric vehicles are more efficient than conventional ones. However the achievable energy savings are not so clear if the electricity required for electric vehicles comes from fossil fuels combustion. Besides, for the production of the electric vehicles it is required much more energy than for the conventional ones, mainly due to the high energy required for producing their batteries.

For this reason the electrification of the mobility should be linked with an increase of energy production from renewable sources. Moreover electro mobility and renewable energies production could have a positive retrofitting, so the electric vehicles could be charged during periods of high renewable sources production and low electricity demand. In this sense electric vehicles can work as a regulator of the electrical system. For the transportation and distribution of the electricity there are significant energy losses. In Spain this losses can achieve values of 10% of total electricity production. Producing the electricity in the same place where is consumed (in site production) can avoid these energy losses.

Solar photovoltaic is a suitable technology to produce in site electricity in the electric charging points. Among the main reasons are:

- The electricity is produced in DC so it's not required an inverter to adapt the current to the battery.
- The solar resource is easy to estimate.
- It is modular in size and shape, which means that the photovoltaic surface can be adapted to the space availability or existing energy demand.
-

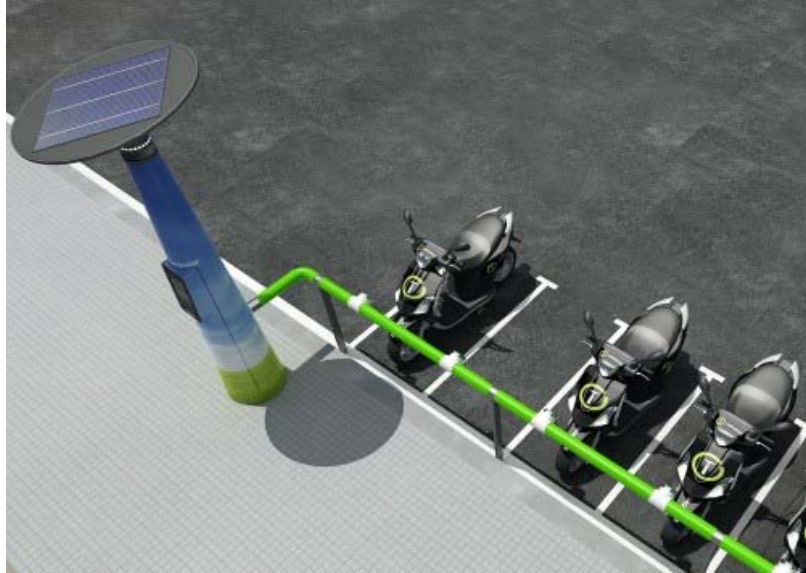
However photovoltaic energy deals with high investment costs and low energy performances. For that reason in the existing initiatives solar energy production is very low related to the potential energy demand of the electric charging point.



5.1. INITIATIVES OF MOBILITY RELATED SUSTAINBLE ENERGY PRODUCTION

5.1.1. INITIATIVES RELATED WITH CHARGING POINTS

Mobecpoint is an initiative specifically designed for electric motorbikes. Is a simple electric charging point designed to allow 25 simultaneous recharge two-wheel electric vehicles (bicycle or motorcycle). The station also allows the recharge of other electric vehicles like quads or Segway type.



Mobecpoint electric charging point for motorcycles

The station integrates a photovoltaic solar panel, but it is very small one and only produces the energy used for the signaling and screen, and also ensures power supply in case of grid's failure. Currently, in Barcelona there are six recharging points for each installation, but it is planned to increase this number to ten.

Another remarkable experience is the **RECARGO project** (Renewables + Electric CARs + Grid Optimization) developed by URBASER. Urbaser is a waste company that manages part of Barcelona's street cleaning and domestic waste, and some of the vehicles used to perform these tasks are electric.

In this project, the charging points for electric vehicles receive energy from a photovoltaic installation of 16kWp. Besides the project integrates an energy storage system, composed by the old batteries of the same electric vehicles, which accumulate the energy during the day, in order to use it when solar radiation is not sufficient to charge the vehicles. The photovoltaic panels are installed on the parking roof of one of

the factories where URBASER manages the municipal waste, and a total of fifty electric vehicles can charge there.

This project has the aim to increase the knowledge about the use of renewable energies for electric vehicle charging in industrial facilities. In addition, the project will study the viability of a second life use of electric vehicles batteries. All these features make this project one of the best initiatives currently carried out in Barcelona.

Wind energy can be also suitable for providing electricity to charging points. The main advantage of wind turbines is that with suitable wind conditions the energy production in relation to the occupied space can be higher than from solar energy. However it has some important disadvantages as elevated investment costs, the fact that electricity is produced in AC, higher visual impact and difficulties to estimate the wind resource. Also wind resource use to be quite low in urban areas.



Wind charging point (Sanya Skypump)

Sanya Skypump is an electric charging point which incorporates a 4 kW wind turbine. This is the first world's charging point that combines a cutting-edge vertical wind turbine (produced by Urban Green Energy Iberia) with an electric vehicle charging technology (developed by General Electric). The installation is located in Barcelona at Cespa's global headquarters, an environmental services company, which runs public contracts in the area of Barcelona.

The wind turbine is daily used to charge part of the electric vehicles used in street cleaning and waste collection services of Barcelona's west zone. When the charging point is not being used, the wind turbine provides the energy to the electric grid. It is estimated an energy output of 6.000 kWh/year.

Making it a **hybrid system** integrating a wind turbine with photovoltaic panels would increase energy production of charging points in addition to allow having a more stable energy production curve, so windy days use to coincide with not sunny days. In the same sense, during the night wind tends to be higher than during the day.

5.1.2. *OTHER ENERGY PRODUCTION PROJECTS*

It is also possible to find some other projects, that although are not directly related with charging electric points, integrate photovoltaic energy in mobility facilities. Some of the most relevant are **photovoltaic panels located in parking's roofs**. For future projects these parkings should integrate electric charging points fed by the photovoltaic panels.

In the **Center's parking of Caldes d'Estrac** (Barcelona) there are installed 1.440 photovoltaic panels, with a total surface of 2.407 m². The parking is also provided with three electric charging points.

The **port of Barcelona**, in order to reduce its energy consumption, economic expenditures and environmental impact, has developed an Energy Efficiency Plan. To reach this goal, nine photovoltaic installations were installed in the roofs of the parking areas and industry buildings. This installation covers a total area of 37.200 m², with 4,8 MWp power installation and generates 6,7 GWh/year. In next future it is planned to install more solar panels (180.000m²), achieving a total output of 8 MWp.



Photovoltaic installation in the port of Barcelona

The automobile factory SEAT, with its project **SEAT al SOL**, has installed the largest photovoltaic plant in Spain to cover its factory in Martorell, near Barcelona.



Photovoltaic installation in the SEAT factory

This installation has more than 20,000 solar panels, covering a total area of 135,000 m², on the roofs of the workshops and the temporal storage vehicles "open fields". The total installed power reaches 4MW. This project has been developed jointly with Gestamp Solar in order to generate clean electricity on a large scale in the same place of consumption.

As said before, a lot of energy is consumed during the manufacture of electric vehicles. Electric vehicles manufactures should incorporate renewable energies on their production systems in order to reduce their environmental impact and avoid energy losses in their networks distribution.

Aside from the implementation of new renewable installations linked to electro mobility, in Barcelona there are other initiatives to increase the share of renewable energy sources in mobility.

One of the most remarkable ones is the **factory of Stocks del Vallès** which is producing second generation fuels (around 31.000 tonnes of biodiesel per year). **Second generation fuels** are those that are produced using organic waste as a raw material. The feedstock used is recycled vegetal oils and animal fat. It is the first factory in Spain and the second one in the world which uses recycled oils for biodiesel production. The oil is collected from particulars, dumps and green points by two waste management companies: CAVISA and ROCSA. These products are made by materials that are not more allowed for human consumption, so it's a way to produce energy without producing damage to the food sovereignty, the main problem of conventional biodiesel.

5.2. INITIATIVES ON SUSTAINABLE MOBILITY WITH INCIDENCE IN ENERGY SAVING

Ele.C.Tra can also follow the guidelines of the Sustainable Urban Mobility plan of Barcelona (2013 – 2018), which has the following objectives:

- Compliance with policy environmental quality parameters: EU directive, Kyoto, etc. (annual average limit values: NO₂: 40µg/m³, PM₁₀: 40µg/m³, PM_{2,5}: 25µg/m³).



- Reduction of the number of private vehicle trip from 26.7% to 18,6% of the modal distribution
- Achieve a figure of 43% for trips by public transport (currently it stands at 40%)
- Reduce traffic victims
- Increase to 58% street space for pedestrians
- Reduce noise from traffic in 60% of public space

Those objectives strongly focus on energy saving, which is the first point that has to be taken into account when implementing renewable energies. Their implementation related to mobility will not be successful unless energy consumption on transport drops significantly.

