E-MOB: Lessons Learnt Guideline

Based both on E-MOB Project results, as also, on secondary research, related publications and more...

2022

E-MOB
Interreg Europe

European Union
European Regional
Development Fund

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https://projects2014-2020.interregeurope.eu/e-mob/

E-MOB

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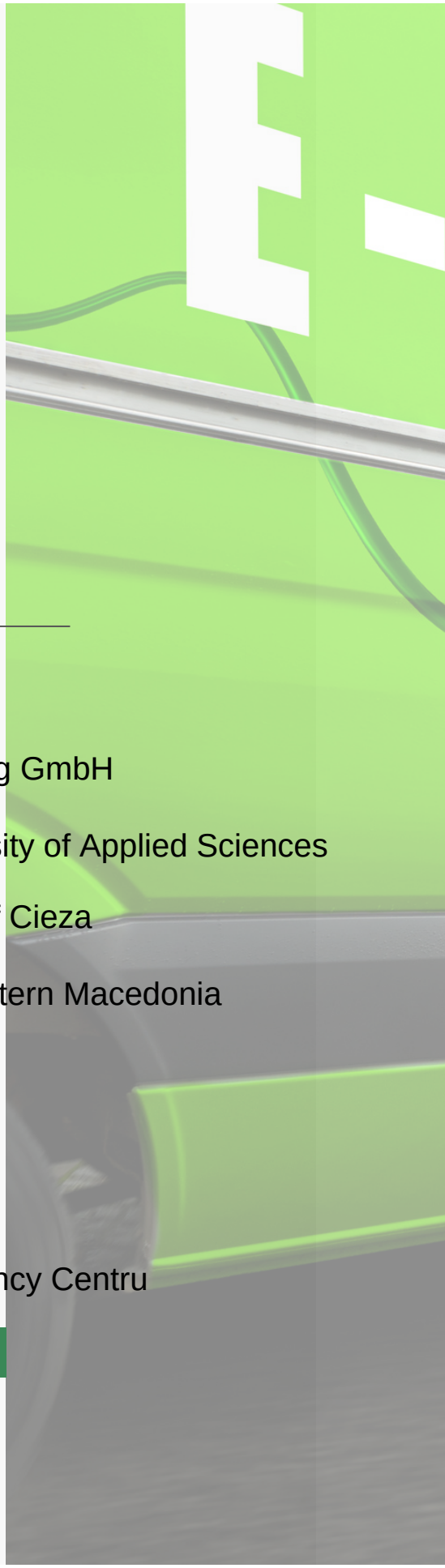

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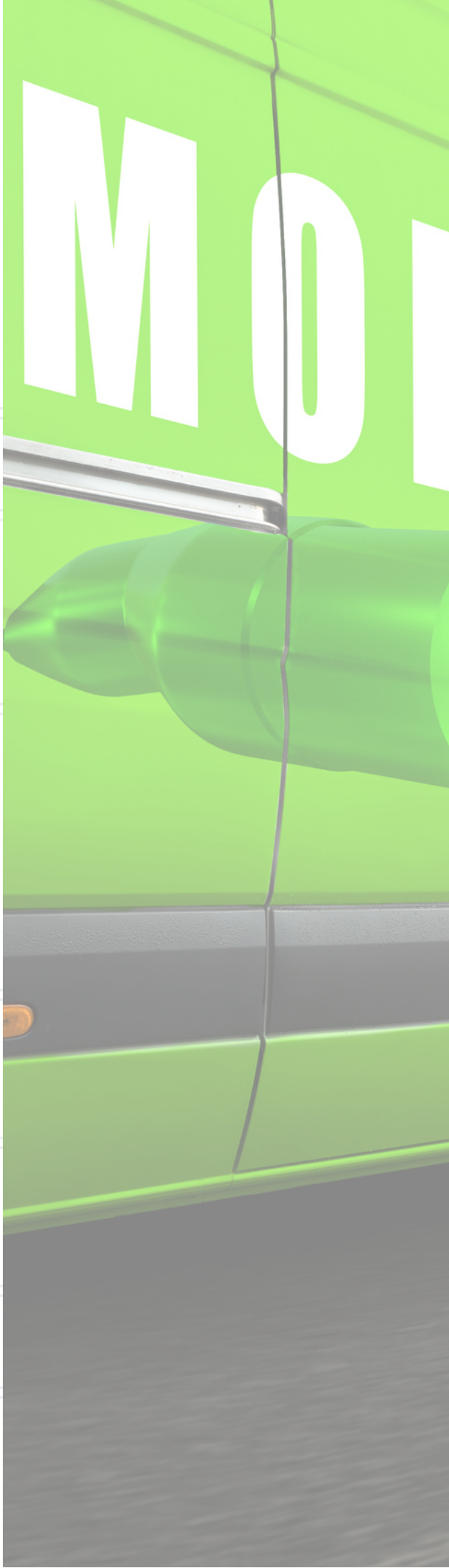

2. E-MOB Identity

E-mobility has a great potential to improve our environment.
The 9 partners of the E-MOB project representing 8 European regions at different stages of e-mobility development, but they all share the vision that e-mobility represents the future of mobility:
a clean, quiet, advanced technology, combined with power, speed and lots of fun.
E-MOB stands for Integrated actions towards enhanced e-mobility in European Regions and aims at enhancing e-mobility solutions in regional passenger transport systems through coordinated policy learning and planning. **As an ambitious target, the partners strive for influencing in total more than 26 million EUR of Structural and other Funds through 8 policy instruments to be revised in the frame of a series of peer reviews and learning conferences.**
Based on the outcomes of this interregional learning process (good practices and policy recommendations), the partners jointly elaborated Action Plans for the improved implementation of the selected 4 Structural Fund Programmes and 4 other policy instruments.

Actors of regional relevance are involved in the whole procedure, being invited in the interregional learning and action planning process. The engagement of stakeholders is facilitated by 8 Regional Stakeholder Groups (RSG). Members of the RSG – together with interested municipalities – have also the possibility to improve their capacities in turning the policies concerned into actions.
Partners elaborated this E-MOB Guideline and organised regional workshops through Phase 1 of the project from August 2019 to July 2022. This coordinated interregional learning contributes to plan and implement concrete measures and projects in the field of e-mobility, bringing tangible results to the participating regions.

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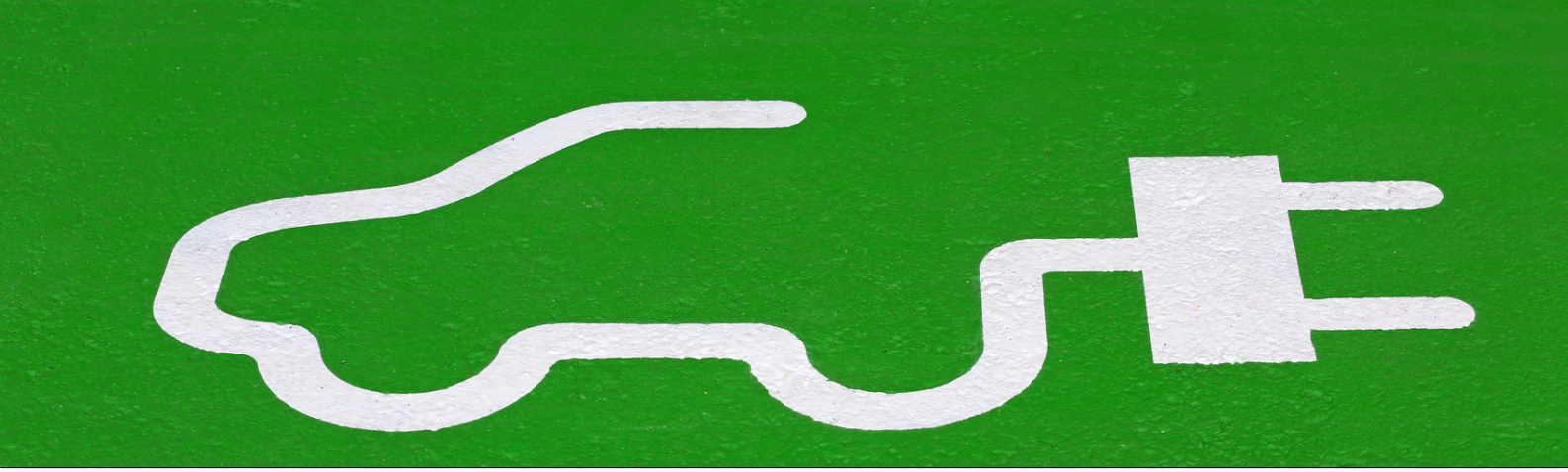


2.1 E-MOB Brief History

Leipzig is currently the fastest growing city of Germany and, as expected, it will continue to grow immensely over the next years. **Therefore, there is an urgent need to improve the mobility concept of the city and to work on environmentally friendly mobility.**
Intelligent mobility measures (e.g. sharing systems, e-mobility) will help to reduce CO2 emissions and ensure sustainable mobility in a steadily growing city. Therefore, Lead Partner (ABW) has developed the project idea and set up the consortium.
The project partners have further developed the learning process together, **mostly through peer reviews,** completing it with an intraregional aspect. This latter stage of the learning process facilitated the anchorage and better implementation of the improved policy instruments and enabled the involved stakeholders to increase their own capacities in the field of e-mobility strategic planning.
The enhanced knowhow of municipalities and regional stakeholders will turn result in better projects and initiatives, fitting to the policy instruments tackled by the project in an optimum way.

2.2 E-MOB Issue Addressed

Europe spends more than €300 billion a year on oil imports, most of it to keep transport wheels turning. Burning this oil in transport leads to it being the single biggest emitter of CO2 in Europe and urban transport is the only sector in the EU today where greenhouse gas emissions continue to rise. Electrification of transport offers a unique opportunity for Europe to simultaneously decarbonise transport, end dependence on imported oil, create jobs & growth and foster industrial innovation
The flagship initiative "Resource efficient Europe" of the Europe 2020, as also 2030 strategy, aims at helping decouple economic growth from the use of resources, by decarbonising the economy, increasing the use of renewable sources,modernising the transport sector and promoting energy efficiency, highlighting that the modernisation and decarbonisation of the transport sector contributes to increase competitiveness.

Here it comes to the contribution of E-MOB to the strategy: The Project Partners share the view that electrification is the only credible option left for deep decarbonisation of surface transport. Electricity is now already a significantly cleaner power source than oil and will become more so in coming decades.

E-mobility promises environmentally friendly transportation: no sound pollution, no exhaust fumes, hardly any harmful emissions.

Cities and regions are largely responsible for urban and regional mobility. Their insights must be heard and considered to move faster in decarbonising the transport sector. Creating supportive policy frameworks, engaging with local stakeholders and exchanging knowledge and experiences through sharing good practice is a necessary step on the road towards zero-emission clean transport.

Within the E-MOB project, public authorities (Amiens Metropole, Koprivnica, Cieza), regional agencies (ABW, TCDA, RDA Centru) and research institutions (UoWM, FHV, UNIN) are working together to develop efficient policy instruments suitable for further improvement of e-mobility in the partner regions.

The exchange of experience within the E-MOB project on e-mobility is organised in the frame of peer reviews and learning conferences that increased knowledge and awareness of existing good practices. E-MOB ensures that these lessons learnt are integrated in regional policies and actions by developing concrete Action Plans for each partner region.

As a result, the project leads to an improved implementation of the selected policy instruments in the field of e-mobility. Furthermore, the mentioned interregional learning process will be completed to a regional workshop for stakeholders.

3. Main Hard facts descriptions in EU level regarding electromobility

3.1 Intro

“In the coming years and decades, the number of electric vehicles (battery electric and plug-in hybrid vehicles) will substantially increase, according to the EU EUCO301 scenario that projects reaching the 2030 EU energy & climate targets and CO2 standards for cars & vans getting progressively more stringent.”

Namely, the stock of electric vehicles in EU28 countries could rise to more than 35 million in 2030 and around 190 million in 2050. In this scenario, by 2050 up to 34% of all final energy demand in passenger car transport could be electric.

The related additional electricity demand (about 356 TWh) would increase overall EU electricity demand by 10%. If electric vehicle batteries are charged without any strategy, this may result in an increase of expected energy not served by the power system or the need for additional peak load capacities.

At the same time, an optimized charging strategy may represent an additional flexibility for the power system and thus facilitate the integration of variable renewable energy sources and bring down power generation costs.

A promising solution

Electric mobility (e-mobility) has emerged as one of the most promising technological solutions to replace fossil fuels and has the potential to power most forms of personal and public transport. **Local and regional authorities have a vital role to play in encouraging uptake: public procurement of e-mobility and the electrification of public transport infrastructure are areas of high potential.**

A range of public transport modes are ripe for electrification including buses, metro trains, trams and ferries. Regions can also help to create an enabling environment for citizens to switch to e-mobility solutions for personal use, including through investment in charging infrastructure, incentives and public-private partnerships.

Decarbonising transport

Transport is proving to be a roadblock to decarbonisation in Europe; unlike other sectors where greenhouse gas emissions have been trending downwards over a long period, transport emissions only started to decline in 2007, and remain higher than 1990 levels. In 2014 greenhouse gas emissions from transport increased compared to the previous year. Overall, transport represents around a quarter of Europe's greenhouse gas emissions, with road vehicles accounting for more than 70% of this.

Transport emissions are also the main cause of air pollution, a growing societal and public health concern, especially in urban areas. The gravity of the effects on human health from transport related pollution is becoming clearer; it causes cancer, impairs lung and cognitive development, is implicated in psychiatric disorders in children, and stunts growth in the womb, making it, according to the BMJ (formerly the British Medical Journal), a 'public health catastrophe'. Over half a million deaths each year in the EU is linked to air pollution, and the health impact of traffic fumes alone cost EUR 67 billion a year.

Electric mobility

A range of alternative energy sources are being explored to replace fossil fuels in transport,ntial to power most forms of personal and public transport, **with two main solutions emerging: hydrogen fuel cell technologies, and electric vehicles.** Hydrogen technologies are so far not as developed, though trials are ongoing and the technology may mature rapidly in coming years. This leaves e-mobility as currently the most promising technological solution. E-mobility refers to vehicles that use one or more electric motors for propulsion, being recharged externally, and primarily getting their energy from the power grid. Electric vehicles can be purely electricity powered or combine an electric motor with a combustion engine ('hybrids'). Almost all of Europe's current transport modes could be electrified; alongside electric cars, electric bikes and electric scooters are increasingly popular for personal travel. **80% of Europe's trains are already electrified, and the electrification of other public transport modes such as buses and ferry boats are more and more common.** Long haul and heavy-duty travel are less well suited to e-mobility, however electric road systems for trucks are already being implemented in several EU Member States. For now, it appears only air travel will remain reliant on liquid fuels.

Electric motors have several advantages over conventional combustion engines. This includes their higher efficiency (converting around 80% of energy to usable power, compared with 20% for a conventional vehicle), high durability and lower maintenance costs. In contrast to other alternative fuels, such as biofuels, electric vehicles have zero tailpipe emissions and therefore do not contribute (directly) to air pollution. Due to their quiet operation, they also create less noise and vibration, thus increasing comfort in urban areas.

The impact of e-mobility on emissions depends greatly on the source of the electricity - nuclear, fossil fuels or renewables. As renewables achieve higher shares in the energy mix, the greenhouse gas emission intensity of e-mobility will decrease. Even today, an electric car powered by the current European electricity mix generates 20-30% less carbon emissions over its lifespan compared to even the most efficient internal combustion engine vehicle on the market.

E-mobility can also offer new flexibility to the electricity grid. IntelligenInnovative measures such as smart Vehicle-to-Grid (V2G) charging systems, mean locally produced renewable energy can be stored in the batteries of electric vehicles. Excess energy can then be fed back into the grid during periods of high demand.

3.2 European and national policies

A. EU level

n 2016, the European Commission (EU) published a European Strategy for Low-emission Mobility. **This strategy reaffirmed the objective of reducing greenhouse gas emissions from transport by at least 60% by 2050, compared with 1990 levels.** One of the main elements of the strategy is to speed up the deployment of low-emission alternative energies for transport (including electricity) and to remove obstacles to the electrification of transport. EU is in the process of passing a Clean Mobility Package of legislative measures, which includes several policies to support the transition to e-mobility. Under the Directive on Alternative Transport Infrastructure, **member states must aim to build at least one public charging point for every ten electric vehicles on the road,** and the directive will make it mandatory to use a common charging plug, to promote EU-wide interoperability. To support demand by users, EU is working on improving customer information by reviewing the Car Labelling Directive and is also promoting clean mobility solutions in public procurement tenders through the Clean Vehicles Directive. The recently passed Energy Performance of Buildings Directive also includes measures to promote e-mobility, such as provisions to ensure that buildings' car parks will be progressively equipped with recharging points.

This applies to residential and non-residential buildings with more than ten parking spaces. To accelerate the development of improved batteries, the Commission invested EUR 200 million through the Horizon 2020 programme between 2018 and 2020 and much more in the next years from the same programme calls. This will contribute to even more widespread use of electric vehicles, as well as strengthening Europe's industrial base. **Regions have much to gain from the emerging electric vehicle market if they can become global frontrunners in manufacturing and research related to the sector.**

Many national governments have taken steps to directly incentivise e-mobility which have offered subsidies for the purchase of electric vehicles, together with partial or full exemptions from registration tax, road tax, and/or company car tax.

A European Strategy for low-emission mobility

The global shift towards low-carbon, circular economy has started and its pace is accelerating. To ensure Europe stays competitive and will be able to respond to the increasing mobility needs of people and goods, the Commission's low-emission mobility strategy sets clear and fair guiding principles to Member States to prepare for the future. The Energy Union strategy contributes to this goal.

Low-emission mobility strategy frames the initiatives that the Commission is planning in the coming years, and it maps the areas in which it is exploring options. It also shows how initiatives in related fields are linked and how synergies can be achieved. It should be seen as one of the tools to modernise the European economy and strengthen its Internal Market.

The main elements of the Strategy are:

- Increasing the efficiency of the transport system by making the most of digital technologies, smart pricing and further encouraging the shift to lower emission transport modes,

- Speeding up the deployment of low-emission alternative energy for transport, such as advanced biofuels, renewable electricity and renewable synthetic fuels and removing obstacles to the electrification of transport,

- Moving towards zero-emission vehicles. energy for transport. While further improvements to the internal combustion engine will be needed, Europe needs to accelerate the transition towards low- and zero-emission vehicles.

Cities and local authorities are crucial for the delivery of this strategy. They are already implementing incentives for low-emission alternative energies and vehicles, encouraging modal shift to active travel (cycling and walking), public transport and/or shared mobility schemes, such as bike, car-sharing and car-pooling, to reduce congestion and pollution.

Finally, this Strategy reiterates Europe's commitment in pursuing **global efforts** to control emissions from international aviation and maritime transport.

A strategy to support jobs, growth, investments and innovation:

Strengthening Europe's competitiveness and stimulating the economy is a priority of all EU commissioners. It should be mentioned that:

- The **strategy integrates a broader set of measures** to support Europe's transition to low-carbon economy. It identifies key priorities, for example in **research and innovation** in low-emission mobility solutions, providing clarity for future **investment** decisions.
- **Manufacturing and service industries** will be able to plan their investments and make business choices with a mid-century goal in mind. Europe's transition towards low- and zero-emission vehicles will be accelerated, fuel efficiency of lorries and coaches will need to step up. Barriers for innovative mobility services need to be removed.
- The **energy sector and fuel suppliers** will be able to plan investments into advanced energy for transport, such as advanced biofuels.
- **Transport is an important employer**. Workers will receive help in acquiring the necessary skills to match the technological transition towards low-emission mobility, in the framework of the New Skills Agenda for Europe.

- This Strategy provides a toolbox for policy makers in **Member States**, at **regional and local level** to design their strategies for low-emission mobility close to where the problems are felt most.

More information can be found here:

- https://ec.europa.eu/commission/presscorner/detail/et/MEMO_16_2497
- The text of the European Strategy for low-emission mobility – Factsheet and the supporting analysis can be found here: https://transport.ec.europa.eu/index_en
- DG CLIMA news - website (including legal documents)
- EPSC Strategic Note 'Towards Low-Emission Mobility: Driving the Modernisation of the EU Economy'
- Press release: Energy Union and Climate Action: Driving Europe's transition to a low-carbon economy
- Fact sheet: Questions and answers on the proposal to integrate the land use sector into the EU 2030 Climate and Energy Framework
- Fact sheet: Questions and answers on the Commission's proposal on binding greenhouse gas emissions reduction for Member States (2021-2030)
- EU legislation currently refers to low-emission vehicles as vehicles having tailpipe emissions below 50g/km. This would include some plug-in hybrids, full electric cars and fuel cell (i.e. hydrogen-powered) vehicles. The latter two examples also represent zero-emission vehicles https://ec.europa.eu/commission/presscorner/home/en#_ftnref1

B. How EU Member States roll-out electric-mobility:

Sufficient accessible charging infrastructure is a key enabler for the accelerated uptake of electric cars.

The following briefing analyses the current and planned future roll-out of EV charging infrastructure in European Member States, based governments' plans (National Policy Frameworks) submitted to the Commission as part of the implementation of the Alternative Fuels Infrastructure Directive.

The aspirations of the member states to support alternative fuels varies greatly – but 10 Member States (Austria, Denmark, France, Finland, Sweden, Germany, Netherlands, UK, Ireland, and Luxembourg) clearly prioritize electromobility. Only 3 countries (Italy, Hungary and Czech Republic) have ambitious goals for the roll-out of natural gas vehicles. Three countries had proposed unrealistically high estimates for future number of EVs on the road by 2020 (Germany, France, Austria).

The recent national plans show that the current level of recharging points available in the EU is sufficient for the number of vehicles on the road – based upon the European Commission recommendation of 10 EVs for each recharging point. National plans for rollout of public charging infrastructures by 2020 EU-wide were also expected to keep pace with the anticipated growth in the number of vehicles.

There will also be sufficient fast chargers alongside the principal highway routes with at least one fast recharger every 40km. Accordingly, there is not likely to be any widespread shortage of recharging points if Member States deliver on their plans – although there may be local areas of over and under supply.

After 2022 significant further investments need to take place, beyond existing plans, to match the number of EVs expected to be on the road. Some further EU funding will be essential particularly in less developed markets. The national plans indicate that the development of a market for EVs in the EU is likely to occur in three distinct waves. Take-up in Western Europe and Nordics countries will happen first and has already begun; South Mediterranean countries are likely to transition to electricity in a second deployment stage with sales picking up appreciably in the mid-2020's. The Baltics, Central and Eastern European countries are more likely to switch to electric cars in significant numbers until the late 2020's or early 2030's - although there could be an earlier secondhand market. Member States need to ensure that they deliver on their national plan commitments for recharging; and several countries (notably Austria and Germany) will need to strengthen fiscal and other incentives to encourage sales to meet their 2020 EV sales targets. There is no time for complacency if the EU wants to become a world leader in zero-emission technologies.

In EU countries, the idea of electromobility began to gain particular importance in the second decade of the 21st century. In 2011, electric cars were used in 19 EU countries, and in 2014, in all member states. In 2011, a total of 15,000 electric cars were used in the EU, and in 2020 already 2.5 million.

C. Regional level

Measures supporting e-mobility regarding **local and regional authorities have a vital role** to play in the promotion of e-mobility, as well, and several measures and policy options are available:

- Charging infrastructure (electricity)

There are many different partnerships and business models available for developing and expanding local charging networks. Several companies are operating in Europe that give users access to their charging network for a fee; **local authorities** may choose to partner with one of these companies and co-sponsor the build-up of charging infrastructure. Offering subsidies or co-financing to local businesses or landowners to construct publicly accessible charging points on private land is also an option, or regional governments may also choose to provide grant funding for the construction of charging stations themselves. Depending on fee structures it is possible to generate revenue from these stations to offset this upfront investment. **Regional authorities** can also influence charging infrastructure by creating a unified payment system to simplify user access.

- Incentives

A range of indirect incentives **can be introduced by regional and local authorities to promote the use of e-mobility options by citizens.** Many cities and regions have altered local traffic rules to create a preferential environment for electric vehicles. This could include free parking, use of bus lanes, or the creation of low emission zones with restricted access for polluting vehicles and more.

- Awareness raising

As is often the case with new technologies, **awareness and understanding of e-mobility is low among many citizens and local policy makers.** Any policies to promote e-mobility should be accompanied by communication efforts to explain how e-mobility works, and its potential benefits for society.

- Procurement

Public procurement can be a powerful market driver for the introduction of new technologies. This is no different for e-mobility. **Many authorities are already looking at their own fleet of vehicles and making the transition to electric vehicles.** A European Clean Bus Initiative has been set up specifically to help local authorities deploy electric and other low emission vehicles.

- Public-private partnerships

Companies and start-ups are offering an ever-increasing range of e-mobility services to citizens. This includes many transport sharing initiatives, as an alternative to private ownership, whereby customers pay for the use of a vehicle for a set time. **Regional authorities can consider ways to encourage this activity in their territory,** for example by entering public-private partnerships. Long standing car sharing schemes are transitioning to electric vehicles. Other car sharing schemes exclusively offer electric vehicles. In urban areas there is an increasing prevalence of electric bike, moped and scooter sharing schemes. These sharing schemes have a great potential to be incorporated into a Mobility as a Service (MaaS) system, which integrates various forms of transport services into a single mobility service accessible on demand.

Sources & further information can be found in the following official EU documents:

- Committee of the Regions – Electromobility Guide for Local and Regional Authorities (2015)
- European Commission – Clean Power for Transport: A European alternative fuels strategy (2013)
- European Commission – State of the Art on Alternative Fuels Transport Systems in the European Union (2015)
- European Commission – A European Strategy for Low-Emission Mobility (2016)
- European Environment Agency – Electric vehicles from life cycle and circular economy perspectives (2018)
- European Parliament - Charging infrastructure for electric road vehicles (2018)
- European Political Strategy Centre – Towards Low-Emission Mobility (2016)

3.3 Some Important E-mobility Standards

Some important Standards that must be considered for the e-mobility charging infrastructure are:

• **Standard ISO/IEC 15118-20** establishing the connection between the EVs and the charging station, as well as enabling EVs to return electricity to the grid, or to power buildings and appliances.

Road vehicles — Vehicle to grid communication interface — Part 20: 2nd generation network layer and application layer requirements.

ISO15118 is a standard for vehicle-to-grid communication, specifying the ways the vehicles communicate with charging devices. The standard also defines preconditions for identification with the cable or via Wi-Fi, enabling the charging device and the back-end service to identify the car and its owner when the vehicle is plugged in.

Technology is ever evolving to continuously enhance customer experience. And the situation is no different with EV charging.

New advanced technology should enable EV drivers to identify themselves safely and easily at the charging station by, as its name suggests, simply plugging in.

In practice, this technology equals a smoother charging experience, increased security and one less thing to worry about.

This standard contributes to the 9th Sustainable Development Goal: Industry, Innovation and infrastructure build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

• **Standard IEC 63110** which will enable charging stations management.

IEC 63110 is an international standard defining a protocol for the management of electric vehicles charging and discharging infrastructures, which is currently under development. IEC 63110 is one of the International Electrotechnical Commission's group of standards for electric road vehicles and electric industrial trucks, and is the responsibility of Joint Working Group 11 (JWG11) of IEC Technical Committee 69 (TC69).

• **The IEC 60364** standard series consists of installation standards and therefore must be used for fixed installations.

If a charging station is not movable and connected via fixed cables, it falls under the scope of IEC 60364.

• **IEC 60364-4-44, clause 443 (2007) provides information on WHEN surge protection is to be installed.**

For example, if surges can affect public services or commercial and industrial activities and if sensitive equipment of overvoltage category I + II ... is installed.

• **IEC 60364-5-53, clause 534 (2001) deals with the question of WHICH surge protection should be selected and HOW to install it.**

• **IEC 60364-7-722 – Requirements for special installations or locations – Supplies for electric vehicles**

As of June 2019, the new IEC 60364-7-722 standard is mandatory for planning and installing surge protection solutions for connection points which are accessible to the public.

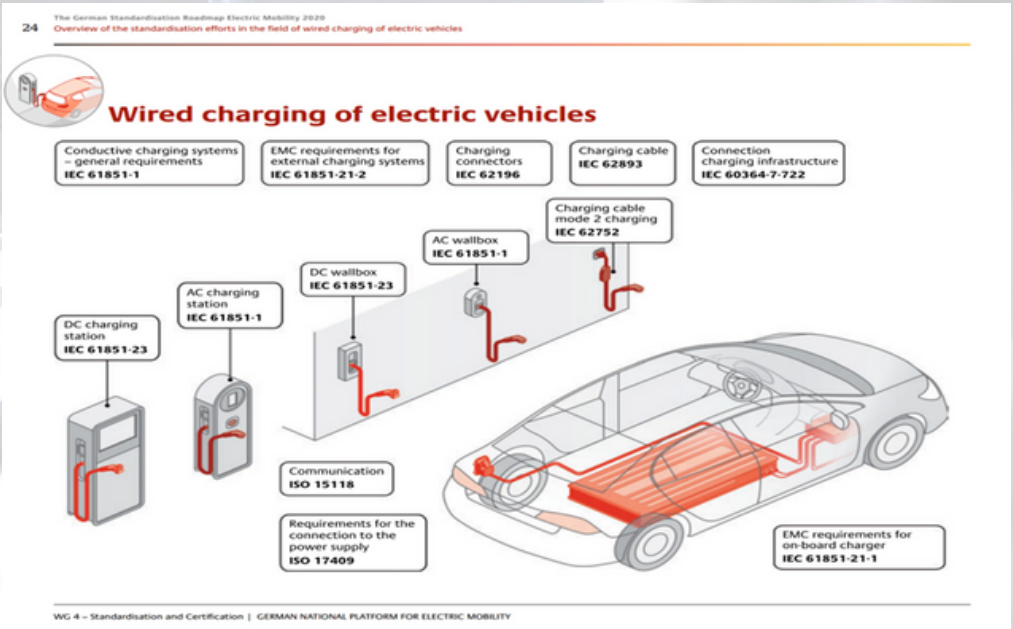
• **722.443 Protection against transient overvoltages of atmospheric origin or due to switching**

• **722.443.4 Overvoltage control**

A **connecting point accessible to the public** is considered to be part of a public facility and must therefore be protected against transient overvoltages. As before, surge protective devices are selected and installed according to IEC 60364-4-44, clause 443 and IEC 60364-5-53, clause 534.

A good example to overview, is The German Standardisation Roadmap Electric Mobility 2020

https://www.din.de/resource/blob/235254/a0d14b63b9685859b1c0c297827e50f8/roadmap-en-2020-data.pdf



3.4 Electric vehicles in municipal fleets

In brief

The objective of using electric vehicles (EVs) in municipal fleets is to reduce emissions and to serve as role model for private vehicle owners. The municipality can demonstrate the applicability of electric vehicles and can benefit from own experience in applying modern technologies when designing a supportive framework for electric mobility. To introduce EVs in city-owned fleets municipal vehicle procurement guidelines need to be issued or adapted so that energy efficiency and environmental performance are considered in vehicle purchase.

Examples

Electric vehicles can be introduced in municipal fleets and fleets of municipal enterprises such as vehicles for waste collection, street cleaning and other governmental services. Many cities already introduced electric vehicles in different fleets. In Beijing for example, electric rubbish collection trucks and electric sweepers are in application based on a local action plan that requires that electric vehicles must make up at least 50% of all new sanitation vehicles. In Lisbon and Rotterdam, municipal employees use electric vehicles for their professional activities.

Results

Through this measure, the share of clean vehicles in the municipal fleet is increased and own emissions are reduced accordingly. Energy savings and emission reduction of electric vehicles are particularly high in driving cycles with frequent stops and short distances, such as those typical for municipal fleets. The net emission reduction of EVs depends on the share of clean energy in electricity generation.

For vehicles that run during night hours reduced noise emissions at low speeds are an additional benefit. Surveys in Lisbon revealed that the municipal employees gained positive experience with driving electric vehicles. However, due to the specific characteristics of EVs in terms of range and charging requirements, new organisational procedures might be needed when continuous operation or long distances are required.

Municipalities can gain extensive knowledge for instance regarding the EV-use, energy consumption, impact on the environment and effect on the electricity grid if the EV application is monitored in detail. If the vehicles are labelled accordingly and the city seeks media attention, the municipal EV fleet can contribute to awareness raising for electric mobility.

Technical and financial considerations

Vehicles in municipal fleets are very suitable for battery electric drive systems due to their usually limited operational range and typically fixed routes. These vehicles are often parked in larger vehicle depots, allowing charging infrastructure to be concentrated. A municipality can analyse the existing fleet according to the vehicles' driving distances, time of non-use and operational purposes. Based on this, vehicles that are suitable to be substituted with electric ones, which drive-system technology (e.g. hybrid vs. all-electric), and the required battery size, charging infrastructure and charging strategy can be identified. Existing fleet management systems and routing might need to be adapted to account for charging requirements.

Investment costs for electric vehicles are typically higher than for conventional vehicles. Lower operating and maintenance costs for EVs compared to conventional vehicles can lead to competitive total costs of ownership compared to conventional vehicles. The number of available electric vehicle types and models is rapidly increasing, however for special purpose vehicles, conversion from combustion engine to an electric drive system or coordination with manufactures for custom-built vehicles might be necessary.

Policy/legislation

Municipal procurement guidelines may encourage or oblige departments and municipal enterprises to purchase fuel-efficient, low-emission vehicles. The local purchasing guidelines can include an EV quota or can be based on environmental performance standards. To reduce investment costs, the municipality can cooperate with car sharing providers to substitute municipally owned vehicles with electric car-sharing vehicles.

Institutions

The municipality is the leading agency for implementation. As head of the city administration the mayor is also responsible for an overall strategy regarding municipal fleets. Municipal departments such as the procurement department, financial department and legal department can be involved in issuing and implemented public procurement guidelines for clean vehicles. In addition, key implementing institutions are departments, municipal companies and service providers that apply the vehicles in their work such as department of public order and safety, public transport providers or waste management services. National governments issue EV purchasing quota for all government agencies.

Transferability

Many cities in Europe, in Asia and in other parts of the world have already successfully introduced EVs in the municipal fleet. The GHG emission mitigation effect depends on the local context in terms of carbon intensity of electricity generation and transport fuels. The measure is ideally integrated into a wider electric mobility strategy. It is favourable for the measure's implementation if charging infrastructure is already readily available in the city. Vehicle models available on the market vary by country.

3.5 Electric buses and Municipal Fleets

Electric bus, main fleets and projects around the world

Electric bus adoption in public transport urban fleet is growing all over the world. It started in China, and it has taken a few years for other regions to start the transition. But now Europe is booming: **the year 2019 will be remembered as the year when the electric bus sales volumes definitive ramp up**. While in 2018 the European electric bus market increased by 48 % compared to 2017, the year 2019 saw a tripling in the number of electric bus registration in Western Europe. And in 2020, the year of Covid, the battery-electric bus market in the same region increased by 22%. What is worth mentioning, 6 EU countries in 2020 have registered several zero emission buses accounting for over 25% of the Class I registrations.

State of play in the development of electric buses in Europe

The new rules adopted by the **European Union** in February 2019 require that **a quarter of new buses purchased by public authorities be "clean" by 2025.** Ratio which will rise to one third from 2030. The expansion of bus lines in European cities will therefore intensify considerably in the years to come. At the same time, 40 cities (including Paris, Berlin, London, Copenhagen, Barcelona, Rome and Rotterdam) have signed the C40 Declaration for fossil-free streets, in order to achieve zero-emission bus fleets by 2025.

Upstream, between 2013 and 2018, Europe adopted an ambitious program, ZeEUS. The objective is to test electrification solutions at the heart of the urban bus system network. Today, the **90 urban demonstrators facilitate the adoption of the electric bus market in Europe.**

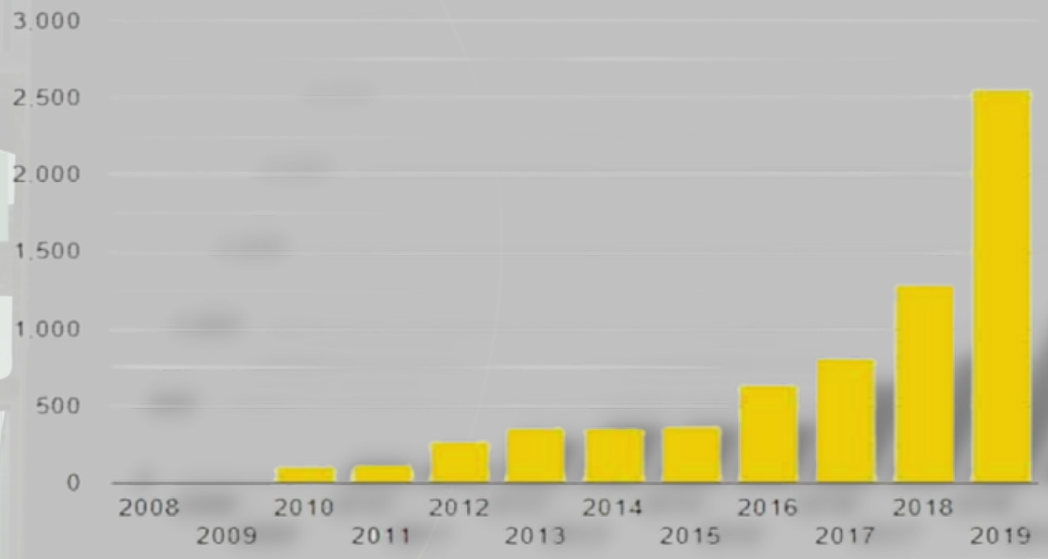
The best European country being the Netherlands (100% electric). The country managed one in four buses running on electric power by the end of 2020. But for several years, the transformation has been underway in all European countries. In London, 3 100% electric lines already exist, out of a total of 8,000 buses. The city hopes for a fully electric fleet by 2037. Germany aims to acquire 3,000 electric buses to electrify most of the fleets in Berlin, Cologne, Frankfurt, Hamburg and Munich.

Europe is still lagging China. In 2025, 99% of electric buses in circulation in the world will still be in China. And the world leaders in electric bus manufacturers are Chinese: Ankai, BYD, Foton, Shandong Yixing, Yutong, Zhongtong… far ahead of the French and Europeans Volvo, Iveco, Solaris or Daimler, for example.

Distribution of electric and hybrid buses in Europe

Growth over the past year has been staggering, increasing the electric bus fleets from 1,289 buses (2018) to 2,561 buses (2019), equivalent to a doubling of the fleet and more than 2% of the total bus fleet (source: European Alternative Fuels Observatory (EAFO). In 2019, 12% of city bus orders were for electric to reach 40% by 2025.

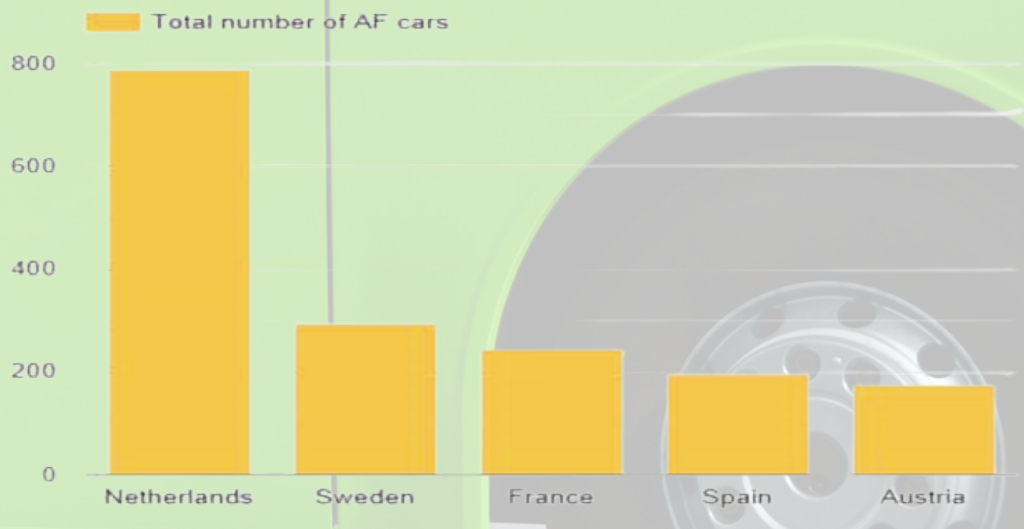
AF FLEET (2019)



Evolution of electric bus fleets in Europe in 2019

In terms of numbers, the best endowed country in Europe is Netherlands with a fleet of around 800 vehicles. Sweden and France come next and Spain and Austria follow.

TOP 5 COUNTRY AF FLEET (2019)



Top 5 European countries equipped with electric buses in 2019

EZeEUS eBus Report #2,
includes an updated overview of electric buses in Europe and can be found here:

https://zeeus.eu/uploads/publications/documents/zeeus-ebus-report-2.pdf

Electric bus market in Europe year 2021

Electric bus registrations increased by 48% in 2021 compared to 2020 in Europe. 3,282 e-buses were delivered last year, bringing to over 8,500 the vehicles registered in the continent since 2012. What is worth mentioning, in 2021 for the first time as many as three European countries registered over 500 e-buses, with Germany leading the shortlist (555 units) followed by UK (540) and France (512).

Electric bus deployment forecasts according to studies

As highlighted by Mrs. Aleksandra O'Donovan, Head of Electrified Transport at BloombergNEF, «Deployment of e-buses in the municipal environment continues to increase. We now expect municipal buses to go electric faster than any other segments of road transport, with e-buses comprising over 67% of the global bus fleet in 2040. (…) **We expect municipal e-buses to rise from 417,000 units in 2019 to over 645,000 units in 2025 (about 39% of the global municipal bus fleet)».**

According to another study released in 2021 and signed by financial consulting company ING, **a third of the 200,000 buses in European public transport will be zero-emission by 2030.** At that year, zero emission buses will cover two thirds of the new city bus registrations. **ING clearly reads: «This will be the decade of change».**

As of end 2021, in Europe there are over 8,500 electric buses running (in the definition are included not only battery electric buses but also plugin hybrids, trolleybus IMC and fuel cell buses). Still today, roughly 98 per cent of the electric buses in the world are deployed in Chinese cities, as already mentioned.

At the end of 2021, in Europe, the share of electric buses on the sales volumes of city buses overcame the 20 per cent. According to UITP, it is going to rise to 20 per cent in 2020. But if we look at the wider 'cake' of the European bus market also including Class II and Class III vehicles, according to ACEA in 2020 6% of the registered buses were electrically powered.

Cities can work with transit agencies to transition their fleets to fully electric buses. Electric buses may have higher capital costs, but they also provide significant economic benefits because of reduced maintenance and fuel costs, especially in high-mileage use cases.

Improving Quality of Life in Cities

Smart cities move with electric transportation. As urban areas shift to a more sustainable approach, many companies can leverage their trailblazing experience and substantial investment in private e-mobility to offer zero-emissions transportation solutions for local governments. Transitioning to e-powered public transportation improves air quality, reduces emissions and noise pollution, cuts costs, and provides the public with a more comfortable and more extensive service.

Not Just Electric Buses

Converting public vehicle fleets is just the beginning. E-powered public transportation solutions include upgrading bus stops and shelters, which will become smart and multifunctional. Sustainable, integrated, efficient and technological solutions also transform passengers' public transport experience, even making wait times useful.

4. Main Soft facts descriptions as supporting management tools for the preparation of electromobility activities.

Intro - Some few examples of new & upcoming EU legislation

EU Taxonomy

The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. The EU taxonomy is an important enabler to scale up sustainable investments and to implement the European Green Deal. This new EU classification system means that industry operators need to extensively report how they have reduced, prevented, and managed emissions in order to have access to financing.
https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

The Energy Efficiency Directive (EED)

Current energy efficiency improvements are intended to reduce at least 32.5% of the EU's overall energy consumption by 2030. This non-binding target can be reached by hastening the shift to more efficient, electric vehicles, and increasing the efficiency of the existing vehicle population.
In practice, multiple countries have already taken concrete steps to fasten the transition towards e-mobility with national zero-emission mobility targets or introducing scrappage schemes and rewards for old cars.
The directive has already been implemented in member countries and can and should be supported with ambitious transport policies that support the EU's 2030 energy efficiency target.
https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en

The Renewable Energy Directive (RED)

By today, most European Union member countries have not yet incentivized the use of electricity as a fuel in the same way they do with for instance biofuels. Yet, electricity is the cleanest alternative to oil.
The refreshed Renewable Energy Directive, RED, offers a chance to move away from crop-based biofuels such as palm oil to cleaner fuels. The creation of a credit system would help in increasing the rise of renewable fuels since renewable electricity requires a separate infrastructure to be introduced to the market.
The deadline for RED transposition in the member countries was the end of June 2021.
https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules_en

The Energy Performance of the Buildings Directive (EPBD)

The revised Energy Performance of the Buildings Directive is a must-know for all real estate sector actors. Depending on the purpose of the building, EPBD obligates new buildings and buildings undergoing major renovations to either install charging stations or ensure the installation of ducting infrastructure in parking spaces.

The Commission has also proposed a smartness requirement for the charging points: meaning, that the chargers should be capable of reacting on signals from the grid. In the long term, smart charging stations are a cost-efficient choice for both real estate owners and consumers.

https://epb.center/epb-standards/energy-performance-buildings-directive-epbd/

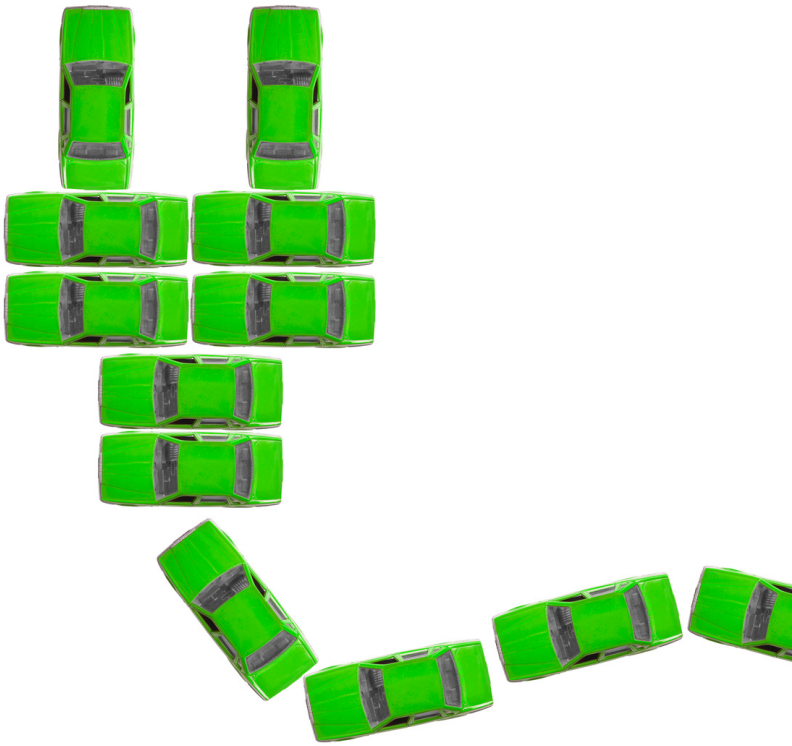
Market Design Directive and Regulation

Furthermore, the Market Design Directive encourages member states to introduce smart metering systems in using electricity.

"Smart homes, smart villages, and smart cities can place the consumer at the center of the energy system. As local and renewable energy sources will decarbonize the energy usage, smart grids are needed to balance the system," Kumpula-Natri explains.

Smartness in charging unravels the possibility that electric vehicles have in providing stability and flexibility to the grid. With MDD and smart charging systems, consumers have a right to use, generate, store, and even sell energy without redundant charges.

https://energy.ec.europa.eu/topics/markets-and-consumers/market-legislation/electricity-market-design_el



4.1 General Recommendations for the preparation & the management of electromobility activities

• Given the expected importance of e-mobility in the future transport mix, authorities **should make e-mobility a key feature in any regional mobility plan,** or consider developing a dedicated Regional e-mobility strategy

• **Stakeholder involvement is vital** and should involve all relevant actors, not only in transport and environment management, but also representatives from industry and research

• Given the importance of tackling problems related to emissions, **other measures will be needed whilst e-mobility (and other solutions) develop,** including air filtering technologies for cars and buildings. To this end, strategies should link to overall longterm regional development, low carbon, air quality and smart specialisation strategies

• **Increasing the number of public charging stations is a pre-requisite for personal e-mobility.** As a rule of thumb, regions should offer one public charging point per ten registered electric vehicles. The EV Energy project's recommendations can provide guidance

• **Shared mobility solutions should be promoted due to their added potential to reduce congestion and pollution.** Public and private sharing schemes for electric cars, bikes and scooters are increasingly common

Authorities should carefully study the impact of e-mobility on the electricity grid. Close co-operation with electricity suppliers, as well as the deployment innovative technologies such as Vehicle2Grid charging, can help ensure security of supply.

• Indirect incentives for electric vehicles – for example bus lane access, or free parking – can be cost-effective measures to promote e-mobility

• Public authorities can lead the way with e-mobility through the procurement of electric vehicles, including for public transport

• Authorities should consider partnerships with private companies to complement other measures on e-mobility. Many start-ups and companies are offering services such as vehicle charging or sharing schemes, which can accelerate the uptake of e-mobility in regions

• Citizens are central to the transition to e-mobility. Awareness raising activities are therefore needed to press home the benefits of e-mobility, and to educate about some of the practicalities of engaging with this new technology.

Sources and further information:

• Committee of the Regions – Electromobility Guide for Local and Regional Authorities (2015)
• European Commission – Clean Power for Transport: A European alternative fuels strategy (2013)
• European Commission – State of the Art on Alternative Fuels Transport Systems in the European Union (2015)
• European Commission – A European Strategy for Low-Emission Mobility (2016)
• European Environment Agency – Electric vehicles from life cycle and circular economy perspectives (2018)
• European Parliament - Charging infrastructure for electric road vehicles (2018)
• European Political Strategy Centre – Towards Low-Emission Mobility (2016)

4.2 Electrify Municipal Fleets: Policy – Management Tools for the preparation of electromobility activities

Cities, regions and counties can lead by example and set incremental goals to electrify their municipal fleets. Workplace charging at municipal buildings encourages employees to drive EVs.

Municipalities can reduce both fleet emissions and operating costs while improving service to the community by replacing their fleet vehicles with EVs.

Local governments should consider the following management model and steps in making the transition to electric:

01

Complete a Comprehensive Fleet Assessment:

I. Collect data on current fleet usage (e.g. types and number of vehicles, common routes, fleet purchase policy).

II. Complete a multi-year total cost of ownership analysis for each vehicle (vehicle cost, fuel, maintenance, insurance, etc.).

III. Update fleet purchasing policy to prioritize electric vehicles (if a vehicle is required) as well as transit, carshare and rideshare.

02

Focus on Fleet Efficiency:

I. Where possible, 'Right-Size' the fleet: prioritize transit, carshare and rideshare where financial savings can be achieved without sacrificing performance

II. Aggregate purchasing and shared services across departments.

03

Complete a multi-year total cost of ownership analysis for each vehicle (vehicle cost, fuel, maintenance, insurance, etc.)

04

Establish City Fleet Electrification targets and replace conventional gas-powered vehicles when suitable EV options are available with equivalent operational capability.

05

Apply for electric vehicle purchase incentives and grants

06

EV Charging Infrastructure:

I. Evaluate charging requirements: Level 1, Level 2, DC fast charge

II.Coordinate EV charger deployments with other departments.

IIII. Partner with electric utilities to install EV charging infrastructure (primarily for Level 2 and DC fast charge).

4.3 Additional management tool (1):

A Case Study supporting tool – Where to start from?

Municipalities face an important question when they consider switching to Electric Vehicles (EVs): ***"Which department's cars should they start with, and is it financially and environmentally worth it?"***

The Project:

Using FleetCarma, Connexus Energy's Municipal Fleet Analysis Project provided a detailed fleet evaluation for the cities of Coon Rapids, Andover, Ramsey, and Blaine in their service territory and provided each with the results, identifying opportunities for adding EVs. Many fleet operators shared the results with city council members to make more informed decisions.

The Results:

In general, Connexus Energy found that incorporating EVs would decrease Total Cost of Ownership (TCO) and reduce CO_2 emissions and overall petroleum fuel use, providing strong evidence to support EV inclusion in city fleets!

Looking under the hood: Municipal Fleet Analysis Project

Municipal city fleets have unique functional demands—light duty pick-up trucks are the mainstay of the fleet, followed closely by SUVs and sedans. While not all municipality vehicles have an electric equivalent, sedans and small SUVs do, and EV manufacturers are quickly working on meeting more municipal needs.

Connexus Energy conducted a study in four communities—Blaine, Ramsey, Andover, and Coon Rapids—to identify which municipal vehicles would most benefit from a switch to EVs. Connexus provided telemetric devices to attach to a set of municipal vehicles.

Municipalities identified the vehicles they wanted to test, and attached the device, measuring daily mileage, acceleration and braking,driver efficiency, engine idle time, and trip length. The results showed that switching to EVs would decrease cost of ownership while also decreasing Carbon emissions for the cars selected.

Considering the benefits of switching to EVs, Connexus Energy hosted EV Ride and Drive events in two cities to give members of the general public and city employees an opportunity to try EVs out themselves!

Charging ahead with lessons learned

EVs have unique maintenance needs, and many municipal garages are not yet up-to-date on the knowledge they need to maintain and service EVs. Currently, municipalities rely on dealer maintenance garages for EV vehicles. Members of the organizations involved have learned that educating frontline municipal fleet mechanics on EVs can go a long way to encouraging EV adoption. Doing so will require a collaborative effort between municipalities, dealerships, and manufacturers.

Leaders of the project plan to present overall project results to community stakeholder groups to encourage participation in future fleet analyses, while sharing knowledge about the importance of training municipal fleet mechanics on EV service and maintenance.

Source:
https://www.cleanenergyresourceteams.org/are-municipal-electric-vehicle-fleets-worthwhile-investment

4.4 Additional management tool (2):

A Case study supporting tool - Action Plan for promoting electromobility in Region of Attica, Greece.

IElectromobility is a very promising sustainable technology for reducing emissions and energy consumption in the transportation sector. During the last years, electric vehicles are gaining increased attention in Greece and various incentives and actions favor their use and purchase. **The aim of the case study was to present a complete Action Plan developed for the Region of Attica, the largest region in Greece, for promoting electromobility through the implementation of concrete and targeted actions, based on the results of the region's current situation analysis.** The actions classified in three primary axes, infrastructure, equipment and promotion, include campaigns organization, installation of charging infrastructure in strategic locations and substitution of part of the regional vehicle fleet with electric ones.

The Action plan gives a complete framework of the steps that should be followed from the analysis of the current situation to the formulation and implementation of the actions and can be used as in inspiration and a guide for other regions interested in electromobility field.

Introduction

In a national level, statistic data for Greece show the same trend in EU, as the share of the transportation sector in CO2 emissions is 29,5% (the second highest after energy industries sector) and the road transportation contributes most to air pollution with a share of 57,3% (EU, Statistical pocketbook 2018). Concerning the Region of Attica, and more specifically the city of Athens, capital of the Region, the share of CO2 emissions per sector is: 30,8% food, 29,1% transport, 13,7% goods, 11,3% gross fixed capital formation, 7,1% housing, 4,6% government and 3,4% services (Baabou et al., 2017). The above presented high shares in national and regional level, reveal the need for the design and implementation of interventions and actions towards a more sustainable mobility. **Within this framework, electromobility and alternative fuels are key - solutions towards a more environmentally friendly transportation system, having a direct effect on energy saving and emissions reduction.**

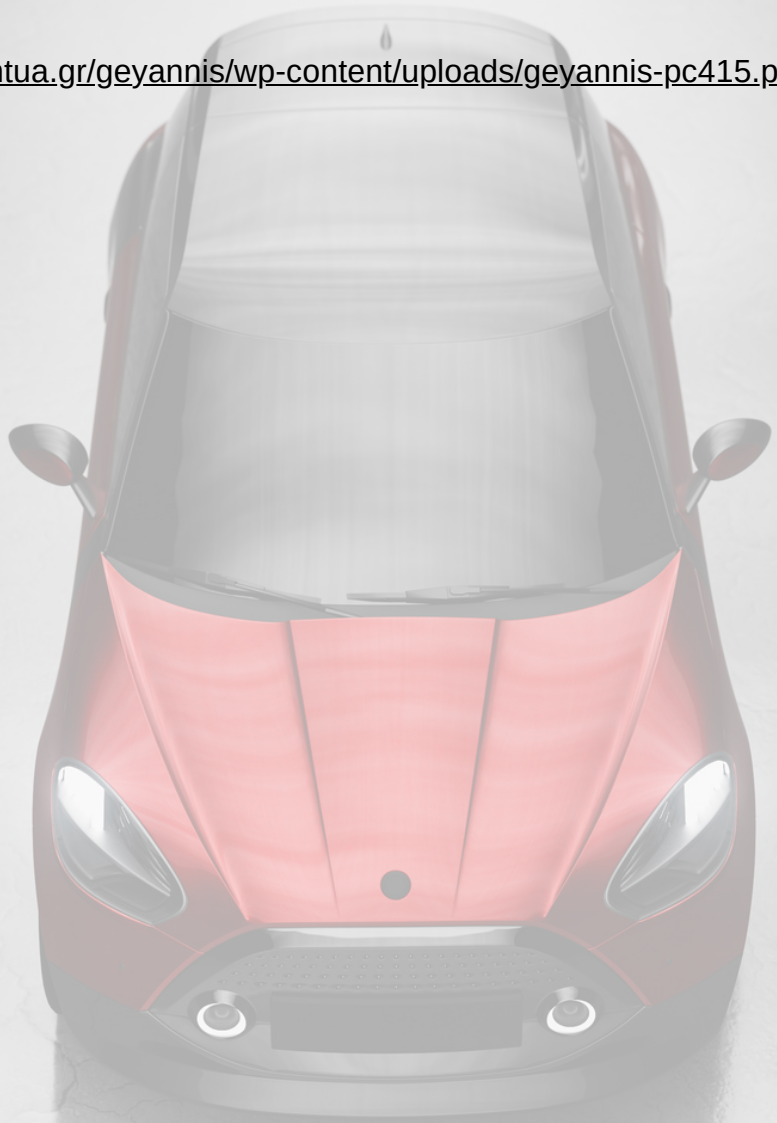
The diffusion of electromobility and alternative fuels is the main goal of e-MOPOLI (Electro MObility as driver to support POLicy Instruments for sustainable mobility) project, a European research project financed by the European Regional Development Fund aiming at the implementation of innovative strategies for reducing the carbon footprint of economic activities in urban and extra-urban areas. A key output of e-MOPOLI project is the development of action plans which will contribute to promoting electromobility and alternative fuels in the region of each project partners.

To achieve this output, nine regions from eight different European countries exchanged ideas, knowledge and policies already implemented that should be adopted, altered or avoided. The aim of this work was to present a methodology towards the development of concrete and successful Action Plan as well as the structure for such a document.

Additionally, the Action Plan for Region of Attica developed based on this methodology and within the framework of the eMOPOLI project was also described. Based on the thorough analysis of the current situation in the region concerning electromobility, five actions were developed and included in the Action Plan classified in three primary axes: infrastructure, governance and promotion. The actions are described in terms of their scope, the background led to their formulation, the individual activities that should be carried out, the stakeholders involved, the timeframe, the cost and the funding sources, the economic, environmental, territorial and electromobility impact as well as the action transferability potential.

The Action plan presented in this work gives a complete framework of the steps that should be followed from the analysis of the current situation to the formulation and implementation of the actions and can be used as an inspiration for other regions interested in electromobility field based on the high transferability potential of the proposed actions but also as a guide for the development of a concrete and efficient action plan.

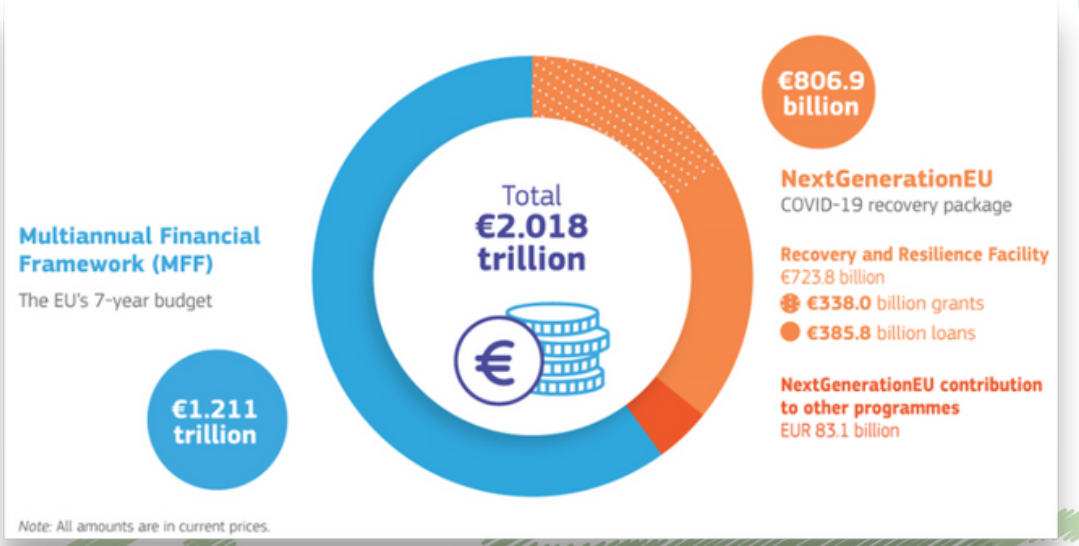
More:
https://www.nrso.ntua.gr/geyannis/wp-content/uploads/geyannis-pc415.pdf



4.5 EU funding 2021-2027

EU financing for transport-related projects in 2021-2027 will continue along the lines of the 2014-2020 period, with some changes. Within the European structural and investment funds, the European Regional Development Fund (ERDF) and Cohesion Fund (CF) will contribute to the projects managed jointly by the Commission and Member States.

The explicitly stated 'partnership principle' implies close cooperation between EU, national, regional and local levels at all stages of the implementation. The rules have been simplified and give higher flexibility for transfers within cohesion policy funds and also between individual regions. This should allow for greater empowerment of regional, local, and municipal authorities in the management of EU funds.



New versions of programmes under direct EU management are finalised: **the Connecting Europe Facility (CEF) 2021-2027** will provide support for projects implementing **the trans-European transport network (TEN-T) and the Horizon Europe research and innovation framework programme** includes a cluster for 'climate, energy and mobility'. Financial instruments from the **InvestEU programme and redefined European Investment Bank (EIB)** lending will be available for bankable projects. The Commission plans to review the transport-relevant State aid rules and establish sustainable taxonomy criteria for all transport modes, to clarify which investments count as sustainable.

In response to the crisis triggered by the pandemic, the EU adopted the Next Generation EU recovery instrument, opening two funding opportunities. The first, **the Recovery Assistance for Cohesion and the Territories of Europe (REACT-EU) fund** will provide an additional €47.5 billion via structural funds until 2022. The second, **the Recovery and Resilience Facility (RRF)** will offer €672.5 billion in loans and grants to support reforms and investments undertaken by Member States. These must be outlined in national recovery and resilience plans that should earmark 37 % for green and 20 % for digital investment and reform. The plans were submitted by 30 April 2021, following a mandatory consultation with regional and local authorities, civil society and stakeholders. While Member States should provide a summary of the consultation and describe how stakeholder inputs have been reflected in their plans, not all are involving local communities as required. The plans were assessed by the Commission and adopted by the Council. If well prepared, they could provide significant additional funding for the transport transformation.

5. E-MOB Focus - Objectives

E-MOB focus is to improve the implementation of regional development policies and programmes, in particular programmes for Investment for Growth and Jobs and, where relevant, ETC programmes, addressing the transition to a low-carbon economy.

Overall and Sub objectives

The E-MOB project aims at enhancing and integrating e-mobility solutions into regional passenger transport systems through coordinated policy learning and planning in 8 European regions. It strives to improve the implementation of selected policies in the participating regions, by supporting exchange of experiences and sharing of good practices and ideas between actors of regional relevance, with the specific aim to prepare the integration of the lessons learnt into regional (e-)mobility policies and actions.

These objectives are fully in line with the Interreg Europe programme that was designed to support policy-learning among the relevant policy organisations with a view to improving the performance of regional development policies and programmes.

More specifically, the project intends to - discover regional strengths and good practices in the field of e-mobility to build the base for future development within and the mutual learning among 8 European regions:

- foster interregional learning among the participating regions by organizing peer reviews and learning conferences in each of them
- improve the implementation of selected policy instruments with relevance for e-mobility by developing, implementing and monitoring related Action Plans in each partner region
- facilitate the transformation of learning into actions by broadening the use and impacts of the tackled policy instruments through a coordinated intraregional learning process involving regional stakeholders
- increasing regional stakeholders' capacities in e-mobility strategic planning by elaborating the E-MOB Guideline.

Project Approach & main outputs

The E-MOB learning process was organised in a 2-step-manner:

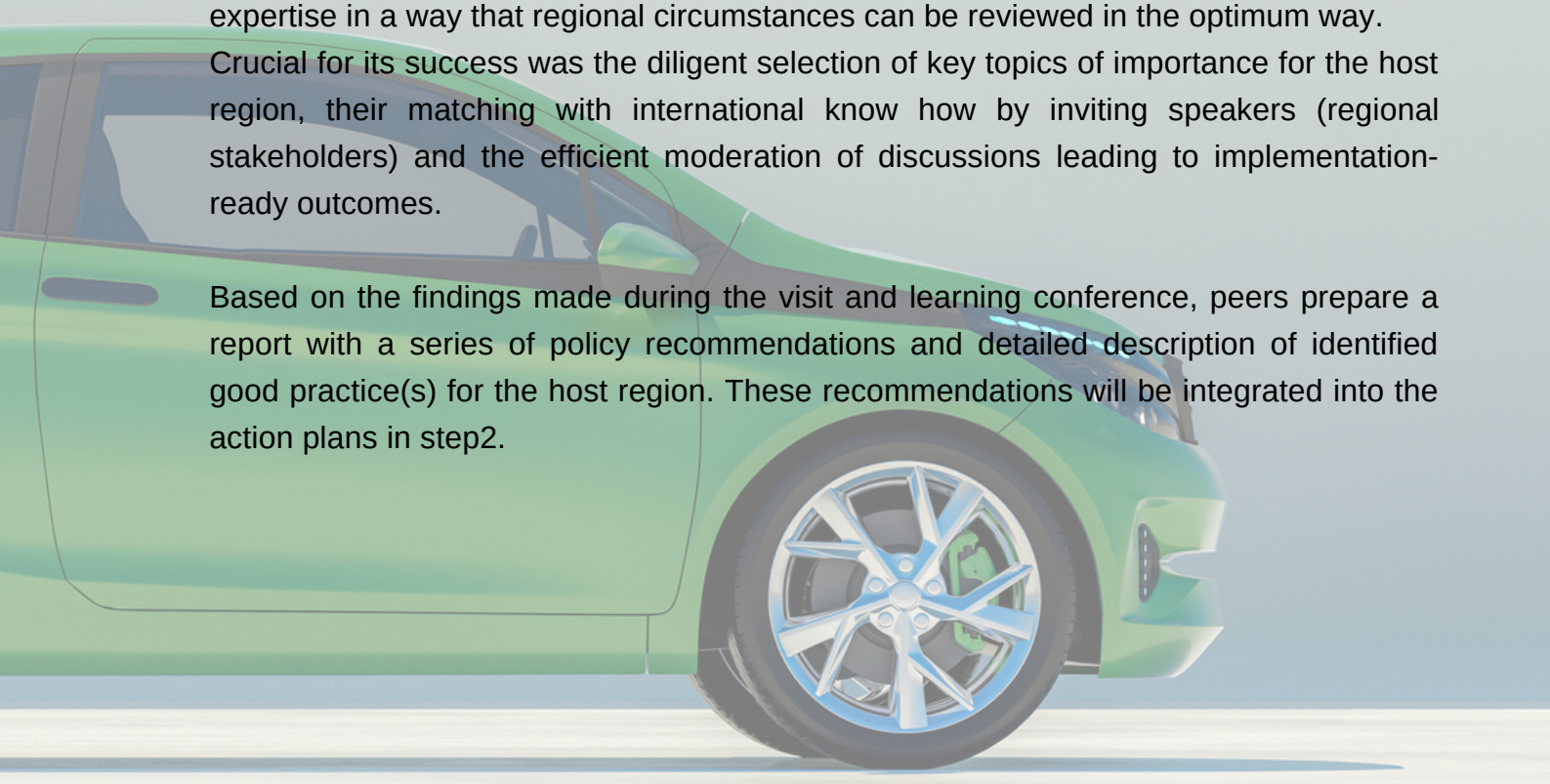
1) Interregional learning: Discovering regional strengths

Step 1 was dedicated to the assessment of what is already there in the participating regions and how this can be further utilized. Case studies, strategic documents, policy instruments, visions of relevant actors, attitude to e-mobility of stakeholders and general public etc. were studied. Good practices were detected and their capitalization potentials considered. This was done by organised peer reviews in the partner regions, ensuring high-quality stakeholder inputs. The peer reviews were online or onsite visits by multinational teams of transport and (e-)mobility experts as well as policy development specialists to a host region.

As a preparation for the review, each host region (PP) elaborated a sound background information package, based on a common criteria catalogue and methodology agreed by the PPs. During the review process, the review team members met and interviewed local stakeholders and investigated (e-)mobility conditions and the practical implementation of the policy instruments concerned through on-site visits and personal testing. A learning conference completed the picture, where local stakeholders, the members of the review team, invited experts, representatives of local media as well as interested citizens discussed the regional circumstances in an interactive and implementation-oriented way. The conference included - plenary session(s) and/or interactive workshops where stakeholders gave valuable inputs to specific topics - discussion round(s) where the members of the review team, local stakeholder & audience interacted.

The learning conference was a new part of the peer review process and aimed at upgrading the methodology with a moderated and concentrated exchange of interregional know how. The underlying idea was that Apps are a primary, but not an exclusive source of knowledge and experiences. So, in every partner region there're other institutions and relevant actors who are planned to be involved in the project. They have additional/complementary know how the project can benefit from. With their involvement the PPs want to ensure that all available knowhow in the regions can be exchanged and transferred. The main goal was channeling and masterminding the expertise in a way that regional circumstances can be reviewed in the optimum way.
Crucial for its success was the diligent selection of key topics of importance for the host region, their matching with international know how by inviting speakers (regional stakeholders) and the efficient moderation of discussions leading to implementation-ready outcomes.

Based on the findings made during the visit and learning conference, peers prepare a report with a series of policy recommendations and detailed description of identified good practice(s) for the host region. These recommendations will be integrated into the action plans in step2.



2) Intraregional learning: Joint planning Step 2 focused on the elaboration of the Actions Plans, based on the peer review recommendations and considering the identified good practices, to improve the policy instrument.

It defined and specified the actions to be implemented, responsible & involved actors, time & budget frame as well as funding sources. To foster the implementation of the Action Plans and the e-mobility focus of the tackled policy instruments, step 2 gone also beyond and supported intraregional learning directly in and by the Regional Stakeholder Groups (RSG) too.

RSG were established at the very beginning of the project and played already a crucial role in the peer reviews, being the interviewees, speakers and participants of the review and the conference.

In step 2, RSG members and other representatives of municipalities had the possibility to learn how to develop a local/regional e-mobility strategy alongside of a common methodology, the E-MOB Guideline, based a.o. on the learning outcomes of the peer reviews. In the end, each region organizes a Regional Workshop. The main goal of this workshop is to discuss the developed pilot actions for the action plan with local stakeholders

Mail Expected Results

The coordinated intraregional learning contributed to plan and implement concrete measures and projects in the field of e-mobility, bringing tangible results to the participating regions.

The foreseen activities and generated outputs led to the main result that regional strengths in the field of e-mobility are not only discovered, but can be effectively exploited in the participating regions to develop the regional passenger transport systems.

The concrete result is the development, implementation and monitoring of 8 improved, tailored policy instruments, revised via 1 coordinated inter- and intraregional learning process increasing the capacities of at least 147 persons and ensuring mutual (policy) learning and identification of the good practice examples by 1 joint framework for exchange of experience and know-how and joint generation of ideas for future development in all 8 participating regions.

Considering the fact that the project involves experienced regions (from Germany e.g.) and regions with less experience (e.g. in Croatia) in the field of e-mobility, one further impact of E-MOB can be seen in its contribution to territorial cohesion, leading to more balance regional development across Europe.

6. E-MOB Good Practices

1. **Electric moto sharing for public workers** by PP8: Municipality of Cieza, Municipality of Murcia, Murcia, Spain

Description

With the aim of continue promoting sustainable mobility in the municipality of Murcia, an electric moto sharing system was implemented in 2018. The system is about facilitating the use of electric motorcycles for their commuting during working hours. The practice has the general aim of reducing the carbon footprint of the municipality, reduce air quality pollution and promote e-mobility, not only among the public workers, but among the whole citizenship. Furthermore, in most of the cases, displacements from one municipality building to another are time consuming, not because of the distances between them, but because the traffic and parking difficulty. With this system, there is a considerable time saved in public workers' daily work.

Eight e-motorcycles have been established in the parking of Abenarabi public building (the one in which there are more public workers). Each of the motorcycles has a charging point and a specific key. The system is supported by an IT system which controls which motorbikes are being used and by who as well as the amount of time each moto is being used.

Transferability

This good practice has a great potential for transfer to other entities, as it is a simple and successful system which public, semi-public or private organizations can adapt to their daily habits. The ambition of the system can vary form a small and pilot project to a great electric motorbikes fleet system, depending of specific conditions.

There are some key aspects as selecting appropriate locations for the installation of the system, the motorcycles autonomy or the kind of the electric charging point to be installed, however, all of these parameters are scalable to each specific condition.

Peer review results and lessons learnt

This good practice has been very welcomed by project partners. It has revealed a big potential for transfer and several recommendations and lessons learned for a further implementation were obtained.

As one of the main inputs, it is clear that it could be interesting to expand this service and incorporate other transport means as well, such as electric vehicles, e-bikes or e-scooters. It is always difficult to develop this kind of innovative services, but due to the good results, it is worthwhile.

In addition, expansions beyond the municipality staff, such as transfer of goods to elderly people (medicine, other), or to establish a new service such as transport of elderly people to care centres and doctors, or for student's transfer could be interesting.

For the improvement of the return of the cards, it might be interesting to send an automatic email or SMS when the card is not returned 15 minutes after the motorcycle was connected to the charging point in the building.

In that line, it could be possible to offer a price at the end of the year for the drivers who returned their card always correctly right after coming back with the motorcycle. Make it an emotional challenge between municipality workers who is the most "reliable" driver. That can be easily done, does not cost a fortune and will hopefully lead to more reliability of all users.

Finally, to support for electrification of the vehicles owned by public sector employees may represent a useful intermediate step to shift from internal combustion vehicles to electric clean ones in the whole citizenship. With regards to the cards that are missing it might be useful to add some benefits who are regular users of the e-bike system especially if they would be using a conventional car/scooter instead so as to emphasize the value of using the e-bikes on a personal level. Possible benefits could be discount on parking, or other benefits that can be monetized, thus adding "real" value to using the e-bike sharing system as intended.

2. Electric vehicles fleet for parks and gardens' maintenance, conservation and restoration in the city of Murcia by PP8: Municipality of Cieza, Companies in charge of the parks and gardens' maintenance, conservation and restoration, Cieza, Spain

Description

The origin of this initiative is to move towards a cleaner service for parks and gardens' maintenance, conservation and restoration in the municipality of Murcia. The aim of the practices is to reduce CO2 emissions, as well as NOx, CO, and PMs emissions. In addition, electric vehicle drastically reduce noise, so as this kind of vehicles are present in parks and gardens this is another benefit to be considered. It includes Acoustic and light signalling to prevent possible accidents.

Currently the fleet consists of about 120 vehicles, including 31 electric vehicles. The rest are hybrid or uses gas as fuel. The service in urban areas is covered 100% by the electric vehicles, which have an autonomy of about 60km and cover about 30km daily. For inter-urban areas, hybrid and gas vehicles are used.

The e-vehicles are used from 7.30 am to 2.00 pm. After the working day, they are parked in a warehouse and charged until they are fully charged. There are three different warehouses located in different parts of the municipality with e-vehicles in order to optimize routes and use the e-vehicles efficiently. Each of them has enough charging points for all of them.

This practice is particularly beneficial for children, are they are the ones who make use of parks and garden and we prevent them to breath pollute air. Taking into account that they are a vulnerable group; this is even more beneficial

Transferability

Because of the scalability and the benefits obtained from this good practice, it is possible to transfer it to other cities. In addition, this good practice can be useful for companies providing these services as well as for local authorities, as it is possible to include these requirements in the public procurement procedures.

Peer review results and lessons learnt

Partners think that the job done in this GP is great and something which can be done in other areas.

It could be possible to use the charging and the parking infrastructure and a new fleet (minibuses, EVs) to offer valuable added value services, such as transfer of goods to elderly people (medicine, other), or to establish a new service such as transport of elderly people to care centres and doctors. They can even use Electric Vehicles to transfer students to schools and back.

In addition, because of the dynamic market of electric vehicles will hopefully lead to more and more vehicles with extended coverage so it might be interesting to change from hybrid vehicles to fully electric vehicles also for inter-urban regions.

In summary, it is clear that the advantages of using electric vehicles and tools have to be made publicly available and it also might be advertised on the vehicles as to raise awareness of the general public.

3. Introduction of public services based on electric vehicles by PP4: City of Koprivnica Koprivnica Municipality, Koprivnica, Croatia

Description

Development of public charging infrastructure for electric vehicles mounted on public light poles. In the context of expanding number of electric vehicles and the increased need for development of charging infrastructure, the City of Koprivnica has developed an innovative approach how to tackle the lack of charging infrastructure for electric vehicles by using low – cost options in order to make the infrastructure more affordable and more accessible. This way of developing charging infrastructure brings the following benefit: lower costs of implementation.

Since there is already the necessary infrastructure in place (electric lines, parking places, constant and adequate power supply) there in no need for large investments in the charging infrastructure. The main expenditure is the charging station itself and the mounting of the station.

Transferability

The potential of this action is rather large. There are many cities of this size in Europe that do not have a public transport system and could learn from the experience of the City of Koprivnica. Also, the future of public transport is certainly electric, so this could be a potential for many cities to learn.

Peer review results and lessons learnt

Many of the partners involved in the E-MOB project have experienced problems with the implementation of charging infrastructure for electric vehicles, especially in the environment of drastic increase of the number of electric vehicles. Contrary to the situation that was present 10 years ago, when the number of charging stations outnumbered the number of electric vehicles, today's situation is the opposite, a situation where the number of charging stations cannot keep up with the number of electric vehicles, and the demand for charging. One of the main reasons for that is, besides the latter, that the charging speeds did not increase drastically, so more vehicles have to use the same specification of infrastructure. The response of other partners is positive, stating that the same problems are present in their municipalities and that this could be a good way to solve the problem of slow and cost intensive establishment of charging infrastructure.

4. Innovative approach for tackling public charging infrastructure by PP4: City of Koprivnica, Koprivnica Municipality and the Regional energy agency North, Koprivnica, Croatia

Description

With the expansion of the number of electric vehicles in Koprivnica, and Croatia and Europe in general there is an increased need for reliable, accessible, and cost-effective charging infrastructure. The main premise that led the representatives of the above-mentioned organisations was the fact that people living in multi storey building, and those represent a large number of the housing units in Koprivnica do not have adequate access to the “slow charging” facilities. Therefore, an idea was developed to mount and install AC charges on street light poles located in neighbourhoods with multi storey buildings and by that, allowing the citizens to charge their vehicles overnight, since they do not have the same possibilities as single homeowners. Also, the second premise was to use the existing infrastructure and make the whole process more cost effective

Transferability

The potential of this action is rather large. Many people do not have the possibility to charge their vehicles overnight. This opens the door for more overnight charging and more energy consumption during the nigh which represents a great relief for the energy systems.

Peer review results and lessons learnt

Many of the partners involved in the E-MOB project have experienced problems with the implementation of charging infrastructure for electric vehicles, especially in the environment of drastic increase of the number of electric vehicles. Contrary to the situation that was present 10 years ago, when the number of charging stations outnumbered the number of electric vehicles, today's situation is the opposite, a situation where the number of charging stations cannot keep up with the number of electric vehicles, and the demand for charging. One of the main reasons for that is, besides the latter, that the charging speeds did not increase drastically, so more vehicles have to use the same specification of infrastructure. The response of other partners is positive, stating that the same problems are present in their municipalities and that this could be a good way to solve the problem of slow and cost intensive establishment of charging infrastructure.

5. The municipality of Kozani PV-charging stations and EVs

by PP5: University of Western Macedonia, Municipality of Kozani, Kozani, Greece

Description

The municipality of Kozani purchased 3 electric vehicles for personnel transport and established a Solar charging station for these EVs. One bottleneck towards the integration of EVs in the public or private transportation sector is the absence of charging stations in the region. Moreover, to prove the CO2 emission reduction, the charging stations should be supported by solar panels.

The three EVs of the municipality are being used by the personnel of the technical service for visiting construction and maintenance works sites. Most of the routes are urban, therefore, the reduction of the urban carbon footprint of the project is achieved.

Moreover, since the charging stations are supported by solar panels, the CO2 emissions of the municipality are reduced. One full charge per day comes from solar energy (almost 35 kWhs). One fast charger is obtained (11 kWs) and three slow chargers (3,6 kWs) were constructed and supplied to the site by the University.

Transferability

The specific good practice shows the potential of universities to act as technical support in the green transport sector for the municipalities, in cases of insufficient funding. Moreover, it is a living – lab showing that the staff mobility needs can be CO2- free, if the EVs are charged by solar energy and the municipalities invest in self-consumption solutions.

University of
Western Macedonia

Peer review results and lessons learnt

Recommendations coming from the partners:
(a) The batteries and the solar panels must be incorporated into the grid in the future, in order for the system to be more efficient,
(b) for expansion of the system, second-hand batteries or systems can be used with proper certificates,
(c) communicate people about the environmental and economic benefits of the initiative trough awareness actions.

The partners learnt the following lessons from the GP:
(a) Renewable energy sources must go hand in hand with electromobility,
(b) the GP shows how important the work of Universities can be in an early stage of implementing a new technology. By choosing the University as a first “living lab”, it is possible to test different aspects of e-mobility,
(c) the most interesting aspect is the capability to cooperate with the University, to achieve the technical solution, adding value to it and creating synergies, being a good example of the successful aspects of cooperation.

6. Electromobility deployment: electric taxis in Thessaloniki

by PP5: University of Western Macedonia, The Hellenic Institute of Transport of CERTH, Thessaloniki, Greece

Description

The Hellenic Institute of Transport of CERTH implemented activities for promoting the electric vehicles in the taxi fleet of Thessaloniki.
Electromobility is of great importance to introduce electromobility in taxi fleets, since taxis are responsible for an important amount of vehicle kilometres travelled within the cities. Seeing that other countries and cities have already made significant steps forward (16% of the taxi fleet in Amsterdam is electric) indicated the need for implementing specific activities in Thessaloniki and in Greece in general, where electromobility is still in its infancy.

The three pillars of the project include activities such as:
• Taxi fleet data analysis in order to assess the potential number of vehicles that would consider going electric
• Contacts to check electric models', suitable for taxis, availability in the Greek market
• Determination of the required charging infrastructure
• Check of the legislative framework for the implementation of incentives in Thessaloniki/Greece and the implementation of charging infrastructures
• Set up of a cooperation agreement between involved stakeholders
• Identification of possible funding opportunities and their requirements, deadlines, processes etc.

Transferability

The specific good practice shows the potential of projects of that type to have a direct impact on the community, creating quantified benefits. The identification and adoption of good practices that have already been implemented in more advanced countries in the field of electromobility was a main pillar of the project, indicating that Thessaloniki's example can also benefit other cities which are lacking behind in electromobility.

Peer review results and lessons learnt

Recommendations coming from the partners:
(a) refundable subsidies can be used as revolving funds for other transportation companies as well, eg parcels delivery,
(b) It is important that not only research institutes say that e-taxis are as good as, or even better than normal taxis, but this should be stated by taxi drivers on their own and be communicated as well,
(c) the most critical aspect for the success of the initiative is the charging infrastructure. If there is not an efficient charging infrastructure, the success would be limited.
The partners learnt the following lessons from the GP:
(a) non-refundable subsidies are still necessary to promote electromobility in taxis, (b) Try to address the issue of grid/EV-interaction in the policy instrument and hoping to convince the policy makers on the importance of a strategic choice of charging station location,
(c) the most valuable insight is the living lab approach followed form the beginning, so every actor is involved and a suitable solution for all the stakeholders is achieved.

7. Presentation of “Nemo” the electric bus and the adaptation of its operating system by PP3: Amiens Metropole, Keolis, Iriazar, Amiens Metropole, Amiens, France

Description

The new bus, named Nemo in honor of Jules Verne, will connect the city center, work centers, leisure areas and important metropolitan facilities. 43 electric buses are the largest purchase of this type of equipment in Europe. They emit no air pollutants and reduce noise and vibration. Nemo will improve the quality of life for travelers.

In 2019, four Nemo entered Amiens public transport with a package of comfort, increased frequency and reduced travel time. Three of them are 100% electric. This means they have zero environmental impact during operation, with no CO2 or particulate emissions. This is the most ambitious electric vehicle project in Europe. One of its main features is fast charging. The bus is charged at the depot at night, and during the day, given the range of around 45 km, the solution is offered in six terminals, each with a fast-charging station. The bus can be connected to the charging system simply by raising the pantograph, and the preparation time for departure is 5 minutes.

The main beneficiaries are the citizens of Amiens. Bright and quiet, it's a clear improvement. Travel information has been revised, as has the train station. Improve waiting comfort and driving time and increase efficiency and making the passenger journey smoother by opening up new distribution channels and new features such as postpaid.

Transferability

Investing in an energy transition can only be a good way to reduce carbon emissions, but this investment is still an expensive decision for local authorities. It requires input of comparative elements to help elected officials select technological solutions that take into account their comparative advantage. However, it is still difficult to determine the life cycle cost of the vehicle, and the environmental benefits are often already discussed in the context of electricity generation or battery recycling.

Peer review results

The feedback the partner had from Vorarlberg University of Applied Sciences concern the loading strategy and communication to users.
The partner advised Amiens to cooperate with a research institute to simulate the interaction between the network and the bus, in order to find a more adequate charging strategy which could give valuable insights into charging problems.
Another thing that Amiens retained was to communicate about the energy used to show users that the buses are powered by green energy and to make this visible which would lead to a better acceptance by the people using the bus.
The feedback Amiens had from University of Western Macedonia concerns the charging time reduction with the use of lithium-titanate batteries which is a strong transferable point. Also relative equipment that could be beneficial to an intercity route since it can essentially increase the maximum distance that can be covered by one electric bus.
The priority movement of the buses at the traffic lights is considered as critical, because it is energy efficient and emphasizes the importance and the special character of the project in the consciousness of the population of the city
The intelligent system to prioritize the load on certain buses to allow the overall load to be smoothed over a longer time · One important point that the technology of using new materials and components is advancing fast, but there is always the issue of waste management and recycling of high-tech materials, which will come to the surface in a few years · A comprehensive cost-benefit analysis is one of the first steps towards the promotion of the e-mobility and needs to be strongly considered before any activity regarding this Good Practice.

8. Electric public transport networks - trolleybus systems upgrade by PP7: Regional Development Agency Centru, Municipality of Brasov, Brasov, Romania

Description

The City of Brasov is one of the largest cities in Romania and public transport is one of the levers to provide sustainable mobility for its citizens and surrounding areas. In November 2015 the Municipality has approved a SUMP that addresses the following challenge in PT sector: improving the quality, security, integrity and accessibility of public transport services, covering the infrastructure, rolling stock and services. To answer to this challenge the Municipality has identified a solution in upgrading and expanding the existing trolleybus system.

26 new trolleybus vehicles have been contracted with a financial support from EU non-reimbursable funds provided by Regional Operational Program 2014-2020, Priority Axis 4, Investment Priority 4.1. The Municipality has set-up a partnership with Romanian Ministry of Regional Development and Local Administration (MDRAP) for a joint- procurement process. The vehicles have replaced an older trolleybus fleet, to provide more reliability and better services (including accessibility for disabled persons).

The trolleybuses are 18-metre long to provide high capacity transport. The main power traction is provided by an aerial wire network, with energy transfer from grid to vehicle provided by a trolley system. The vehicles are equipped with power traction batteries to provide an wire-free autonomy of 5 km. The batteries are recharged during service operation from trolleybus grid and provide a support to extend the services ahead of infrastructure expansion, with carbon free traction system.

The main stakeholders are the Municipality of Brasov, the Metropolitan Transport Authority of Brasov, RATBv (the PT operator). Main beneficiaries of the practice are the citizens of Brasov area who benefit from carbon-free public transport system.

Transferability

This good practice has a great potential for transfer to other entities, as it is a simple and successful system which public, semi-public or private organizations can adapt to their daily habits. The ambition of the system can vary form a small and pilot project to a great electric trolleybus fleet system, depending of specific conditions.

AGENȚIA pentru DEZVOLTARE REGIONALĂ CENTRU

Peer review results

The trolleybus system is a viable road transport solution for routes with a very long predictability, allowing a good balance of investment and operational risks between infrastructure and vehicles. The main takeaway in this good practice is that the smaller capacity batteries have a correspondingly lower purchase cost, on these advantages only appear if the overhead infrastructure is already there.

Other regions has chosen to use electric bus technology that can be recharged at the terminus and has encountered problems with the reliability of its system, particularly because of its very innovative aspect. The example of the Centru Region shows that it is possible to achieve the same environmental performance without taking technological risks. The use of a back-up battery even makes it possible to eliminate overhead contact lines over a short distance (in the city centre, for example), which could prove essential in other cities, where are in place architectural restrictions.

9. Electric public transport networks - battery electric buses

by PP7: Regional Development Agency Centru, Municipality of Brasov, Brasov, Romania

Description

Up to 2018, Brasov City used to operate a bus fleet based on internal combustion engines, where more than 90% of vehicles were EURO4 or less. Implementation, starting with November 2015, of a SUMP in the city and metropolitan area has put pressure on municipality to upgrade the bus fleet to lower carbon footprint.

The municipality purchased 52 electric buses with 80% financing from the Romanian Administration of the Environmental Fund (AFM), in two lots, of 42 and 10 buses, respectively. The battery electric buses have replaced an older diesel bus fleet, to provide more reliability and better services (including accessibility for disabled persons).

The 42 buses in the first lot have a length of 12 meters, with 3 double doors each, fully low floor, centrally located electric traction motor (rated power: 160 kW, with braking energy recovery), traction batteries (capacity 263 kWh, minimum range 200 km, minimum service life: 5 years). The 10 buses in the second lot are 8-m long, will have a minimum transport capacity of 50 people of which at least 16 on seats (for 8m buses). The duration of use of electric batteries is at least 5 years and ensures a range of at least 200 km. Electric batteries will allow a fast charge (5-10 minutes) and a slow charge (maximum 6 hours) without losing their functional qualities.

The main stakeholders are the Municipality of Brasov, the Metropolitan Transport Authority of Brasov, RATBv (the Public Transport operator). Main beneficiaries of the practice are the citizens of Brasov area who benefit from carbon-free public transport system.

Transferability

This good practice has a great potential for transfer to other entities, as it is a simple and successful system which public, semi-public or private organizations can adapt to their daily habits.

The ambition of the system can vary form a small and pilot project to a great electric motorbikes fleet system, depending of specific conditions. The battery electric bus system is a viable road transport solution for routes with less predictability, allowing a simple system to modify routes and areas served by this kind of vehicles.

Peer review results

After having purchased a large amount of buses and having considerably invested in new infrastructure we must bear in mind the up-coming technology for hydrogen drive and autonomous vehicles. Both may change the future of mobility.
Furthermore, the future of public transport may result in more flexible routes and in smaller vehicles, which operate according to the varying needs of passengers – on demand.

10. Vkw VLOTTE – creating charging solutions and charging infrastructure for e-mobility by PP6: Vorarlberg University of Applied Sciences, Illwerke vkw, Bregenz, Austria

Description

In 2008/2009, Vorarlberg decided to cover 100% of its energy needs from renewables by 2050 including the whole mobility sector. Therefore, 2008 the partly public funded project VLOTTE started as one of the first measures of the model region for electromobility. One of the key targets was the market preparation for EVs in Vorarlberg and testing of practical suitability of the vehicles used. Another target was the determination of technical issues as energy consumption, noise emissions and influence of social factors like attitudes and experiences of long-term users.

Executing project partner were the illwerke vkw AG, the regional energy supplier. They started with 50 E-vehicles, built a photovoltaic system on the 1400 m² roof area of the new carport located at the illwerke vkw and reactivated already existing electric charging stations. Within the first 2 years VLOTTE introduced 357 electric vehicles (EV´s) to customers, public authorities and interested private persons. VLOTTE also installed 139 public charging stations and 3 fast chargers.

After this initial “project character”, VLOTTE has grown to a separate business branch of illwerke vkw in the last 10 years. In 2021, all activities in relation to e-mobility are concentrated within VLOTTE and the reached key results are impressive: more than 4500 electric cars in total; more than 16% of newly registered cars in 2021 were electric cars; 530 charging points, 76 fast chargers and 10 high power chargers are operated.

FHV
Vorarlberg University
of Applied Sciences

Transferability

VLOTTE is a blueprint for the chances new technologies offer if all relevant stakeholders pull in the same direction. The good practice shows what is possible if a public funded project leads to a real business including many stakeholders: regional value creation, sustainable business mode and great confidence of the population in the new technology.

Peer review results and lessons learnt

The good practice is a very good example for the necessity of long-term projects in which stakeholders work together for several years or almost a decade. The scale and the ambition of the project is very high and it shows that local political action can have very significant effects on the energy transition of the private vehicle fleet.

An interesting approach could be to use the batteries of the 5,400 electric cars in circulation to reallocate electrical energy in the distribution network during peak consumption periods, and to recharge the vehicles only during off-peak periods on the overall electrical distribution network. This practice would allow the user, if he wants, to benefit from more advantageous tariffs depending on the time of recharging.

A very important aspect is the fact that fostering e-mobility without fostering renewable energy generation at the same time does not make sense. Hence, concrete plans for extending renewable energy capacity should always accompany increasing e-mobility penetration.

As e-mobility is still expensive, inclusion is a key challenge for the future. Hence, the inclusive social aspects should be also promoted, and access to shared mobility modes of transport and public transportation should be ensured for the most vulnerable groups so they are not left behind.

The main challenge is to convince more people to use e-cars and to adopt e-mobility. For these reasons, e-mobility can be expanded to other transport means except buses, (taxi, ambulance, municipality vans, leasing cars).

11. **E-bus system Feldkirch** by PP6: Vorarlberg University of Applied Sciences, Vorarlberger Verkehrsverbund (VVV), Feldkirch, Austria

Description

E-buses has to play a major role in future public transport. In a pilot project of VVV, the goal was to implement 4 e-buses to serve the area between Bludenz, Feldkirch and Götzis. The buses are in operation since February 2020. The Good Practice shows the necessity to care about the whole process from the political framework, over the implementation, operation, and optimization of the whole e-bus system.

The good practice reached its objective with a “problem first” (regional realization of the clean vehicle directive) approach and the interaction between stakeholders (VVV and state of Vorarlberg). Next, regions and bus lines suitable for electric buses were identified based on simulations of an external company. The economic efficiency, the electric affinity of the bus operators and other framework conditions were also investigated. In a last step, tendering, awarding, procurement and contracting of the vehicles and the charging infrastructure was necessary.

After installing the charging infrastructure by illwerke vkw, the local energy service provider, the operator of the buses (ÖBB postbus) started the test phase to learn about the maturity of the buses, experiences made within bus circulation, drivable distances and charging behaviors, special requirements for maintenance of vehicles and chargers. Lastly, tracking and measurement of charging behavior and mileage of the buses was implemented to gain information for an optimal operation.

Transferability

The good practice is transferable to all regions that want to foster e-busses as part of a low CO2 emission mobility concept. The hardware (busses, charging stations etc.) are available on the market so the biggest challenge is to get grid operator, energy distributor, fleet operator, and municipality at one table to implement the concept in a way that all stakeholders are heard and that their needs are addressed.

Peer review results and lessons learnt

E-busses are seen as a good solution for the integration of e-mobility in cities and regions. This good practice supports it once again. All partners see the good practice as a very well thought trough demonstration project that is scalable and transferable. Metropole Amiens even stated that starting with a low number of e-busses in a demonstration project might have advantages over transforming the bus system in a region to fast. The experience of Amiens suggests that the greatest attention should be paid to the statistics of availability (number of buses available for operation during the morning rush hour) and reliability of the fleet (breakdown rate/km).

In general, difficulties can occur in different regions when it comes to implementation. In first place, certain competences are necessary on a regional level and some regions might not have these competences. Second, the municipality of Cieza reported that after including the requirement of installing e-busses in the urban bus service within a procurement, companies didn't even participate in the offer anymore as they stated that the profit would be too low. Hence, it seems to be necessary to include financial benefits for bus operators at least for the first demonstration projects. This has been done in Vorarlberg as well and can serve as a blueprint for other regions.

Another aspect that was discussed was the charging optimization via simulation as possibility to lower grid impact and to downsize infrastructure. This is an important aspect when more and more electric busses are included in one region.

To enhance the usage of e-busses even more, motivation can be increased by non-technical issues like gamification, bonus systems including free visits to museums etc. So next to technical aspects, one also has to keep in mind marketing and communication issues as well.

12. The Protheus project by PP2: Protheus Holding Plc., Protheus Holding Ltd, Paks, Hungary

Description

The Protheus Project is a smart grid approach combining RES capacities, electricity self-consumption and electric vehicles as well as smart city functions. The ultimate goal is to create a vertical integration by bringing together production steps involved in the local transport service, increasing efficiency, decreasing emissions, operation and energy costs. The project secured different funding from different sources (ELENA, Operational Programmes), and so far project developed the local electric bus system, charging points and there are already RES capacities in place that can be exploited. The energy aspect consists of energy production, storage and consumption (a separate balance group needs to be established), while the transport aspects should encompass a wide range of transportation options, not just buses, but also e-taxies, e-bikes and other modes of transport. To open up these options to the public, a card system will be developed to give a single access point to all services offered by the project.

Transferability

There are no extraordinary, novel technical elements to be implemented in the Protheus-project, the synergies however are instrumental in a way that only they can provide a financially and environmentally sustainable system that is able to reduce GHG emissions and offer modern, convenient services to the public so they might use their cars less frequently thus contribute to a better environment. For Municipalities and service providers, this requires significant expertise in the fields of energy, transport, IT and excellent coordination between these sub-systems and different funding sources.

Peer review results

This is a quite complex project, covering many technical aspects, therefore the recommendations and suggestions range from the forms of RES integration (net metering for Municipalities, energy flow optimization) via effective development of the charging network considering public and private vehicles, to increased attention to awareness raising activities and the inclusion low-power e-mobility. These are all aspects of the project that need to be developed further, and the discussion adds lots of new ideas to that.

13. **Long-time rental of E-taxies in Paks** by PP2: Protheus Holding Plc., Protheus Holding Ltd, Paks, Hungary

Description

Paks is the home of the only nuclear power plant in Hungary. Building on this image of clean energy, the intention of the Municipality is to develop an environmentally friendly transport system to attract more users over time, especially since the city is expected grow considerably due to the expansion of the power plant in the following years. Electric vehicles are inviting for passengers but come with a hefty price tag. To support local companies, Protheus Holding, a Municipality-owned company applied for funding and purchased three electric vehicles and leased them to taxi operators. National financial support accounted for 1,5 million HUF per vehicle. Taxi operators pay a fee based on the fuel consumption of a conventional car (32 Ft/km including VAT) thus repaying the investment cost to the Holding over time as the operation of the electric vehicles is cheaper than cars with an internal combustion engine. The investment should have a very generous payback time of around 4-5 years based on an average yearly mileage of around 60,000 kilometres. The taxi operators are generally favourable of this scheme as service costs are less than before and the investment was paid in advance. The owner during this period is the Protheus Holding and they are only keepers of the car until a fixed 4 years or 200,000 km period, after that they will be offered to purchase the cars on a residual value. Based on the feedback from the operators they are most likely will take this opportunity.

Transferability

This is a simple, locally funded alternative that can support the spread of electric vehicles without the need for national support schemes and can be implemented easily especially in relatively smaller settlements with a limited amount of vehicles that need to be procured. Electric charging points however have to be developed in the vicinity of taxi stands and garages to support the frequent charging of the vehicles.

Peer review results and lessons learnt

This Good Practice is quite unique as it goes somewhat against the current trend of subsidized purchases. However, as Peers have suggested, that has an advantage of also including charging stations for further effects. Others have recommended a further extension of the scheme involving Municipal companies (utilities, such as waste management, maintenance, etc.) to decrease the pollution generated by these public services even further. This process fortunately has already started!

14. Mobility Stations by LP: Aufbauwerk Region Leipzig GmbH, Leipzig, Germany

Description

At mobility stations, the focus is on the intelligent connection of motorised private transport with public transport and the networking of different mobility services. They are located at central transport hubs in Leipzig and facilitate the transfer between mobility services. The mobility stations create a connection between public transport and other transport providers at prominent network points in Leipzig. In previous scientific and planning debates on the subject, the benefit of a mobility station is described with the convenient and easy change from one means of transport to another through spatial concentration, a presentation and marketing effect for multimodal mobility concepts, a positive effect on walking and cycling, Relief effects in moving and stationary traffic through relocation, a contribution to the creation of a new traffic culture to regain urban quality of life and a more attractive city. This is associated with a reduction in greenhouse gas emissions, pollution and the high rate of motorization. In addition, a “benefit in terms of sustainability, image and innovative transport development for a municipality or region” should be created. Especially with regard to demographic change, mobility stations should contribute to improving accessibility, especially for people without permanent e-vehicle availability, and to creating and securing cost-effective and flexible mobility in urban areas, but also in rural areas." A combination of different transport offers covers the mobility needs of a person even without owning a car and achieves this at comparatively lower fixed and overall costs due to the high loss of time value of a car.

Transferability

Traffic flows are bundled at mobility stations. This can not only increase the utilization of classic public transport such as buses and trains, but also make the use of other mobility offers, like e-vehicles for car sharing more efficient. Through an appealing design and the placement of high-quality forms of use mobility stations can become attractive locations within urban districts. Catering establishments with appealing outdoor catering benefit from the high customer frequency, but at the same time also offer social security in the evening and at night. But mobility stations can also become places of exchange and socializing during the day life: They are easily accessible for all age groups, offer access to mobility and additional functions (shopping facilities, services, social exchange) and, with the appropriate design, add structural value to the environment and the traffic station. The stronger the multimodal alternative offers due to increasing practicability and reliability in the everyday mobility of the residents, the more likely it is that there will be no parking space - e.g., in favour of e-car-sharing parking spaces or one close to home Mobility station for district development - accepted.

15. Flexa by LP: Aufbauwerk Region Leipzig GmbH, Leipzig, Germany

Description

Flexa offers flexible travel options through intelligent bundling of travel requests. Flexa serves all connections in the area of operation at any desired time during operating hours. When booking, you can specify any point in Leipzig or in the rest of the MDV area as the start or destination, the next stop is determined automatically and the exact position is displayed with a description of the location when booking.

Transferability

Even if this measure is not easy to implement, as it requires a good local partner who can provide the innovative route finding, this practice should be considered for implementation in other regions. Especially the connection of the suburbs to the city centres, which is often insufficient, can be achieved. At the same time, the money for the construction of permanent infrastructure, such as bus stops, tram lines or others, is saved. The running costs are also significantly lower and can be adapted according to demand. Thus, the practices offer ideal conditions for implementation in suburbs of urban areas, but also in rural areas.

7. Concluding Note - Acknowledgment

This document, titled **E-MOB Guideline**, was created because of a joint effort by the organisations participating in the E-MOB Interreg Europe project. **The E-MOB Guideline** is considered as a useful deliverable of the E-MOB project, not only to project partners, but also to other interested in the topic bodies.

It is co-funded by the Interreg Europe Programme 2014-2020 through the 4th call for proposals, **addressed to the topic of Low-carbon economy.**

This Guideline **cannot be taken** to reflect the views of the European Union or the programm. In case any party is interested in extracting pages from this Guideline regarding the Good Practises, the Guideline & the related primary source must be mentioned.

The main purpose of the Guideline is to promote all partners good practices, to educate and to inspire more organisations to develop other projects on the same topic.

The Guideline has been elaborated by the **University of Western Macedonia and the Interreg Europe expert Konstantinos Karamarkos.** Data and information have been collected by the E-MOB project partners, as also through primary sources for the two sections regarding Main Hard & Soft facts descriptions.

The **Good Practices** included in this Guideline have been identified by the relevant project partners. The peer reviews comments on each Good Practise are an abstract of the responsible partners peer review reports.

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Definition of methodology for best practice identification and characterisation: Aufbauwerk Region Leipzig GmbH.

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Lead Partner:	**Aufbauwerk Region Leipzig GmbH**
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Main Abbreviations

Abbreviation Definition

BEV - Battery Electric Vehicle
CM - Constraint Management
CCGT - Combined Cycle Gas Turbine
DSO - Distribution System Operator
EC - European Commission
EENS - Expected Energy not Served
EV - Electric Vehicle (covering BEV and PHEV)
EVSE - Electric Vehicle Supply Equipment
EVSP - Electric Vehicle Service Provider
GC - Grid Compliant
OCGT - Open Cycle Gas Turbine
PHEV - Plug-in-Hybrid Electric Vehicle
PV - Photovoltaics
RES - Renewable Energy Sources
RTP - Real-Time Price(s)
ToU - Time-of-Use
V2G - Vehicle to Grid

E_MOB Partners

AUF BAU WERK
Projektagentur für Region und Europa

AYUNTAMIENTO DE Cieza

FHV
Vorarlberg University
of Applied Sciences

KOPRIVNICA

University of
Western Macedonia

University
North

AMIENS MÉTROPOLE

AGENȚIA pentru
DEZVOLTARE
REGIONALĂ
CENTRU

E-MOB: E-mobility has a great potential to improve our environment

Cars, trains and planes account for a quarter of global energy consumption and approximately the same proportion of emissions. That is a heavy load – but at the same also a unique chance to limit our impact on the climate.

The nine partners of the E-MOB project represent 8 European regions at various stages of e-mobility development, but they all share the view that e-mobility represents the future of mobility: a clean, quiet, advanced technology, combined with power, speed and lots of fun.

Interreg E-MOB

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