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Electric **C**ity **Tra**nsport – Ele.C.Tra

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Model executive planning report

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Abstract:

The model executive planning is necessary for all following working steps, because it identifies the project operating bases, in terms of set of elements useful to implement the project in all cities involved. This report is common and unique to all cities involved and project aspects.

Table of Contents

1 Introduction ... 5

2 Inputs ... 6

2.1 Ex-ante survey results ... 6

2.1.1 Pilot cities ... 7

2.1.2 Non-pilot cities ... 8

2.2 Infrastructural mobility aspects ... 10

2.2.1 Pilot cities ... 10

2.2.2 Non Pilot cities ... 11

2.3 Best practices ... 12

2.4 NSGs' suggestions ... 13

3 Key aspects ... 16

3.1 Self-Sustainability ... 16

3.2 Area of application ... 16

3.3 User target ... 20

3.4 Users' needs ... 20

3.4.1 Pilot cities ... 20

3.4.2 Non Pilot cities ... 21

4 Model ... 21

4.1 Governance ... 21

4.1.1 Area Mobility Management Offices ... 21

4.1.2 Users' incentives ... 22

4.1.3 Stakeholders involvement ... 22

4.1.4 Other actions ... 27

4.2 Service supply ... 27

4.3 E-vehicle characteristics ... 27

4.3.1 Types of vehicles ... 27

4.3.2 Characteristics and targets ... 28

4.3.3 First contextualization elements ... 30

4.4 Infrastructure aspects ... 30

4.4.1 Charging power levels ... 31

4.4.2 Charging modes ... 32

4.4.3 Connection to the AC network ... 32

4.4.4 E-charging infrastructure characteristics ... 33

4.4.5 Reference standards ... 33

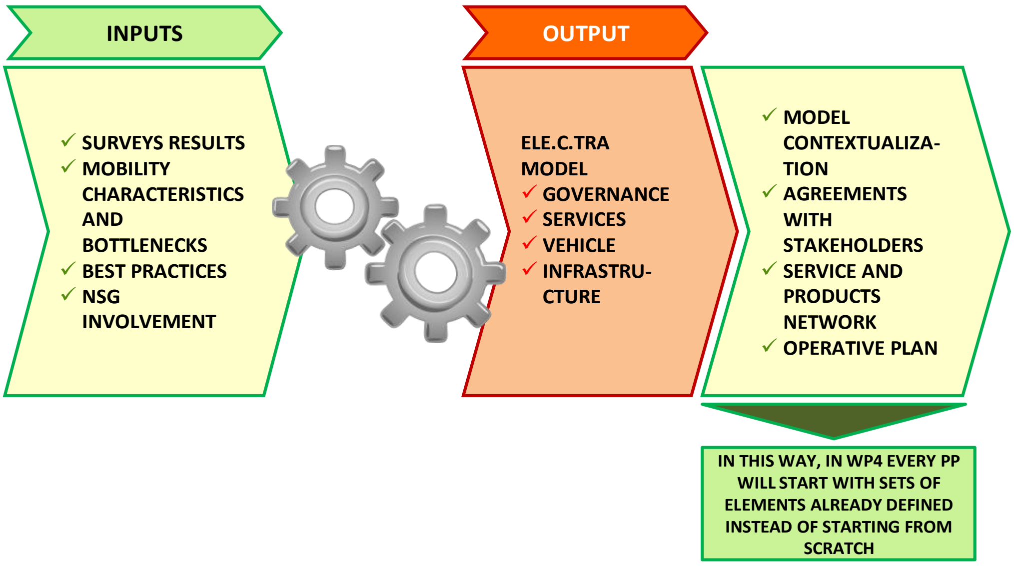
1 Introduction

This report represents the summary of the results of the model planning of the project so to create the basis for the contextualization in the 3 pilot cities (Genoa, Florence and Barcelona) and service carrying out.

The model is defined as the set of elements, issues and actions that constitute the project approach for the encouragement of the diffusion of electric vehicles. In particular, for each pilot contextualization it will be possible to choose the main aspects and elements regarding each city involved.

The model has been deployed in consistence with ex-ante analysis results and with the outcomes of the stakeholders' involvement, which it is possible to name "**INPUTS**". The model, which represents the "**OUTPUT**" of this activity, allows us to obtain a set of data and information in order to carry out "Local analysis review Report" and consequently to contextualize the model in each pilot city.

THE MAIN ASPECTS OF THE MODEL PLANNING



At a glance, the main aspects of the report are:

- identifying the common elements between all cities, by ex-ante analysis results;
- highlighting specific topics and critical issues, which limit functions and benefit the project;
- identifying a set of elements to apply in all cities (pilot and non-pilot), distinguishing the several topics.

The issues addressed in this report, which represent the main assumption for the model, are:

- self-sustainability and so the transferability of the model;
- area of application, in terms of what and how to promote and involve in the project;
- e-scooter users' target, in consistence with what is highlighted by ex-ante analysis and stakeholders' involvement;

- mobility needs of the scooter users, in order to ease the implementation of the services promoted by the project.

In this way, it is possible to identify solutions in terms of concrete actions finalized to contextualize the model in each pilot city and create the requirements to transfer the model. They can be synthetized by:

- governance actions, creating specific offices for the project aims, promoting facilities and dissemination campaigns;
- offer of services, provided by private operators;
- e-vehicle characteristics, to identify a set of common elements ;
- infrastructure aspects, in terms of requirements concerning the network of charging electric points.

2 Inputs

To create a unique model suitable not only for the pilot cities but also for non-pilot ones (“transferability model”), the following inputs have been considered:

- the survey results carried on in of each local context, mainly in terms of general mobility issues and aspects, current needs of scooter users and day-trip problems. Then, a focus on tourists’ needs is given;
- the analysis of focal points of the surveys (indicated in “Report on current mobility and network”), to identify infrastructural bottlenecks and highlight the accessibility issues for each city;
- the best practices regarding electric and sustainable mobility in the partner countries, paying attention to other European projects linked to the Ele.C.Tra goals;
- the suggestions and proposals coming from the stakeholders involved, such as vehicles and energy suppliers. These inputs could be collected during the first meeting of National Support Groups, mainly for the pilots.

2.1 Ex-ante survey results

Thanks to the ante-operam survey results, it is possible to summarise the main common aspects for the project contexts about mobility and e-mobility, distinguishing the pilot from non-pilot cities. On the other hand, identifying specific aspects is important, in order to resolve critical issues or to strengthen particular aspects.

In this way, this report gives a common “data-set” regarding the ante-operam surveys, to have a clear and useful overview of the main current situations in all partner cities.

In particular, the key aspects highlighted for every city group (pilot and non-pilot) are synthesized in the following:

- mobility aspects;
- current mobility critical points;
- focus on motor vehicles;

- focus on e-vehicles;
- e-vehicle perception by citizens;
- e-scooter users' target;
- priorities for citizens about sustainable mobility.

2.1.1 Pilot cities

Regarding the pilot cities of Genoa, Florence and Barcelona, the main results are:

- mobility aspects:
  - main attractor places, mainly regarding scooter mobility:
    - areas of high concentration of economic activity (mainly offices) and also university areas
    - the central urban part of cities, that often includes the main touristic areas (e.g. Porto Antico in Genoa, Repubblica Square in Florence, Catalunya Square in Barcelona);
    - the main urban railway stations, used by commuters (e.g. Piazza Principe/Brignole in Genoa, Santa Maria Novella and Campo di Marte in Florence and Sants station or Plaça Catalunya station in Barcelona);
  - day time slot when trips increase: 7-9 am and then approx 11 am-1 pm. For going back, in Italy the time slot 5-6 is relevant and in Spain later (6-7 pm);
  - reason: work and school;
  - main transport means: good potentiality for sustainable mobility and for all pilot cities, in terms of public transport and walking, mainly due to:
    - short distance to travel;
    - mild climate;
    - density and compactness, especially of the historical centre of the cities;
- current critical mobility points:
  - public transport use (mainly high cost for users);
  - traffic congestion;
  - parking shortage, mainly for Genoa;
- focus on motor vehicles:
  - high lack of knowledge (and then low current predisposition) about alternative solutions to vehicle ownership;
  - mainly owners;
  - short day trips (~10 km for all cities);
  - good predisposition to use scooters by tourists and residents;
- focus on e-vehicles:
  - most people has never used an electric vehicle;
  - high lack of knowledge about the real features and benefits of e-vehicles. It's important to note that in Barcelona, where there are several e-charging points already installed, most people do not know if it is possible and how to use them;
  - good predisposition to use them in the future, if there are convenient conditions;

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  - solutions most chosen: sharing and leasing based on the distance travelled. However, the complete ownership is the solution currently preferred in all pilot cities;
  - incentives: mainly discount to buy or use them, reduction of ownership taxes;
- e-vehicle perception by citizens:
  - weaknesses: mainly for high cost;
  - strengths: comfort and safety;
  - benefits: travel costs linked to fuel-price decrease, atmospheric-pollution decrease;
  - critical issues: charging point shortage, low information about e-vehicle issues;
- priorities for citizens about sustainable mobility:
  - public transport development, sustainable vehicle and intermodality improvement;
  - infrastructure for sustainable mobility development, such as solutions in order to decrease e-charging time;
  - incentive policies and actions, such as reserved lanes, bike routes, etc;
  - policies to reduce the number of circulating vehicles, such as the implementation of a tax on cars or limitations of the circulation on specific days;
  - alternative solution promotion to use vehicles (e.g. sharing);
  - innovative transport means improvement (electric and hybrid);
  - effectiveness increase of information and dissemination campaigns regarding electric and innovative mobility.

At a glance, regarding the pilots, Genoa, Florence and Barcelona analysis provides the same citizens' issues and needs and equal knowledge and perception levels regarding e-mobility. In particular, despite few people having used e-vehicles (also in Barcelona, where the e-charging infrastructure is more developed), there's great interest in trying.

2.1.2 Non-pilot cities

Regarding the non-pilot cities of Lisbon, Murcia, Rafina-Athens, Zagreb, Skopje, La Valletta and Suceava, the main results are:

- mobility aspects:
  - main attractor places: City centre and historic centre, Universities, schools and campus, Shopping centres, malls, major commercial areas, Urban areas and business zones, Touristic sites);
  - day time slot when trips increase: mostly in the morning 07:00 to 09:00 and in the afternoon 17:00 to 19:00;
  - reasons: **mainly:** Work (50% as average)+School; **other reasons:** leisure, hobby, shopping, visit;
  - main transport means: Public transport (over 45% as average), Private car (about 40% as average); **less used:** walking, bikes, trains, motorcycles and scooters;
- current mobility critical points:
  - large increase in the number of vehicles that leads to **traffic congestion, traffic jams** (having as effects: increased number of traffic accidents, increased pollution and noise, longer journey times)

  - **parking shortage**, that leads to illegal parking and high parking fees
  - **public transport:** ineffective, not appropriate, too expensive, too crowded, not covering all areas, too slow, unsuitable timetable
- focus on motor vehicles:
  - low percent of ownership regarding scooters in most of the non-pilot cities *(3% in Skopje and Suceava, 6% in Lisbon, 7% in Zagreb, 16% in Murcia and 23% in Rafina - Athens);*
  - considering the extent of most trips 10-12 km as average, the major part of the owners could use electric scooters;
  - considering the fact that most of the non pilot cities have a high car dependency and the fact that all ante-operam surveys have revealed a lack a knowledge regarding alternative solutions to cars, awareness and information campaigns are needed;
- focus on e-vehicles:
  - large percentage (over 90% in average) of the residents from the non pilot cities has never used and electric vehicle and have little knowledge on electro mobility. The need of information and awareness campaign arises, in order to promote green means on transport;
  - high percentage of people who would be interested in testing, or even buying and EV, revealing a good potentiality for sustainable mobility in the non pilot cities;
  - solutions most chosen: ownership, sharing, leasing, rental;
  - incentives: discount, no local+pollution tax, environmental bonuses;
- e-vehicle perception by citizens:
  - strengths: comfort, safety, speed, parking;
  - weaknesses: high cost;
  - critical issues: charging, lack of knowledge, possibility of being stolen
  - benefits: no carbon emissions, lower fuel costs, noise reduction, lower road taxes;
- priorities for citizens about sustainable mobility:
  - **means of transport consume the least energy and produce less pollution** (walking, bicycles, collective transport and shared car);
  - **other alternative fuels and other technologies** that allow a different motorization (electric and hybrid vehicles);
  - **collective passenger transport**: Public transport, Bus services, Intermodal transfers, Integrated ticketing, Park & Ride, Accessible transport systems, Bus rapid transit, Quality of service;
  - **sustainable (green) transport infrastructure**: greenways, bikeways, busways, railways;
  - **access restrictions**: Access management, Car Restricted Zones, Multifunctional areas, Parking Management, Pedestrian zone, Traffic calming / Speed reduction.

All non pilot city results have shown the fact that motorised traffic is one of the greatest problems the residents confront with. The question of how to enhance mobility while at the same time reducing congestion, accidents and pollution is a common challenge to all non pilot cities. The residents' positive response towards e-vehicle within all non-pilot cities would not solve the problems of traffic and congestion. Green vehicles are more fuel-efficient, but only in comparison with standard vehicles, because they still contribute to traffic congestion and road crashes. The results of the WP2 analysis within non pilot cities have shown the need of a sustainable mobility model that responds to the following:

- Gives alternative solutions to motorised traffic (like sharing, short term rental);
- Reduces traffic congestion, noise and air pollution;
- Solves the „last mile” problem by connecting users to public transport networks.

2.2 Infrastructural mobility aspects

In terms of mobility, the results of the ex-ante analysis are useful to highlight in this Report:

- the type of the attractor points usually reached and currently linked with scooter mobility, by both the infrastructural analysis of each city and the ante-operam survey results. In this light, it will be possible to identify the places more interesting for scooter users and then where it’s possible, for example, to evaluate facilitations and/or electric charging points (e.g. railway stations, parking used by scooter users, tourist attractors). In this phase, it’s not required to identify the specific places of every context (it will be done in the contextualization tasks) but only the type of attractor points to address the solutions;
- the type of infrastructural bottlenecks that could constrain the project effectiveness. However, it is not requested to specify any bottlenecks in all project cities but only the type of problems linked with e-mobility success (e.g. current shortage of electric charging points, vehicle congestion).

2.2.1 Pilot cities

The attractor places more interesting for the project and more useful in order to increase the effectiveness of the model are approximately equal to the main mobility urban attractors. In thi light, it is possible to highlight the following areas, which every contextualization analysis could evaluate for its own city and then include in the service implementation:

- near the main economic activity centres;
- railway stations, mainly used by commuters (workers and students);
- the main parking places for scooters, that are often in the central part of city,
- schools, where there’s a relevant number of students at least 16 years old. It’s interesting to highlight that in Barcelona, contrary to Genoa and Florence, students don’t use scooters to go to school, because of the high proximity of schools to residences;
- near the main university seats;
- where there are important attractor places for citizens and tourists (e.g. stadium, fair exhibitions, marina, etc);
- near motorway toll gates, if they are near the central part of the city;
- specific touristic places, often near the main car parks or in the central part of the city.

The model for the pilot cities would like to highlight the mobility infrastructure issues that could represent constraints for the implementation phase. In particular, they are:

- interchange nodes not effective, and this happens when they do not ease the day trips with more transport means and then with other innovative mobility systems, if present. For example, when there are more different places to see the timetables of different lines or transport means in the same bus stop or station, e.g. because there are more transport operators, or there is not useful information to find the transport means to continue own trip in a stop/station or, finally, there isn't information to find where to take e-scooters, e-vehicle or bike;
- lack or shortage of charging points, for the project but also in a general frame of the urban e-mobility promotion;
- road infrastructures with a low level of security, in terms of high number of accidents;
- specific road network points where there are traffic jams, mainly in the rush hour. This aspect is often due to road infrastructural bottlenecks and in this case, to use scooters in general and e-scooters in particular could be more difficult;
- infrastructural bottlenecks of the rail network used by commuters every day, that prevent public transport use by workers and students;
- parking shortage in urban areas or in specific areas, mainly for Genoa and Florence. In this case, it could be more difficult to promote reserved parking places for e-scooters and more in-depth analysis and evaluation will be necessary.

Obviously, the project focus is not on resolving these problems or the project planning of their solutions, because they are issues that involve the whole urban area and more aspects of mobility and development policies. They are indicated to clarify where or why to implement the model may be less useful, if solutions aren't planned or on-going by public bodies or decision makers.

2.2.2 Non Pilot cities

As shown above, the main attractor places for each non-pilot city are the city centre, historical centre or areas around (universities, schools and campus, shopping centres, malls, major commercial areas, urban areas and business zones, touristic sites). By analyzing each city ante-operam survey results, we can highlight the following common areas, which every non pilot could evaluate and then include in the service implementation:

- railway, metro and bus stations, mainly used by commuters (workers and students);
- main touristic attractions (temples, museums, churches, theatres, stadiums, fairs, exhibitions, galleries, archaeological sites, etc.);
- city centre and main pedestrian squares;
- main schools, universities and college campus where there is a great number of students over 16;
- main commercial centres or commercial street that act as places of attractions, creating strong mobility flows both for residents and tourists;
- near airport;

- near the harbour area or main beaches for the Mediterranean cities.

The main constraints in terms of mobility infrastructure for non-pilot cities for future implementation of the Ele.C.Tra are:

- Increase in car traffic leading to traffic network congestions, traffic jams and long trip to destination. This affects the safety level and increases the number of traffic accidents;
- lack of charging infrastructure, except Lisbon and little use of EV;
- insufficient number of parking spaces, no parking spaces for scooters;
- interchange nodes are not effective, lack of Park & Ride systems or, if present, are not implemented;
- lack of reserved lanes for buses, bikes;
- general public has little knowledge on EV and limited access to information. Lack of public awareness and information campaigns on sustainable mobility.

The above mentioned constraints will not be solved within the project, but must be taken into consideration when creating and adapting the executive service for each city.

2.3 Best practices

The actions/practices analysed have covered a variety of important topics which include mobility, energy, waste, urban planning, water, biodiversity and social cohesion. The detailed analysis results are included in "Best practices Report".

At a glance, the analysis has highlighted the keys for identifying and applying a best practice relying on the ability to optimize the qualities of an organization with practices in common with other subjects.

In this way it is possible to discover the effectiveness of energy management opportunities of electric vehicles, paying attention to citizens' needs. In particular, the following are highlighted:

- the most successful factors of innovative modes of transport will rely on high accessibility which may comprise a set of facilities and tools for users to ease e-vehicle use by citizens and tourists, for example to prevent long access walks and to extend opening hours and hire time;
- specific knowledge and best practices dissemination is not automatically transferred to other cities, in spite of the good best practice spread in European countries;
- energy systems are still highly based on non-renewable sources. Indeed, from the National Renewable Energy Action Plans one can deduce that there is very little attention to the use of renewable sources of energy for transport other than rail. It is estimated how if 2.5 % of the current fleet of passenger cars in Europe (est. 200 million) were to be powered by electricity from renewable resources, one percentage point of the 10% target for transport energy would be replenished by renewable electricity. However, current policies on electro-mobility and the rapid progress of Li-based battery technology may well lead to the required amount of 5 million cars. The contribution of electric powered mobility towards these targets is expected to be significant;

- an effective governance system to provide a centralised framework to develop e-mobility is desirable. A public private partnership might be a governance tool so it should provide a suitable democratic control of the expansion of this new technology in the city, and at the same time provide business opportunities to the private companies collaborating in it;
- the existence of previous sharing successful experiences (like Bicing in Barcelona, Car Sharing in Genoa and Bike Sharing in Florence) is useful to implement a light e-vehicle system not only in terms of ownership;
- exemplifying public promotion practices to spread new mobility models (like the electrification of the municipal fleet in) are necessary to increment knowledge and familiarity of citizens with new transport options.

2.4 NSGs' suggestions

In consideration of the role of the pilot cities in the project, specific attention has been given to the National Support Groups of the Italian pilot cities (Genoa and Florence)[1], involving several stakeholders regarding e-mobility and mainly thanks to the Launching Event and the 1st Italian NSG event:

- batteries:
  - removable batteries for only private e-scooters and not for shared e-vehicles, easing their use by those who haven't got a garage and outdoing the fixed e-charging point spread in cities;
  - having more types of batteries for scooter e-power, taking into account the practice of the Swiss Postal service, that has got 3 or 4 types of batteries for different types of routes. Then, the Swiss Postal service aims to have a fleet of 7,500 e-scooters by 2016. In the model it's possible to consider these issues only for batteries recharging at home and not heavy and after further in-depth analysis;
  - allowing the use/buying of two (or more) types of batteries by users, in order to optimize vehicle performances based of the type of trip to go on. Indeed, day-trip needs in urban context are very different from weekend-tour ones, for example. This opportunity could increase the e-vehicle appeal;
- e-charging:
  - involving students and then easing the charging by university and schools;
  - promoting e-charging points of blocks of flats and/or urban neighbourhoods;
  - promoting e-charging points in public garages, by incentives to their owners;
  - easing sponsors that allow e-charging-column installation free of charge;
  - taking into account the issue linked to e-charging speed, but in consideration of the current technical e-scooter requirements the project will do in-depth analysis for the specific theme;
- e-charging point spreading:
  - increasing effective marketing actions;
  - increasing the appeal of e-urban vehicles;

[1] The Spanish Group will meet before the end of March and the next phases of the project will include the Spanish stakeholder suggestions.

    - involving local-utility suppliers to install e-charging points if possible and if relevant;
    - taking into account solutions in accordance with landscape and urban beauty aspects;
    - trying to increase the number of e-vehicles in circulation to ease the e-charging point investments (e.g. Tesla in the USA);
- e-scooters:
    - battery operation time is not a real problem, because the distance covered every day is low (EU average: ~20 km);
    - low information level (and so low current predisposition) regarding e-vehicle use and benefits for citizens;
    - e-mobility is not a real part of the urban policy and business decisions;
    - e-scooter prices are too high, even if e-vehicle gives benefits in terms of safety and environmental safeguarding;
- how to promote e-vehicle use without specific budget by public bodies and municipalities:
    - occupation of public land tax free for sponsors that give e-charging columns free of charge;
    - free access for e-scooters in restricted urban traffic zones and/or in public transport reserved streets and/or where there's road pricing;
    - promoting urban areas only for e-vehicles;
    - promoting electric school bus services, to raise awareness with families and students on e-mobility and e-vehicles;
    - organizing an offer useful for e-scooter users and easy in terms of management and promotion (e.g. discount for using e-vehicles, charging them and using buses and/or trains);
    - providing reserved parking for e-scooters;
    - parking free for e-scooter where there's pricing for traditional vehicles;
    - reserved lanes for e-scooters;
    - priority access in the main urban and interchange car parks.

The 1st Spanish NSG was held in Barcelona, the 2nd of April 2014. Different electromobility stakeholders from different fields were present on the debate: public administration, business and civil society. Murcia and BCNecologia participated as partners of the project. Its main conclusions were:

Reasons for a low use of EV:

- It is agreed that **EV are not well known,** though at the moment we are at a stage in which the electric vehicle piques curiosity. It is agreed that we are in a process that is just now beginning and that will continue expanding with the decline of oil.
- The **main problem** is a **fear of the battery running out**, despite current models maintain a degree of autonomy.
- An added difficulty is that the conventional motorcycle is treated very well right now, with people parking them wherever they like… in this respect it needs to be many additional advantages in order to convince someone to switch from gas to electric.

- It has been proven that **the main market is in fleets**, or larger groups of vehicles. Ever since the government decided to draft tenders to require part of their public vehicle force to be electric, their presence has grown. With respect to the private sector, the biggest market is in local businesses (delivery pizza, mail service…); because these users tend to do more economic calculations to see if an electric motorcycle is worth its cost.

Advantages of EV:

- **Better environmental conditions** are mentioned as the main advantage. Electric vehicles are noiseless. It is also noted that although the electric scooter does not have harmful emissions for the quality of city air, if electricity does not come from renewable energy sources pollution problem remains, only moving to a different place. Furthermore, not all emissions are kept in the electric vehicle; those due to bearings, resuspension of particles, fluids etc. will continue existing, so drastic measures in the reduction of traffic are the main need. This is not to say that the switch from car to motorcycle is not beneficial. It could be interesting to prioritize the electric motorcycle in the most polluted areas of the city.
- It is noted that **future vehicles must run on renewable or residual energy**.

What can the government do to encourage the use of EV?

- **Make sure the infrastructure is there**. In Barcelona, for example, there is an extensive network of charging stations. Most of them are public and free for users because the Municipality pays for the purchase, but this cannot last forever. Soon they will pay for electricity in the same way that people pay for gasoline now. It is also noted that **electric vehicles can be charged at home or in parking lots**. For this the neighbouring communities will have to be helped with respect to organizational, technical, urban, and government matters.
- Set the example and make their fleet even more electric. **More public purchase of electric motorcycles is requested**.

About the electric market:

- Energy supply to EV, now almost covered by public administrations, represents new business opportunities. It is mentioned that the current network of gasoline stations could be recycled to be used as recharging points.
- Selling electric motorcycles is very complicated, and a very large company should assume the economic risks that this implies for the present. Small companies have many market difficulties.
- **Electric bicycles** are brought up: a good analysis of the experience with shared bicycles needs to be made, a program that has already expanded to many cities because of the elements it shares with the shared motorcycle. Its establishment is considered very important (above all in sectors with defined populations, or in areas with more hills) and theft is identified as a big problem that needs solving.

Implementation of a scooter sharing system.

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- The difficulty in countries with a Mediterranean environment and in Spain in particular, is the **reluctance to abandon the ownership to certain consumer goods, including vehicles**. For example, systems like car sharing still have very little usage.
- **Economic difficulties** are important on sharing systems management.
- **Price integration** between public transportation and sharing systems and also the creation of the personal mobility card in Barcelona could be elements that contribute to the use of EV
- It has been proven that **the main concern with regards to motorcycles is safety**, whether electric or gasoline powered. It is necessary to put more effort into road-safety education. It is asked that the government acts on the physical factor of the road itself (eliminating visual obstacles, pavement, passing lanes…) since with respect to the human factor and the vehicle itself the government has fewer means to act. It is warned that the implementation of sharing services grants more access to scooters to the inexperienced or insufficiently qualified driver. Then it is asked of businesses to be very **careful with the maintenance of the motorcycles** in order to minimize vehicle related accidents.
- When the time comes to promote the shared electric motorcycle, it is asked not to be an indiscriminate promotion. Prioritizing, through varied metering, for example, off-peak usage hours in which electricity is cheaper.
- In the case of Barcelona, where motorcycle usage is very high (30% of all vehicles are motorcycles) it is proposed **not to encourage motorcycle use in general but to promote the change from the conventional motorcycle to the electric.**

3 Key aspects

The main assumptions to define the model are its area of application, the target and the e-vehicle users' needs, noted by the ante-operam survey results and the NSGs' suggestions. In this light, it will be possible to optimize the project effectiveness addressing actions and solutions.

3.1 Self-Sustainability

The main assumption of the project is the financial self-sustainability. Indeed, the project does not include any financial funding to "force" the market and to acquire directly e-vehicles. In this way, it's easier the model will continue in the afterlife project period and also in other non-pilots and non-partners contexts.

In order to guarantee the future application of the model, it's essential to carry out and continuously strengthen the stakeholder network, connecting the partners with other public bodies, suppliers, firms, etc…

3.2 Area of application

In consideration of:

- ante-operam survey results, that have shown the predisposition of citizens and tourists for light e-vehicles in general and not only for scooters;

- similar law/rule framework regarding all light e-vehicles, including quadricycles and taking into account the 2002/24/EU directive;
- same functions and type of demand mobility to which vehicles are addressed (short urban day trips);
- similar technical requirements and performance in urban contexts;

it may be interesting to extend the focus of the project to all light e-vehicle types. Obviously, for every local context whether and how to apply this aspect will be analyzed, including other e-vehicles and developing synergies and links with other actions/policies.

In most of the countries involved in the project, the main differentiation regarding the types of e-vehicles, that can be assimilated to e-scooters in terms of mobility functions, is referred to the maximum values of power and speed. At a glance, it’s possible to identify:

- mopeds, with max power of 4 kW and 45 km/h;
- motorcycles, with power and speed higher.

In the following table, there are further details about type of vehicles and licences in accordance with each rule and law national framework.

	DIRECTIVE/LAW	VEHICLE CATEGORIES	VEHICLE CHARACTERISTICS	LICENSES
ITALY	2002/24/CE DM 31.1.2003	Moped “ciclomotore”	max speed of 45 km/h max power of 4 kW	AM (min 14 y.o.)
		Motorcycle “motociclo”	speed and power higher	A1 (min 16 y.o) A2 (min 18 y.o) or A
SPAIN	2002/24/CE	Moped “ciclomotor”	max speed of 45 km/h max power of 4 kW	AM (min 15 y.o.)
		Motorcycle “motocicleta”	speed and power higher	A1 (min 16 y.o) A2 (min 18 y.o) or A
PORTUGAL	2002/24/CE DL 44/2005 de 23Fev	Moped “ciclomotor”	max speed of 45 km/h max power of 4 kW	AM (min 16 y.o.)
		Motorcycle “motociclo”	speed and power higher	A1 (<=11Kw; min 16 y.o) A2 (<=25Kw; min 18 y.o) or A (all power; min 24 y.o or 2 year A2 experience)
ROMANIA	2002/24/CE GEO 195/2002	Moped “moped”	max speed of 45 km/h max power of 4 kW	AM (min 16 y.o.)
		Motorcycle “motocicleta”	speed and power higher	A1 (min 18 y.o) A2 (min 18 y.o) or A (min 18 y.o)
GREECE	separate law framework for e-scooters	Moped Μοτοποδήλατο (“motopodilato”)	max speed of 45 km/h max power of 4 kW	AM (min 16 y.o.)
		Motorcycle Μοτοσυκλέτα (“motosikleta”)	speed and power higher	A1 (min 18 y.o) A2 (min 18 y.o)
MALTA	Subsidiary Leglisation S.L.65.26	Moped	max speed of 45 km/h max power of 4 kW	
		Motorcycle	speed and power higher	
MACEDONIA	Law for safety of traffic on roads	„Велосипед со помошен мотор“	max speed of 25 km/h max power of 0,25 kW	A1 (min 14 y.o)
		„Мопед“	max speed of 45 km/h max power of 4 kW	A (min 16 y.o)

CROATIA	Act on Road Traffic Safety (NN 67/2008, 48/2010,74/2011 and 80/2013)	Moped	max 50 ccm, max 50 km/h	AM (min 15 yr. old)
		b)A1 motorcycle c) A2 motorcycle d) A motorcycle	b)up to 125 ccm, 11kW c)up to 35 kW, less than 0,2 kW/kg d)over 35 kW	b)A1(min 16 yr. old) c) A2 (min 18 yr. old) d)A (min 20 yr. old)

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3.3 User target

In terms of user target, there is not a relevant gap between pilot and non-pilot cities. Indeed, the ante-operam surveys have clearly highlighted the main user target is characterized by:

- young people, about 16-35 years old;
- students or workers;
- those who take short day trips from home to school or office (max ~30 minutes per trip);
- men and women have very similar interests.

The model identifies, in particular, 5 user targets, closely linked to mobility needs:

- systematic short trips (workers and students);
- systematic long trips (workers and students);
- non-systematic trips (tourists and residents);
- firm fleets for internal/short trips (e.g. to deliver pizzas or to reach another side of the firms/factory where the user works);
- firm fleets for urban trips (e.g. for mailmen or to deliver quickly small goods).

So, there are across-the-board needs, that could influence the e-vehicle type choice, such as:

- garage availability;
- sharing;
- charging in own final destination of the trip (school, office or at home).

These aspects are linked with the e-vehicle characteristics in §4.3.

3.4 Users' needs

3.4.1 Pilot cities

The ante-operam survey results and the suggestions of NSGs have highlighted the following users' needs, that may be focused not only on the same aims of mobility plans or development actions identified by public bodies:

- more information regarding e-mobility and the solutions available and then more effective dissemination campaigns;
- saving time today spent for travelling, by:
  - decreasing vehicle congestion, thanks to the reduction of the number of trips carried out with private vehicles;
  - having more facilities for motor vehicles or bus/train users;
  - increasing and upgrading of the mobility infrastructure, in order to ease day trips;
  - increasing the number of parking places and their accessibility in urban contexts;
- easing the intermodality with scooters, e.g. train+scooter or bus+scooter or scooter+walking for short distances in city centres;

  - resolving concrete issues for e-scooter users, such as removable batteries and helmets in case of vehicle sharing.

3.4.2 Non Pilot cities

Regarding non-pilot cities of Lisbon, Murcia, Rafina-Athens, Zagreb, Skopje, La Valletta and Suceava, the ante-operam results have highlighted the following main needs:

- more information and awareness campaigns on electric mobility, with particular reference to the economic and fiscal incentives, the benefits of the electric vehicle;
- the need of charging infrastructure within the city;
- the need of infrastructure investment, such as:
  - more parking spaces for cars and special parking spaces for scooters;
  - more facilities for public transportation and effective interchange nodes, easing intermodality by combining transport means;
- need of traffic decongestion and pollution reduction.

4 Model

4.1 Governance

In this case "governance" refers to all processes of management and decisions that seek to define actions, improve solutions and verify performance for the project implementation, without directly including infrastructural upgrading actions.

4.1.1 Area Mobility Management Offices

The Area Mobility Management Offices are the physical and virtual places, one for each pilot, 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 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.

Most activities above indicated have already started up, by the Launching Event, the creation of NSGs and the other tasks of the project.

4.1.2 Users' incentives

The model identifies some of the incentives that can be activated by public bodies, large-scale distributors and energy suppliers. The ones by the e-vehicles suppliers will be evaluated through more in-depth analysis and taking into account every specific supplier and context during WP4.

1) public transport reserved lanes use by e-vehicles, that allow e-vehicle users to decrease the day-trip time avoiding traffic jam issues and without to create constraints for buses. This incentives could be very useful mainly in the Italian pilots;
2) restricted traffic zones use by e-vehicles, they are sustainable and noiseless;
3) free e-vehicle park where now there is park pricing with free e-charging, if possible. In this way, it's possible to guarantee certain parking time to commuters that use sustainable and environmental safeguarding vehicles, as e-scooters, in metropolitan areas;
4) free e-vehicle park and e-charging in private parks, also covered. In this way, the project will involve and raise private stakeholder awareness of sustainable mobility. Indeed, they are strong interests in urban mobility;
5) free e-charging given by large scale distributors, energy suppliers or other stakeholders. This aspect is also a marketing opportunity for those who supply the free service for increasing the number of its own customers, for promoting specific discounts or green communication/marketing actions;
6) discount for e-scooters users to use in specific shops or markets;
7) discount using Fidelity Card systems;

4.1.3 Stakeholders involvement

The stakeholders involved in the project give an important contribution to the model, by, for example:

- creation and management of the service in the pilot/pilots where their vehicle are implemented, with the support of the project team during the experimentation period;
- promotion of the e-vehicle use both for working/studying day trips and for tourists;
- suggestion and notes about the several aspects linked to the issues, such as needs, critical points, technical requirements, etc;
- concrete actions to allow the supply of e-vehicles and/or easing vehicle use by citizens and tourists.

The stakeholders are involved mainly by the National Support Groups, that allow them to exchange information and issues about the implementation. In this light, the project includes two events for each NSG. Then, the non-pilot cities also have their own NSG, in order to create the assumptions to implement the model in the future.

Further actions are focusing on stakeholder involvement to maximize the solutions' effectiveness and they are detailed in the following paragraph.

The project involves several types of stakeholders in order to allow them to obtain benefits. In particular, it's possible to identify 4 categories of stakeholders:

- business, focusing on the e-vehicle and their components suppliers/distributors, ex. e-vehicle and technological suppliers, retailer and rental shop;
- infrastructure, in terms of infrastructure, linked to e-vehicle use, manager involving attractor poles (malls, touristic point managers, etc), transport and other public service operators, charging points and energy suppliers;
- demand, focusing on the user needs satisfaction, mainly involving firms, commuter associations, schools, universities, public offices, tourists operators, hotels and malls/shops involving their customers;
- institutional, addressed to raise institutional subjects awareness of the Ele.C.Tra. goals, taking into account subject as local authorities, public bodies, associations, universities and research institutes, radio stations, etc.

The benefits that can be obtained thanks to the involvement in the project for each type of stakeholders are summarized in the table below, distinguishing 4 different types of actions (communication/promotion, development opportunities, synergies and mobility issues). Obviously, It's useful to highlight benefits can be identify in a better way thanks to NSG inputs and implement in each specific context involved.

WHY SHOULD STAKEHOLDERS JOIN THE PROJECT?

	BUSINESS	INFRASTRUCTURE	DEMAND	INSTITUTIONAL
COMMUNICATION/PROMOTION	To increase marketing action effectiveness, in terms of promotion of their products and services and in consideration of the wide range of type of users involved.	To increase marketing action effectiveness, increasing the interest towards the electric mobility and, as a consequence, the number of consumers	To raise their users/customers/students/etc awareness of sustainable mobility and innovative means of transport, taking into account the environmental issues. In this light, social responsibility will be improved	To raise citizens awareness of environmental and sustainable mobility issues and so in terms of social responsibility
	To improve the visibility of their products/services		To improve the visibility of their products/services (mainly for tourist operators, hotels, malls and shops)	To ease the promotion of the institutional objectives and so their achievement
	To acquire new markets (new geographical contexts and/or new customers)		To improve accessibility and acquire new customers (mainly for hotels, malls, shops, tourist operators)	
			To improve the touristic appeal of their cities (mainly for tourist operators, hotels, malls and shops)	To improve the touristic appeal of their cities

	BUSINESS	INFRASTRUCTURE	DEMAND	INSTITUTIONAL
DEVELOPMENT OPPORTUNITIES	To ease the trade of their products (e-vehicles and them components), thanks to the set of incentives the project gives to citizens and tourists	To improve the number of e-vehicles users, and so the purchase of their recharge services	To improve the purchase of their products/services indirectly by marketing actions and discounts linked to the e-vehicle use (for firms, malls and shops)	
	Innovation of their business, by the e-vehicle and its components purchase	Innovation of their business, by the e-charge purchase or energy supply for e-vehicles	To allow their users/customers/students/etc to use innovative products like e-vehicle and so to satisfy their needs both implicit and explicit	To support the modal shift to innovative and sustainable means of transport
	Diversification of the products/services supplied on the national/international market (e.g. not only sharing but also buying, hire and end-purchase)			
	To acquire new markets (new geographical contexts and/or new customers)	To extend the energy supply network also thanks to agreements with public bodies and/or privates		
	To improve the visibility of their products/services	To improve the visibility of their products/services		

	BUSINESS	INFRASTRUCTURE	DEMAND	INSTITUTIONAL
SYNERGIES	To be included in NSG National Support Group with useful exchange of information and acquisition of new subjects for future cooperation, both between other local providers and between international subjects	To be included in NSG National Support Group with useful exchange of information, between other local providers and between international subjects	To be included in NSG National Support Group with useful exchange of information, with other local subjects, public authorities, and international subjects	To be included in NSG National Support Group with useful exchange of information, enhancing the cooperation links with not only local stakeholders but also international subjects
MOBILITY ISSUES	To support and participate in the experimentation of an innovative mobility model	To support and participate in the experimentation of an innovative mobility model	To support and participate in the experimentation of an innovative mobility model	To support and participate in the experimentation of an innovative mobility model
			To improve the quality of life of users, thanks to trips less stressful	To improve the quality of life of citizens, thanks to trips less stressful
			To decrease the time spent for day trips and parking for workers and students	To raise awareness of mobility issues and sustainable transport, in accordance with European policies and 20-20-20 strategy
				To improve the sustainable mobility, in order to reduce the atmospheric pollution and noise

4.1.4 Other actions

To strengthen the exchanging of information, the dissemination and the relevant stakeholders' involvement through specific actions, the model includes:

- School and university involvement, to focus on young students (at least 16 years old), in accordance with the user target that use scooters very much. How can the model involve them?
    - By specific dissemination campaigns to be held in schools, with particular attention to technological device use (website, app, social network, etc.);
    - By specific events with teachers and pupils;
    - Promoting e-charging points by schools (columns, if present) and/or in schools (thanks to removable batteries), like the main supporting infrastructure available;
    - Raising awareness in families, focusing on safety (topics already noted by interviewees);
- firms Mobility Management involvement, to optimize results in regard to workers' needs, through specific facilities and tools for e-scooter users (e.g. discount to buy/to hire an e-vehicle, reserved scooter places in the firm's park if present);
- info web-based platform carrying out and promotion, in order to ease e-scooter users and linked to the project website www.electrproject.eu . 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, if possible;
- other dissemination campaigns, focusing on specific user target and/or local needs.

4.2 Service supply

The Model identifies more types of service in order to acquire e-scooters by users. Each city contextualization will allow us to choose the most suitable service or services or to tune with the local needs and issues. In this light, the model identifies:

- Buying the e-vehicle by citizens or tourists, with discounts if possible;
- E-vehicle hire for periods longer than a few days and until 6 months, focusing on workers' and students' needs;
- E-scooter sharing for short periods (max a few days), mainly focusing on tourist needs or non-systematic resident trips but also for regular users;
- End purchase of the e-vehicle after hire/sharing period.

4.3 E-vehicle characteristics

4.3.1 Types of vehicles

The categories of electric vehicles, which can meet the characteristics of the project, include the following, as indicated by DIRECTIVE 2002/24/EC, chapter I, "Scope and definitions", Article 1 , subsections 2 and 3:

- two-wheeled (scooters , for example);
- three-wheeled (tricycles);
- four-wheeled (quadricycles).

In summary we have:

- mopeds: two- wheeled vehicles, three-wheeled vehicles or quadricycles with a max speed of 45 km/h and a motor max power of 4 kW;
- motorcycles: two- wheeled vehicles, three-wheeled vehicles or quadricycles with a max speed higher than 45 km/h and a motor max power higher than 4 kW.

4.3.2 Characteristics and targets

In consideration of the greater diffusion of e-scooters in Southeast Asia, it is easy to find an important number of Chinese suppliers.

However the e-vehicle quality component is an important aspects. For example, the battery can be considered one of the fundamental components that determines substantially the basic performance of the EV (speed, and cost of maintenance parts, etc. .). Even the possibility of removal of the battery may affect the performance, in this case for the charging of EV.

Consequently, the aspects that influence the choice of an EV can be several and in this case we tried to synthesize in the Table A below, trying to classify the EV types in according to the type (mopeds or motorcycle).

The work is carried out with the support of the stakeholders participation in the Italian National Support Group. In this light, we considered the elasticity of the system (e.g. types of batteries, movable batteries or not) and we have indicated the technological choices that each category of electric scooter has to offer. It's important to point out what summarized in the tables A and B below is approximate because of the market and technological changes, specific needs in every context, etc.

Table A: the main technical characteristics of vehicles suitable for the service

	POWER	
	≤ 4 kW	> 4kW
SPEED	≤ 45 km/h	> 45 km/h
BATTERY LIFE (km)	30 km-80 km	60 km-80 km
TYPE OF BATTERY	Litium, silicon, silicon gel, lead	Litium, silicon, silicon gel
CHARGING TIME	from 1h to 6 h	from 1h to 6 h
CHARGING CYCLES OF BATTERY	from 400 (silicon, silicon gel, lead) to 2000 (litium)	from 400 (silicon, silicon gel, lead) to 2000 (litium)
MOVABLE/FIXED BATTERY	both	both
CHARGING CONNECTORS	Schuko for household charging 16A single-phase (3A type) for public access areas However there are plug adaptors	Schuko for household charging 16A single-phase (3A type) for public access areas However there are plug adaptors

The Table B below links the main technical characteristics of the vehicles with the specific project users' target.

The model identifies, in particular, 5 user targets, closely linked to mobility needs:

- systematic short trips (workers and students);
- systematic long trips (workers and students);
- non-systematic trips (tourists and residents);
- firm fleets for internal/short trips (e.g. to deliver pizzas or to reach another side of the firms/factory where the user works);
- firm fleets for urban trips (e.g. for mailmen or to deliver quickly small goods).

So, there are across-the-board needs, that could influence the e-vehicle type choice, such as:

- garage availability;
- sharing;
- charging in own final destination of the trip (school, office or at home).

Table B: the main technical characteristics of vehicles and targets

TARGET	POWER	TYPE OF BATTERY	MOVABLE BATTERY	OTHER
SYSTEMATIC SHORT TRIPS (WORKERS AND STUDENTS)	≤ 4 Kw	Lead Lead Gel Silicon Gel Lithium	better YES	
SYSTEMATIC LONG TRIPS (WORKERS AND STUDENTS)	> 4 Kw	Silicon Gel Lithium	better YES	
NON-SYSTEMATIC TRIPS (TOURISTS AND RESIDENTS)	both	Lead Lead Gel Silicon Gel Lithium	Not relevant	2 or more seats in each vehicle
FIRM FLEETS FOR INTERNAL/SHORT TRIPS	<= 4 Kw	Lead Lead Gel Silicon Gel Lithium	better YES	
FIRM FLEETS FOR URBAN TRIPS	> 4 Kw	Silicon Gel Lithium	better YES	
GARAGE	Not relevant	Not relevant	better YES	
SHARING	Both	Silicon Gel Lithium	Not relevant	helmet compartment in every scooters
CHARGING IN OWN DESTINATION	Not relevant	Lead Lead Gel Silicon Gel Lithium	YES	

4.3.3 First contextualization elements

In the contextualization phase, more in-depth analysis will be carried out in order to choose and tune in all aspects suitable for every context. In this case, it will be possible to create the basis for future implementation in non-pilot (and non-partner) cities.

In this light, it is possible to identify the following aspect that could influence the choice of the type of e-vehicles:

- specific weather conditions (e.g. too cold in winter);
- geographical characteristics (e.g. mountains or hills);
- e-charging network and spread of charging points;
- road infrastructure critical issues (e.g. width or type of pavement of the main roads);
- strong vehicle congestion in the main roads in cities, that could limit the speed of vehicles.

4.4 Infrastructure aspects[2]

The charging points for electric vehicles are currently characterized by considerable cost for the charging station that include the infrastructure and the system of management and control (Motherboard and Identification System).

Generally, the current system has planned and created for electric cars without making any kind of evaluation to other electric vehicles (light electric vehicles for example). In this light, the current charging system is mainly characterized by more stations with only 1 or 2 sockets in each charging point, due to the e-car charging needs (long stop time to charge and not more than 1 time per day).

Nevertheless in large urban areas of Mediterranean Europe the strong diffusion and the good predisposition of residents and tourists to use light electric vehicles, such as scooters, could develop a network of "light" charging more focused on the spread of points and connection sockets rather than the station itself, changing the model and how to charge e-vehicles.

So, the current model to charge e-vehicle is not completely suitable for e-scooter, considering the specific users' needs, such as mode of use (frequent short trips), more stops on the same day and in different areas too, battery life (more than daily use) and recharge times (between 4 and 6 hours). On the other hand, these needs could develop a different charging system, with short charging time (up to 30 minutes) but several times in a day and in different places of the city.

[2] The paragraph has been written thanks to:
European Green Cars Initiative: "Facts & Current Status of the Standardization for Electric Vehicles: Batteries and Charging Infrastructure"
Deliverable 7.2 Standardization issues and needs for standardization and interoperability Version 1 of "Green Emotion project" http://www.greenemotion-project.eu/home/index.php:
"D.2.8 Overview of FEV-related Current and Upcoming Standardization", Action ICT4FEV funded by the European Union in the framework of the European Green Cars Initiative under the FP7
"Focus Group on European Electro-Mobility Standardization for road vehicles and associated infrastructure: Report in response to Commission Mandate M/468 concerning the charging of electric vehicles", CENELEC

4.4.1 Charging power levels

Essential in the specification of charging infrastructure is the **power level**. Several power levels can be defined according to the power taken from the grid and the charging speed, if possible.

In this way, it's possible to define 3 different charging types: "normal", "semi-fast" and "fast".

Normal charging is referred to a power level corresponding to standard power outlets typically available in residential installations. The rating of standard power outlets varies depending on the regions of the world.

In most European countries the standard outlet is 230V, 16A, up to 3,7kW, which allows to obtain 10kWh of a typical medium-sized vehicle with max three hours of charging time and offers adequate power for overnight charging (typical practice for both private and commercial electric vehicles).

In some countries however the standard outlets are lower rated (e.g. United Kingdom 13A, Switzerland 10A).

Semi-fast charging is referred to a use of levels exceeding those of a standard domestic outlet, but which could be made available in a typical residential or commercial setting. It can be achieved either with a higher current single-phase connection or with a three-phase connection.

Semi-fast charging allows the charging of medium sized vehicles in just under one hour and for a range of 50km. The power level of 22kW is generally accepted as the upper limit of "semi-fast" charging

Finally, for fast charging higher power levels are used. This creates the need of specific infrastructure beyond standard domestic or industrial socket-outlets, with typically charging power levels higher than 22 kW.

The charging can be performed with a DC or an AC connection between the vehicle and the charging post.

In the DC case, a fixed battery charger has to be connected to the battery, and heavier and more expensive fixed infrastructure is thus necessary. The DC charging stations may be:

- regulated, where the charging current dispensed by the charger is controlled by a communication signal from the vehicle, or unregulated, where this current is controlled on-board the vehicle; corresponding in this case to a DC grid;
- isolated, where there is a galvanic separation between the DC connection and the AC grid (through transformer) or non-isolated where the DC connection is galvanically connected to the AC grid.

It's useful to highlight the fast charging system is now in phase of experimentation and it's mainly addressed to e-cars only.

4.4.2 Charging modes

The **IEC 61851** standard requires that all charging installations be protected by a residual current device (RCD), which will protect persons against electric shock in case of failure of the isolation.

The following text which describes the different charging modes is referred to the sub clause 6.2 "EV charging modes" of IEC 61851-1 standard.

Mode 1 charging: connection of the EV to the AC supply network (mains) utilizing standardized socket-outlets not exceeding 16 A and not exceeding 250 V AC single-phase or 480 V AC three-phase, at the supply side, and utilizing the power and protective earth conductors.

Mode 2 charging: connection of the EV to the AC supply network (mains) not exceeding 32 A and not exceeding 250V AC single-phase or 480 V AC three-phase utilizing standardized single-phase or three-phase socket-outlets, and utilizing the power and protective earth conductors together with a control pilot function and system of personnel protection against electric shock (RCD) between the EV and the plug or as a part of the in-cable control box. The inline control box shall be located within 0,3 m of the plug or the EVSE or in the plug.

Mode 3 charging: connection of the EV to the AC supply network (mains) utilizing dedicated EVSE where the control pilot function extends to control equipment in the EVSE, permanently connected to the a.c. supply network (mains).

Mode 4 charging: connection of the EV to the AC supply network (mains) utilizing an off-board charger where the control pilot function extends to equipment permanently connected to the AC supply.

4.4.3 Connection to the AC network

For Mode 1 and Mode 2 charging (also for Mode 3 charging with power-line communication), standard plugs and sockets can be used encompassing only phase, neutral and earth contacts. In most areas, this will usually be the standard domestic plugs as described in several national standards and typically rated 10 to 16A.

These domestic plugs are not really suited for the electric vehicle charging and then a better alternative is to use industrial plugs and sockets, as defined by the international standard **IEC60309-2**. However, the use of a physical control pilot conductor (Mode 3 and 4) needs the introduction of specific accessories for electric vehicle use, such plugs and sockets described in the international standard **IEC62196** ”Plugs, socket-outlets, vehicle couplers and vehicle inlets - Conductive charging of electric vehicles”.

Part 1 of this standard gives general functional requirements, integrating general requirements from the industrial plug standard **IEC60309-1** with the electric vehicle requirements of **IEC61851-1**. Physical dimensions for AC accessories are treated in Part 2, which presents standard sheets for several types of plugs and socket-outlets, such as:

- type 2: three-phase plug rated for currents up to 63A, and with two auxiliary contacts. It is based on a production by the German company Mennekes. The need for three-phase accessories was expressed by 29 European car manufacturers and utilities, recognizing the potential benefit of three-phase charging;

- type 3: also a three-phase type, and based on a design by Italian company SCAME further adopted by the ”EV Plug Alliance”.

A new common standard framework will be defined by the end of 2015. In this light, the model is built so that to allow the integration with the new rule/law framework.

4.4.4 E-charging infrastructure characteristics

Compared with the IEC standard described above, in the following table the technical characteristics that could have the charging electrical points for the electric vehicles in the project are described, in consistence with the different how to use.

Table C: the main characteristics of e-charging infrastructure

	PUBLIC AREAS	PRIVATE AREAS WITH PUBLIC ACCESS	PRIVATE AREAS
E-VEHICLE CHARGING MODES (IEC 61851-1)	Mod 2/Mod 3	Mod 2/Mod 3	Mod 1/Mod 2/Mod 3
RFID VEHICLE IDENTIFICATION SYSTEM	yes	• Yes, in case of energy trade • No, with free energy supply	Not necessary
SOCKET (IEC 69-6)	Socket for single-phase 16A connector (3A type) for e-charging in public access areas	Socket for single-phase 16A connector (3A type) for e-charging in public access areas	Socket for: • Schuko connector for household e-charging • single-phase 16A connector (3A type) for e-charging in public access areas
SAFETY SYSTEM COMMUNICATION SYSTEM VEHICLE/INFRASTRUCTURE (IEC 61851-1)	Present in the e-charging point and light e-vehicle with safety system	Present in the e-charging point and light e-vehicle with safety system	Not necessary

4.4.5 Reference standards

The specific reference standards are:

- **CEI EN 61851-1** Electric vehicle conductive charging system – General Information;
- **CEI EN 61851-22** Conductive charging – AC electric vehicle charging station.
- **CEI R069-001 (CEI 69-10)** AC connection devices for electric vehicle conductive charging
- **CEI 69-6** Standardisation sheet on plug and socket for connecting electric road vehicles to the electricity grid.
- **CEI EN 60950-1** Information technology equipment – Safety – Part 1: General requirements

- **CEI EN 610000-6-1** Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light industrial environments.
- **CEI EN 610000-6-3** Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Emissions for residential, commercial and light industrial environments.
- **CEI CT 312-1 Safety** instructions for electric road vehicle recharging stations.

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