IEE project Contract N: *IEE/12/856/SI2.644759*

PRO-E-BIKE

Promoting electric bikes and scooters for delivery of goods and passenger transport in urban areas

TRANSFERABILITY ANALYSIS

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December 2015

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

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1 Project pilot cities

The PRO-E-BIKE project promotes clean and energy efficient vehicles, electric bicycles and electric scooters (commonly named "E-bikes") for delivery of goods and passenger transport among private and public bodies such as delivery companies, public administration and citizens in European urban areas, as an alternative to conventional "fossil-fueled" vehicles.

For each pilot city, a strategic framework was developed with a list of concrete measures and an action plan for facilitation of E-bikes utilization and market uptake. Action plans were prepared for the respective municipalities or policy/decision makers, which will serve as a basis for meaningful work in the future and for implementing measures and policies, and obtaining funds. The exception was Portugal, where two action plans were prepared: one for Lisbon and another for Torres Vedras.

The pilot cities, actively involved in the PRO-E-BIKE project, are: Zadar (Croatia), Valencia (Spain), Motala (Sweden), Moravske Toplice (Slovenia), Genova (Italy), Heerhugowaard (Netherland), Torres Vedras (Portugal) and Lisbon (Portugal). Pilot cities vary according to different criteria, e.g. population, area of municipalities, climate features, and other.

Locations of the pilot cities are shown on the map below:

Image 1: Locations of pilot cities in EU regions

The following table shows the key characteristics of the pilot cities that participated in the PRO-E-BIKE project. The following indicators are described:

- population (number of inhabitants),
- density (population per km^2),
- surface (in km^2),
- climate features,
- traffic situation.

Table 1: Comparison of the key features of the pilot cities

Country	City	Population	Density	Surface	Climate	Traffic situation
Croatia	Zadar	75,082 inhabitants	3,000/km^2	25 km^2	July is the hottest month in Zadar with an average temperature of 25 °C, and the coldest month is January at 7 °C with the most daily sunshine hours (13) in August. The wettest month is November with an average of 100.7 mm of rain. The best month to swim in the sea is in August when the average sea temperature is 25 °C.	Due to the flat terrain with small slopes, Zadar has very favorable conditions for the construction of bicycle paths and development of cycling. For this reason, the City of Zadar is planning to develop a new cycling infrastructure, as well as to upgrade and modernize the existing one, in order to provide higher safety of all road users and encourage the dissemination of the use of bicycles as a common means of transport. It will encourage greater use of bicycles in everyday transportation, which will have an impact on reducing CO_2 emissions and will encourage further development of environmentally friendly transport. All together would contribute to a cleaner city and higher living standard in Zadar, as well as to the tourism development.
Italy	Genova	594,904 inhabitants	2,400/km^2	243.60 km^2	Genoa has a hot Mediterranean/ dry-summer subtropical climate. Summers in the city are pleasant and not as humid as in other Italian cities, with temperatures of about 20 °C. The winter weather in Genoa is pretty mild at around 10 °C.	The urbanized area and the main roads are concentrated on the coastline and in the two main valleys. The road network is characterized by an average width of about six meters, which, during peak hours, leads to high saturation indexes. Almost 60% of Genoa citizens prefer walking and public transport while the rate of cycling is low, less than 1% according to a recent survey. In 2008, the first, and actually unique, bicycle lane was inaugurated in Genoa: it is a 2.5 kilometers long shared path (with pedestrians) between the city center and the Municipality of Genoa. The bike-sharing service in Genoa is limited in size, number of stations and bikes, and it is underutilized.

Nether-land	Heerhu-gowaard	53,321 inhabitants	1,389/km^2	134.65 km^2	The climate of Heerhugowaard is classified as cold and temperate. The rainfall in Heerhugowaard is significant, with precipitation even during the driest month. The average annual temperature in Heerhugowaard is 9.1 °C. Precipitation here averages 781 mm.	The city of Heerhugowaard aims to make sustainable transport an integral part of future urban developments. They promote sustainable transport modes such as the (E-)bike among the city's aldermen and councilors. Besides, Heerhugowaard is trying to adjust the infrastructure of the city to the advantage of the cyclists. The city also aims to increase the awareness of entrepreneurs about the possibilities that E-(cargo) bikes offer. In order to achieve the city's aims, Heerhugowaard has worked together with Mobycon on an action plan. Various measures have been defined therein that might be implemented to increase the use of E-(cargo) bikes.
Portugal	Lisboa	545,245 inhabitants	6,458/km^2	100.05 km^2	Lisbon and its metropolitan area has a Subtropical-Mediterranean climate, with short and very mild winters and warm summers.	Public transport has recently undergone great improvements to accommodate bicycle traffic. Moreover, an integrated ticket has recently been introduced to all public transport users. A bike-sharing system is expected to be finished in 2016. There is a high level of traffic in the city center.
Portugal	Torres Vedras	79,465 inhabitants	200/km^2	407.15 km^2	The climate is mild and generally warm. The winter months are much rainier than the summer months. The average temperature in Torres Vedras is 15.7 °C.	Soft modes of mobility have been one of the strategic areas of action set by the county, which already provides a bike-sharing system called "Agostinhas". The name is a tribute to the renowned cyclist Joaquim Agostinho who lives in the city.
Slovenia	Moravske Toplice	752 inhabitants	87/km^2	8.6 km^2	Most rainfall is seen in June, July and August (rainy season). On average, the warmest month is August and the coolest month is January.	Transport infrastructure in Moravske Toplice and traffic connection to neighboring places are very good. Due to the proximity of the highway location, good traffic position of Moravske Toplice is favorable and attractive for tourists, entrepreneurs and other visitors to this tourist destination. Great emphasis in recent years was placed on constructing bike path that connects Moravske Toplice with neighboring villages and with Murska Sobota, the largest city and the cultural, economic and educational center of the region.
Spain	Valencia	800,000 inhabitants	6.000/km^2	134.65 km^2	Valencia features a typical Mediterranean climate, with an average temperature above 17 ºC. Warm summers and mild winters.	The City Council has worked over 20 years to improve the environmental quality, setting reduction of greenhouse gases emission and the fight against the climate change as main goals.
Sweden	Motala	42,545 inhabitants	34/km^2	1,267 km^2	In Motala, the climate is cold and temperate. Motala is a city with a significant rainfall. There is a lot of rain even in the driest month. Precipitation here averages 602	Motala city (Sweden) has had problems with a lot of traffic through the city. Motala is also a bike-friendly city, aiming for a continuous improvement. Cycling in Motala is easy and provides a fast way to get to work, school and other activities. Distances are short, and every year, the number

					mm.	and the length of the bicycle paths are increased. Measures have also been implemented to increase the number of people using bicycle instead of car as a means of transport. A new bridge has changed traffic flows outside the city. A 50-year tradition of organizing Sweden's biggest cycling race makes Motala a cycling city. Motala has high ambitions when it comes to becoming a fossil-fuel-free city, and plans to increase cycling traffic. The municipality works to influence employees, politicians and residents to see the bike as the first choice for short-distance transport. PRO-E-BIKE is a way to generate interest in electric bicycles.

2 Assessment of performance

The following table shows the main benefits and results achieved in the pilot cities involved.

Table 2: Overview of the main benefits and results achieved in the pilot cities

Country	City	Involvement of pilot city in the PRO-E-BIKE project	Main benefits
Croatia	Zadar	The City of Zadar developed the action plan for the promotion of E-bikes and organized 2 Info Days where such type of vehicles were promoted. The project was also promoted in the media and the City of Zadar's web site, as well as during the City of Zadar Energy Week. Utility Company Čistoća Ltd. and home for mentally ill adults St. Francis also tested the E-bikes, which have proven to be a good alternative to the conventional ones. The activities performed were significantly successful.	The main result and effect of the activities was an increased interest of citizens, delivery companies and tourists, as well as a more efficient everyday work performance. The main benefit that these activities and results brought to Zadar was an increase in everyday work efficiency of the communal inspectors who mostly used E-bikes and E-scooters, especially during the tourist season when the traffic roads are crowded, which finally resulted in the reduction of fuel consumption and maintenance costs. Target groups were involved by official invitation of the City of Zadar, as well as through the media, Energy Week, project presentations, etc. The target groups immediately recognized benefits of the involvement, so no significant stimulation was needed.
Italy	Genova	The interaction with Genoa Municipality was very positive and several dissemination events were organized in synergy between the two IEE projects, PRO-E-BIKE and Ele.C.Tra. Both Info Days have been organized simultaneously, allowing to reach a wider audience – public administration representatives, mobility managers of companies, E-vehicle producers and retailers, and general population.	The interactions with Genoa Municipality allowed sharing of the PRO-E-BIKE goals and ensured great visibility of the PRO-E-BIKE project among companies and citizens. The involvement of the Municipality in the activities related to the redaction of the action plan was more difficult due to the procedures of the Public Authority and the existing plans and priorities of the Municipality regarding mobility.
Netherland	Heerhugowaard	The city of Heerhugowaard was very interested to put effort into the project from the beginning. However, the initial enthusiasm has waned a little because only one company (Subway) has joined the project since then. Nevertheless, an action plan was developed and they participated in the exchange event at Motola. Also, an additional information event on electric vehicles was organized for local businesses, in which PRO-E-BIKE had a separate stand with information about E-(cargo) bikes and E-scooters for companies. Heerhugowaard has gained considerable insight into promoting E-bike technology to retail and small independent companies. The action plan is helping them to implement (parts of) SUMP into the amended Local Traffic and Transportation plan.	The biggest benefit for Heerhugowaard is the development of the action plan, since it gives them concrete tools to promote the use of E-(cargo) bikes and E-scooters for professional use. In many cases, however, other end-users have benefited as well. Info Day was organized especially for companies in Heerhugowaard. The city actively followed up with the interested parties. For instance, a group of retailers from the inner city recently had questions on how to organize deliveries into pedestrian-only areas. This proved a great opportunity to propose the use of E-(cargo) bikes to them. The discussion on this is still ongoing.

Portugal	Lisbon	In the city of Lisbon, three pilots were conducted. ISS (Occam) E-scooters were introduced for daily deliveries in two different companies: Camisola Amarela and Moço de Recados. Additionally, two Info Days were organized to raise awareness of companies and general public regarding the use of electric scooters and bicycles as an alternative to reduce emissions and noise. Presentations and information regarding the PRO-E-BIKE project were provided, and the pilots were conducted in the city of Lisbon, where the pilot companies were presenting their vehicles and expressing their opinion regarding the utilization of E-scooters for distribution. The main target groups were companies and the general population. To encourage the involvement of the companies, we provided them with the E-scooters and E-bikes for their daily deliveries. By doing so, we gave them the opportunity to test this technology without costs. To encourage the involvement of the general population, we conducted Info Days where several presentations and explanations were provided in order to raise awareness regarding the use of this technology and its benefits.	PRO-E-BIKE was announced by the media through different channels, as well as during the Info Days. The pilots have been producing good results. The companies are satisfied with the performance of the E-scooters and they intend to continue using them after the completion of the pilot. The companies that accepted the challenge are already using this type of vehicles and will certainly serve as a trigger for the adoption of this technology by other companies. Although it is not possible to quantify the success of the dissemination actions (Info Days and news in the media), we had several participants, especially delivery companies, looking for information during the Info Days. With these pilots, the city of Lisbon has launched a new paradigm where electric scooters and bikes are promoted instead of conventional vehicles.
Portugal	Torres Vedras	The Municipality of Torres Vedras is extremely committed to the PRO-E-BIKE project. In addition to several meetings which were aimed at developing the action plan, the Municipality also supported PRO-E-BIKE activities, such as two Info Days and testing of the E-bikes during the 6-month period. As for the Info Days, both were organized with the support of the Torres Vedras Municipality. The first Info Day was held in the Municipal Market on March 14, 2015. The target groups of the event were local traders and the general public. The second one took place during the European Mobility Week, on September 22, near the Bus Terminal of Torres Vedras. The venue had been chosen because of its proximity to the park & ride areas and the parking spot of the electric vehicle from another European project, REPUTE (Renewable Public Transport Enterprise), which is a project on the use of renewable energy in public transport. The Municipality is very familiar with the use of the E-bikes and did not hesitate to test them with the employees under specific conditions. One of the E-bikes was used by an employee for delivery of internal mail/documents to the local schools every day, and the other one was placed in a pool system, which was used by the employees for travelling to local meetings, services,	The E-bike used for the delivery of documents to the schools was a successful experience. Its performance was in accordance with the demands, and the employees were very satisfied with it. The E-bike used in the pool system was also a positive experience in general. However, it has not been used as much as it was initial expected, as it has proved difficult to motivate the employees to use it instead of the car. There were also some technical problems preventing the use of the E-bike (e.g., when charged but not in use, the battery shut off and the E-bike did not work, making it necessary to call maintenance).

		etc. During the 6-month period, they have used the E-bikes for their activities.	
Slovenia	Moravske Toplice	The Municipality of Moravske Toplice organized two Info Days. The first one was organized within the 18th Municipal holiday of Moravske Toplice, where electric bicycles were introduced. Presentation of the electric bicycles to the general public was one of the activities where the operation of electric bicycles could be practically shown and tested. The second Info Day was organized as part of the 20th bicycle marathon in the municipality of Moravske Toplice, which is amongst others also the pilot city of the project. We managed to get general interest for electric bikes amongst the participants of the bicycle marathon. We have thus contributed to raising awareness of the advantages and benefits of using the electric bikes in various companies.	The introduction of E-bikes to the wider public is one of the activities that actually shows and demonstrates the benefits and advantages of using of the E-bikes for various purposes and in various business activities. The key findings were that by using of electric bikes, the involved companies: ○ have saved more money (less fuel costs); ○ helped to reduce harmful emissions in the air; ○ helped to increase the visibility of their company in the local environment. By participating in the PRO-E-BIKE project, we wanted to show to companies and other interested individuals that the usage of electric bikes is a viable form of sustainable mobility, suitable for businesses located both in urban and rural areas.
Spain	Valencia	Valencia city council has shown its involvement in this project since the early beginning. Through the Environmental Department, the city officials have been informed of every action. They have actively participated in the trials, using one of the cargo bikes for deliveries to "Mercado Central", a food market managed by the city council. Environmental officials have also actively participated in the two Info Days organized during the extension of the project to promote sustainable transport in the city. Two Info Days have been organized with the collaboration of the city council, pilot companies, urban logistics experts and representatives of other similar European initiatives (Dorothy project and the Cluster of Logistics in the Valencia Region). Other target groups, such as retailers, municipal food markets, LSPs, supermarkets, transport associations, etc., have been informed about the benefits of the project.	Main benefits of the project were those related to the awareness regarding the use of sustainable vehicles, both for passengers and freight deliveries. Valencia city council is very committed to reduce pollution levels in the city by implementing low-emission vehicles in other activities such as police, Aguas de Valencia (water supply in the city), cleaning, garden maintenance, office material supply, etc. After completion of the trials, there were many remarkable results. 2,670 kilometers were covered during the 6 months of the project extension, which represents about 28.5 km per day. Depending on the company, the average number of orders per day varied between 3 and 12. Saving in CO_2 totaled 0.5 kg CO_2 per order (about 819 kg in total), and 0.2 EUR per order in fuel consumptions (about 330 EUR in total).
Sweden	Motala	The testing period of the E-bikes in home care services was very important in terms of creating interest and understanding that the E-bikes really are an alternative to the car on short trips. It also led to other activities, such as child care and adult education, acquiring E-(cargo) bikes. During the Info Day, the municipality had the opportunity to inform about their E-bike projects for others in the region and was inspired by other companies and organizations that have replaced car with electric bicycles. During the annual business exhibition in Motala with 6,000 visitors and 150	Participation in the PRO-E-BIKE project supported Motala's plan to increase cycling. Through participation in the project, a section in the upcoming cycle plan will focus on the conditions for E-(cargo) bikes.

		participating companies, the municipality presented its activities and then exhibited electric cargo bikes at their stand. Through cooperation with the electric company ESEA, two EU projects could be the region's first electric vehicle trade show, which allowed politicians and officials in the region to meet the suppliers of all the different electric vehicles, as well as the companies that provide charging stations, and a road show where companies from the former exhibition visited the municipality so that more politicians and officials would have the opportunity to test drive the electric vehicles and meet the suppliers.	

3 Sustainability of the actions

In most cases, the pilot companies were involved in the delivery of various goods, letters and small packages, tobacco products, office materials or other specific services. In very short time, they have recognized the advantages and benefits of using E-vehicles for their business and their customers. The key identified benefits/advantages were: cost savings, promotion of the pilot companies, better quality of provided services and good feedback from their clients.

After completion of the project, many pilot companies will continue with the use of E-bikes or/and E-scooters. Due to numerous benefits, the majority of the pilot companies have committed to continue using E-bikes and E-scooters in the future. The new vehicles have already been implemented in their daily activities and contribute to reduction of noise and emissions without performance losses.

Out of 38 pilot companies participating in the testing of E-bikes and E-scooters, 27 companies (71%) decided to continue using E-bikes and E-scooters in the future. 11 companies (29%) decided not to continue using them.

The action plan of Genoa, for example, identified three main themes, Cycle-mobility, Electric-mobility and Cycle-logistics, included a context analysis for the city of Genoa, and tried to determine the measures that could be adopted to promote the transport with E-bikes, ensuring their feasibility and sustainability. For Cycle-mobility, in particular, the action plan of Genoa identified the enhancement of urban cycle-network as one of the main issues to be tackled in order to improve the safety level of cycling in the city of Genoa: this action is in line with the efforts of the Municipality to foster Cycle-mobility, as highlighted in the SUMP 2010. Furthermore, the action plan underlined the potential of establishing 30 km/h zones throughout the city, as a no-cost, yet very effective incentive for Cycle-mobility. As for Electric-mobility, the action plan remarked the positive initiatives carried out by Genoa Municipality, underlining the role of public administration in reinforcing the perception of this technology among citizens and in easing the shift from traditional vehicles to electric ones.

Finally, the contribution of the public administration has been highlighted for the third level of action, Cycle-logistics, showing how it can contribute to promoting the start-up of microenterprises and dedicating unused public space to the set-up of urban logistic center, both of which foster private entrepreneurship with limited cost to public administration.

The action plan (developed for and made available to each of the involved pilot cities) represents the initial step towards the ultimate objective in the context of the European Commission initiative to reduce CO_2 emissions by 20% by 2020. The scope of the action plan is constantly developing – it states that it should be regularly updated to adapt to the market conditions, to the national and European guidelines on energy efficiency and renewable energy sources, as well as to new proposals and initiatives by the municipal administrations and professional organizations.

For many years, most of the pilot cities have been working on and pursuing the objectives of sustainable mobility. Several strategic plans were developed regarding Mobility and Electric Mobility, as well as participation in different projects, which demonstrated the commitment of the involved municipality to sustainable mobility.

Some countries are planning to continue the activities included in their action plan, e.g. planing regular meetings with stakeholders and organizing various informational days, along with other dissemination actions, during the mobility week. The "E-Bike simulation tool" is available for the companies, which helps them to estimate potential benefits of the introduction of E-bikes as a substitute for their current conventional fleet, measured in euros (EUR) and environmental impact (CO_2 emissions, etc.).

4 Lessons learned

As for the test period, it is very important that the staff and managers are well informed about the purpose of reducing car travel, and that the project is part of municipality's or company's environmental efforts. Staff who feel empowered and managers who can explain the benefits will certainly achieve better results. Also, when introducing new modes like electric vehicles, it is very important that all involved get the opportunity to test the vehicles before they are used in actual service.

Some remarkable points have been identified during the project about the ways to successfully introduce E-scooters and E-bikes to urban logistics activities.

- E-scooter performances: Contractors of big companies are afraid to use E-scooters because of their concerns about battery duration. However, distances travelled during average working days are often far shorter than the battery life, and the scooter can be recharged during the night (thus avoiding the need for fast recharge systems). Logistics companies have very stringent operational requirements, but the tested E-scooters demonstrated their technological reliability.
- E-scooter cost: Another problem is related to the E-scooter's purchase price, which often needs to be covered by the subcontractor: in this case, the companies can provide incentives, such as free recharge of the E-scooter.
- E-bike performances: Big logistics companies are afraid to introduce E-bikes to their logistics chain because they are perceived as inefficient: during the pilots, they demonstrated their effectiveness for delivering letters and small parcels (E-bikes), as well as bulky boxes (E-cargo bikes). PRO-E-BIKE experience shows that they can be a reliable alternative to traditional vans. Another issue concerns the load capacity, but the pilots demonstrated that the right choice of the bike type (bikes with normal frame, cargo bikes or cargo trikes) can provide sufficient load capacity without any performance loss, especially if the company chooses a pedal-assisted bike.
- Role of public administration: The introduction of E-bikes makes the logistics chain more complex (and expensive) due to the need for warehouses for E-bikes. Public administrations can play a crucial role by providing disused public spaces to logistic companies for E-logistics. Furthermore, they can encourage Cycle-logistics by creating cycle paths for connecting suburban areas with city centers and 30 km/h zones throughout the city. Finally, they can work on the promotion of E-mobility by enhancing access of electric vehicles to some areas of the city, providing network charging and including E-vehicles in their fleet.

One of the main lessons learned is that entrepreneurs, stakeholders, public authorities and policy makers should be involved from the beginning. Maximum results can only be achieved with coordinated efforts. Efforts have to be made in terms of regulations or benefits for the companies that use E-scooters and E-bikes, so that they perceive these vehicles as something that gives them added value.

Private stakeholders (delivery companies) showed high reluctance and suspicion regarding the use of the E-scooters. Therefore, it is necessary to continue to raise their awareness. However, once the pilots started, their reluctance disappeared. If there are some difficulties in capturing the interest of stakeholders, a possible, useful and feasible solution is to combine with other flagship events (e.g. festivals, mobility events). Sometimes it was not easy to convince the companies to buy (or even try) the E-bikes. The key lessons learned by many stakeholders were that goals are achievable and that individuals are willing to engage, but the key problem in ensuring the continuity of operations is often the lack of necessary funds.

For example, during the implementation of the pilots in Valencia (Spain), some problems regarding the infrastructure have been detected as well. Bike lanes are too narrow to be used by cargo bikes. In these cases, car lanes have to be used, which can pose safety problems. This issue should be taken into account by the public authorities. There is also a lack of regulation regarding the traffic of cargo trikes, as they are often not included in the regulation. In this case, policy makers should work to solve this problem.

5 Success stories

Success stories arise spontaneously as a result of circumstances and the interest of stakeholders in implementing certain measures to improve the current situation and contribute to a better quality of life and sustainable mobility. During the implementation of the project activities, the needs of the involved stakeholders have been identified, as well as their expectations and desire for a certain shift forward, which will also contribute to the improvement of the situation.

27 pilot companies out of 38 participating (71%), which have tested this E-vehicles for delivery of various

goods, letters and small packages, food, tobacco products, office materials and/or other specific services (home care services for the elderly and the disabled, living at home), decided to continue with the use of E-bikes/E-scooters in their business activities once the trials ended.

Among those commended for achieving the common goal were representatives of the involved municipalities from different EU regions, as well as representatives of various pilot enterprises and other stakeholders. In many cases, a completely new vision of doing business was developed from the so-called pilot activities. Businesses that implemented test activities (use of E-bikes and E-scooters) have acquired a new dimension, a new perspective, new opportunities, new goals, and new customers.

The most important aspect of the involvement in the project has been the creation of interest in electric bicycles.

Subsequently, some agreements have been signed between logistics companies and the bike manufacturer. Moreover, by organizing Info Days, companies and citizens have shown interest in learning more about these initiatives.

With the PRO-E-BIKE project, we introduced delivery companies to manufacturers of E-scooters and E-bikes. They are now business partners, working together to promote a more sustainable mobility. Their use of the vehicles was a successful experience and they intend to continue with its use.

The PRO-E-BIKE project contributed to the emission and energy consumption reduction in the involved municipalities, to addressing social responsibility aspects and to the increase in the productivity and process efficiency of the municipalities.

Image 2: Pilot company PUURLAND, Ibiza, Spain

6 Performance indicators

Key performance indicators are very important for the decision of organizations to use the E-bikes. Organizations use them to estimate and evaluate their performance against previously established long-term objectives.

During the project implementation:

- 38 PILOT COMPANIES participated in the testing of the E-bikes and E-scooters;
- 16 INFO DAYS were organized; two per each project partner;
- 8 ACTION PLANS have been developed, one for each of the participating cities:
  - Action plan for the pilot city of Zadar (Croatia),
  - Action plan for the pilot city of Valencia (Spain),

- Action plan for the pilot city of Motala (Sweden),
- Action plan for the pilot city of Moravske Toplice (Slovenia),
- Action plan for the pilot city of Genova (Italy),
- Action plan for the pilot city of Heerhugowaard (Netherlands),
- Action plan for the pilot city of Torres Vedras (Portugal),
- Action plan for the pilot city of Lisbon (Portugal).

During the trial period, constant monitoring was carried out with delivery companies. The main parameters measured during the pilots were:

- Total kilometers travelled,
- Kilometers travelled per day,
- Average distance per order (km),
- Average weight transported per day (kg),
- Average driving speed (Km/h),
- Fuel savings per order (EUR),
- Services (round trips),
- Incidents, e.g. failed deliveries, customer complaints, technical malfunctions, fines, etc.,
- Maintenance costs per E-bike,
- Insurance costs per E-bike.

Possible performance indicators for evaluation of the effects could be:

- variation in cycle paths (% and km),
- variation in 30 km/h zones (% and km^2),
- variation in number of E-bikes used by logistics companies (% and No.),
- variation in number of E-scooters used by logistics companies (% and No.),
- variation in number of E-vans used by logistics companies (% and No.),
- variation in distance travelled by E-bikes (% and km),
- variation in distance travelled by E-scooters (% and km),
- variation in distance travelled by E-vans (% and km),
- variation in number of platforms using E-vehicles (% and No.),
- variation in number of logistics companies using E-vehicles (% and No.),
- variation in number of E-scooters sold,
- variation in E-scooters for delivery per company,
- percentage of deliveries conducted with E-scooters,
- variation in number of orders delivered by E-bikes.

Image 3: E-bike used in Slovenia for delivery of mail and small packages

7 Conclusion and summary of the most important messages

The PRO-E-BIKE project could be considered as a success story for most of the involved pilot cities. After development of the pilots, companies showed complete satisfaction with this kind of deliveries. Moreover, information days organized have created high expectations among citizens and companies.

Recommendations for further actions with regard to the introduction and use of E-bikes for delivery services in the involved companies:

- If the bike is a new type of vehicle in the organization, it is important to:
  - talk positive about the electric bike,
  - give staff opportunity to test drive the new bike,
  - allow staff to borrow electric bike for private use.
- Maintenance should be clear so that everyone knows where to go in case of problems.
- Create e-bike routes where you always use the electric bike instead of a car.

The introduction of E-vehicles can play a significant role in terms of reducing the impact of pollutants and climate-altering emissions:

- The use of electric bicycles (E-bikes and E-cargo bikes) could help to overcome some limitations (related to the orography of cities) of traditional bikes, commonly used for Cycle-logistics, and to increase the carrying capacity.
- Furthermore, the synergy with the E-scooters would enable a range of vehicles with a very low impact, capable of a wide range of deliveries.
- finally, the introduction of electric vans allows a fully electrified fleet.

The E-scooters proved to be efficient in serving the delivery companies in Lisbon, situated on several hills, and other cities. The pilots companies are satisfied with the performance of the E-scooters and intend to continue with their use after the completion of the pilots. The pilots produced good results. They seem to be a suitable way to promote sustainable delivery service, at no cost to the delivery companies. It is important to promote the involvement of the general population. Entrepreneurs, stakeholders, public authorities and policy makers should be involved from the beginning in order to obtain maximum results.

Municipalities are very important players in the process of promoting the use of E-bikes/E-scooters to companies in the local environment. In order to stimulate the use of E-(cargo) bikes and E-scooters, municipalities should help to:

- inform public (companies, stakeholders),
- build or renew the necessary infrastructure (electric charging points; E-bike-friendly infrastructure: focus on bumps, poles, sidewalks, parking spaces, sharp corners, narrow bike paths),
- promote the use of E-vehicles in companies.

Besides strategic plans reporting the commitment to sustainable mobility by decision makers and municipalities, it is also important to implement measures adjusted to local contexts and cultures. Also relevant are communication and dissemination through events to raise awareness of the use of these vehicles, such as PRO-E-BIKE Info Days. Finally, synergies with other projects and cooperation with municipalities is the best way to reach all target groups, from public and private companies to the general public.