

Go Pedelec!

Go easy!

www.gopedelec.eu



Promotion of the use of
pedelecs in European cities

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What is a pedelec ?

Bicycle with electric motor assistance

Electric bicycle is a term, which covers two different concepts of vehicles with an auxiliary electric motor. On the one hand, there are bicycles equipped with an auxiliary motor that cannot be propelled by that motor itself. The motor assists only when the cyclist pedals. For these vehicles the term "pedelec" is coming generally into use. On the other hand, there are cycles equipped with an auxiliary electric motor that can be propelled by that motor itself. The cyclist does not necessary need to pedal. These vehicles are generally called E-bikes.

pedelec = pedal + motor

While pedalling the rider gets additional power from the electric drive system. The control of the motor output of a pedelec is linked to the riders pedalling contribution by means of a movement or power sensor. In other words: the electric motor is activated as soon as the rider *starts to pedalling and deactivated as soon as the rider stops pedalling*.

E-bike = motor can do the work without pedalling

The motor output of an E-Bike is activated and controlled by using a throttle or button. Human power and the electric motor are independent systems. This means that throttle and pedals can be used at the same time but - in contrast to a Pedelec - they don't have to.

Pedelecs can be used by people of all ages, due to the fact that it does not require a driver license and no special insurance. Pedelecs can be used like a bicycle on forest roads as well as bicycle lanes virtually almost everywhere.

European legislation stipulates that only pedelecs "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, or sooner, if the cyclist stops pedalling" are classified as bicycles.

E-Bikes are always classified as mopeds. For them as well as for pedelecs where the motor output exceeds 0,25 KW and/or the motor assists beyond 25 km/h are classified as mopeds. They have to comply with the type-approval legislation as laid down in Directive 2002/24/EC and all accompanying Directive.

Fact and figures on Pedelecs

The world seems to be recovering, although slowly from economic crises but the business of electric bikes has continued to do well. More and more countries and cities support the purchase of pedelecs and develop different concepts that should stimulate pedelec sales. Europe is on the upswing to move into the million unit yearly sales range for pedelecs. Gasoline and diesel fuel near \$ 10 a gallon keeps cars small and interest in pedelecs is growing daily.

Worldwide Electric Bike Sales (Estimates)					
Year	2008	2009	2010	2011	2012
Europe	500,000	750,000	1,000,000	1,350,000	2,200,000
Worldwide	23,500,000	22,618,5000	24,247,000	25,929,000	29,082,5000

Example of Netherlands: pedelec sales year 2009: 150,000 || this is a accumulation of 30% to year 2008 and 10% of the bicycles that sold overall.

Worldwide Electric Bike Sales Still Trend Upward:

Electric Bike sales took a small hit in several markets but the worldwide total in 2009 was estimated to be only 3.7% lower than 2008. In China is at a plateau in the 20 million range but is still expected to grow. Europe is expected to move into the million unit range in 2010 and growth is expected in the USA as independent dealers are learning the larger profits realized from electric bike sales are a plus. Adding LEV sales shows the sales will nearly cross the 30 million unit mark in 2012.

Europe is now the second largest market after China, with an estimated sale for 2009 of more than 750,000 pieces. This represent vigorous growth over the last few years. At this year's Eurobike (famous exhibition) show, nearly every major bicycle brand in Europe was showing an electric bike, as the industry there has found them much more profitable than normal bikes.

Europe electric bike sales to grow faster now:

The pedelec has been popular for around ten years in Europe with The Netherlands enjoying a large electric bike population that has grown at a 45% rate in 2008. Now there is a move by large European firms, such as Bosch, and possibly Schaeffler and Hella.



Future Trends:

The future of electric bicycles continues to be excellent. Electric bicycles will continue to evolve, and that the general trend will be toward more powerful, more useful vehicles. But for many reasons (fuel price, traffic and parking congestion, urbanization, air pollution, changing transport modes) electric powered, two wheel, personal vehicles will continue to grow rapidly. Size of market by 2025 will be close to 115 million pieces per year.

(source: Frank E.Jamerson, Ph.D. With Ed Benjamin, Electric Bikes Worldwide Reports, 2010 Update to the 2009 Edition)

A pedelec as a means of public transport

Public transport or public transportation is normally described as “passenger transportation services which are available for use by the general public, as opposed to modes for private use such as automobiles or vehicles for hire.”¹ Public urban transportation is normally offered by municipal authorities or by public private partnerships. It is under this conditions and criteria that bicycle rental systems or also called bicycle sharing systems as Velib in Paris, OV-Fiets in the Netherlands, Call a Bike in Germany and Bicing in Barcelona also can be considered as part of the public transport system.

The successful implementation of bicycle rental systems in many cities in Europe and worldwide is not yet at its high point as the growth rate internally (in cities) and externally (worldwide initiatives) is still growing and growing.

After new developments to reduce overhead costs of the systems by introducing smart cards, using special design bikes which spare parts could not be used on other bicycles and the combination of cell phones to give access to the systems, now the newest trends are crating fleets of pedelecs added to the rental systems as part of public urban transport systems.

These initiatives are being initiated in cities as Stuttgart Germany, Salzburg² and with OV- Fiets in more than 150 cities in the Netherlands and have in common the vision that the (partly) electrification of the bicycle fleet can have a positive impact on the efficiency of the public transport system in an urban context. And although a competition between the conventional and bicycle public transport initiatives might be foreseen, reality is different: Public railway companies as Deutsche Bahn in Germany and NS Railway in the Netherlands are the main partners in the Bicycle sharing systems in their countries. It speaks for itself that these companies see more benefit from participation and developing bicycles and electric bicycles in their fleet as part of the service they want to offer to their clients. It maybe clear that this additional service is also reflected in higher numbers of users in the trains as pedelecs and conventional bicycles are used in transport to and from the railway stations.

In the Netherlands about 30 % of all train commuters arrive at the train stations by bicycle. In some cities this percentage is almost 50% when the parking conditions for cyclists are comfortable. As parking space near stations is a huge problem a solution can be found in promoting more rental bikes instead of private bike use. Rental bikes combined with pedelecs makes it even more attractive to change from one mode to another.



Pedelecs and social cohesion

Transport is essential for social integration of people:

Pedelecs can play a vital role in the social integration of elderly people. With a growing population of old age living in isolated situations adaptation to transport systems and target group orientated mobility services have to be implemented. Partly solutions have to be sought in adoption to type of vehicles (electric bikes, pedelecs) but also access and therefore adaptations to public transport systems have to be included as to broaden social inclusion of women, children, youngster, disabled and elderly people.

Transport facilities play therefore a vital role in the process of social cohesion in cities. Not only defines transport and mobility access to employment and education facilities, but also it has great influence on personal development, social welfare.

Combined with the fact that European urban population is generally getting older is more and more important that policy and decision makers are aware of their possibilities to keep their citizens mobile and thus participative and active.

Sustainable mobility shall be based on:

- a socially just secures the necessary access of all citizens to mobility. From schoolchildren to senior citizens as well as to physically handicapped people.
- an economy-focused mobility in order to secure jobs and the competitiveness of cities through an optimized accessibility and a well established and functioning traffic system within the city
- an environmentally-friendly mobility in order to reduce emissions and the consumption of resources through an intelligent mixture of the modes of transportation contributing to a higher quality of life in our cities.
- Lower income groups have 5 times less access to transport than higher income groups
- Woman have 15 to 25 % 30% less access to transport than male
- 30% of lower income groups have no access to public transport at all



Make your choice today!

Go  Pedelec!

Pedelecs and tourism

Bike rental systems can play an important function in the promotion of tourism in rural as well as in an urban context. The advantage of including electric bicycles in the rental bike fleet is that a significant larger target group can be reached. From different examples can be learned how electric rental bikes can have an extra economic benefit to tourism industry.

In the German Federal State Thüringen the Saale-Orla Kreis leased electric bicycles to give them to the tourism sector to increase the attractiveness of the district for cyclists, because the nature is wonderful but the area is very hilly. Thüringen want promote the smooth and sustainable tourism. Along the famous walk and cycle ways rental and charging stations are opened. People can rent pedelecs for a small fee.

Znojmo City Hall (Southern Moravia) opened an electric bike rental station in June 2009. The 10 electric bikes are available (over the summer season for a small fee) for leisure travel within the city and its beautiful National Park „Podyji“ close by.

In Switzerland a dense network of bicycle rentals is functioning : they have 1.400 pedelecs available for rental.

In the hilly part of the southern Netherlands several initiatives have been launched for rental electric bike systems. Sometimes initiated by the local tourists offices, sometimes by private sector initiatives they have proven to be very successful. Even restaurants on tourist routes do now promotion campaigns with the selling argument that on their locations batteries can be charged during coffee break or lunch! On www.stekkerweb.eu are charging stations at cafes and restaurants overall Europe to be seen.



Pedelecs and health IBC EE

Obesitas

Aprox 20-30 % of European population are suffering severe overweight (source cycling and health UK) As no measures are taken this trend will be growing more and more and consequences will not have only a severe impact on society as a whole but also on the individual level.

Mental health, mental stress

Mental problems and psychological problems are frequently causes for many diseases. It is proven that sport and physical exercise have a positive influence on these kind of diseases (Di Lorenzo et al 1999). Sport and physical exercises have sometimes the same effect as medicines to influence the hormone balance which is behind mental depressions. Other surveys from Denmark proved that cycling has a positive effect of the feeling of happiness. People who cycle more than twice a week are generally more happy than non cyclists.



Do you want to get more exercise?

E-bikes assist your pedaling; they don't replace it. Many people find they ride more (and get more exercise) when they have an electric assist.

The usage of daily moving:

According to the World Health Organization people who use a bicycle / pedelec for the daily commute live longer and the risk to get cancer, cardiovascular disease and depressions will be reduced dramatically (source: www.who.int)

The risk of death is reduced for 50% through daily moving of 3,2km (sources: report of Dipl. Sportwiss. Billy Sperlich, Deutsche Sporthochschule Köln)

The risk of Heart-Diseases and Diabetes is reduced of 50% (sources: Dr. Günter Klein, WHO-ECEH Bonn, Europäisches Zentrum für Umwelt und Gesundheit der WHO)

Improvements of blood pressure, coordination of muscles, movability of the body, energy of the body, staying power. (sources: Dr. Günter Klein, WHO-ECEH Bonn, Europäisches Zentrum für Umwelt und Gesundheit der WHO)

The usage of daily moving to improve the health is also very important for reducing the number of staff away sick in companies. In the Netherlands a survey revealed a savings of 27 million Euros a year when workers use regularly a bicycle to come to work (TNO 2009) A regular cyclist in this case was defined as a person who cycles to work 3 times a week with a minimum distance of 3 km (round trip) or 4 times a week with a minimum of 2 km (one way trip). From the survey another result is important for the pedelec potential as some 67% of non cyclists indicated that main reason for not using a bicycle was, arriving sweated at work"

The pedelec for its characteristics can overcome these constraint and has therefore excellent potential in the campaigns against obesities and health.

Special characteristics of Pedelects can help to overcome obesities:

- **pedelects let you cycle with less effort**
- **pedelects force you to use your own energy**
- **research shows that pedelec cycling has the same result on energy balance as conventional cycling.**

On the site of an electric bicycle producer there is a calculator where on can see the amount of calories you burn when cycling.

Bicycle/Pedelec parking, battery swapping and charging infrastructure EE

One very important question of a pedelec-rider is the question “Where do I charge and park my pedelec?”.

The common problem of the parking situation in cities, that becomes more and more difficult does also regard the pedelec-rider.

Main requirements on a infrastructure of parking, battery swapping and charging for pedelecs are:

- to be close at the end of the ride,
- built safe to avoid theft and vandalism
- be independent from weather
- charging stations should be at the parking areas and local public transportation stops



The options of charging are:

- **charge at home with the socket and the own charging set, only possible indoor, lasts 3-6 hours**
- **charge at public charging stations quickly, lasts 5 – 15 minutes** Battery swapping is possible if the battery is standardized or owned by a operating company like tourists boards, for example the tourist board of the Saale-Orla-Kreis in Germany.

Since several years proprietary battery change systems and charging system work very well at many tourist sites in Switzerland and today as well in the first German areas. A proprietary system works fine in a closed system!

Battery swapping and charging is organized locally manual like in hotels, restaurants, tourist information and bicycle stores.

The best- practice examples of the implementation of pedelecs in the traffic management systems shows Japan.

Japan has a very good infrastructure for pedelec riders and combines parking, battery swapping and charging for pedelecs.

Examples in Europe:

Solar charging station of the company Anton Paar in Austria

The station charges the company own eZee bike electric bicycle fleet

Energy area Weitz-Gleisdorf in Austria

Pedelecs as a carrier to public transport systems

How about the costs?

Charging and battery swapping infrastructure should be adaptive to existing infrastructure to be low cost and easy to grow the network fast.

Maybe reuse existing infrastructure?

In Japan automated parcel deposit boxes have been successfully reused as battery swapping and fast charging stations. Currently DHL is building a parcel station network all around Germany, battery swapping function may make this infrastructure more profitable and accepted.

The role of local governments on pedelec promotion

One of the role of municipalities is to arrange and or coordinate the mobility. As a result of the ongoing process free market more and more the role of municipalities is facilitating instead of operator of (public)TRANSPORT

Municipalities can influence the quality of citizen life by facilitating all possibilities for all kinds of transport.

This includes parking as well as public transport

Some examples:

- **Include pedelecs in the municipal transport vehicles fleet**
- **Support road shows as initiative for citizens to raise awareness**
- **Facilitate charging points for electric vehicles including pedelecs**
- **include pedelec promotion in overall cycling promotion**

As an example of active pedelec promotion many local governments in the Netherlands give for free electric bikes to companies to use them for a certain period (3 months) This initiative is also introduced in the city of Tczew in Poland as part of the stimulation of pedelecs in the PRESTO project.(www.presto-cycling.eu)

Another important examples can be found in the partner city of Stuttgart where an ambitious target is launched to have 100.000 e vehicles on the roads of the Stuttgart region in 2020. A large part of this will be pedelecs and 1200 pedelecs will be on short term be introduced by an electric bike rental system(www.eltis.org)



Economic benefits of Pedelecs and cycling in general

Cycling offers a range of financial savings to the individual but also wider economic benefits which benefit to the entire society.

Cycling provides economic benefit as improved public health as well as reduced levels of traffic congestion, reduction of greenhouse gas emissions and reduction of expenditures on transport fuel.

Most benefits arise when cycling is replacing short distance car trips. This is the case in approximately 25-40 % of all trips in European urban areas. (trips < 7.5 km)

In general it is shown that investments in cycling infrastructure can have a cost benefit ratio varying of 1:3 till 1:8 depending on the local situation. Every banker would be jealous about this figures as the return of investment!

Provide a vehicle with the joy of cycling without the uncomfortable aspects like pushing up a hill, arrive sweated at work.

Because of higher average speed, more destinations are accessible in convenient time.

A pedelec allows to carry easily heavier loads like pulling a children- or cargo trailer. Practical experiences show that many families have replaced their second car by a pedelec.

Pedelecs are the most energy efficient method of individual transport:

- The energy used for a 33 kilometres pedelec-ride are equal to the energy used for cooking one pot of coffee or taking a shower consuming 10 litres of warm water. Source (Tomi Engel, Deutsche Gesellschaft für Sonnenenergie e.V. / International Solar Energy Society, German Section)

„When asked to defend e-bikes against the charge they pollute the planet because they're not totally human powered, Henshaw said:

“Quite a significant part of the damage done by bicycles is in manufacture, and high-end MTBs with all the titanium and carbon gizmos, and a shelf-life of a few years use a lot of energy in production and distribution. Electric bikes typically do more miles. Many ordinary bikes with wide knobbly tyres, overweight components and horrid gears, hardly ever get used, whereas electric bikes are generally used much more. So there is, oddly enough, a good argument that for ordinary not-very-fit people, an electric bike will keep them fitter, because they will use it a lot more.

"Electric bikes are much more likely to replace car journeys. So they should really be compared with cars in terms of fuel use and environmental damage.

"An electric car does some 1,000mpg, and it converts energy very efficiently into motion. We charge ours from solar panels, but the energy use is so small, it's hardly worth bothering about. A cyclist working hard, and scoffing carbs and choccy, then taking a long hot shower has used much more energy."

Source: <http://knol.google.com/k/energy-global-warming-and-electric-bicycles#>



- This little energy needed can be easily generated by renewable energy. With the energy produced by a solar panel of 0.3 m² mounted on a middle European roof a pedelec can be ridden 5.000 kilometres.

Source: (Tomi Engel, Deutsche Gesellschaft für Sonnenenergie e.V./ International Solar Energy Society, German Section)

CO₂ emission of a car drive of 5000km: 1.150kg CO₂

CO₂ emission of a pedelec ride (recharged with green energy) of 5.000km: 0 kg CO₂

Source: Angela Budde Dipl.-Ing. (FH) Umwelttechnik, <http://sites.google.com/site/hinundwegperpedelec/Home/energieverbrauch>

Improvement of living conditions because of reduction of emissions: noise, exhaust emissions including respirable dust and CO₂! (f.e. Shanghai has changed from a continuously poisoned city by about 10 million combustion engine two wheelers to a city with much less noise and much cleaner air thanks to about 15 million electric bicycles)

Property value increases near main traffic routes due to reduction of noise and emissions

Less land consumption for traffic

Provides more mobility to people for the ways for their daily sales, f. e. to the supermarket

Pedelects are often capable to replace car trips and the need for a second car in a family. Pedelects are much cheaper in the purchasing and running costs. Even a quality pedelec costs typically 1.500-2.500 Euro. Due to the low running costs electric utility companies like Salzburg AG leases pedelecs for low as 49,90 Euro a month which makes it easily affordable for every citizen.

Compare of speed and human watts of pedelec and bicycle: Source: (Tomi Engel, Deutsche Gesellschaft für Sonnenenergie e.V./ International Solar Energy Society, German Section)

List of Literature

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CODE-2 ®-Studie LIEBL et al. 2001 ; Deutsches Diabetes- Forschungsinstitut 2000

Used Websites:

Go Pedelec!	www.gopedelec.eu
Extra Energy	www.extraenergy.org
IBC Mobilization	www.mobilization.org
ELTIS	www.eltis.org

Partners in the project



Austria

• **Energieautark Consulting GmbH.**

Project coordinator and country manager for Austria. Energieautark consulting gmbh, a young 3-man consulting company, founded in 2006 has the main goal of selling energy autonomous systems (auto-supply of energy autonomous homes purely based on renewable energy). Mobility is part of the business model and in particular electric vehicles. (www.Energieautark.au)



• **Stadt Graz**

With 252.000 inhabitants, Graz is the second largest city in Austria. It is the capital and the cultural, economic and educational centre of the province of Styria. The municipality of Graz has been involved in several EU-Projects, such as CIVITAS, Trendsetter, Urban, PIMMS and ASTUTE.



Germany

• **ExtraEnergy:.**

ExtraEnergy is a non-profit organization headquartered in Tanna, Germany. It's main activities are the dissemination of independent information and the promotion and testing of light electric vehicles (LEVs) around the world.



• **Stadt Stuttgart** The Landeshauptstadt Stuttgart is the municipal administration of the City of Stuttgart. It has almost 600.000 inhabitants and as a State Capital it is the urban centre of the Metropolitan Region of Stuttgart with over 3 million people and also the economic and political centre of the State of Baden-Württemberg with 10 million inhabitants.

Italy

- **Cosmoroma**

Cosmoroma is a non profit association with the mission of raising the awareness for vehicles with low environmental impact. The focus of activities is on electric vehicles since its foundation in 2000. This outset has made Cosmoroma an important partner of vehicle and battery manufacturers.



- **ANEA (Agenzia Napoletana Energia e Ambiente)**

ANEA, The Naples Agency for Energy and the Environment, is an independent, non-profit organisation aiming to promote the rational use of energy, renewable energy sources and sustainable mobility.

**International
Bicycle
Consultancy**



The Netherlands

- **IBC (International Bicycle Consultancy)**

IBC is a non profit organization with headquarter in Utrecht, the Netherlands. IBC is for more than 20 years active in activities and programmes which promote the use of bicycles in urban contexts. Cycling promotion in all its aspects is the core business of activities of IBC.

- **City of Utrecht**

The city of Utrecht like many other cities around the world is considering the introduction of a hire bike system (as functioning for instance in Barcelona, London and Paris) Investigations are now executed to see what the added value of electric bicycles can be to such a bike hire system. Electric bicycles are taken in consideration for reason of the already high share of bicycle property in the Netherlands.



Gemeente Utrecht

Hungary

• Miskolc Holding Local Government Asset Management Corporation

founded in 2006, with the sole proprietorship of Miskolc City of County Rank – is a holding organisation with a share capital of 16 billion Ft. and with 2.575 employees. Miskolc Holding Plc. itself plays a key role in town planning, strategic enterprise development exploiting synergies and economy development activities. In case of economy development activity strengthening innovation potential is a crucial goal.

ekolo.cz

Czech Republic

• Ecolo.cz

ekolo.cz stands for electric propulsion. Company produces its own brand of electric bikes, sells electric scooters and promotes the usage of electric cars. ekolo.cz is the country strongest brand for e-bikes. The company is also involved in intensive education of usage electric bikes as great urban transport solutions.

Intelligent Energy



Europe

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