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EU COMMUNITY

INTELLIGENT ENERGY EUROPE

Promotion & Dissemination Projects

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

D.6.2 Report on innovative and renewable energy

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.

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Abstract:

This report has been produced to document about the innovative and renewable energy measurements which have been identified in the pilot projects. These measurements take into account how much energy has been produced and saved during the project by through the utilization of innovative and renewable sources. These measurements are a main feature of the Ele.C.Tra model and are supported through local, regional and national initiatives. MIEMA, the Maltese partner, has the role of compiling the results obtained from the pilot project in terms of renewable and innovative energy matters.

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1. Introduction

This work package will document the innovative energy prompted by the pilot tests. Hence it will document about the critique of the mobility posterior the empirical pilot actions. This has been accomplished through a user surveying methodology directed at identifying and taking stock of opinion change whilst bringing forth energy measurements linked to electric mobility. This aims to:

- Support the replication and transferability of the model, in terms of enhancements of the pilot tests already experimented and calibrated to non-pilot needs and concerns;
- Check and optimize project result indicators for non-pilot cities;
- Bring about the fulfilment of the non-pilot city Plans.

Produced innovative/renewable energy measurements, to recognize the amount of energy produced amid the project by creative and sustainable origins that are linked to the Ele.C.Tra model and backed by local/regional/national dynamisms. With the aim of subtask results attained during the project period, this report is executed by the Maltese associate responsible of renewable and innovative energy issues.

This deliverable deals with the evaluation and quantification of the innovative and renewable energy produced during the pilot projects in the corresponding cities by the corresponding partners. The measurements will be compiled so as to calculate how much clean energy is produced and how much tonnes of Green-House-Gasses are reduced during the pilot project through the use of innovative sources. In this way the compilation of this sheet will account about the potential energy savings in the Ele.C.Tra model. This study will also focus on the national and local initiatives contributing to innovative energy which back the Ele.C.Tra transport model. The Malta Intelligent Energy Management Agency (Malta) is in charge of compiling these results and will report about the findings.

2. Barcelona

2.1. Charging Electric Energy

In Barcelona, all the electric charging stations are connected to the general electrical grid. However there are only a few select stations which incorporate renewable energy sources:

The **Sanya Skypump** is the first charging point in the world which incorporates a wind turbine (4 kW vertical axis wind turbine). The charging point was installed by the companies

Urban Green Energy Iberia (UGE) and General Electric (GE) in August 2012, and is supplying the electricity to the vehicles of CEPSA, an environmental services company from Barcelona. The charging point allows for quick charge mode at 400 V and 32 A (12,8 kW), therefore it's required to be connected to the general electrical grid.

Sanya Skypump. Source: UGE

Mobecpoint is a motorbike charging point which incorporates a PV solar panel. However, this solar panel only provides enough electricity to power the screen in case of an electrical outage. There are 9 Mobecpoint stations in Barcelona city, and 3 more in the Metropolitan Area.

Mobecpoint in Barcelona. Source: Dibastudio

Some companies are working towards the design, fabrication and installation of charging station, integrating PV panels for the direct energy supply of vehicles (self consumption).

Currently, there are not examples of that in Barcelona but there are in other Spanish cities:

- In November 2011, an installation of the first charging point with photovoltaic (PV) energy in the Juan Carlos I Botanical Garden, located in Alcalà de Henares (Madrid). The charging point has 15 PV panels and a capacity for charging four vehicles and five bicycles.

Charging point in Alcalà de Henares. Source: Ambient@

- In June 2014 there was an installation of a PV charging point in a concessionaire located in Huércal (Almeria), allowing the simultaneous charging of 4 vehicles. The PV panels are integrated into a pergola and in a tower with a sun tracking system, possessing a total power of 21 kW.

Charging point in Almeria. Source: CIRCUTOR

- In September 2014, another similar installation (solar pergola plus solar tracking tower) was installed in a fruit and vegetables exporter company located in El Ejido. The station allows the charging of 8 vehicles and has 60 kW of solar power.

Charging point in El Ejido. Source: CIRCUTOR

- In January 2015, an installation of the largest PV charging point in Spain was completed. It is owned by a fruit and vegetable company and located in Las Norias (Almería). It has charging points for 54 vehicles and a solar power potential of 165 kW, distributed in a solar pergola and a solar tracking tower.
- More recently in October 2015, in Zaragoza, the first charging station which integrates photovoltaic energy and an energy storage system was installed. The storage system is based on lithium batteries with a capacity of 20 kWh and 20 kVA of power. The storage system allows compensating the active and reactive power, reducing the impact of the electric vehicles within the general electrical grid.

Charging point in Zaragoza. Source: Ecoticias

To calculate the CO2 related to the energy consumption of the electric scooters related to Ele.C.Tra project, a Spanish electrical grid mix in 2014 was used.

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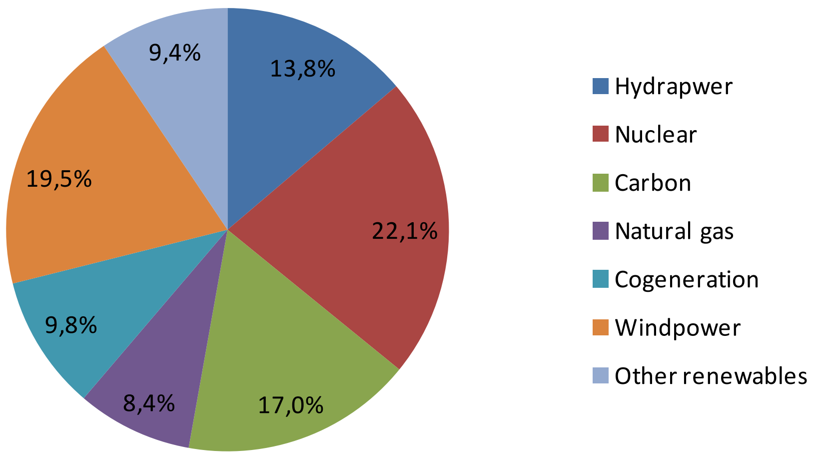


Spanish electrical mix. Source: REE

	*Source 1	Source 2	Source 3	Source 4	Source 5	Source 6	Source 7
**Source Utilised for Charging (PV's, Wind Energy, Geothermal etc...)	Hydraulic	Nuclear	Carbon	Natural gas	Cogeneration	Wind power	Other renewable sources
***Carbon Footprint [kg's of CO2 /KWh]	0	0	1.09	0.41	0.44	0	0
****Number of Electrical Units consumed for Charging	16,800	26,900	20,700	10,300	12,000	23,800	11,500

* Source: the way electrical energy utilised to charge the scooters' batteries was generated. This may be conventional fossil fuelled power stations, photo voltaic panels, etc... Account for each type of source and it's carbon footprint (amount of kilogrammes of GHG gasses produced for the generation of 1 KWh)

** Write the type of source from where electrical energy was generated

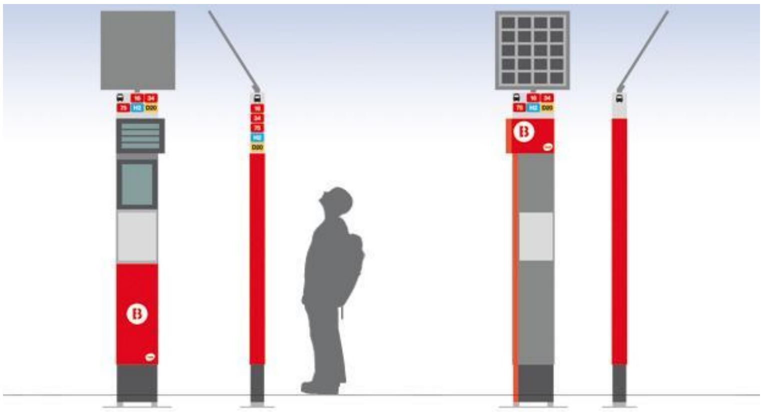
*** This is the amount of Carbon Dioxide in Kilogrammes of GHG for the production of 1 KWh (estimate is good too)

**** The total amount of Electrical Units KWh's

2.2. Actions Carried out to increase the efficiency in mobility

The Barcelona council, within the last few years, has aimed at increasing the amount of energy generated by local and renewable sources by promoting the implementation of new installations, which offer subventions of 50%. In addition, the council is also installing photovoltaic panels and small wind turbines in municipal buildings and strategic locations of public space, as in existing pergolas, streetlights or bus stops.

Since 2012, coinciding with the implementation of the new bus network in Barcelona, there have been installed several bus stops integrating photovoltaic panels. The energy produced is stored in batteries and supplied to the bus stop screen which includes dynamic information for the user. In that way the bus stop becomes autonomous and self-sufficient, so they are fed exclusively by solar power and have no connection to the electric grid. An innovative design that does not require much space, enables panels to be installed in any type of sidewalk .



Bus stop with PV pannel. Source: TMB

Unfortunately the renewable energy market, specifically the photovoltaic market, has been almost paralyzed due to certain Spanish regulatory changes, hampering the implementation of new installations, rendering them economically unprofitable. These regulations have discouraged, during the Ele.C.Tra project period, installing any new renewable platforms linked to mobility.

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2.3. Use of e-light vehicles

*e-light vehicle ID No.	**Kilometers Travelled	***Amount of Electricity Consumed during charging [KWh]	****Type of Vehicle it replaced Eg. Petrol Car, Diesel Car, Petrol Scooter etc…]	*****Way the Scooter was used
MOTIT	356,160	26,600	Petrol scooter	Sharing
COOLTRA	787,000	63,000	Petrol scooter	Renting
URBAN POLICE	405,833	32,500	Petrol scooter	Sharing
TOTAL	1,548,993	122,100	-	-

* Identification of the e-light vehicle
** The total amount of distance recorded on the OdoMeter for each corresponding EV
*** The total amount of electricity in KWh given to the corresponding light vehicle
**** The way e-light vehicle were released to the people making use of them. For example one EV per person or else the way each EV was shared amount the people utilise it.

3. Firenze

3.1. Charging Electric Energy

Electric mobility has been one of the priorities in Florence sustainable plans for transport sector for years because the PA has always strongly believed in the EV potential to decrease pollution both at local but also at global level due to the fast improvements in the electricity production sector.

Florence municipality has based its incentives policies on three main pillars:

- Public charging network availability with high interoperability standards
- Permission to enter restricted areas for EV
- Financial support at different level (municipal, regional and national)

The first step for the EV roll out was the availability of a punctual recharging network: the municipality has built, manages and regularly improves a wide network (the biggest in Italy) following the best technical standards available.

The last refurbishment of the network ended in June 2015 and now EV users in Florence can count on 173 stations with 346 sockets/places.

In order to map the polarity of interest for urban mobility, the charging sites have been selected on the basis of the main categories of reference: stations and institutional sites, Hospitals, Parkings, Commercial centers and areas, Cultural/recreational places and sports facilities, Industrial Districts and large companies. The map of the sites has also included the

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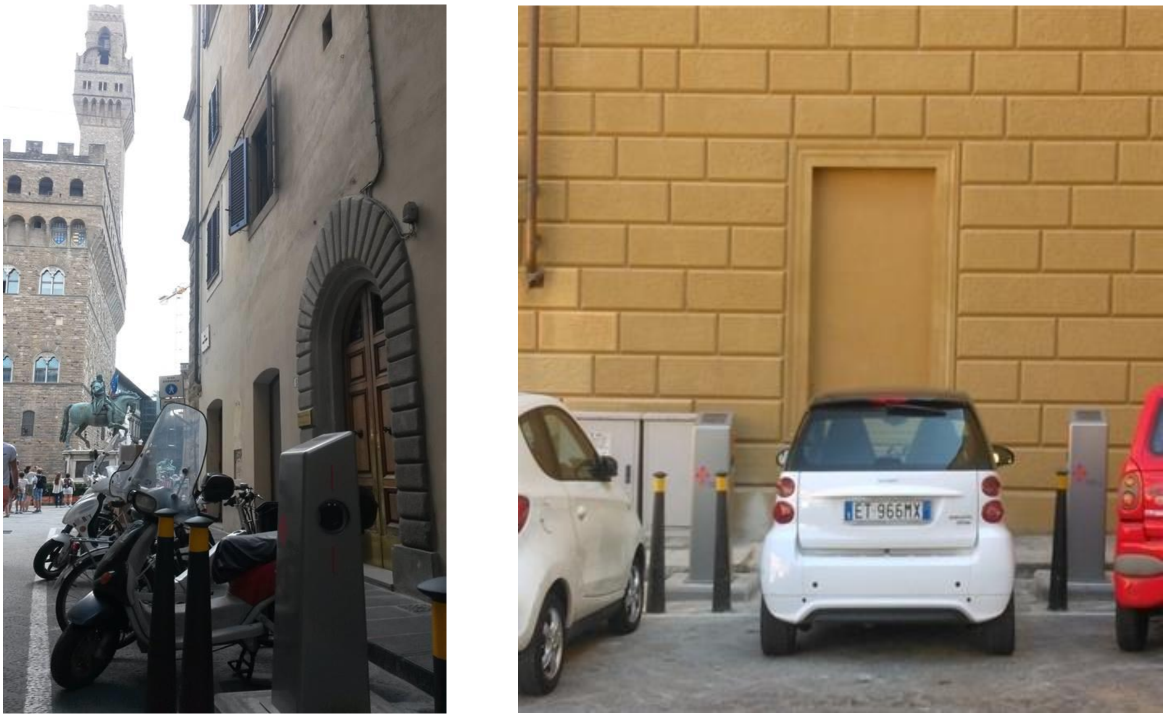
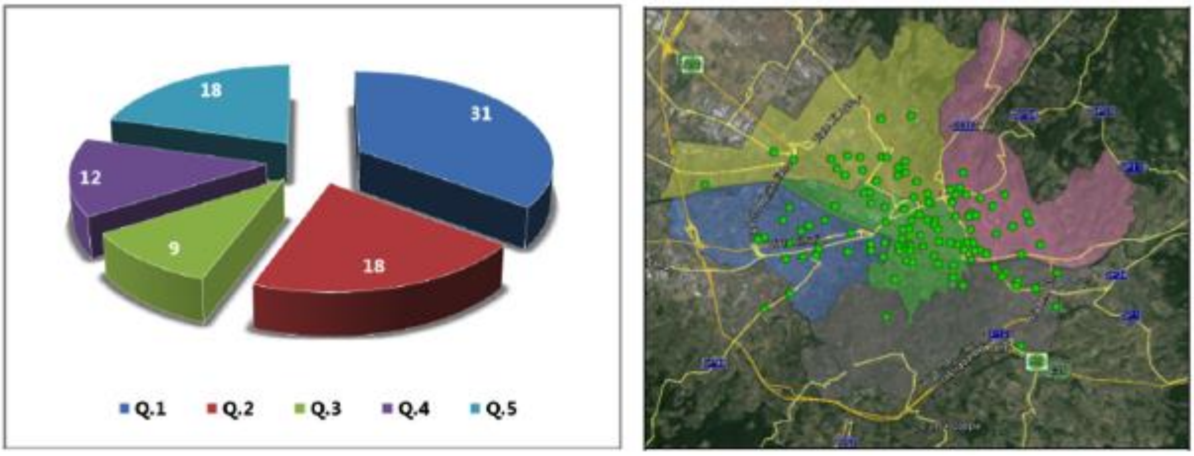
current charging stations.



New Charging points in Florence.



District distribution of the charging stations in Florence

To boost the use of EVs, the recharge in the pilot period is free of charge for anyone and it's paid by the Municipality.

Regarding the technical options selected, the recharging stations had to deal with the cultural heritage Superintendence, which didn't allow the direct installation of RES on the public charging points. In Florence all the electric charging stations are connected to the

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local electrical grid.

To support the RES exploitation and to optimise the GHG savings, the municipality decided

- To promote the installation of PV to feed the network
- To promote the use of PV recharging points on private areas and in the neighbourhoods with an agreement with a producer

To calculate the CO2 related to the energy consumption of the electric scooters related to Ele.C.Tra project, the local energy factor calculated for the Sustainable Energy Action Plan monitoring was used: it takes into account all the efforts the municipality has paid to the optimisation of the electricity production at local level. It is referred to the last emission inventory under calculation which belongs to 2015.

In the case of the local renewable electricity production (other than biomass/biofuels), the emissions have been estimated by using the emission factors in the table below (Table 6 of the SEAP Guidelines) following the IPCC standard emission factor methodology which has been used for the baseline (2005) and the other monitoring inventories.

TABLE 6. EMISSION FACTORS FOR LOCAL RENEWABLE ELECTRICITY PRODUCTION

ELECTRICITY SOURCE	STANDARD EMISSION FACTOR ($t\ CO_2/MWh_e$)	LCA EMISSION FACTOR ($t\ CO_2$-eq/MWh_e)
Solar PV	0	0.020-0.050 (8)
Windpower	0	0.007 (9)
Hydropower	0	0.024

Distributed electricity generation allows to reduce electricity transport and distribution losses and to use microcogeneration and low-scale renewable energy technologies. Distributed energy generation associated with unpredictable (cogeneration, solar photovoltaic, wind, biomass…) renewable energy sources is becoming an important issue in the European Union. The electricity grid must be able to distribute this energy to the final consumers when the resources are available, and rapidly adapt the demand: this is why Florence has decided to promote electric mobility and to exploit its potential for the network balancing.

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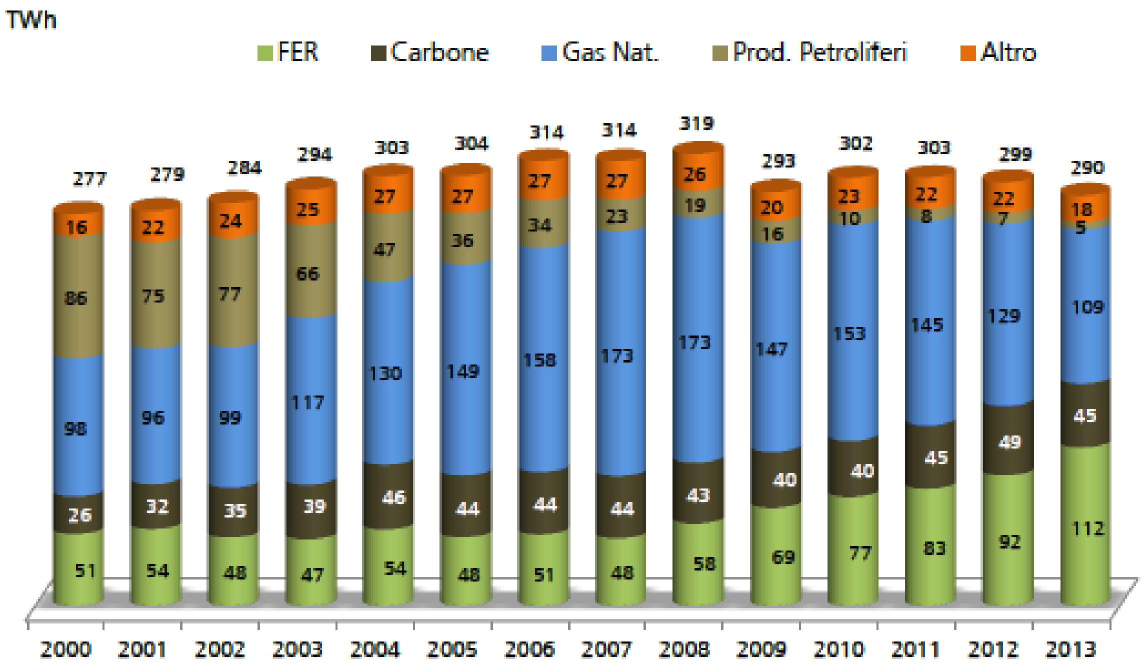

Italian electrical production. Source: GSE

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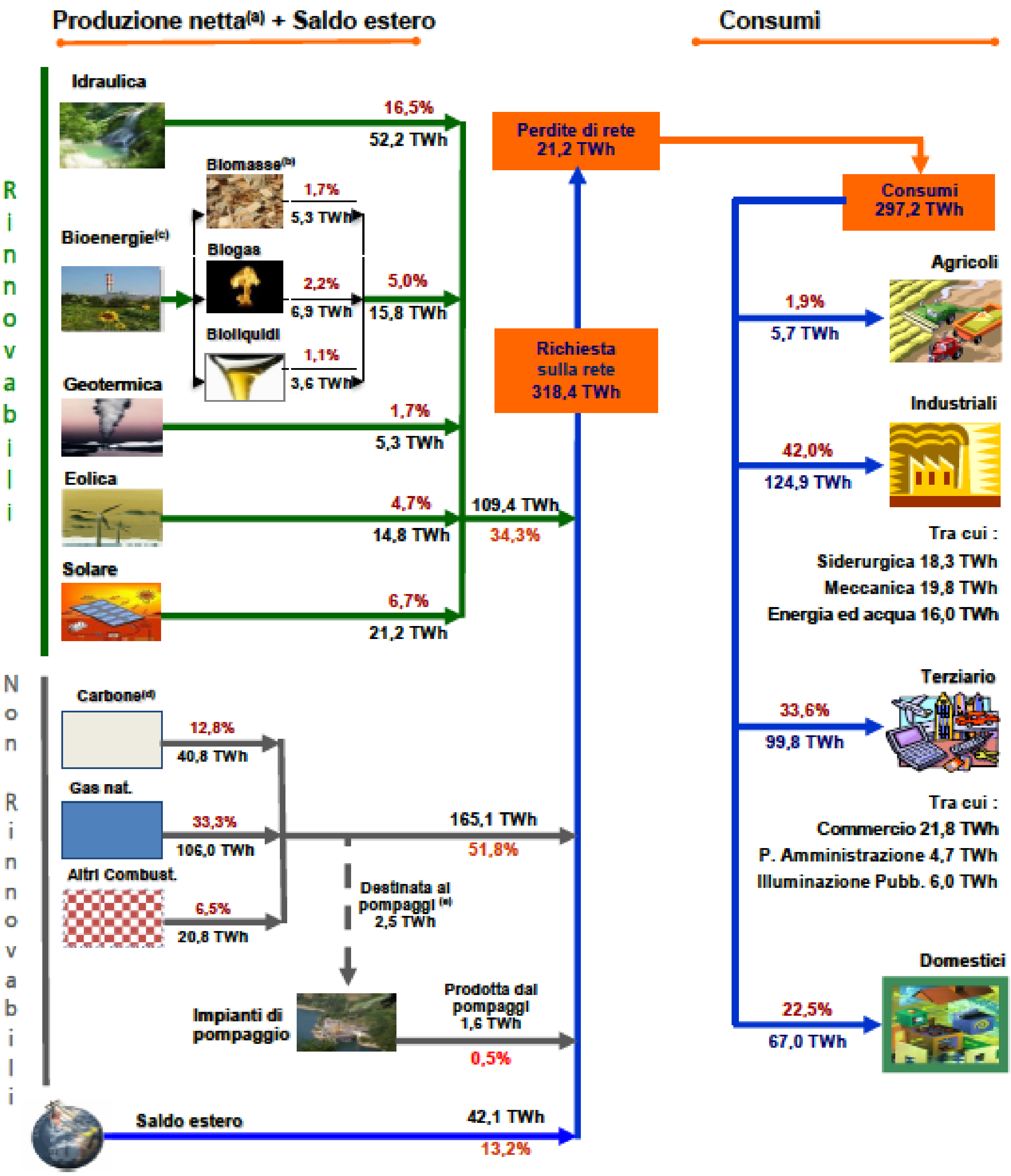

Italian electrical balance 2013. Source: GSE

Considering the evolution of the national emission factor for electricity consumption and the local situation (i.e. the amount of green electricity purchased and the RES & CHP production), the local emission factor in Florence results in 0,325 t/MWhe instead of 0,4823

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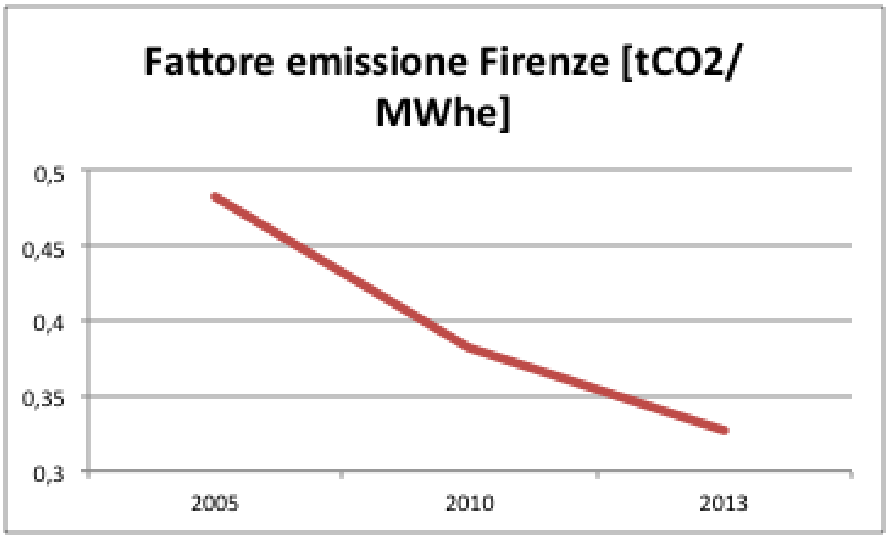
t/MWhe of the year 2005.



Emission factor evolution in Florence. Source: SEAP monitoring

	**Source 1*	*Source 2*	*Source 3*	*Source 4*	*Source 5*	*Source 6*	*Source 7*
****Source Utilised for Charging (PV's, Wind Energy, Geothermal etc…)**	Electricity mix from the local network (34.5 % RES, 65,5% fossil fuel)						
*****Carbon Footprint [kg's of CO2 /KWh]**	0.3818						
******Number of Electrical Units consumed for Charging per year During project**	110,000 283,936						

* Source: the way electrical energy utilised to charge the scooters' batteries was generated. This may be conventional fossil fuelled power stations, photo voltaic panels, etc… Account for each type of source and it's carbon footprint (amount of kilogrammes of GHG gasses produced for the generation of 1 KWh)

** Write the type of source from where electrical energy was generated

*** This is the amount of Carbon Dioxide in Kilogrammes of GHG for the production of 1 KWh (estimate is good too)

**** The total amount of Electrical Units KWh's

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3.2. Actions Carried out to increase the efficiency in mobility

By joining the Covenant of Mayors (by unanimous approval of City Council resolution no. 2010/C/0008), the City of Florence has joined in the fight and is working to reach the declared goal of reducing CO2 emissions in its own territory by at least 20% by the year 2020.

The transport sector has the largest impact, with 0.88 Mt/year of CO2 emitted, 34.5% of the total. What is required is a substantial, integrated action which makes it possible – even in a difficult situation such as that of urban Florence, congested as it is by commuter and tourist flows – to achieve a significant reduction in the environmental impact of mobility in the context of the city. In the light of the complexity of the sector and the major impact that transport has on both air quality and citizens' quality of life, the plan envisages a well-defined series of actions that involve both the framework program and the creation of important infrastructure for the city.

Moreover mobility problems affect Florentines everyday life significantly and the municipality has long been committed to improving mobility. Florence faces considerable obstacles from the mobility point of view: the city suffers from a singular urban structure and its impressive and attractive heritage architecture brings large volumes of people.

The city's approach to the mobility problem are as comprehensive as possible including measures around: infrastructures (tram lines, exchange parking areas, ...), Low Emission Vehicles and Zero Emission Vehicles, sharing systems also with electric vehicles, pedestrian areas and ecoroad pricing, biking paths, electrical mobility plan, real time controlling operative central connected to information systems (web portal accessible via WiFi in every city square, street advices and traffic lights system), street cleaning systems, etc.

On the basis of the policies and recommendations of the Structural Plan, priority interventions have been identified, such as access to zones of the city (e.g. pedestrianisation, limited traffic zones, eco-road pricing policies), the planning of parking areas and charging systems (Parking Plan with the creation of park-and-ride car parks) in addition to directly and indirectly promoting the technological modernization of vehicles in circulation. Connected with this overall action is the creation of an ever wider network of cycle paths/lanes and the possibility of setting up a bike and car sharing services that can integrate with available public transport and that is aimed not only at residents but also the millions of tourists that visit the city every year.

A significant contribution to improving the availability of public transport is represented by the construction of tram lines (line 1, already completed, lines 2 and 3 and extensions) with the capacity of attracting substantial mobility flows bound for the city centre; this intervention requires several support measures, including creating park-and-ride car parks, optimizing the strategy of integrated transport, and improving information accessibility (Wi-Fi and Web 2.0 on board).

The citizens and city users' acceptance of these actions has been tested through new social communication channels and the first applications (tram line one, pedestrian area Duomo-Tornabuoni, parking strategies, etc.) are providing excellent results.

City traffic, which will be partly eased by the abovementioned actions, will be subject to traffic-flow-easing measures through the creation of a modern traffic management centre capable of providing real-time information regarding critical traffic situations and alternatives, linked to the existing information portal accessible to the public (the web-based portal and updatable message panels).

The Imobi service (www.imobi.fi.it) with real time info, allows users to browse:

- Schedules and routes of public transport service;
- The location and availability of parking spaces in parking lots;
- The position and status of the gates of the limited traffic zone (ZTL);
- Restrictions/closures for work on regional and provincial roads.

Both the municipal vehicle fleet and public transport will undergo technological modernization and it will be possible to trial the use of electric vehicles for private mobility which, especially in certain central zones, will be able to help reduce the impact of emissions in terms of greenhouse gases and the noise aspect.

New infrastructures as well as new ICT advanced mobility services for citizens will be available in the next future thanks to a comprehensive lighthouse project focussed on electric transport in the mobility sector.

3.3. Use of e-light vehicles

*e-light vehicle ID No.	**Kilometers Travelled	***Amount of Electricity Consumed during charging [KWh]	****Type of Vehicle it replaced Eg. Petrol Car, Diesel Car, Petrol Scooter etc…]	*****Way the Scooter was used
TOTAL	5,700,000	200,000	Petrol scoter, petrol car	Purchased/ Sharing

* Identification of the e-light vehicle
** The total amount of distance recorded on the OdoMeter for each corresponding EV
*** The total amount of electricity in KWh given to the corresponding light vehicle
**** The way e-light vehicle were released to the people making use of them. For example one EV per person or else the way each EV was shared amount the people utilise it.

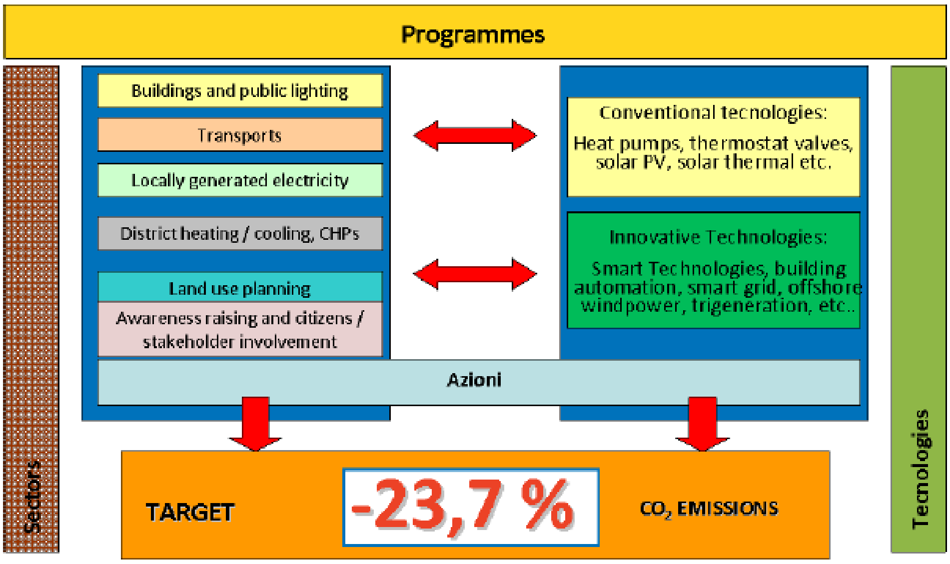
4. Genoa

4.1. Charging Electric Energy

Electric mobility is one of the most significant objectives to reach in Genoa: this is also confirmed by the planned projects in Energy, Smart Building, Smart Mobility and Smart Port.

In particular, some important actions were reached in Genoa, as:

- the signing of the Covenant of Mayors in 2009;
- the creation of the Genova Smart City Association - AGSC (www.genovasmartcity.eu) involving over ninety members among institutions, research, business and civil society;
- the submission, as one of the first in Italy, of its Sustainable Energy Action Plan (SEAP) in 2010, setting the 202020 goal at -23.7% GHG emissions through eighty actions with indication of actors, costs and timeline.



Target and programmes in Genoa SEAP

In Genoa the production of the electricity coming especially from fossil fuels but it's important underline that from 2010 to today 5MWhs of Photovoltaic (PV) have been installed on the local territory.

Starting from the 2005 "Baseline Emission Inventory" (BEI) showing energy consumption flows and CO2, improvement actions in buildings, transport, energy production, lighting, awareness and integrated planning were found and their implementation is constantly monitored following guidelines.

With the SEAP Monitoring of 2014 year BEI 2005 was "re-calculated" in order to accept some

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comments of the JRC Feedback Report in MEI - Monitoring Emissions Inventories - (it shows the progress respect to the target) and make them comparable one to each other. So the actual local emission factor in Genoa results in 0,483 tCO_2/MWh. Besides the comparison between BEI/MEI highlights a value of - 9,4% of CO_2 emissions.

A. Final energy consumption

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	115.844		210.214		12.990	47.795								113		386.956
Tertiary (non municipal) buildings, equipment/facilities	690.854	51.913	956.305	70.771	138.311	54.575										1.962.730
Residential buildings	670.036	25.957	2.494.569	11.730	-	357.202							17.289			3.576.783
Municipal public lighting	37.800															37.800
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																-
Subtotal buildings, equipments/facilities and industries	1.514.534	77.870	3.661.088	82.501	151.301	459.572	-	-	-	-	-	-	17.289	113	-	5.964.269
TRANSPORT:																
Municipal fleet						30.676	6.618									37.294
Public transport	14.222		179			96.603	269									111.273
Private and commercial transport						190.000	1.505.628					10.000				1.705.628
Subtotal transport	14.222	-	179	-	-	317.279	1.512.515	-	-	-	-	10.000	-	-	-	1.854.195
Total	1.528.756	77.870	3.661.267	82.502	151.301	776.851	1.512.515	-	-	-	-	10.000	17.289	113	-	7.818.464

CO_2 or CO_2 equivalent emissions

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	CO_2 emissions [t] / CO_2 equivalent emissions [t]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	55.953	-	42.463	-	3.624	12.761	-	-	-	-	-	-	-	-	-	114.801
Tertiary (non municipal) buildings, equipement/facilities	333.681	10.486	193.174	16.348	38.589	14.571	-	-	-	-	-	-	-	-	-	606.851
Residential buildings	323.627	5.143	503.903	2.710	-	95.373	-	-	-	-	-	-	3.484	-	-	934.340
Municipal public lighting	18.257	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.257
Industries (excluding industries involved in the EU Emission trading scheme - ETS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Subtotal buildings, equipments/facilities and industries	731.520	15.730	739.540	19.058	42.213	122.706	-	-	-	-	-	-	3.484	-	-	1.674.250
TRANSPORT:																
Municipal fleet	-	-	-	-	-	8.190	1.648	-	-	-	-	-	-	-	-	9.838
Public transport	6.869	-	36	-	-	25.793	67	-	-	-	-	-	-	-	-	32.765
Private and commercial transport	-	-	-	-	-	50.730	374.901	-	-	-	-	-	-	-	-	425.631
Subtotal transport	6.869	-	36	-	-	84.713	376.616	-	-	-	-	-	-	-	-	468.235
OTHER:																
Waste management																
Waste water management																
Please specify here your other emissions																
Total	738.389	15.730	739.576	19.058	42.213	207.419	376.616	-	-	-	-	-	3.484	-	-	2.142.485
Corresponding CO_2-emission factors in [t/MWh]	0,483	0,202	0,202	0,231	0,279	0,267	0,249				-	-	0,202	-		

Energy consumption and CO2 emissions in Genoa – Source: SEAP

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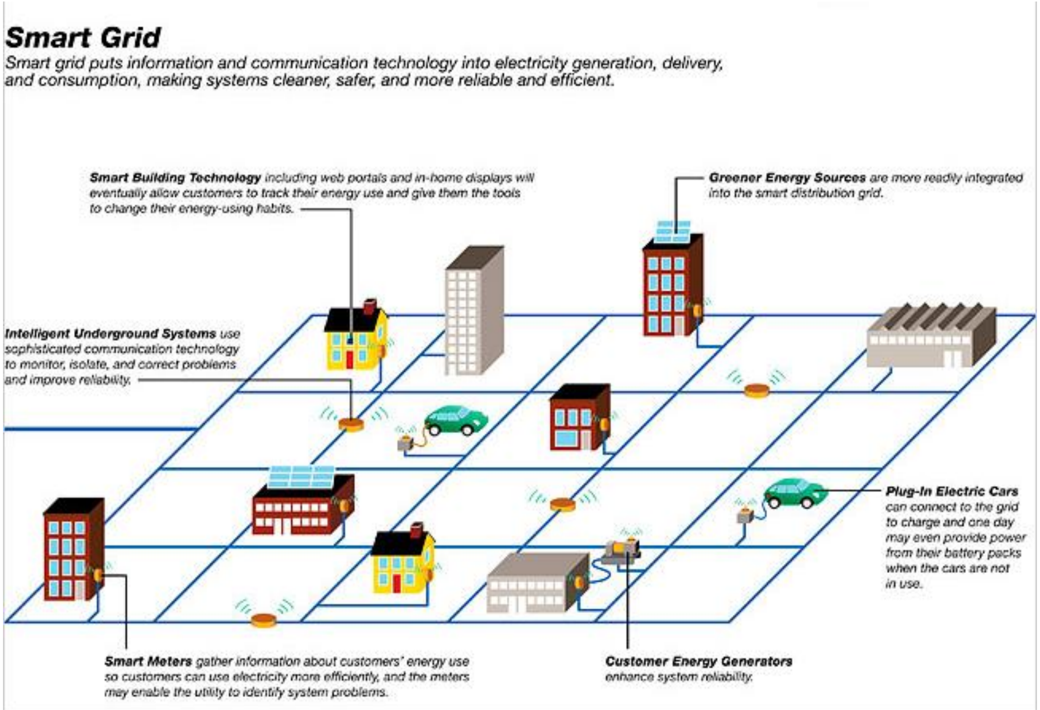
Concerning the existing operative tools in the electrical field the "Smart Electricity Grids" represents one of the main "Enabling Infrastructures".

In this context the electricity grid is renewed in order to accommodate the flows of electricity from distributed energy sources, optimize energy flows, enable new services for customers, implement an electric mobility system and an innovative and sustainable Public Lighting system.



Example of Smart Grid

The main Smart Grids measure identified for the Municipality of Genoa for the "Electric mobility" is the scaling up of the recharge infrastructure for electric vehicles.

In Genoa there is in place the so-colled "Telegestore" which is a remote management system on which is based the Enel Smart Metering System.

Currently in the city of Genoa there are 17 public recharging infrastructures for electric vehicles (14 for public use + 3 for car sharing vehicles) that are managed and controlled by an ICT application called "Electric Mobility Management System (EMMS) developed by Enel.

Here is an abstract of the charging points map in the Genoa territory.

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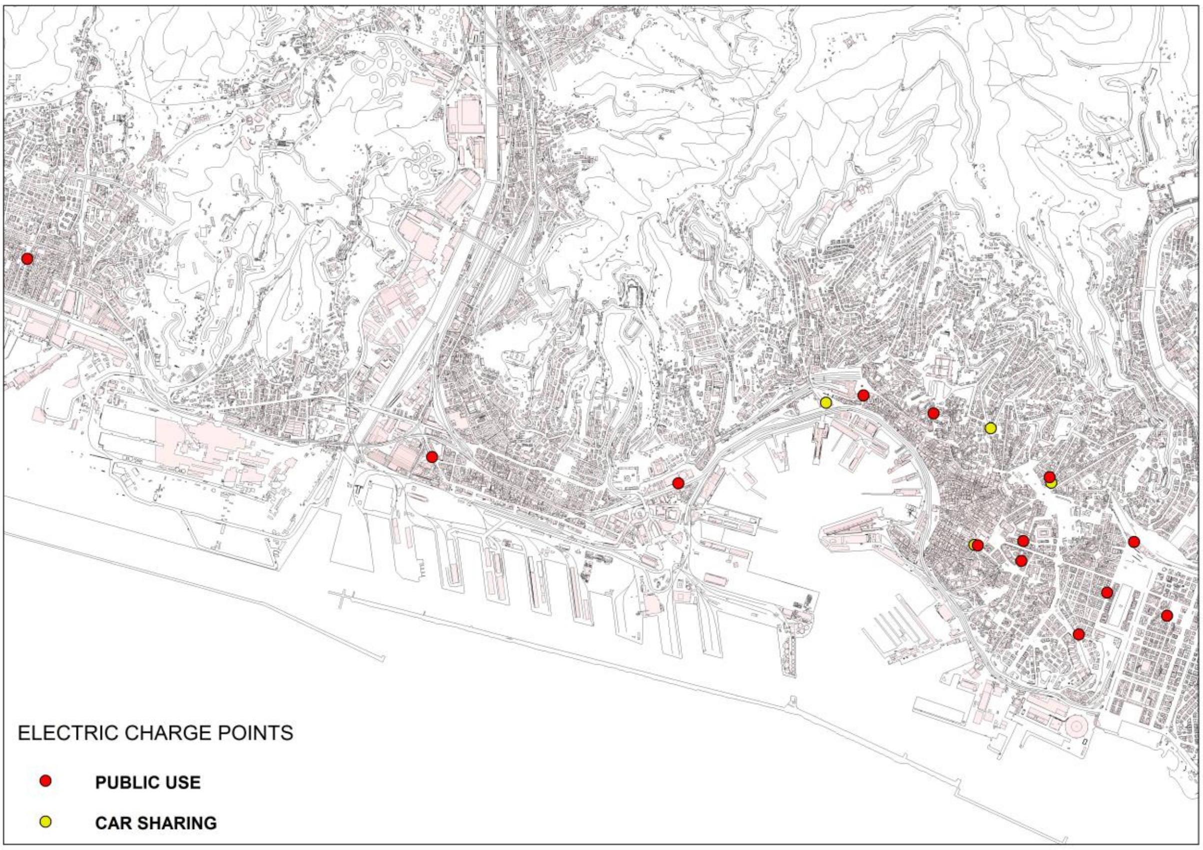

Abstract of the charging points map in Genoa

The charging columns are equipped with two types of sockets, to allow maximum adaptability to the standards of the electric vehicle charging: the charging socket SCAME and the charging socket Mennekes.

The columns require a three-phase network connection of 20kw (charging in 4-8 hours).

A charging point in Genoa

With regard to the data in the table below it's evident this result: during the Electra project period the charging points have been used a lot by Genoa e-users, because, as confirmed by ENEL data, the consume in KWh's for each electrical unit is high (1259 KWh's).

	*Source 1	Source 2	Source 3	Source 4	Source 5	Source 6	Source 7
**Source Utilised for Charging (PV's, Wind Energy, Geothermal etc…)	Conventional fossil fuelled power stations						
***Carbon Footprint [kg's of CO2 /KWh]	0,483						
****Number of Electrical Units consumed for Charging	21.400 kWh in total (Source: Enel data) of which 12.018 kWh consumed for charging by e-light vehicles						

* Source: the way electrical energy utilised to charge the scooters' batteries was generated. This may be conventional fossil fuelled power stations, photo voltaic panels, etc… Account for each type of source and it's carbon footprint (amount of kilogrammes of GHG gasses produced for the generation of 1 KWh)

** Write the type of source from where electrical energy was generated

*** This is the amount of Carbon Dioxide in Kilogrammes of GHG for the production of 1 KWh (estimate is good too)

**** The total amount of Electrical Units KWh's

4.2. Actions Carried out to increase the efficiency in mobility

Regarding the actual status quo of the urban mobility in Genoa here there are some data.

- Urban density: municipality area - 610.000 inhab. in 240 km² (2.500 inhab / km²); in the central area - 276.000 inhab. in 28 km² (9.850 inhab / km²).
- Urban road network: 1.400 km, 7 motorway gates, 5 Mveh/year in/out.
- Fleet composition: Private cars = 290.000; 2-wheels = 140.000; LDV = 25.000.
- Modal share: 42% private; 43 % public; 15% other.
- Public transport network (154 Mpax/year): 137 bus lines (913 km) + 4 on-demand transport services; 1 metro line (7,5 km; 8 stations); 2 funiculars + 1 rack railway + 11

lifts; 1 boat service; 1 suburban railway line (25 km).

- Complementary to public transport: car sharing, bike sharing.
- 23.000 parking places subjected to payment:
  - BLU AREA zones (20.000): residents pay a yearly subscription to park with no limit, while the non-residents have to pay on a time basis,
  - ISOLE AZZURRE (3.000): parking places subjected to payment in the proximity of main public services and centres of attractions.

The Municipality of Genoa is one of the first cities in Italy to submit its Sustainable Energy Action Plan (SEAP) in accordance the Mayors' Covenant initiative of the European Commission, whereby each city makes a voluntary and unilateral commitment to reduce its CO2 emissions beyond the target of 20% by 2020.

The SEAP, in mobility field, foresees a series of planning actions, through the local Urban Mobility Plan (P.U.M.), including energy efficiency requirements in the urban mobility system. Some of the actions in progress are:

- Protected road axes: establishment of dedicated public transport priority lanes.
- Parking policy: expansion of the Blue Areas (resident permit parking program and priced parking for non-residents).
- Elevators and funiculars: creation of vertical lift systems consisting of elevators and funiculars for the densely populated hillside areas and/or intermodal hubs within the system of urban mobility.
- Environmental islands: a combination design to penalize private vehicle traffic, favoring the public transport and guaranteeing road safety, also for cyclists and pedestrians.
- Extension of the subway line: extension of the existing metro line.
- Eco-friendly fleet transition plan: the local bus company made plans to introduce new eco-friendly vehicles replacing the highly polluting buses.
- Interchanging hubs: in the network system interchangers are crucial in terms of guaranteeing efficient service.
- Goods Transport: areas off limits for non-commercial private vehicles in order to rationalize traffic generated by the commercial vehicles around the old town.
- Expansion of the car sharing service, in order to discourage the use of private vehicles.
- Soft mobility: new models of soft mobility in order to reduce traffic congestion, noise,

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air pollution and improve the quality of life for citizens by cycle paths (bike and e-scooter sharing service).

- Wireless city network: this action intends to implement a wireless city network allowing Internet access to all citizens and visitors of the city through their own portable notebook, laptop computer, tablet-PC, and smart-phone.

In particular, about the e-mobility it's foreseen the expansion of the number of electric charging points in the Genoa urban area, thanks to national / European and private funds.

4.3. Use of e-light vehicles

*e-light vehicle ID No.	**Kilometers Travelled	***Amount of Electricity Consumed during charging [KWh]	****Type of Vehicle it replaced Eg. Petrol Car, Diesel Car, Petrol Scooter etc…]	*****Way the Scooter was used
TOTAL	611.428 kms in total of which 343.378 kms travelled by e-light vehicles	21.400 kWh	Petrol scoter, petrol car	Purchased/Rental

* Identification of the e-light vehicle
** The total amount of distance recorded on the OdoMeter for each corresponding EV
*** The total amount of electricity in KWh given to the corresponding light vehicle
**** The way e-light vehicle were released to the people making use of them. For example one EV per person or else the way each EV was shared amount the people utilise it.

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