

A NEW MOVE FOR BUSINESS

Electric cycle logistics
in European cities



www.pro-e-bike.org



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





PRO-E-BIKE

promoting-electric-bike-delivery



PRO-E-BIKE IN SHORT:

-  Electric bikes proved to be very efficient in dense urban areas where most delivery rounds are short. In many ways they perform better than motorised vehicles, saving money and increasing efficiency.
-  The introduction of electric cycle logistics not only contributes to EU and national policy targets, but can enable cities to stand out as front runners in innovative urban policies and logistic solutions - LEAD BY EXAMPLE!



Sufinancirano iz programa Europske Unije
Inteligentna energija u Europi

LEGAL DISCLAIMER

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission are responsible for any use that may be made of the information contained therein.

FOREWORD

Our cities are bustling with people - and merchandise. Moving goods smoothly and in an environmentally friendly way represents a major challenge. But a solution may be just around the corner, as new technologies, such as electric bicycles, are rapidly gaining ground.

Cycling helps reduce pollution, and it is also a completely different way to experience a city and its public spaces. Based on these premises, Nantes, host city of the Velo-City Congress in 2015 and holder of the title of European Green Capital in 2013, has developed an ambitious and comprehensive cycling policy. Since 2010, Nantes Métropole has subsidised the purchase of 4,000 e-bikes for use by individuals and businesses alike. Similar initiatives are underway in cities all over Europe.

This report sums up the European cities' efforts to promote the use of e-bikes and e-cargo bikes for delivery and logistics purposes. These are true car alternatives: e-bikes are not only reliable but also cheap to operate. Furthermore, their use helps companies promote themselves as green enterprises.

For city authorities, the challenge of the day is to draw up strategies, policies and regulatory measures to encourage modal shift to sustainable logistics. Cities with policies, strategies and plans that promote 'cycle logistics' are already seeing the benefits

This report also shows how cities can lead by using bikes to deliver municipal services. The positive examples presented herein can inspire and serve as models for other cities interested in learning about best practices.

The use of e-bikes is growing at the national level as well. For example, France's national postal service La Poste already uses 20,000 e-bikes to deliver and collect mail and it plans to expand its fleet to 30,000 in the near future. Throughout Europe, a similar trend is hard to miss: an increasing number of companies use bicycles, e-bikes or e-cargo bikes to deliver goods to their customers cost-effectively, quickly and reliably.

Need to move goods?

Think bikes.

Johanna Rolland

*Mayor of Nantes
President of Nantes Métropole
President of EUROCITIES*



PREFACE



Pierfrancesco Maran

*Deputy Mayor on Mobility, Environment,
Subways, Public Water, Energy, Milano
Municipality*

In Italy, Milan is one of the most active cities in the field of sustainable mobility. In addition to the construction sites for the fifth underground line, the congestion charge area (Area C) that covers the whole city center and 6 car sharing operators, Milan is moving fast also on cycling: in 2015, 1.000 e-bikes were added and integrated alongside the 3.600 traditional bikes of the BikeMi, the city bike sharing service, and more than 100 km of new cycle paths are planned for next 5 years in the just approved SUMP (Sustainable Urban Mobility Plan), for integrating the existing network.

Besides this public investment, in Milan private actors - in particular logistics operators - are catching cycling opportunity, convinced by marketing, sustainability and benefits: companies are making big changes in the spirit of the goals of Area C : i.e. in 2015 GLS launched the first e-logistics platform with 11 e-vans and 9 e-bikes, able to replace 15 traditional vans; furthermore TNT, in 2015 replaced the deliveries of 4 vans with 5 bikes.

The report includes tangible examples of how companies can meet the challenges of mobility, environment, and economy: thanks to new and reliable technology of e-bikes and e-cargo-bikes they can reduce costs, increase efficiency, grow their business, and hire more staff.

KEY POINTS AND RECOMMENDATIONS



There is a clear trend in European transport policy to address the negative impacts of motor transport: air quality, congestion, CO₂ emissions, road danger and noise. Cities, and their citizens, want to see action.

Logistics contributes heavily to these impacts, while trends such as the growth in e-commerce mean that the requirement for last mile logistics, short distance urban deliveries, will only grow.

Cycles, including e-bikes and e-scooters, can play a significant role in a cleaner, more efficient urban delivery system. PRO-E-BIKE worked with 40 partners, from private and public sectors, large and small, in seven EU member states to test this.

The project demonstrated that e-bikes were popular, efficient, reliable and - above all - saved money compared to the motorised alternative. Most of the participants were so impressed, they are continuing or expanding their use of e-bikes, after the project end-point.

This document is for city administrations, national policy makers, and anyone considering a move to employ cycle logistics. It outlines the major learning points and success factors, and sets out nine recommendations for the most successful implementation.

RECOMMENDATIONS FOR AUTHORITIES AT ALL LEVELS

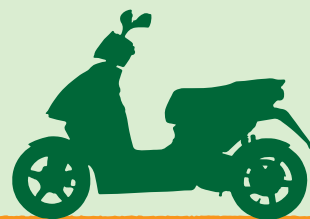


1. Policies, strategies and plans should take cycle logistics into account
2. Regulatory measures are needed, promoting mode shift to sustainable transport
3. Cycle infrastructure, such as bike lanes and cycle parking, should be expanded and improved
4. Local authorities should procure e-bikes and commission cycle delivery services
5. 30 km/h urban speed limit should be implemented, to make all cycling safer
6. Traffic law should be enforced
7. Development of urban logistics centres should be supported
8. Cycle logistics trials should benefit from fiscal and financial incentives
9. Public information and promotion are needed, to advertise the advantages of e-bikes



CONTENTS

Key points and recommendations	2
1. Introduction	4
2. Electric bicycles and scooters for delivery of goods and services	5
3. Business pilots	6
4. City administration pilots	11
5. Learning points and success factors from cycle logistics pilots	13
6. General recommendations: how to maximize the benefits of cycle logistics	17
7. PRO-E-BIKE tools for businesses, cities and municipalities	19
8. Future prospects for cycle logistics	20
9. Conclusions	20
PRO-E-BIKE project card	21
References	23



1. INTRODUCTION

A majority of Europeans considers air and noise pollution, road congestion, traffic casualties and the cost of mobility as important problems, and believes that city authorities should be mainly responsible for reducing traffic in cities (1). Logistics operations in urban areas are significant contributors to these problems, and cities need to address them.

The logistics sector is responsible for about 20% of CO₂ mobility emissions in urban areas (2), represents between 8 and 18% of urban traffic flows (3) and reduces road capacity by 30% (4). At the same time, inefficient delivery can damage the image of businesses operating in dense urban centres, while the growth of e-commerce in Europe brings a demand for efficient and cheap delivery services, any time of the day and in any part of the city.

It has become clear that urban mobility policies and patterns must change: cities across Europe are moving towards low-emission, sustainable, noiseless and healthy mobility, for people and for freight. Innovative zero- or low-CO₂ urban logistics can contribute to this goal, particularly in dense urban areas where most freight trips are short.

In this context, it is natural that delivery companies such as DHL, UPS and FedEx are engaging seriously with cycle logistics for 'last mile' delivery, driven by cost, environmental concerns, health of employees and the public image of the organisation.

A number of research and modelling projects have developed consistent predictions of the local freight market share which could be taken by bikes. Gruber et al estimate that electric cargo bikes could take 19% - 48% by distance of courier logistics now done by motor vehicles (5).

The CycleLogistics project concluded that bicycles could do 51% of all logistics trips and 25% of commercial delivery trips in EU cities (6). Even more impressively, the MOBI research group at Vrije Universiteit Brussels suggests that 68% of trips could be shifted from motor vehicles to bikes (7). This shift from conventional motor vehicles could be achieved without increasing overall costs, and would of course reduce social externalities (8).

Cleaner cities, lower congestion and noise levels improve the quality of life for citizens, so it is clear that cities and municipalities should support a shift to cycle logistics. An innovative European research project called PRO-E-BIKE was established under the Intelligent Energy Europe programme, to pilot and test the use of pedelecs, electric cargo bicycles and tricycles, and electric scooters, for a range of delivery services. It included 40 businesses, in different industrial sectors and of different sizes, in seven European countries and 20 cities.

The results really were impressive. The partners achieved measurable cost savings, and in almost every case were so convinced by the pilot experience that they are now continuing, or even expanding, their use of electric bikes.

This report outlines the main impacts of the project, illustrated with case studies. It provides advice and recommendations for a range of public and private sector operators looking at the possibilities of cycle logistics. We hope it will answer any questions the reader may have, and give support and reassurance to city authorities and their local partner organisations to make cycle logistics a major part of future strategies and liveable cities.



Various types of electric bicycles are available for business or personal use. We tested a number of these in different settings: pedelecs, e-cargobikes; e-cargo tricycles, e-scooters and e-cargo bikes for children.

For conventional electric bicycles, a choice of equipment such as boxes, bags and trailers can be mounted for delivering loads. Most cargo bikes are also designed to fit various designs of special purpose boxes, to adapt to the needs and preferences of the user.



WHAT IS AN ELECTRIC BICYCLE?

European Union directive 2002/24/EC defines electric bicycles as “Cycles with pedal assistance which are equipped with an auxiliary electric motor having a maximum continuous rated power of 0.25 kW, of which the output is progressively reduced and finally cut off as the vehicle reaches a speed of 25 km/h (16 mph) or if the cyclist stops pedaling.”

Individual member states of the EU are left to implement the requirements in national legislation and to determine the legality of road access.

The term electric bicycle, or officially in EU **electric pedal-assisted cycles (EPAC)**, includes different concepts of vehicles with an electric motor. **Pedelecs** are bicycles equipped with an auxiliary motor that cannot be exclusively propelled by that motor: only when the cyclist pedals, does the motor assist. **E-bikes** are bicycles equipped with an electric motor that can be exclusively propelled by that motor: the cyclist is not necessarily required to pedal. In this document, we use the general term e-bike for pedelecs, e-cargo bikes, e-tricycles, e-scooters etc,

For more info please visit [www.pro-e-bike.org /PUBLICATIONS/D2.1](http://www.pro-e-bike.org/PUBLICATIONS/D2.1)

THE ELECTRIC BICYCLE MARKET IN EUROPE

Sales of e-bikes in the EU have been on a strong rising trend over the past decade, from almost 100,000 in 2006 to 1.1 million by 2014. The market is most developed in ‘traditional’ cycling countries such as Germany and the Netherlands, but others such as France and Spain are also seeing market growth. Italy was the largest e-bike manufacturer, followed closely by Germany. Not surprisingly for such a new technology, advances are making e-bikes faster, giving longer range and greater carrying power, and improving reliability.



Regular pedelec with bags for delivery (HP, Croatia)



e- scooter (Marujo restaurant, Portugal)





Cargo e-bicycle (GKC Grafica, Italy)

Cargo e-tricycle (EROSKI, Spain)

Types of electric bike tested within PRO-E-BIKE

The choice of the right type of vehicle is important for business. Commercial e-bike operators will need to consider the range of options, and select the type(s) of e-bike best suiting their needs and preferences.

In general, e-scooters have the largest carrying capacity (150 - 180 litres load space), maximum up to 80 km/h. However, their cost is two to three times that of a pedelec and double the cost of e-cargobikes.

An e-cargobike offers similar load capacity to an e-scooter (160 litres), a speed of 25 km/h (which is of course adequate for most urban uses) and good autonomy, with a range around 70 km.

Pedelecs offer the best performance in terms of costs, being much cheaper to buy, but offer considerably less capacity than e-cargobikes and e-scooters (Figure 1).

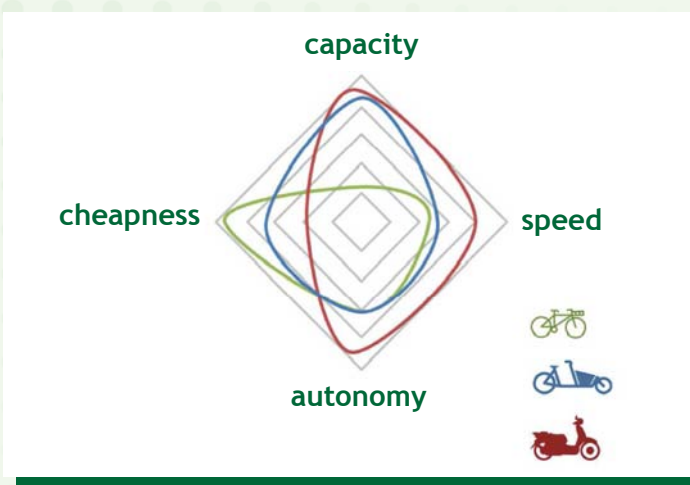


Figure 1: Performance comparison between various forms of e-bike (Poliedra)

3. BUSINESS PILOTS

PRO-E-BIKE set out to test and prove the various types and models of electric bicycles and scooters, working with 40 companies of differing types and sizes across different industrial sectors and in 7 different EU member states. The objectives of the project were to confirm whether e-bikes could be a viable delivery choice for these many different businesses, and to identify learning and decision points to help future commercial users make informed choices of e-bike.

The project was a great success. The e-bikes were found to be reliable, flexible and popular, and above all, more economical than the motorised alternative.

Most pilot operators have continued to use their e-bikes after the project end date, with three member states showing 100% continued use. Some operators have invested significantly in e-bikes following their trial. Building from a project fleet of 79 e-bikes of various types, the total number in use now is 267. We expect this growth to continue, and also for new e-bike investment to be generated in areas adjacent to our project sites, as has already happened in Sweden (see Section 4).

Table 1. Summary of PRO-E-BIKE pilots

Country	No of companies	No of vehicles	e-bikes continuing	Real number of e-bikes in service after trials
Spain	3	3	100%	3
Netherlands	5	10	100%	10
Sweden	5	19	100%	19 + 18 new e-bikes
Italy	4	7	86 %	7+ platform with 6 new e-bikes
Croatia	9	21	86%	16 + 180 new e-bikes
Slovenia	8	11	36%	4
Portugal	6	8	50%	4
Total	40	79	81%	63 pilots + 204 new = 267

The case studies below illustrate the impacts and experience of a selection from the private sector partners.

CASE STUDY: GLS, MILAN, ITALY



In Milan, during the 10 months of the pilot, the global delivery company and number 2 in Italy GLS, delivered almost 50,000 letters and small parcels, covering more than 20,000 km with a fleet of four pedal assisted bikes. This workload would otherwise have required two to three motorised vans.

The introduction of the e-bikes, and the positive experience of GLS in using them, stimulated new ways of thinking about logistics in the city, and resulted in development of a new urban consolidation centre.



E-vans and e-bikes at GLS logistic centre in Milan. Source: POLIEDRA

After the trial, GLS decided to continue using e-vehicles for goods deliveries in Milan, creating a new logistics platform completely dedicated to e-vans and e-bikes. The main factors behind this decision include:

- the cost savings: energy costs of the e-vehicles were only 15% of those for conventional motor vehicles
- Milan's city centre congestion charge area (AreaC)
- GLS needed a new logistic platform because of market enlargement
- GLS considered the new, greener e-logistics platform as a marketing investment.

The total annual operating costs of the new GLS e-fleet compare well against the previous approach. This means that environmental and social benefits for the community and marketing gains for the company are effectively free. GLS estimates that the e-fleet saves around 90 tonnes of CO₂ per annum.

“GLS moved their logistics centre to a new location in Milan, replaced 3 delivery vans with 6 e-bikes, and hired more staff for the extra vehicles. The result was increased deliveries, productivity and efficiency. Even though GLS employed more people to do the same work, they still save money.”

Roberto Nocerino, Poliedra-Politecnico di Milano

CASE STUDY: ENCICLE, VALENCIA, SPAIN



ENCICLE is a parcel delivery company in Valencia, focused on e-commerce deliveries. The company trialed a Garbicycle electric cargo tricycle, with a load capacity equivalent to 10 standard e-bikes or one van (Figure 2). In one month the trike covered 3,081 km and effectively replaced one conventional van.



Figure 2. One cargo tricycle with 200 kg capacity of can replace 10 e-bikes or one van (ITENE)

E-bikes proved to be very easy to maintain (just 1.5 hours per month) and a perfect option for accessing the urban centre due to time-slot restrictions for motor traffic. In the Spanish pilots, e-bikes were felt to be more efficient and faster in urban centres compared to motorised vans.

“Now we are able to deliver goods with zero emissions and in an efficient and sustainable way, whilst maintaining our customer satisfaction. We believe in the e-bikes and their potential to meet the future needs of our company and our city”

Candela Fernández Martínez, Encicle

CASE STUDY: RESTAURANT MARUJO, OPORTO, PORTUGAL



The restaurant “Marujo” in Oporto trialled the use of an e-scooter for home deliveries so as to reduce the environmental impact and create a green image.

The electric scooter (see photo) was provided by the company EasyCycle. The restaurant managers intend to maintain the service after the trial. The scooter was found to be robust, handy and economical to operate. A very important aspect is that maintenance is simple and the scooter is always ready to go.

The motto of Marujo’s home delivery service is: “a possibilidade dos clientes usufruírem em casa das mesmas refeições deliciosas que teriam no restaurante mas de forma sustentável” (enjoy the same delicious food at home, sustainably) and this ‘green’ aspect seems to appeal to customers.



The box for food deliveries on Marujo’s electric scooter

CASE STUDY: MARLEEN KOOKT, AMSTERDAM, NETHERLANDS



Marleen Kookt has used 15 E-cargobikes for the delivery of meals since the business was founded in 2011. This innovative and ‘green’ form of delivery is part of the company’s identity, not only appealing to customers but also employees - most of Marleen Kookt’s couriers actively chose the company because of the delivery by bike.



Marleen Kookt cargo e-bike for food delivery


Marleen Kookt sees the use of these delivery bikes as economically viable because of their flexibility in urban areas and the positive image they create. Each e-cargobike can transport up to 10 meals. Over years of use the company has developed its logistical processes around the bikes, with a separate garage for storage, maintenance and charging the bikes.

Marleen Kookt can be seen as a mature operator of e-bikes for commercial delivery, with almost five years of successful operation. Occasional technical issues have arisen, such as electric motor breakdown or, unavoidably, punctures, but the company is still convinced that its choice of transport is the right one. It now looks forward to the development of faster e-cargobikes and new technology like automatic locks. If the market for meal deliveries keeps growing, Marleen Kookt plans to invest in more e-cargobikes.



Hrvatska Pošta is the Croatian national postal service. It elected to trial two models of electric bicycle and one e-scooter, to replace motor scooters for daily delivery rounds. The outcomes were analysed in terms of CO₂ emissions reduction, operational savings and the reaction of postal workers. Hrvatska Pošta was so impressed with all three outcomes that the company decided, even before the trial was over, to acquire 180 electric bicycles to replace motor scooters. 2015 saw them roll out e-bike delivery across the country.

The annual savings per vehicle are around €920. After the replacement of all 180 motor scooters with e-bikes, it is estimated that the overall cost savings will be approximately 85%, while CO₂ emissions will be lower by 100 tonnes annually.



“Electric bicycles are for me the biggest novelty during all my years working in Croatian Post. The bicycle is light and easy to operate and I like it. It looks very promising for flat terrain. Also, it is good to promote activities that are good for the environment.”

*Robert Kovačević, Hrvatska Pošta
(postman for 30 years)*



Croatian postal workers with their new vehicles



4. CITY ADMINISTRATION PILOTS

For a local authority, e-bikes can be a reliable, flexible and money saving option, with the added benefit that they reduce carbon emissions and local toxic air pollution, and promote a sustainable image.

Within the PRO-E-BIKE project, action plans were developed for eight pilot cities (Valencia, Zadar, Genova, Heerhugowaard, Motala, Moravske Toplice, Torres Vedras and Lisbon), working in collaboration with local policy makers. These action plans propose measures to create favourable conditions for e-bike uptake.

Several cities decided not only to develop measures within the action plans, but also to actively use e-bikes in their own services (Table 2). This form of committed municipal leadership can be an important element in a strategy to promote cycle logistics.



Čistoća Zadar, Croatia

Table 2. Pilot cities which introduced e-bikes in their own service provision

Zadar (HR)	<p>Čistoća – waste management business</p> <p>City officials – public space surveillance</p> <p>St. Francis Home for Adults – delivery of food and groceries</p>
Motala (SE)	Home-care service working with four other municipalities
Valencia (ES)	Deliveries from Mercado Central, a market owned and managed by Valencia community
Torres Vedras (PT)	<p>Câmara Municipal (CMTV) – document transfer within the municipality</p> <p>Serviços Municipais da Água e Saneamento (SMAS) – municipal water company, reading water meters</p>



SMAS, Torres Vedras, Portugal.

CASE STUDY: MOTALA, SWEDEN



Motala has the aim of becoming a carbon-free municipality, and although it is often called a cyclist city, it recognizes that to achieve this aim it needs to increase the use of bikes. The city is committed to creating better conditions for cycling, such as more and better cycle routes and more bike parking.



Motala now uses electric bicycles in its home-care service and for adult education teachers visiting work experience students. The municipality uses cargo bikes in child-care, for excursions and to enthruse children and parents to try new transport choices in the city.



Home-care service and child transport in Motala Sweden

CASE STUDY: ZADAR, CROATIA



In the city of Zadar e-bikes introduced by the project were very well accepted. They are used by municipal services for street cleaning, by local authority inspectors within the historic core of the city where traffic restrictions apply, and for delivery of supplies and food to clients of a residential home for adults. The e-bikes have proven very useful for short distances within the city centre.

A success of PRO-E-BIKE was that initial pilots inspired other cities to take similar action, such as food deliveries to a residential home in Zadar and an e-bike home-care service in Lipik, Croatia, based on examples in Sweden. Meanwhile, the Swedish city of Motala was inspired by a Dutch example, acquiring 10 cargo bikes for child-care.

A particularly interesting aspect of the Motala experience for city leaders is that a number of neighbouring authorities in the province of Östergötland contacted the city to find out more about the pilot and to learn from it at first hand. Motala itself was impressed by the pilot and is continuing to use e-bikes in the home-care and child-care services, and now at least six neighbouring authorities are doing the same, and exploring other potential uses for these bikes.

It is good for city administrations to be seen as leaders, and to share knowledge in new fields with the neighbouring authorities, as these local authorities in Östergötland have done. The results will be improvements to local services and money saved from public budgets.





Municipal inspector and home-care service employee in Zadar, Croatia

5. LEARNING POINTS AND SUCCESS FACTORS FROM CYCLE LOGISTICS PILOTS

There is now sufficient experience, from trials and pilots in European and elsewhere, to identify a number of considerations and success factors around the desirable and predictable shift to cycle logistics. This section outlines some of the key issues, while Section 6 makes specific recommendations.

The first very important factor is that delivery bikes - electrically assisted or not - are popular. This can be seen in the enthusiasm of the Croatian postal workers, or the way customers of the restaurant Marujo asked to ride and test the e-bike which delivered their food orders. In this context, it is worth noting that a positive endorsement of the e-bikes by managers within the operator can positively influence employees: this of course is true of change in most fields.

WHERE WILL CYCLE LOGISTICS WORK BEST?

As regards the potential for cycle logistics development, this is partly conditioned by the characteristics of the city itself. In general, the potential is higher in flat, dense cities.

Some of the pilot sites using e-scooters in particular felt that they offered insufficient range, taking into account the long charging times. This meant they were less effective for deliveries to the outskirts of some cities (especially hilly cities such as Lisbon) or over longer distances in rural areas.

Similarly, Čista narava, a business owned by Moravske Toplice municipality in Slovenia and in a rural setting, while they found e-bikes are very good for activities such as local waste collection, small-scale road repairs and reading water supply meters, could not demonstrate a cost saving. If Čista narava were located in an urban area and not in the countryside, e-bikes would have been a better option.



Waste collection, Moravske Toplice, Slovenia

Urban areas, where the distance between stops is shorter and motor traffic has less or no speed advantage, may be the preferred habitat for bikes.

The local climate is often thought to be a decisive factor, but in reality the highest acceptance of cycle delivery services has so far been in northern Europe where there is a strong cultural heritage of cycling, although in Scandinavian and other northern countries

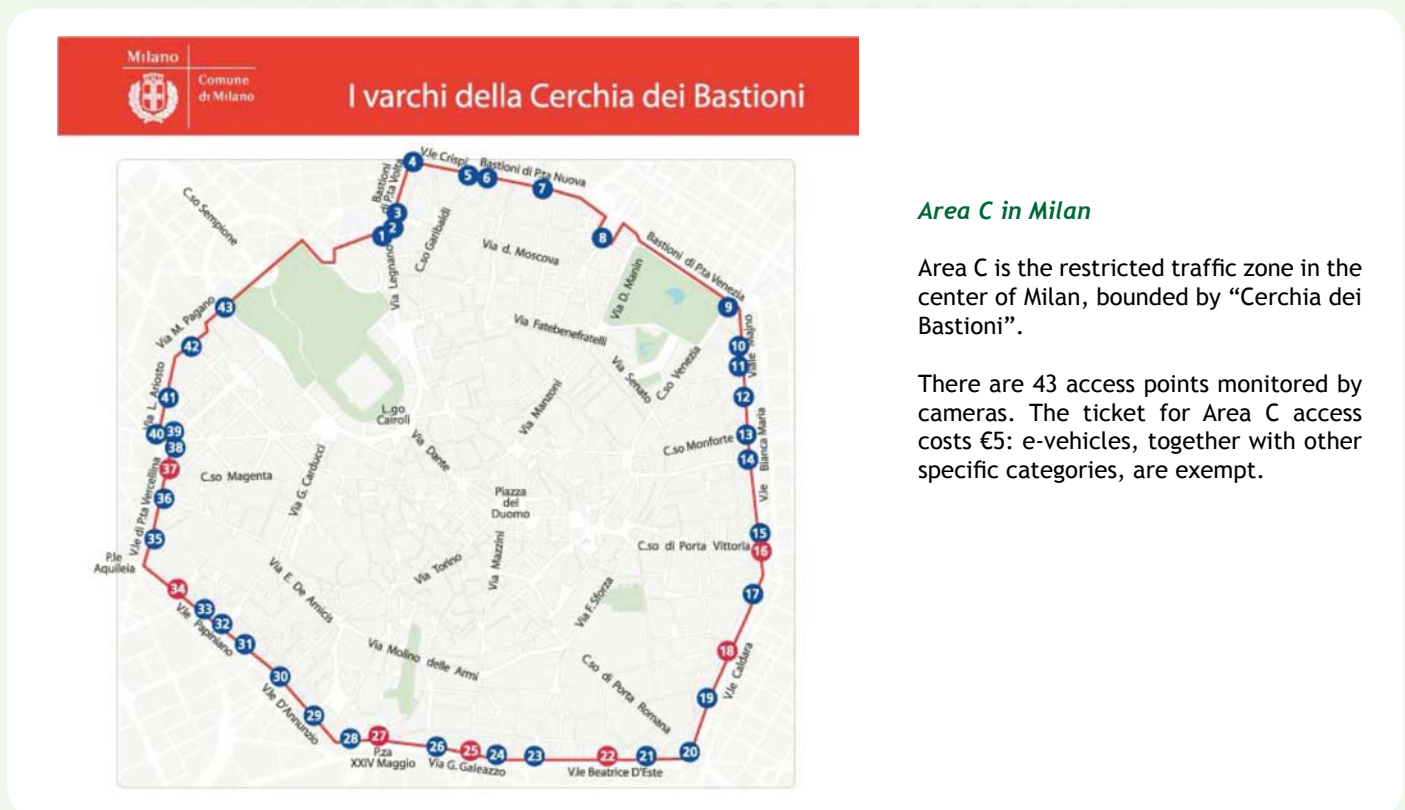
the climate may be difficult. In the Swedish pilot for example, the weather represented the major obstacle in winter conditions if bike lanes were not cleared, but even this far north the pilot was a great success - so great that neighbouring authorities have followed Motala in switching to e-bikes. This level of success in a Scandinavian country suggests a significant potential for e-bike growth in other parts of Europe.

THE IMPACT OF LOCAL POLICIES AND STRATEGIES

It is clear that bicycle delivery will be most successful where other elements of mode shift to sustainable mobility are in place. If the city is easy accessible by car or if conditions for cycling are poor, there is less incentive to change to the bike.

A coherent set of policies is needed, to stimulate shift from private motor transport to more progressive alternatives, as for example with Area C, the traffic-restricted low emission zone in central Milan (Figure 3), or congestion charge schemes such as London.

It will also help business planners if there is a clear long-term trend in moving to more sustainable transport options - if for example the city is committed to a programme of improvements to the cycling infrastructure.



Area C in Milan

Area C is the restricted traffic zone in the center of Milan, bounded by “Cerchia dei Bastioni”.

There are 43 access points monitored by cameras. The ticket for Area C access costs €5: e-vehicles, together with other specific categories, are exempt.

Figure 3. Area C in Milan as an example of measures to reduce emissions in the city centre

The development of Urban Consolidation and Distribution Centres may be a key factor in establishing ‘last mile’ delivery systems by bike. These centres, located close to city centres, provide goods transfer and temporary depots for deliveries within the city. Authorities may have unused buildings which can be

offered as a distribution centre, free or at reduced rent, so as to incentivise businesses converting part of their motor fleet to e-bikes. Such an arrangement may also serve to regenerate a run-down part of the city.⁽⁹⁾

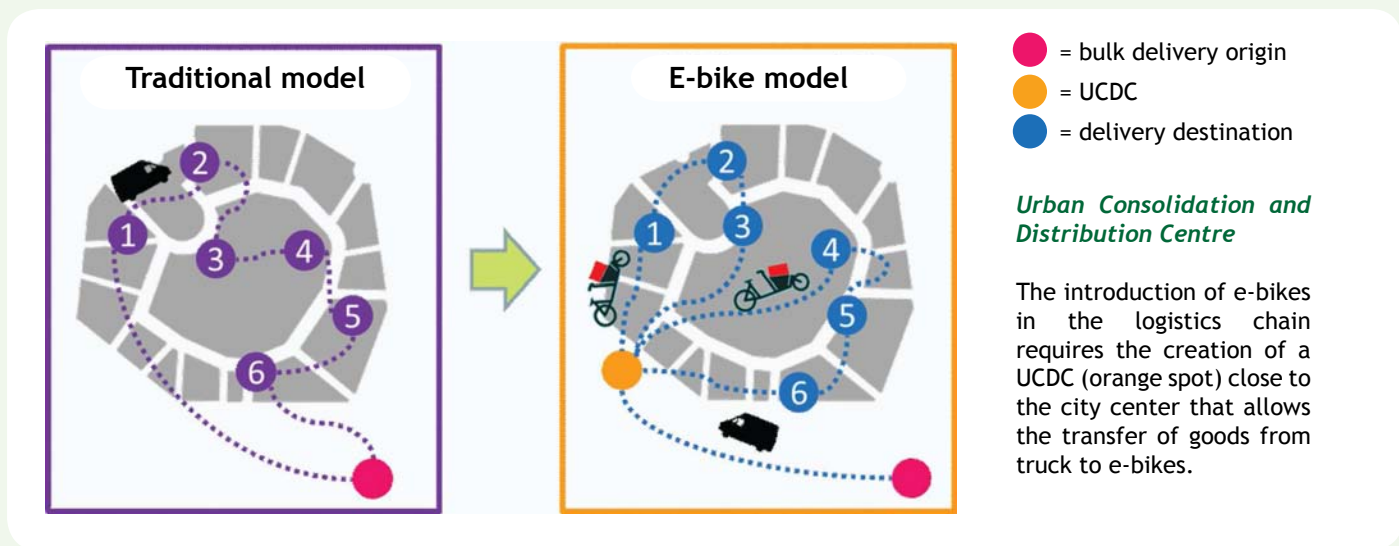


Figure 4. New logistics infrastructure and patterns make e-bikes efficient (Poliedra)

WORKING PRACTICES

As we have seen, delivery by e-bike implies a whole new approach to logistic planning, with new consolidation centres and reappraisal of delivery routes. The delivery operator will develop new ways of working, to make best use of the strong points of cycles, and in many cases may move to a hybrid mix of motorised and cycle-based delivery.

An interesting example comes from one of the first major logistics companies to incorporate cycles into their operating model, DHL. After a pilot with 33 bikes in 14 Dutch cities, which showed cost savings of over €13,000 per bike and a reduction in motor vehicle mileage, DHL Express began to roll out its cycle delivery system, which by 2014 was working in 9 European countries. DHL's European fleet now includes over 26,000 bikes, of which 9,000 are electric bikes or trikes. The French La Post fleet counts 20,000 ebikes, expanding by 2017 to 30,000.

Because the bikes, with their capacity of 140 litres, can't carry as much as a motor vehicle, in the Dutch cities each is paired up with a DHL Express delivery van, giving greater load capacity as well as the flexibility of the bike. This change to working practices required a redesign of the delivery software and logistics planning system - a major task, but one which DHL clearly feels has benefited the business ⁽¹⁰⁾ ⁽¹¹⁾.

The maintenance and repair functions are important - as the e-bikes are used in business, it is very important that maintenance be regular and professional, and that occasional breakdowns should be corrected rapidly: again, this is similar to other areas of the business. The Croatian Post contract includes 3 years of maintenance, batteries included. The Spanish experience emphasized the importance of training in terms of driving and maintenance, since driving style can influence the battery range.

It is however worth noting, as a senior figure from Hrvatska Pošta pointed out, that while if a motor scooter suffers a breakdown it must stay by the side of the road, if an e-bike battery runs out the rider can still pedal back to the depot.

Several issues remain that are more country specific. In several countries, there will be a need to develop understanding within the insurance industry, regarding insurance of the bike (theft, damages) and the driver (accidents). Likewise, some police forces may require education and explanation about cycle logistics in general, especially concerning tricycles and quadricycles.

As the cycle logistics industry matures and e-bike deliveries become common, 'early-adopter' problems of this kind are being quickly resolved.

SUPPORT AND EXPERTISE

A number of national or local authorities and agencies may be able to provide positive financial conditions for investment in cycle logistics. Examples include the Croatian Fund for Environment Protection and Energy Efficiency, which supports the acquisition of electric vehicles at national level, the city of Graz, which contributes 50% of purchase price up to €1000 or Munich, contributing 25%.

Environmental Protection and Energy Efficiency Fund, Croatia

As noted elsewhere in this report, Hrvatska Pošta made the decision to invest in 180 electric bicycles, in order to make deliveries simpler, cheaper and greener. The investment value, around €500,000, was co-financed by the Fund with around €150 000.

Since 2014, the Fund has worked to co-finance the acquisition of electric bicycles for local authorities and businesses, covering 40-80% of the investment cost. This offer has been well received, and the Fund plans to continue co-financing of electric bicycles in 2016, with the aim of reducing levels of motorised traffic in cities.



The Hrvatska Pošta electric fleet was co-financed by the Environmental Protection and Energy Efficiency Fund



International Cargo Bike Festival

There is also a growing body of expert support, from the cycle logistics industry itself (see information below on the **European Cycle Logistics Federation & International Cargo Bike Festival**), from the European Cyclists' Federation and its national member groups, and from project partners and pathfinder local authorities.

The **European Cycle Logistics Federation** is a professional body which represents and supports cycle logistics companies across Europe. Aims are to highlight best practice, share knowledge & influence relevant stakeholders.

The **International Cargo Bike Festival** is organised every April in the Dutch city of Nijmegen, by Fietsdiensten.nl. Electric-cargobikes can be tried and tested. For cargobike producers, this is good shop window, while for businesses considering a move to cycle logistics, it is a source of useful knowledge.

6. GENERAL RECOMMENDATIONS: HOW TO MAXIMIZE THE BENEFITS OF CYCLE LOGISTICS

To support e-bike delivery as a contribution to better urban transport more generally, a city should create better conditions for cycle logistics and for cycling as a whole.

Analysis of success factors in the project sites⁽¹²⁾ shows that the most successful pilots were supported by public policies such as congestion charges, zero emission zones, delivery time restrictions etc. By creating environments more suitable for all types of bikes - electric or not - the cities could contribute to a higher cycle share in urban logistics.

Furthermore, innovative business concepts often include partnerships with the local authority or other government administrations. As an example, the provision of buildings in public ownership for logistic centres proved to be a significant act of support to smaller messenger companies.

An authority committing to the promotion of cycle logistics is therefore also supporting the local economy and better environmental practice.

Each city or region has its own character, circumstances, opportunities and problems in addressing cycle logistics, and should be addressed on its own terms. However, the partners identified many common success factors. These form the basis of the recommendations below, to serve as a guideline and inspiration in forming policies, plans and measures.

RECOMMENDATIONS FOR AUTHORITIES AT ALL LEVELS

Policies, strategies and plans should take cycle logistics into account

The cycle logistic concept should be included in strategic documents such as local Sustainable Urban Mobility Plans (SUMP) and Sustainable Urban Logistics Plans (SULPs), spatial planning and regeneration strategies, as part of the wider objective to promote mode shift to sustainable transport. Transport studies and traffic simulations should take into account the potential for cycle logistics.

Regulatory measures are needed, promoting mode shift to sustainable transport

Proven measures include road pricing and congestion charging schemes, low emission zones, parking restrictions, delivery time restrictions and fully or partially traffic-free zones. For more examples of restrictions across the EU, visit <http://www.urbanaccessregulations.eu>.

Cycle infrastructure, such as bike lanes and cycle parking, should be expanded and improved

New and better infrastructure enables faster and safer business logistics operations, while also facilitating mode shift from car to bike for other journey purposes. Infrastructure design criteria should take into account vehicles such as cargo bikes and tricycles.

Local authorities should procure e-bikes and commission cycle services

Local authorities can themselves show the way to other local operators, by introducing e-bikes to their own fleets. And/or by commissioning cycle logistics services from e-bike operators. This may require modifying procurement policies.



30 km/h urban speed limit should be implemented, to make all cycling safer

30km/h limits have a wide range of benefits in terms of safety, supporting mode shift to sustainable urban mobility, and even improvements to public health through the promotion of active travel. They also shift the balance of advantage to pedal powered deliveries.

Traffic law should be enforced

All forms of sustainable transport benefit from action to prevent drivers of motor vehicles from creating danger and obstacles.

Development of urban logistics centres should be supported

‘Last mile’ delivery systems by bike are likely to be most efficient where transshipment from longer-distance freight systems, such as road and rail, can take place close to city centres. City authorities may have unused buildings which can be offered as a distribution centre, free or at reduced rent, so as to incentivise businesses converting part of their motor fleet to e-bikes.

Cycle logistics trials should benefit from fiscal and financial incentives

National fiscal policies, investment programmes and financial incentive schemes should all take into account the many benefits generated by a shift to sustainable transport, for freight as well as passenger travel. The free trials Pro-E-Bike provided saw over 80% of the bikes adopted. Cycle logistics is good value.

Public information and promotion are needed, to advertise the advantages of e-bikes

Campaigns and events can be organised, to secure public approval and advertise the various benefits created by a move to cycle logistics.



Food delivery, Brussels, Belgium

7. PRO-E-BIKE TOOLS FOR BUSINESSES, CITIES AND MUNICIPALITIES

In order to reassure business managers and local officials that e-bikes will be efficient and reliable in their logistics chain, the partners developed the PRO-E-BIKE simulation (SIM) tool and information toolkit.

The SIM tool is a cost calculator enables potential users to make comparisons between conventionally fuelled delivery vehicles and e-bikes, and to analyse the potential benefits in terms of cost and emission reduction. It calculates total lifetime running costs, from purchase, registration, taxes & insurance fees, fuel & maintenance, etc.

Users enter specific costs and values, such as vehicle purchase price and kilometres travelled: country-specific values such as registration, vehicle tax, insurance and fuel costs are already within the model.

These defaults can however be changed by users in order to model the impact of various business risks: changes to motor fuel or electricity costs, tax regimes or new road pricing schemes and so forth. This makes it a valuable support for public and private agencies to make informed business planning decisions about cycle logistics.

The Toolkit is available at <http://www.pro-e-bike.org/publications2>.

- Try the PRO-E-BIKE Simulation Tool and calculate the cost and environmental savings your business can make by replacing motor vehicles with e-bikes!
- See how other businesses have succeeded with e- bikes.
- The tool and the business models are available in 8 versions (English, Croatian, Dutch, Italian, Portuguese, Slovenian, Spanish and Swedish), each with relevant local content and values: <http://www.pro-e-bike.org/publications2>



Electric wheel, Ducati componenti, Croatia

8. FUTURE PROSPECTS FOR ELECTRIC CYCLE LOGISTICS

The European White Paper on Transport of 2011 sets a basis for the development of cycle logistics at EU level ⁽¹³⁾.

One of the goals identified in the white paper is to achieve **near-zero-emission urban logistics in major urban areas**, by 2030. The Commission plans to produce best-practice guidelines for monitoring and management of urban freight flows, to define a strategy for moving towards ‘zero-emission urban logistics’, and to promote joint public procurement for low-emission vehicles in commercial fleets.

Cycle logistics is not explicitly mentioned in the White Paper, which seems a remarkable omission, but clearly it can be a major contributor to achieving the goals.

In 2013 the European Commission adopted the **Urban Mobility package**, in which particular attention is given to urban logistic efficiency ⁽¹⁴⁾. The Commission believes that improvements in urban logistics such as better mode and vehicle selection, improved load factors, route optimisation and access to loading/unloading zones can reduce the cost of goods and services.

The Commission now recommends member states to give urban logistics proper consideration in planning for urban mobility, for example in SUMP, and to encourage cooperation, exchange of data and information, training, etc. for all actors involved in urban logistics chains⁽¹⁵⁾ ⁽¹⁶⁾. It states that European Structural and Investment Funds “should be used more systematically for the funding of integrated packages of measures, where cities have developed an integrated local transport plan, such as a Sustainable Urban Mobility Plan, and identified the appropriate actions”.

The European Cyclists’ Federation (ECF) created a set of recommendations on the development of guidelines for urban logistics, based on the practical experience of a large number of stakeholders ⁽¹⁷⁾. This guidance, addressing key success factors, barriers and success stories, was presented to the European Commission in 2015 and will assist with the development of cycle logistics at the European level and in Union policy.

9. CONCLUSIONS

Replacing motor vehicles with e-bikes saves users money and e-bikes are popular. They are widely adopted after trials. The PRO-E-BIKE pilots showed that in most of the trial settings, e-bikes and e-scooters were a genuinely competitive alternative to motorised vehicles in delivery services. Because of this, the great majority of the partners, both public and private sector, decided to continue using e-bikes or e-scooters after the pilot phase, even without any financial support. Some participants reshaped their logistical structures to use e-bikes for last mile logistics.

The logistical process with e-bikes is naturally different, since these vehicles cannot carry as much volume and weight as conventional vehicles and their maximum trip length is shorter. For smaller delivery rounds however, the e-bikes proved to be more economical, since the purchase price and maintenance costs are lower.

The project experience shows that, even though the current technology is still being refined, in dense urban areas e-bikes can outperform fossil fuel vehicles, especially if they are supported by cities through appropriate policies and measures.

By supporting clean vehicle delivery and creating opportunities for development of this new market, cities can improve the environment and quality of life for their residents while contributing to local, national and European targets.

One of the main lessons learned is that entrepreneurs, stakeholders, public authorities and policy makers should work together from the beginning, to coordinate their work and ensure measures are suited to local contexts and culture. This is how they can maximise the benefits.

PRO-E-BIKE has demonstrated that cycle logistics forms an integral part of city mobility. It should be an automatic element in policies and strategies not only for mobility, but also for urban planning, energy and environment. **The potential for cycle logistics is significant, our project has demonstrated that it can be successfully introduced, and now is the moment for cities across Europe to follow this lead.**



MAIN PROJECT OUTPUTS

- Various types of modes of e-bikes, e- cargo bikes and e- scooters were tested in 40 companies in 7 EU countries.
- Conventionally fuelled vehicles within target groups were replaced with e-bikes after testing in 28 cases.
- The confidence in the technology enhanced among users and resulted in certain investment and usage of electric bicycles and scooters.
- The problems with technology are communicated to the industry.
- Measurable effects of CO₂ reduction and savings in companies were demonstrated with simulation tool.
- The experiences and lessons learned were shared among stakeholders on national and EU level through meetings, workshops, conferences etc.
- The pilot cities were familiar with electric bike delivery.
- The policies for e-bike uptake were promoted through action plans and organisation of info days in pilot cities.
- Collaboration with EU projects with similar objective was established

PROJECT TARGET GROUPS

DELIVERY COMPANIES OR COMPANIES THAT DELIVER THEIR OWN PRODUCTS

- Postal companies, international delivery services, professional carriers (letters, packages, parcels...)
- Retailers (home delivery of goods from markets, tobacco shop, organic products from farms)
- Food delivery (restaurants, fast food chains)
- Delivery of company products by the company courier

SERVICE COMPANIES (PRIVATE OR PUBLIC)

- Communal inspectors
- Social and home care service (for elderly and disabled people)
- Waste collection
- City tourist board
- Water meter readings for municipality

PASSENGER TRANSPORT

- Childcare centre; rickshaw, e - scooter taxi
- Transport to the meetings for company employees

PUBLIC ADMINISTRATION IN THE PILOT CITIES (POLICY MAKERS)

E- BIKE DISTRIBUTORS AND PRODUCERS

CUSTOMERS

PROJECT PARTNERS



PROJECT PILOT CITIES AND COMPANIES

COUNTRY	CITY	COMPANY	SERVICE
Spain	Valencia	Encicle	e-commerce delivery
		Valencia Market	Local market
	Ibiza	Eroski	Big retailer
Netherlands	Arnhem	Puurland	Local and organic products
	Heerhugowaard	Subway	Fast food delivery
	Almere	DHL	Delivery of parcels
	Utrecht	DHL	Delivery of parcels
	Nijmegen	BSO Struin	Child care center
	Amsterdam	Marleenkookt	Fresh and healthy meals
Sweden	Motala	Municipalities	Health/home care service
	Ydre		
	Atvidaberg		
	Kinda		
	Linköping	Aleris	Health/home care service
Italy	Genova	Eco Bike Courier	Parcels and bulky items
		Grafica KC	Print material
		TNT	Letters and small packages
	Milan	GLS	Parcels
Croatia	Zagreb	Hrvatska pošta	Letters and small packages
		DHL	Letters and small packages
		CityEx	Letters and small packages
		EIHP	Business meeting, documentation transfer
	Zadar	Kiosk	Retailer
		Communal inspectors	Surveillance of city surfaces
		St. Francis home	Meal, grocery delivery
		Čistoća Zadar	Maintenance of public areas
Lipik	City	Home care service	
Slovenia	Murska Sobota	3LAN	Computers
		Biroprodaja	Delivery of office material
		Kratochwill	Food
	Martjanci	Bistra Hiša	Transport of food and other household needs
	Tešanovci	Čista Narava	Maintenance of public areas
	Maribor	Slovenian post	Letters and small packages
	Ljutomer	Senpo	Furniture
	T-Lotus	Transport paints to customers	
Portugal	Oporto	Marujo restaurant	Delivery of food
	Lisbon	Camisola Amarela	Delivery company
		Moço de Recados	Messenger
		ISS partnership between ALD Automotive	For internal delivery of mail
	Torres Vedras	SMAS	Services of Water and Sanitation
Municipality Torres Vedras		Delivery of materials and correspondence to the schools in the municipality;	

REFERENCES

- ¹ European Commission, Directorate General for Mobility and Transport (DG MOVE) (2013). Attitudes of Europeans towards urban mobility. Special Eurobarometer 406. Wave EB79.4-TNS Opinion & Social, December 2013. http://ec.europa.eu/public_opinion/archives/ebs/ebs_406_en.pdf
- ² Schoemaker, J., Allen, J., Huschebek, M., & Monigl, J. (2006). Quantification of urban freight transport effects I. BESTUFS Consortium, www.bestufs.net.
- ³ MDS Transmodal Limited. (2012). DG MOVE European Commission: Study on Urban Freight Transport: Final report. Chester, UK: MDS Transmodal Limited.
- ⁴ Patier, D. (2002). La logistique dans la ville. ed. Celse.
- ⁵ Gruber, J., Ehrler, V., & Lenz, B. (2013). Technical potential and user requirements for the implementation of electric cargo bikes in courier logistics services. Paper presented at the 13th World Conference on Transport Research.
- ⁶ Cycle logistic Project (2014). D7.1 Baseline Study_Cyclelogistics (Cyclelogistics Project 2011-2014) http://www.cyclelogistics.eu/docs/111/CycleLogistics_Baseline_Study_external.pdf
- ⁷ European Cyclists' Federation, 2015. New research: Only 1 in 3 logistics trips needs motor vehicles: over 2/3s could be shifted to bikes. <http://www.ecf.com/news/new-research-only-1-in-3-logistics-trips-needs-motor-vehicles-over-23s-could-be-shifted-to-bikes/>
- ⁸ Conway, A., Fatisson, P.-E., Eickemeyer, P., Cheng, J., & Peters, D. (2011). Urban micro-consolidation and last mile goods delivery by freight-tricycle in Manhattan: Opportunities and challenges. Paper presented at the Conference proceedings, Transportation Research Board 91st Annual Meeting 2012.
- ⁹ Poliedra (2015) PRO-E-BIKE: Transferability Potential of Good Practices
- ¹⁰ http://www.dhl.com/en/press/releases/releases_2015/express/dhl_introduces_cubicycle_an_innovative_cargo_bike.html
- ¹¹ http://www.dpdhl.com/en/responsibility/environmental-protection/improving_efficiency/vehicles/dhl_express_bicycle_couriers_in_european_cities.html
- ¹² PRO-E-BIKE Business models <http://www.pro-e-bike.org/publications2/>
- ¹³ European Commission (2011). WHITE PAPER Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system /* COM/2011/0144 final <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0144>
- ¹⁴ European commission (2013). Urban Mobility package: Together towards competitive and resource-efficient urban mobility. COM(2013) 913 final. http://ec.europa.eu/transport/themes/urban/doc/ump/com%282013%29913_en.pdf
- ¹⁵ A call to action on urban logistics, SWD(2013) 524 final <http://ec.europa.eu/transport/themes/urban/doc/ump/swd%282013%29524-communication.pdf>
- ¹⁶ A call for smarter urban vehicle access regulations. SWD(2013) 526 final <http://ec.europa.eu/transport/themes/urban/doc/ump/swd%282013%29526-communication.pdf>
- ¹⁷ European Cyclists' Federation (2016) Recommendations on cyclelogistics for cities <http://www.ecf.com/wp-content/uploads/CYCLE-LOGISTIC-internet.compressed.pdf>



PRO-E-BIKE COORDINATOR

Energy Institute Hrvoje Požar
www.eihp.hr
Matko Perović; mperovic@eihp.hr
Željka Fištrek; zfstrek@eihp.hr



PRO-E-BIKE PARTNERS

Instituto tecnológico del embalaje, transporte y logística
www.itene.com
Emilio González; egonzalez@itene.com
Jorge Leon; jleon@itene.com



Poliedra - Centro di servizio e consulenza del Politecnico di Milano su pianificazione ambientale e territoriale
www.poliedra.polimi.it
Roberto Nocerino; nocerino@poliedra.polimi.it



Mobycon
www.mobycon.com
Ronald Jorna; r.jorna@mobycon.nl



East Sweden Energy Agency
www.energiost.se
Kickan Grimstedt; kickan.grimstedt@energiost.se



European Cyclists' Federation asbl
www.ecf.com
Dr Randy Rzewnicki; randy@ecf.com



Razvojna agencija Sinergija
www.ra-sinergija.si
Stanislav Sraka; stanislav@ra-sinergija.si



Occam
www.occam.pt
Lara Moura; lara.moura@occam.pt



Lombardo Bikes
www.lombardobikes.com
Emiliano Lombardo; elombardo@lombardobikes.com



Instituto Superior Técnico
www.tecnico.ulisboa.pt
Vasco Reis; vascoreis@ist.utl.pt

IMPRINT

Authors: Željka Fištrek, Energy Institute Hrvoje Požar; zfstrek@eihp.hr, and Randy Rzewnicki, European Cyclists' Federation; randy@ecf.com

Editor: Philip Insall, Insall & Coe

Acknowledgements: ITENE, Poliedra, Mobycon, East Sweden Energy Agency, European Cyclists' Federation, Development Agency Sinergija, Occam, Lombardo, Instituto Superior Técnico

Published by: Energy Institute Hrvoje Požar

Graphic design: Martina Komerički Košarić, Energy Institute Hrvoje Požar

Photos: Cover photo: Hrvatska Pošta; others - PRO-E-BIKE project partners and pilot companies

Copyright: Energy Institute Hrvoje Požar on behalf of the PRO-E-BIKE consortium

GLS is one of the largest express courier in Italy with 120,000 customers. They opened a new logistics centre to a new location in downtown Milan, replaced 6 delivery vans with 9 bikes, and hired more staff for the extra vehicles. The result was increased deliveries, productivity and efficiency. Even though GLS hired more people to do the same work, they still save money.

Mr Simone Vicentini, General Director of GLS Enterprise, Milan, Italy



"In addition to the ease of use of the e-cargobike I'm positively surprised with the attention it creates. Regularly people tell me they know me because of my e-cargobike. This is of course very positive for the image of my company!"

Steven Koster, PUURLand

"Our project was very successful and our neighbour authorities were so impressed they also invested in e-bikes"

Ms Agneta Niklasson, chairman of the technical committee, Motala, Sweden

