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Promotion & Dissemination Projects

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

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Report on transferability parameters

Project Co-funded by the Intelligent Energy Europe Programme of the European Union

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

Abstract:

"Report on transferability parameters" is useful to identify the main model aspects, by a unique and simple set of parameters (quantitative and qualitative) and in consistence with the contents of the deliverable "Model executive planning Report", that shall be adaptable to all non-pilot cities involved and other non-partner urban areas in the future.

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1. INTRODUCTION

The “Report on transferability parameters” is the deliverable referred to the project, in order to identify the transferability parameters. In this light, it’s possible to highlight the main model aspects, by a unique and simple set of parameters (quantitative and qualitative), that shall be adaptable to all non-pilot cities involved and other urban areas in the future.

In particular, the transferability parameters indicated within this report represent the set of elements already identified in the “Model executive planning Report” that are suitable for a future implementation:

- in all non-pilot contexts;
- in non-partner cities.

In this way, this analysis includes common elements/parameters that can be applied in every city and that aren’t constraints for the development of the model in the European countries.

So, this Report recaps the following topics:

- area of application, in terms of type/characteristics of e-vehicle suitable for non-pilot cities;
- type/characteristics of the main EleCTra user target, also in the future;
- user needs;
- type of user incentives that could be implemented or evaluated;
- type/characteristics of stakeholders that could be involved to increase the Ele.C.Tra effectiveness in the future and for non-pilot cities;
- elements and characteristics of further dissemination actions, that could be interesting and useful for the e-mobility development;
- type of services to implement;
- specific e-charging point and e-vehicle aspect to increase the spread of e-mobility in Europe.

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2. INPUTS

In order to create a unique transferability model for all non pilot cities the following inputs have been considered:

A. **The survey results carried on in of each local context,** namely the followings:

2.1. COMMON MOBILITY ASPECT OF NON PILOT CITIES

Non pilot city		Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
Mobility aspect	**Main attractor places**	City centre Business zones Historic centre	Downtown centre Areas around the city centre Port Airport Famous monuments Museums Big urban areas of Eastern Attica	City centre Famous monuments University Airport Museums Shopping centres and malls	City centre Shopping centres Monuments	City Centre (36%) North part of the city (new districts) University Commercial street Shopping Centres College Campus Malls	Major commercial and service areas Universities (and other schools) Hospitals City centre Historical centre Parks	Harbour area Museums Galleries Archaeological sites Beaches Religious sites Natural attractions
	Day time slot when trips increase	Morning Afternoon	Morning: 07 to 09 Afternoon: 17 to 19	Morning (59%) Noon (44% resident , 40% tourists)	**No data**	**No data**	morning hours of arrival to work	working hours 9-18
	Raison	Work Return from work School Hobby Shopping Visit	Work (48%) Hobby School Visit	Work Shopping School	Work - 27% Leisure - 22% School - 13%	Work (39%) School (22%) Leisure (18%)	Work+school (57%) Private personal reasons (34%)	Work (81,03%) School (6,03%) Hobby (3,45%);
	Main	Public transport	Own car – 45%	Public	Public	Walking (42%)	Private car (46%)	Private car (78,63%)

	Transport mean	(47%) Car Walking Bicycle Train (other) Scooter	Public transport - 25%	transport - 56% Walking – 22% Private car 21%	transport - 73% Car – 24% Walking - 14%	Public transport (26%) Private car (24%)	Public transport (44%) Motorcycles and bicycles (1.7%);	Public transport (12,82%) Scooter+motorcycle (3,41%) Walking only 1,7%
COMMON 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		**Morning** **Afternoon** ***(mainly working hours)***						
Raison		**Mainly: Work (50% as average)+School** **Other reasons: leisure, hobby, shopping, visit**						
Main Transport mean		**Public transport (over 45% as average)** **Private car (about 40% as average)** **Less used: walking, bikes, trains, motorcycles and scooters**						

2.2. CRITICAL POINTS OF NON PILOT CITIES

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
CRITICAL POITS	▪Large increase in the number of motor vehicles ▪Network congestion, traffic jams (36%) ▪Increased pollution and noise ▪Growing number of traffic accidents ▪Illegal parking ▪Longer journey times ▪High cost of public transport/train (24.7%) ▪Crowded PT (12.7%) ▪Too long travel time with PT (35.5%) ▪Big distance from bus/tram stop to home/work place (7.8%) ▪Too long waiting time for PT(3.9%) ▪Parking shortage (10.7%)	▪Lack of appropriate public means of transport ▪Traffic (27%) ▪Buses stop away from their destinations (17%) ▪Buses are too expensive (13%) ▪Too long travel time with PT (45 minutes in average)	▪Large increase in the number of motor vehicles ▪Absence of parking lots ▪Polluting transit traffic ▪Traffic (50%) ▪Too long travel time with PT (25 minutes in average) ▪Buses too crowded (37%) ▪Parking shortage (32%)	▪Traffic ▪ Lack of parking ▪Buses too crowded	▪Parking shortage (20%) ▪Crowded public Transport (8%) ▪Traffic (22%) ▪Nothing: 19%	▪Traffic (28,5%) ▪Too long travel time (36% of daily trips take 1 to 2 hours) ▪Shortage and price for car parking ▪ Price of public transport tickets ▪Public transports too crowded ▪Station dwell lengthy (8,8%), ▪Trip lengthy and Unsuitable timetable (8,4%) ▪Stations are not near (7%) ▪PT too expensive (5,1%) ▪Several destinations (3,7%);	▪Traffic congestion 70,34% ▪Ineffective public transport system ▪Car-dependency ▪Parking shortage 11,02% ▪Too long travel time with PT (24%) ▪Too long waiting time for PT(32%)
COMMON 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**

2.3. MOTOR VEHICLES IN NON PILOT CITIES

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
MOTOR VEHICLES	▪ 7% of residents possess a motorcycle or a scooter ▪ Mostly one motorcycle/scooter per household ▪ Daily distance travelled - 1 to 40 km	▪ 23% possess a scooter or a motorcycle ▪ 86% of responders have only one motorcycle per household	▪ 3% of residents possess a motorcycle or a scooter ▪ low information level regarding alternative solution to use vehicle	▪ 3% possess a motorcycle or a scooter	▪ 16% own a motorcycle or a scooter ▪ Daily distance travelled - 12 km	▪ 6% own a motorcycle/scooter ▪ (33%) of the owners of motorcycles/scooters make daily trips not longer than 10 km, while only 12% travel more than 50 km per day	▪ 7% of residents possess a motorcycle or a scooter ▪ Mostly one motorcycle/scooter per household ▪ Car dependency
COMMON POINTS							
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.**							

2.4. E-VEHICLES IN NON PILOT CITIES

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
FOSCUS ON EV	▪ **93% never used an EV** ▪ **75% would be interested** in testing or buying EV ▪ **7% of residents have at least once used** an EV ▪ **Solution most chosen**: sharing (50%), rental, leasing ▪ **Incentives**: discount 48.5%, environmental bonuses (14%) and suspension of local (12.8%) and pollution taxes (6.8%) for EV owners	▪ **85% never used an EV** ▪ **90% would be interested** in testing or buying EV ▪ Out of 15% that used an EV, **26% have used electric scooters** ▪ **Solution most chosen:** complete ownership (29%), sharing (26%) ▪ **Incentives:** discount (32%), exemption from local taxes (24%) and pollution taxes (20%)	▪ **93% never used an EV** ▪ **50% would be interested** in testing or buying EV ▪ Lack of information ▪ **Solutions more chosen:** complete ownership (42%), sharing (20%), leasing (19%) ▪ Type of EV needed in Suceava – 45% e-cars, 27% e-buses, 14% e-bikes, and only 6% e-scooters ▪ **Incentives**: no pollution tax + no local tax (56%), discounts for purchase (47%), ecobonus (38%). ▪ **Solution most chosen**: complete ownership (53%)	▪ **90% never used an EV** ▪ low information level regarding real features and benefits of e-vehicles ▪ 34% will probably use an electric motorbike/ scooter rental service ▪ **Solution most chosen**: ownership (24%), "monthly leasing" - 24%, "leasing based on driven distance" - 18%, "shared use with more people in the vehicle" - 8% ▪ **Incentives**: discounts (32%), removal of local taxes (18%), granting environmental bonuses (14%) and the option "remove emissions taxes to owners" (11%)	▪ **89% never used an EV** ▪ 11% used EV, out of which **14% had used an e-motorcycle/ e-scooter** ▪ **71% would be interested** to try or purchase EV ▪ **Solutions more chosen:** sharing (12%), monthly leasing (19%), buying (38%) ▪ **Incentives**: discount (44%), reduction of the ownership taxes (23%), granting environmental bonuses (15%)	▪ **88% never used an EV** ▪ **only 3.3% drive an EV on a daily basis** ▪ Strong interest (65%) in testing (or even buying) an electric vehicle ▪ **Solution most chosen**: full ownership (43%), leasing (23%), Sharing systems (11%) ▪ **Incentives** exemption on local taxes, both mentioned by 45% of interviewees	▪ **98,14% have never used an EV** ▪ **31% would be interested** in trying or buying EV ▪ **Willingness to use a scooter sharing system**: 26,17% will never use, 34,58% most probably not, while 39,26% will consider using it ▪ **Solution most chosen**: ownership (56%), "monthly leasing" - 6%, "leasing based on driven distance" - 10%, "shared use with more people in the vehicle" – 1,8% ▪ **Incentives**: discount (50%), no local taxes (15%), environmental bonuses (15%)
COMMON POINTS							
Large percentage (over 90% in average) of the residents from the non pilot cities has never used and electric vehicle and have little							

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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.

- **Solution most chosen**: ownership, sharing, leasing, rental
- **Incentives**: discount, no local+pollution tax, environmental bonuses

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
ELECTRIC VEHICLES PERCEPTION BY CITIZENS	▪ **Strengths**: comfort (4.0), safety (3.9), speed and parking (3.5) ▪ **Weaknesses**: high cost (2.0) ▪ **Critical issues**: charging 46%, lack of knowledge (20.7%) and possibility of being stolen (12.7%); ▪ **Benefits**: NO carbon emissions (47.3%), lower fuel costs (36.3%);	▪ **Strengths**: safety (39%), speed (37%), comfort (37%), parking (31%) ▪ **Weaknesses**: high cost (27%) ▪ **Critical issues:** possibility of being stolen (34%), charging (23%), lack of knowledge (23%) ▪ **Benefits:** lower fuel costs (39%), NO carbon emissions (36%), reduction of noise (9%)	▪ **Strengths**: comfort, safety ▪ **Weaknesses**: charging (36%), being stolen (24%), lack of knowledge on how to use it (23%), parking (20%), cost ▪ **Critical issues**: infrastructure (no charging points), very low information level ▪ **Benefits**: no carbon emissions (65%), lower noise (58%), fuel costs (54%)	▪ **Strengths**: speed, comfort, safety, parking ▪ **Weaknesses**: Lack of awareness, high cost (28%) ▪ **Critical issues**: "battery charging" (58%), "tricky parking" (17%), "danger of theft" (7%). ▪ **Benefits**: reducing emissions (52%) and have no fuel expenditures (33%)	▪ **Strengths**: comfort (28%) and safety (28%); ▪ **Weaknesses**: high cost (28%), parking shortage (18%); ▪ **Critical issues:** battery charging (58%), Tricky parking (17%) ▪ **Benefits**: NO carbon emissions (53%), lower fuel costs (24%), less noise and lower road taxes 8% each.	▪ **Strengths**: safety, comfort and parking possibilities ▪ **Weaknesses**: speed, high cost ▪ **Critical issues**: charging (72%) ▪ **Benefits**: no carbon emissions (65%), lower fuel costs (28%)	▪ **Strengths**: safety, comfort ▪ **Weaknesses**: high cost ▪ **Critical issues**: charging (54%), lack of knowledge (13%) ▪ **Benefits**: no carbon emissions (64%), lower fuel costs (11%)
COMMON POINTS							
▪ **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

2.5. PRIORITIES FOR CITIZENS ABOUT SUSTAINABLE MOBILITY

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
SUSTAINABLE MOBILITY PRIORITIES	▪ Promotion of **sustainable transport modes** ▪ Education on **sustainable mobility** ▪ **Infrastructural improvements** ▪ Better **integration between different transport modes** ▪ New services such as **carpooling system, car sharing** etc.	▪ **Sustainable (green) transport infrastructure** ▪ **Access restrictions** ▪ **Different motorization** (electric, hybrid) ▪ **Sustainable mobility** (walking, bike, car sharing, collective passenger transport) ▪ **Integrated pricing strategies**	▪ **Sustainable (green) transport** infrastructure - (33%) ▪ **Different motorization** (electric, hybrid) (28%) ▪ **Sustainable mobility** (walking, bike, car sharing) (20%)	▪ **Sustainable mobility** (walking, bike, car sharing) - 49% ▪ **Different motorization** (electric, hybrid) - 17% ▪ **Sustainable (green) transport** infrastructure: - 17% (for tourists)	▪ **Sustainable mobility**: **bicycle** (26%), **walking** (23%) ▪ Increase the use of **public transport** (24%) ▪ **Sustainable vehicles** 24%	▪ **Promotion of public transports** (37%) ▪ **Promotion of electric vehicles** (16%) ▪ **Increased use of bicycles** (14,1%) ▪ **Sharing** (8%) ▪ **Scooter** (5,7%)	▪ **Different modes of transport** ▪ **Introduction of electric scooters** ▪ **Sustainable mobility** (walking, bike, car sharing) - 26% ▪ **Sustainable vehicles** 18% ▪ **Sustainable (green) transport infrastructure** (13%) ▪ **Public transport** (29%)

COMMON POINTS

Sustainable mobility means "Satisfying the needs of the current generation without compromising the ability to satisfy the needs of future generations". Sustainable mobility is therefore the mobility model that enables movement with minimal environmental and territorial impact. All the above non pilot cities have in common the following priorities in sustainable mobility:

- **Means of transport consume the least energy and produce less pollution** per km travelled and passengers have greater recognition (**travel on foot, by bicycle, collective transport and shared car**);
- **Other alternative fuels and other technologies** (natural gas, Liquefied Petroleum Gas (LPG), Bioethanol (alcohol), biodiesel) 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.

2.6. INFRASTRUCTURAL MOBILITY ASPECTS – CITIZENS' ASSESSMENT

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
INFRASTRUCTURAL MOBILITY ASPECTS	▪ **Road network** – cars, motorcycle, scooter ▪ **Public transport**: tram, bus, suburban railway, funicular ▪ **Train** ▪ **Mobility**: cycling, walking ▪ **Parking**: lack of parking, charging	▪ **Road network** – cars, motorcycle, scooter ▪ **Public transport**: bus ▪ **Mobility**: cycling, walking ▪ **Parking**: lack of parking ▪ **international airport of "El. Venizelos" in Spata** ▪ **Ports: Rafina and Lavrion**	▪ **Road network** – cars, motorcycle ▪ **Public transport**: bus, mini bus ▪ **Mobility**: cycling, walking ▪ **Parking**: lack of parking ▪ **Train stations:** national and international ▪ **Airport**	▪ **Roads and highway network:** cars, motorcycle, scooter ▪ **Railway Traffic:** national and international ▪ **Air transport** ▪ **Pedestrian zones:** large area ▪ **Mobility**: cycling, walking ▪ **Public urban and suburban traffic:** buses	▪ **Road network** – cars, motorcycle, scooters ▪ **Public transport**: bus, tram ▪ **Mobility**: cycling, walking ▪ **Parking**: dense bicycle-parking network **Pedestrian zones**: large area	▪ **Road network** – cars, motorcycle, scooters ▪ **Public transport**: bus, tram, metro, funiculars and elevators ▪ **Trains** ▪ **Ferry** ▪ **Airport** ▪ **Mobility**: cycling – low importance, walking ▪ **Parking**: lack of parking, charging ▪ **Existence of a network of equipment for charging electric cars**	▪ **Road network** – cars, motorcycle ▪ **Public transport**: bus ▪ **Ferry** ▪ **Airport** ▪ **Mobility**: walking ▪ **Parking**: lack of parking ▪ **Ports**
COMMON POINTS							
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.

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
CONSTRAINTS	▪ Increase in motorization and traffic network congestions ▪ Reduction of safety level ▪ Greater number of traffic accidents ▪ Limited bus network, small density of coverage ▪ Incoherent cycling lanes ▪ Lack of parking spaces, pay-per-stay parking spaces and time limits, insufficient parking garages ▪ Lack of pedestrian zones ▪ Ineffective Park&Ride system ▪ Narrow streets, without the ability for expansion ▪ Uncompetitive public transport	▪ Increase in car traffic: traffic network congestions, traffic jams and long trip to destination ▪ Inappropriate public means of transport	▪ Increase in car traffic: traffic network congestions, traffic jams and long trip to destination ▪ Incoherent cycling lanes ▪ Lack of parking spaces, no parking spaces for scooters ▪ Lack of pedestrian zones ▪ Narrow streets, without the ability for expansion ▪ Lack of public awareness and information campaigns on sustainable mobility ▪ Lack of charging infrastructure ▪ Lack of use on EV	▪ Increase in car traffic: traffic network congestions, traffic jams and long trip to destination ▪ Lack of charging infrastructure ▪ Lack of use on EV ▪ Low information level regarding real features and benefits of e-vehicles ▪ Lack of parking	▪ Increase in car traffic: traffic network congestions, traffic jams and long trip to destination ▪ Parking shortage	▪ Increase in car traffic: traffic network congestions, traffic jams and long trip to destination ▪ Small experience in electric mobility ▪ Limited bus network, not covering all urban area ▪ Lack of parking	▪ Increase in car traffic: traffic network congestions, traffic jams and long trip to destination ▪ Lack of charging infrastructure ▪ Lack of use on EV ▪ Low information level regarding real features and benefits of e-vehicles ▪ Lack of parking ▪ Lack of charging infrastructure

COMMON POINTS

The main constraints in terms of mobility infrastructure for non-pilot cities for future implementation of 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.

2.7. TARGET GROUPS AND NEEDS

Non pilot city	Zagreb	Eastern Attica – Rafina – Athens	Suceava	City of Skopje	Murcia	Lisbon	Malta
TARGET GROUPS	▪ Men – 63% ▪ 16-35 years (50,7%) ▪ Employees (84%) ▪ Students (9,3%)	▪ Men – 56% ▪ Average age - 16-35 years (45%) ▪ Employees (38%) ▪ Self-employed (29%)	▪ Average - 35 years old ▪ 54% are female ▪ 31% are students ▪ 42% employed ▪ Educated people	▪ 16 – 55 years old (89%) ▪ 54% female ▪ 56% employed ▪ 21% students ▪ Educated people	▪ 16 – 55 years old ▪ 51% are female ▪ 36% employed ▪ 26% students ▪ Educated people	▪ 16 – 35 years old (47%) ▪ 54% male ▪ 68% employed or self-employed ▪ 7% are students ▪ 41% willing to use sharing ▪ Willingness to use sharing - higher on younger people (16-35 y.o.)	▪ Men – 60% ▪ 16-35 years (33%) ▪ 36-55 years (36%) ▪ Employees (64%) ▪ Self-employed (about 14%) ▪ Students (5%)
COMMON TARGET GROUPS							
▪ young educated people, about 16-35 years old; ▪ students, workers or self - employed; ▪ those who take short day trips from home to school or office (max ~30 minutes per trip); ▪ men and women have very similar interests.							
USER 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.

B. Suggestions and proposals coming from the stakeholders involved. These inputs were collected during the National Support Groups, mainly in Spain, Portugal, Macedonia and Romania:

	Spain	Portugal	Macedonia	Romania
Benefits	The main market is in fleets (delivery pizza, mail service…) EV can be charged at home or in parking lots Better environmental conditions	Increase transport efficiency Decreases air pollution and noise pollution Reduces energy imports Reduces transport costs Reduce no of vehicles High efficiency in space/capacity usage	No carbon emissions Traffic decongestion	No pollution associated with internal combustion engines, BUT EV still have environmental costs: electricity Lower costs of fuel and maintenance Reduction of emissions Improve fuel economy
Bottlenecks	Lack of knowledge both for residents and tourists Fear of the battery running out Infrastructural bottlenecks – charging stations that do not work Reluctance to abandon the ownership to certain consumer goods, including vehicles Economic difficulties – of the some 650 sharing initiatives in the world, almost none are profitable	Mind-sets and behaviours Lack of information	General lack of knowledge regarding e-mobility Lack of information Lack of infrastructure Lack of knowledge and awareness	Lack of charging infrastructure Lack of knowledge Low information level (and low current predisposition) regarding e-vehicle use and benefits for citizens EV are too expensive, even if it has environmental benefits EV need too much time to recharge

				Limited lifespan of batteries
Promotion activities:	Public institutions should set an example	Advertising Involving companies in CSR activities to sponsor the system Promotional price	Raise awareness to change the way of living, the mentality and culture of citizens Promotion of EV by buying EV for the local government	Promotion within students Test drives for students, residents and local distribution companies
Suggestions	Price integration (public transportation, sharing systems…) and the creation of the personal mobility card Future vehicles must run on renewable or residual energy	Integration with public transport services will boost the feasibility of the sharing system Institutional users (large enterprises, public organisations) should also be motivated to adhere to the sharing system, using it for their day-to-day operations involving specific types of travels	Introducing electrical Cavaliers in the city center area, for movement of elderly or disabled people Use home made charging points – made in Macedonia Vehicles in the future should use renewable energy Need of subvention and tax reduction	Buying EV with rented batteries and developing new business of battery recharge station Buy EV for the municipality and promote e-mobility

Common suggestion and discussion points:

1. The **most obvious advantage** of electric vehicles is that **they don't produce the pollution**. However, they still have environmental costs. The electricity used to recharge EV batteries has to come from somewhere, and right now, most electricity is generated by burning fossil fuels. Of course, this produces pollution. **The suggested solution is <u>Vehicles in the future should use renewable energy;</u>**
2. **Another important advantage** of battery-powered motors over gas-powered engines is **the lower cost of the fuel** - that is, electricity for EVs and gas for the internal combustion engines. Beyond the fuel-saving benefit, EVs **offer another major cost savings: maintenance.** Since an EV is fully electric, it no longer uses oil to lubricate the engine.

3. A system that combines **electric mobility (EM), sharing solutions and two-wheeled vehicles** will decisively contribute to **increase transport efficiency**:
    a. **Electric**: decreases air pollution and noise pollution; reduces energy imports; reduces transport costs;
    b. **Sharing**: higher usage of the vehicle, reducing number of vehicles;
    c. **Two-wheeled vehicles**: high efficiency in space/capacity usage (both in terms of road network and parking supply);

but it also triplicates the challenges:

a. Electric: autonomy limitations and problems of quick reloading;
b. Sharing: system must be practical and attractive (easy to use and with favourable costs);
c. Two-wheeled vehicles: seasonality and safety problems; not fitting to all types of users;

4. The **major disadvantage** of EV, is the **time required to recharge the batteries**. A possible solution to the recharging situation may be **battery-replacement stations**, where instead of recharging your EV you can simply swap your drained battery for a fully charged one. This system would allow batteries to be recharged outside of vehicles and would greatly reduce the amount of time required to get an EV up and running again after its battery is fully discharged.
5. **Another major disadvantage is that EVs are considerably more expensive than comparably equipped small to midsized gas-powered vehicles. Suggestions: more incentives: *discounts, no local tax, no environmental tax, eco-bonuses.***
6. **Public authorities' involvement in promotion of EV is crucial and they need to be an example for the community. They need to be involved in realizing the charging infrastructure, in promoting e-mobility and setting examples for the community. *E.g. buying EV for own use and promoting e-mobility within residents, tourists, students and local distribution companies*** *(postal office, pizza delivery),* ***test drives and rental;***
7. **Sharing systems are an interesting opportunity for manufacturers of electric vehicles**, because these systems contribute to the mainstreaming of electric mobility; therefore **active support from the manufacturers should be envisaged**, for the launching and subsequent development of the system. In particular, electric scooters can contribute to the diffusion of electric mobility: motorcycles are the only type of electric vehicle that has removable batteries, therefore facilitating the charging operations (the major concern of potential users of EM), even if users don't have their own parking space.
8. **Integrating stakeholders beyond the area of mobility is important**; **large companies engaged in corporate social responsibility principles should be mobilised as sponsors of the system**, improving their public image and contributing to reduce final costs for the end users. Advertising (in the vehicles and other communication channels) could be a good solution for these sponsors;
9. **Learning from other sharing systems is essential**, to avoid pitfalls and to identify the conditions for success; there are many examples of sharing or hiring systems for bicycles (e.g.

Barclays Cycle Hire in London, BUGA in Aveiro, Bicing in Barcelona), or for 4-wheeled vehicles (e.g. car2go in Amsterdam and other cities).

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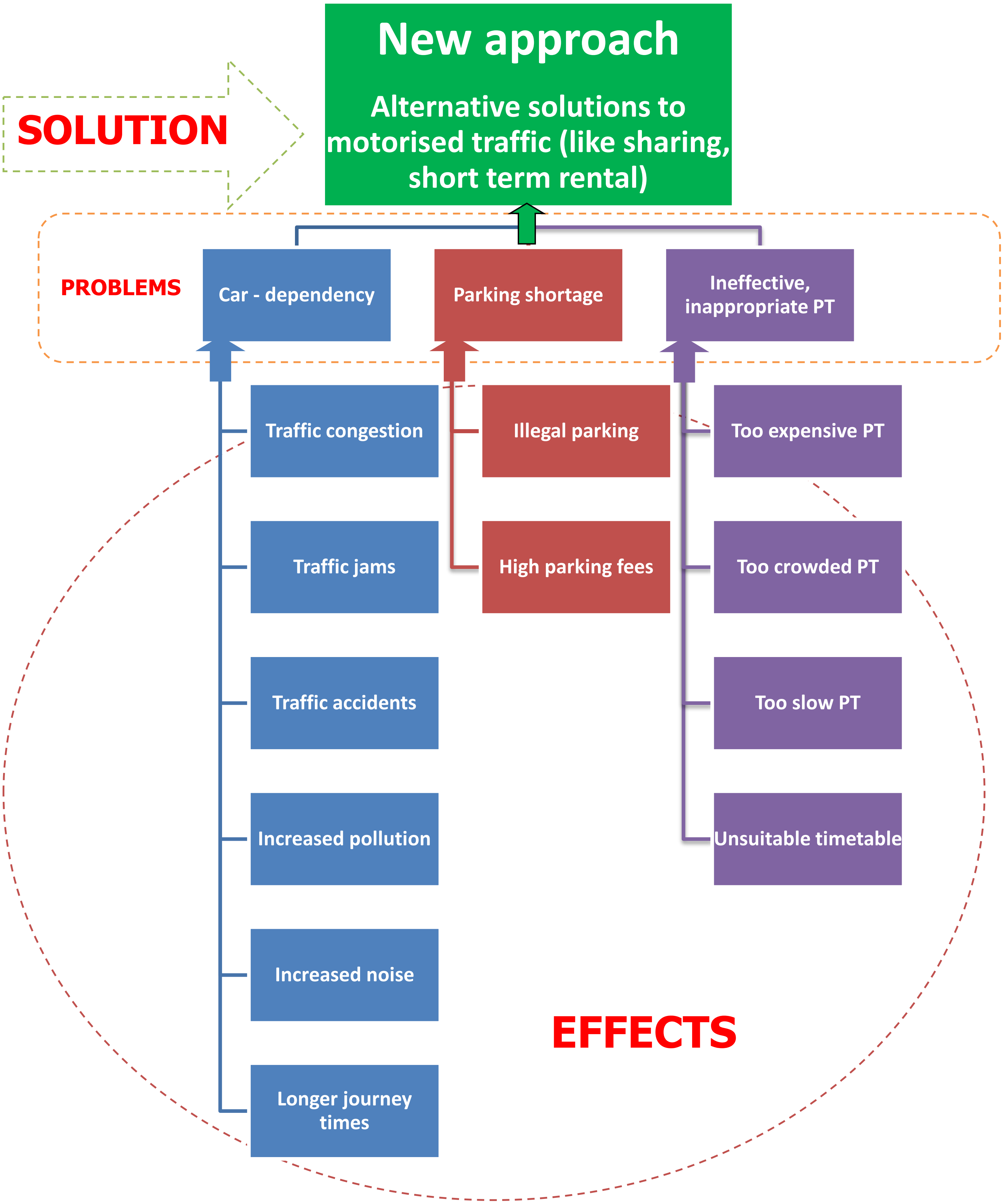
3. AREA OF APPLICATION

Transport is the second largest contributor to greenhouse gas (GHG) emissions globally, largely driven by the road sector. Achieving the transition to a low-carbon economy will require significant reductions of transport-related emissions. Transport infrastructure systems are also vulnerable to climate change impacts. **As a result of the above analysis on the non pilot cities, delivering both climate mitigation and adaptation at scale requires unprecedented changes in transport infrastructure systems and demand patterns.**

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 ante operam analysis (synthesized in the picture below) 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.



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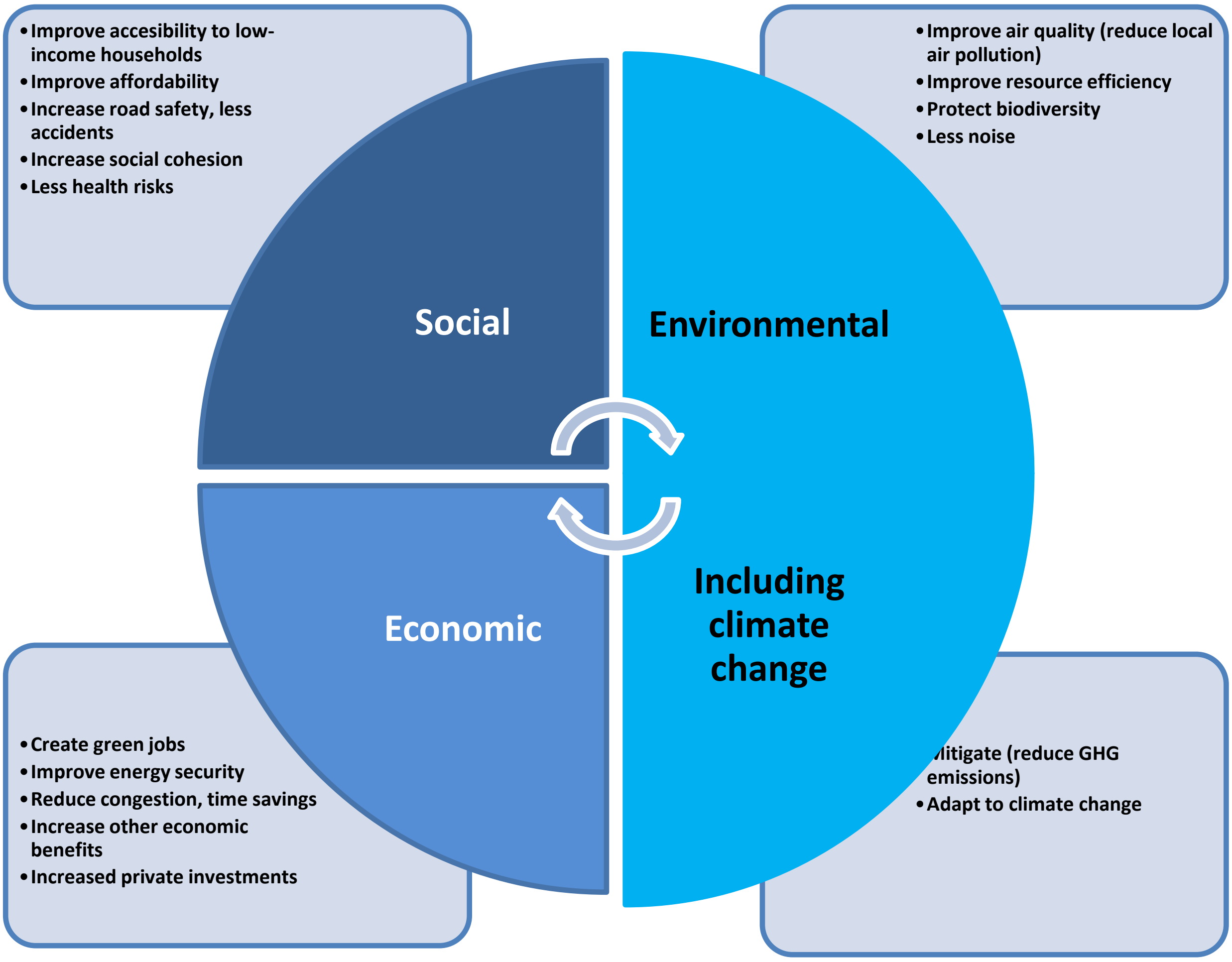
Strategies towards sustainable transport – often described as the Avoid-Shift-Improve (A-S-I) approach – **requires that governments adopt policies that encourage people and businesses to avoid or reduce the need to travel, shift to more carbon-efficient transport modes, and improve vehicle and fuel technologies,** as well as to integrate climate-resilient goals into transport infrastructure strategies, all of which are highly dependent on specific country contexts.

Irrespective of the climate change agenda of each non pilot city, **current investment flows are insufficient to meet transport infrastructure needs to support economic growth and social goals. To avoid lock-in into carbon-intensive and climate-vulnerable transport infrastructure development pathways, there is a need to shift investment towards sustainable transport.**

A key challenge for Ele.C.Tra non pilot cities is to distribute costs and benefits on sustainable mobility across stakeholders in order to take into account the full social, economic and environmental co-benefits, as seen in the graphic below.



Source: Adapted from GIZ 2012

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 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	speed and power higher	A1 (min 18 y.o)

		(“motosikleta”)		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)

4. USER TRAGET

In terms of user target, 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;
- **user targets are motivated by the cost savings, but worry about battery life/range and infrastructure.**

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.

5. USER NEEDS

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.

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6. USERS' INCENTIVES

A number of both financial and non financial policies promoting the EV market uptake can be deployed by public authorities at a national and/or city level.

Included in the **financial incentives** there are:

- Direct subsidies on EVs purchase: discounts, no VAT);
- Differentiated vehicle taxation (e.g. due to CO_2 differentiated vehicle registration and/or circulation tax;
- On a local level, policies such as free parking spaces (or differentiated parking tariffs).

The category of **non financial incentives** is also very diverse and the adequacy of these relies on the local conditions. Nevertheless, a few of non financial incentives are:

- Regulatory framework - positive discriminatory measures such as limited access to certain areas of the city (low or zero emission zones), eligibility for using restricted lanes e.g., bus or high occupancy lanes
- Capacity building

Regarding users' incentives, the ante – operam surveys identified some of the incentives that can be activated by public bodies, large-scale distributors and energy suppliers.

1) Discounts when buying an electric vehicle;
2) Governments incentives: eco-bonus, purchase incentives, exemption from local taxes, circulation taxes, pollution taxes;
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.
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;

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7. STAKEHOLDERS INVOLVEMENT

Stakeholders can be considered as the key actors with a specific interest in the development of a certain policy or measure. It is clear that the effectiveness (and efficiency) of any given strategy depends on the level of agreement between the stakeholders concerned. Cooperation and development of an integrated approach is therefore a necessary condition for success.

Electromobility is no different. Thus, a vital step to ensure a successful outcome is to engage all relevant stakeholders from the beginning.

This principle is a key element of the Ele.C.Tra. approach. Each city will set up a National Support Group to bring together key stakeholders in an integrated planning process in order to create the assumptions to implement the model in the future. In this light, the project includes two events for each NSG.

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

- promotion of the e-vehicle use both for working/studying day trips and for tourists;
- suggestion and notes about the several aspects, 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.

National Support Groups will involve scooter suppliers, local sharing operators, local authorities, transport operators, transport users associations, vehicle industry (resellers, importers or manufacturers), tourism industry and research institutes to cooperate on a homogenized basis in view of the use of electrical scooters.

The National Support Groups will be involved as advisory boards in order to exchange ideas and issues during the meeting. In particular, the National Support Groups will allow:

a) to validate the model, in terms of management structure and users facilities (e.g. charging point types, access cards for the users or other methods, the characteristics of energy and e-scooter suppliers in every city);
b) to evaluate the funding search for e-scooters that have been used in every pilot area and, if possible, that would be used in non-pilot countries;
c) to calibrate/verify the pilot systems by the non-pilot national stakeholders too through a set of parameters and indicators.

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Further actions are focusing on stakeholder involvement to maximize the solutions' effectiveness and they are detailed in the chapter 2.

8. OTHER FUTURE DISSEMINATION ACTIONS

The lack of information, or worse misinformation, regarding EVs is a major barrier that needs to be tackled. Raising awareness of electric mobility is an important function for cities to increase the number of electric vehicles, driven by consumers and in commercial fleets.

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

- regional clusters stakeholders, like local and regional authorities, regional chambers of commerce, in order to emphasize the advantages of electrical scooter sharing, to mobilize beneficiaries from all parts involved in electrical scooters' industry and to bring down to local and regional level European practices on alternative fuel and transportation adopted by other cities;
- 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, the app, social network, etc);
    - By specific events with teachers and pupils;
    - Raising awareness in families, focusing on safety (topics already noted by interviewees);
- other dissemination campaigns, focusing on specific user target and/or local needs.

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9. TYPE OF SERVICE

The *Model executive planning Report* 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 Ele.C.Tra. 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.

9.1. TYPE OF THE ELECTRA VEHICLES

The categories of electric vehicles, which can meet the characteristics of the project Electra, 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.

9.2. 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 aspect. 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.

So 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 was 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 EleCTra 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);

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- 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 the EleCTra 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	

9.3. 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, in this phase it’s 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.

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10.INFRASTRUCTURAL ASPECTS

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).

Then, 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.

10.1. 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	SEMI-FAST CHARGING	FAST CHARGING
✓ standard power outlets typically available in residential installations; ✓ In most European countries the standard outlet is 230V, 16A, up to 3,7kW, which allows to obtain 10kWh of 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	✓ higher power levels are used ✓ need of specific infrastructure beyond standard domestic or industrial socket-outlets, with typically charging power levels higher than 22 kW.

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

10.2. 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.

10.3. 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 EleCTra is built so that to allow the integration with the new rule/law framework.

10.4. 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 Electra 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

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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

10.5. 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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11.STRATEGIES

The success of local EV roadmaps depends not only on the measures but also on local conditions that influence the market's response and, consequently the effectiveness of the measures deployed.

As part of the project, each non pilot city will realize the "Non-pilot cities Plan", based on previous activities (e.g. non-pilot target group). The plan will specify:

1) the SOLUTION for every city to apply a similar system in every non-pilot area;
2) HOW to apply the system;
3) WHEN to begin non-pilot e-scooter systems;
4) WHO involves in every local system.

All non-pilot cities will have to realize the Non-pilot city Plan, **to identify context characteristics and issues and define activities and steps of future development in their own cities and surroundings of similar e-scooter sharing services.**

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