E-MOTICON

e-Mobility Transnational strategy for an Interoperable Community and Networking in the Alpine Space

GUIDELINES

Interreg
Alpine Space

EUROPEAN UNION

E-MOTICON

EUROPEAN REGIONAL DEVELOPMENT FUND

Dear readers,

the project e-MOTICON dealt with the problems of low and inhomogeneous deployment of electric mobility (e-mobility) throughout the Alpine Space regions. The number of electric charging stations (E-CS) at the beginning of the project varied from 15 to 235 E-CS per million inhabitants whereas the number of electric vehicles (EV) varied from 70 to 470 per million inhabitants. One reason for the inadequate diffusion is low interoperability of E-CS, often due to the limited integration of planning instruments used by Public Administrations (PA) and their lack of knowledge in technological innovation and business modelling.

After the analysis of policies, technological solutions and business models, e-MOTICON delivered a White Book on innovative E-CS planning. The White Book covers a transnational strategy with respect to e-mobility requirements in the Alpine Space and derived Regional Action Plans. The project provides a toolset to anticipate E-CS network requirements and tested it in 3 joint pilot actions. A transnational community involved public administrations and representatives of the e-mobility industrial sector, research centres, regional agencies, end users and public transport agencies. The overall goal was to improve Public Administrations' capacity on E-CS planning, cooperation as well as to increase knowledge and enhance consensus.

As a final result for all e-MOTICON followers we are now able to present the final guidelines condensing practical findings, conclusions and recommendations collected throughout the project.
For each topic relevant to Public Administrations on local and regional level, a mixture of elements is addressing it: General information, recommendations, lessons learnt, use cases, examples or best practice. To ensure a comprehensive approach for the reader, the guidelines provide reference to further detailed information and tools compiled and elaborated within the e-MOTICON project and beyond.

Enjoy reading

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1 A step-by-step approach

Taking a leading role in the planning and implementation of a comprehensive infrastructure for electric mobility is a challenge to every Public Authority (PA). While the subsequent chapters provide background knowledge and specific guidance for PAs, we want to start with a proposal for a generic step-by-step approach:

Supporting electric mobility on a local and regional level:
step-by-step programme for Public Authorities

1. **Build the capacity to deal with the challenging task of planning**, setting up and promoting a comprehensive infrastructure to support electric mobility. This step comprises selecting interested persons to take responsibility, referring them to respective background-information and bringing them into contact with peers. For basic information on electric mobility and charging infrastructure check chapter 2.
2. **Define the role your authority wants to play**. Chapter 3 describes possible roles of Public Authorities. They range from passive monitoring to comprehensive and proactive planning and promotion of electric mobility.
3. **Set a favourable framework** for the development and management of a satisfying infrastructure. Spatial planning and local and regional ordinance can hinder or promote up-to-date solutions. Chapter 3 describes the potentials in the sphere of influence of regional and local authorities.
4. **Identify the need for charging infrastructure in size and location**. This step comprises the assessment of public and private needs and potentials for building and operating charging stations (including private charging points in residential and tourist areas). Chapter 4 contains a general advice to create concepts and some good practices (Regional Action Plans).
5. **Select, motivate and cooperate with partners** or build and operate your own infrastructure. It may be a task of the Public Administrations (PAs) to step in when private operators leave “market failure areas” open. But the most prominent task of a PA may be to find cooperative regional or supra-regional partners that take care of the charging infrastructure in their town or region (check chapter 5).
6. **Assist citizens and guests in finding and accessing charging stations**. Technical ground should have been laid with the previous step. As outlined in chapter 6, Public Authorities can refer e-car drivers to comprehensive information systems. They can give advice with respect to trustworthy service providers.
7. **Help increase convenience and usability**. Chapter 6 also describes the gains and pains of EV-users in general and gives some hints for PAs that want to help them – in their decision processes, in finding the right information and in assessing advertised solutions.
8. **Foster the overall deployment of electric and other fossil free mobility solutions**

2 Electric mobility in a nutshell

The following chapter will introduce the terminology and will give a dense description of the overall challenges and solutions of electric mobility today and the near future.

2.1 What are key technologies and standards for charging infrastructure?

In the past years, technology and availability of charging infrastructure has quickly evolved. By mid of 2018 there were around 60,000 public and semi-public charging stations in the Alpine Space countries[1]. The vast majority holds 1 - 2 connectors (charging points) for AC charging with up to 22 kW. DC fast charging in the range of 50 kW is so far mostly being established by private organisations (e.g. Tesla) and energy utilities at selected and frequently visited places (e.g. restaurants, malls or filling stations alongside highways). The key technologies that are involved with charging are:

- AC and DC chargers together with respective cables for public and semi-public charging stations (see Tab. 1, Tab. 2);
- AC chargers deployed via Wall Boxes for charging at home or at office places;
- Mobile chargers, i.e. adapter-cables with an in-cable control box that connects e-vehicles to a big variety of 230 V / 400 V outlets.

In addition to the electrical charging there are ICT technologies to ease and manage the use of charging stations. Amongst those are:

- mapping services: internet browser or app-based maps displaying the location of charging stations;
- access services: mostly RFID cards or apps asking for user credentials to provide at given E-CS and checked against the database of the Charge Point Operator (CPO);
- payment services: direct payment (with credit cards or payment services such as PayPal) or registration-based payment based on invoicing by an Electric Mobility Provider (EMP), often linked to the respective access service;
- roaming services: consolidation of access and payment mechanism with multiple CPOs and EMPs, allowing the user to contract with one supplier and still use the charging infrastructure of other providers.

[1] **https://www.eafo.eu/fuel-map**

TABLE 1: COMMONLY USED CHARGING STATIONS

Shape and name	Standard	Characteristics	Usage
 Schuko plug	IEC 60884	for AC, max. 3.7 kW (230 V, 16 A)	connects car via cable control box (Mode 3 cable) to 230V outlet; to not overload system better reduce to 2.3 kW use blue CEE
 Type 2	IEC 62196-2 “Type 2“ VDE-AR-E 2623-2-2 (“Mennekes plug”)	for AC, private E-CS max. 22 kW (400 V, 32 A), public E-CS max 43 kW (400 V, 63 A)	European standard for AC charging; note: latest version since 2015 is equipped with a “shutter”, which makes attempts to establish a “Type 3” cable obsolete
 CCS Combined Charging System	IEC 62196-2 combined with IEC 62196-2 and including ISO/IEC 15118 (DIN SPEC 70121)	for fast DC charging; up to 170 kW (in practice 50 kW)	fixed connection at E-CS, plug connects to car; European standard for DC charging
 CHAdeMO	IEC 62196-3 ISO/IEC 61851-23 and 61851-24	for fast DC charging; up to 100 kW (in practice 50 kW)	fixed connection at E-CS, plug connects to car; mainly used by Japanese cars, often available at fast charging E-CS in Europe

TABLE 2: COMMONLY USED CHARGING MODES AND RESPECTIVE CABLES

Type-name	Standard	Characteristics	Usage
Mode 2	IEC 61851-1 Mode 2	in-cable control box (ICCB) connecting to car and charging stations with a big variety of plugs	depending on available electrical system and outlets, starting from 230 V household charging to 400 V 3-phase (see 0); ICCB often allows to select and control energy flow
Mode 3	IEC 61851-1 Mode 3	Type 2 / Type 2 plug (e.g. for BMW i3, Renault ZOE) or Type 2 / Type 1 plug (e.g. Nissan Leaf); max. 43 kW	cable connects AC charging station with vehicle (no communication support via ICCB)
Mode 4	IEC 61851-1 Mode 4	cable fixed in a charging station, often with Type 2 plug for the car	used for >= 50 kW DC charging

Figure 1: Home charging with cable control box (ICCB)
Source: B.A.U.M. Consult

Figure 2: Private charging point with wall-box
Source: ETREL

Figure 3: (Semi) public single system charging station
Source: Schneider

Figure 4: Public multi system fast charging station
Source: B.A.U.M. Consult

2.1.1 Connectivity and interoperability

Today, electrical charging stations (E-CS) are usually connected via one or multiple information and communication technologies (ICT):

- The battery-management in the car communicates via standardized protocols with the stationary or mobile charger (state-of-charge, shutting the plug etc.);
- The Charge-Point-Operator can connect to the E-CS for monitoring or maintenance purposes;
- The user connects to the E-CS to identify himself, supply payment information and request services via RFID-card reader, credit card slot, touch-screen, smartphone-app, QR-reader etc.;
- The Electric Mobility Provider (EMP) communicates with the access and payment elements of an E-CS to receive and verify access codes, credit card data or similar.

2.1.2 Minimum requirements

For an up-to-date E-CS and for practical purpose an E-CS should provide: INTEROPERABILITY: According to IEEE (Institute of Electrical and Electronics Engineers), interoperability is “the ability of two or more systems or components to exchange information and to use the information that has been exchanged”. Obviously, interoperability of E-CS infrastructure allows for the implementation of many technical features to ease maintenance and access to charging stations. NON-DISCRIMINATORY ACCESS: An E-CS allows for non-discriminating access when the user does not need any contract with the operator of the E-CS and can access and pay with commonly used means. While the utmost quality of non-discrimination used to be a coin-slot, nowadays EC-cards, credit cards and smartphone payment systems count as well. Here is where interoperability meets non-discrimination: without an ICT-connection to the E-CS there will be no means to verify the access and payment means.

2.1.3 Access, identification and payment

While obviously private and home E-CS have an easy access method (e.g. locked in a garage) and payment is via invoice by the home energy provider, public or semi-public E-CSs identification and payment need to be organised. The identification and payment process are closely linked in most cases. For access and identification typical methods are (also see chapter 4):

- Chip-card (e.g. with RFID code) issued by an EMP or a network of EMPs and read at the E-CS;
- Smartphone app in combination with a pictorial code (e.g. QR code) or a unique identifier on the E-CS (e.g. the Electric Vehicle Supply Equipment ID - EVSEID) that connects the registered owner of the smartphone with the CPO or EMP of the E-CS;
- Mobile phone interface that allows to send an SMS with the E-CS ID to the operator which in turn issues a permit for the sender of the SMS to use the identified E-CS and usually puts the costs on the mobile invoice;
- Touch-screen on the E-CS with a user-interface to communicate with the CPO / EMP;
- Zero payment: Operator of shopping centres, supermarkets or touristic locations tend to invite their customers and guests for free charging;
- Direct payment: EC legislation calls for a so called “ad-hoc” method so users of an E-CS do not need to register and display their personal financial data to any of the operator or service providers. Mostly used methods are:
  - credit card systems (e.g. VISA, Mastercard) with a card reader or a means to enter credit card data on a screen at the E-CS;
  - general online payment systems (such as PayPal, Mobile Money Wallet).

Note: a few providers experiment with cash payment. However, this seems to be more complicated to implement and there will be more acceptance for other methods.

- SMS payment: The user identifies himself via SMS and receives the cost claim together with his mobile invoice. First experiences have been made with the SMS & Charge project in Germany but few providers select that option;

- Dedicated payment systems for e-mobility are emerging (e.g. Wirelane). The payment method can be implemented by many operators of many types of charging infrastructure. It separates the access model from the payment model and may give users more comfort and confidence in the treatment of their financial data.

If you have a choice you may implement a payment solution that contains a cost element for using the parking space. That will motivate users to not occupy it longer than necessary.

- Contract-based payment links the payment to an existing contract with the operator of the charging station spot or the provider of the mobility service. Management of the charging event and the related financial claims normally is handled through a charging network or roaming provider (see below). Multiple models are implemented:

- If the EMP is the user's energy provider (see example "Seamless Mobility in the Allgäu Region on page 18) the charge costs will show up on the energy invoice;
- If the EMP is a private provider or a charging network, costs will be invoiced separately or directly accounted to a registered credit card or bank account.

- Some providers allow for accounting charge costs to separate accounts of employees of a company.

2.1.4 Networks of charging providers

Except from private cases, electrical charging stations and their operators today can be separated in the following in groups:

- Normally one Charge Point Operator (CPO) operates a set of E-CS technically and may also manage access and payment, i.e. will be the Electric Mobility Provider (EMP);
- Meanwhile, various traditional fuel station operators provide charging points at their stations (e.g. ASFINAG in Austria with fast chargers every 100 KMs);
- Sometimes, a group of CPOs forms a local or regional EMP network (see example "Seamless Mobility in the Allgäu Region on page 18). They use the same electrical technology and an identical ICT to offer seamless access for their customers;
- EMPs or regional EMP networks may form an EMP alliance that allows any registered customer of any of their members to access the E-CSs of the group. Good examples are Ladenetz.de (an alliance of about 150 German energy utilities that jointly offer access to about 2,200 E-CS in Germany) or the E-Laad foundation in the Netherlands. Some of these alliances have jointly developed and use the Open Clearing House Protocol (OCHP) which opens the opportunity to international cooperation;
- Meanwhile large networks of CPOs are growing on national or international level (e.g. Chargemap, Plugsurfing). At a minimum, such a charging network refers users to their registered E-CSs via a map and to their respective member EMP. In some case they offer specific access and payment means for their registered users.

For the user it is usually most convenient to have access to national or international e-roaming platform (e.g. GIREVE, Plugsurfing or Intercharge operated by Hubject). EMPs, regional EMP networks or EMP groupings may connect to such a super network. If a user is registered with any of the members of the roaming network it can access the E-CSs of any other member. While (a trustworthy) roaming operator handles the access and payment procedures, it does not get hold or processes personal and process data of other charging events. The user receives an invoice listing all charge events from the EMP he has a contract with. The Open Charge Point Interface (OCPI) is an industry standard that may be widely adopted to implement such roaming networks. To further simplify the charging of electric vehicles, roaming networks tend to cooperate and align their processes and implement Inter-Roaming. GIREVE, MOBI.E, Enel, Hubject and e-clearing.net launched such a cooperation to connect these five major e-Roaming platforms in Europe. Smatrics, Sodetrel, Gotthard Fast Charge, Fastned and Grønn Kontakt form the Open Fast Charging Alliance.

3 Possible Roles of Public Authorities

Choices of PAs concerning e-mobility infrastructure can depend on many aspects and can find expression in many different actions, ranging from passive monitoring to comprehensive planning and proactive promotion of electric mobility. According to the e-MOTICON Transnational Strategy, the complete lack of common strategy and coordination regarding the role of PAs generates an inhomogeneous environment. This entails the risk to hinder e-mobility diffusion and to create critical situations due to the inconstant and unpredictable commitment of the PAs. In order to guarantee a coherent environment for e-mobility diffusion and to limit the presence of different rules and different levels of infrastructure deployment in different areas, e-MOTICON partners agree on the importance that all the involved PAs need to act homogenously. We strongly suggest that both the Regional Authorities and the Municipalities should act, at least, in order to facilitate and coordinate the deployment of a homogenous and effective infrastructure inside their territories, with a strong attention also to neighbouring areas.

According to e-MOTICON, there are 5 main actions that are suggested for Regional/Territorial Authorities:

1. Set minimum technical rules on infrastructure deployment;
2. Set infrastructure requirements for new buildings and new fuel stations;
3. Funnel economic resources (European, National, Regional) to “market failure areas”, in order to cover “black areas” without infrastructure;
4. Organize information and education programmes and coordinate the actions of different stakeholders and operators in the regional territory;
5. Coordinate the different planning activities within the Regional/Territorial Public Authority, creating synergy among territorial planning, urban planning, traffic planning, environmental planning and more.

Similarly, there are 5 main actions that are suggested for Municipalities:

1. Act as a stimulus for the infrastructure deployment, without a direct intervention on realization and management;
2. Facilitate the installation of charging stations both in public and private areas (permissions, public-ground usage regulation, technical support);
3. Include e-mobility and infrastructure development in the planning activities, leveraging on Sustainable Urban Mobility Planning instruments;
4. Keep constant attention to regional regulations, guidelines and suggestions and actively answer to the requirements;
5. Intervene on traffic/parking management and green public procurement to increase EV adoption and generate conditions that are more profitable for e-mobility service providers.

It has to be noticed that e-MOTICON partners generally consider the direct involvement of the PA as infrastructure owner or as e-mobility service provider as rather inefficient. Exceptions can exist, as in the case of the very first stages of the network development (where municipality could be the only actor to invest in it) or in the case of public funding legally reserved only to public bodies.

National legislation and incentives
Eco Fund is a specialized public financial institution for the promotion of environmental protection in the Republic of Slovenia. Since 2008 it grants favourable loans to municipalities, other legal entities, SMEs and private individuals and citizens, as well as irreversible financial incentives for various measures of efficient use of energy and the use of renewable energy sources. Dedicated grants for the installation of E-CSs as well as for the purchase of e-vehicles are well used.

4 Identifying the need of charging infrastructure in size, location and technical requirements

One of the most important tasks for PAs in order to promote electric mobility is the provision of reasonable information about the future demand, potential locations for E-CS as well as the needed technical requirements needed for potential operators of E-CS.

4.1 How to estimate a reasonable number of charging stations?

The estimation of a reasonable number of charging stations depends on a variety of certain and uncertain factors and may differ from one location to another. Therefore, a variety of approaches exists, taking into account factors such as number of inhabitants, development of the electro mobility market, housing structure, existing companies, touristic attractiveness.

Public vs. private charging

Charging infrastructure can be distinguished by its accessibility:

- Public: the charging infrastructure can be used by anyone at any given time (24/7 access);
- Semi-public: public but with a restricted access (e.g. limited opening hours, necessary registration, restricted user group or car type);
- Private: charging infrastructure is not publicly accessible (households, companies).

No matter the approach, the following overview gives a first idea what factors might be considered in calculating the need for charging stations in a defined area:

Existing and planned charging infrastructure	How many E-CS are already in place?
	Where are they located?
	What are their characteristics in terms of power, accessibility (private, public, semi-public), utilization rate?
	What infrastructure is already planned in the near future?
Existing and predicted electric cars	How many electric cars are in use? What percentage?
	Different scenarios for the future, relying on estimation
Structural data of the analysed area	Number of inhabitants
	Population density
	Rural or urban area
	Building density
	Demographical development
Economic data	Employment rate
	Number/size of important companies and industrial estates
	Inbound and outbound commuters
	Per capita income
Touristic data	Attractiveness of the region
	Number of touristic attractions
	Number of tourists (day visitors and overnight stays)
	Numbers of hotels, etc.
Transport and mobility data	Modal split
	Registered cars
	Public transport availability
	Availability of car sharing options
	Number of parking spots and private parking spots/total parking spots ratio
Energy infrastructure	Power supply provider
	Grid operator

BEST PRACTICE

PROJECT SYANE

Pushing forward electro mobility with citizen participation in Haute-Savoie, France.

Syndicat des énergies et de l'aménagement numérique de la Haute-Savoie

In Haute-Savoie, cars are the main means of transport. They account for 80% of vehicles in travel. While the national average of vehicles per 1,000 inhabitants stands at 482, Haut-Savoie counts 640. The traffic grows 2% annually. Added by an increasing distance from home to work these circumstances have led to localized problems of air quality, resulting in an atmospheric protection plan.

In this context, the SYANE project was defined following feasibility studies conducted in 2014 and validated by a Steering Committee composed by various public authorities. These studies have shown the interest and high expectations of public authorities in terms of information and support for the installation of charging infrastructure on their territory.

The diagnosis of the territory revealed that Haute Savoie was a department with high potential, particularly conducive to electro-mobility given the dynamism of its population, the high rate of household equipment in vehicles as well as an average home-work distance that is compatible with the use of the electric vehicles. In the framework of e-MOTICON and within the SYANE project a comprehensive questionnaire (280 questions) was developed making it possible to include opinions of inhabitants and users in their management and operation of E-CS.

What followed was a growing use of electric vehicles with 350 full electric vehicles in circulation at the end of 2013 and 1,750 electric and rechargeable hybrid vehicles at the end of 2017. By 2030 23,000 rechargeable vehicles are forecasted.

4.2 How to avoid the existence of “black areas” in the supra-regional charging network?

Even if it is becoming less and less common within the Alpine Space there is still the risk to find completely unequipped areas, where EV drivers could have hurdles in driving and charging, especially in rural and mountainous areas of some countries. These parts of territory often represent “market failure” areas, where traffic is too low and the number of charging events could unlikely create interesting revenues for a service provider.

Even if the genesis of these areas is not related to PA activities but to a lack of private investors, according to e-MOTICON partners’ opinion this is where Regional Public Authorities should focus on the problem and to provide EV charging as a “public service”. Covering “black areas” would let everybody travel in the whole regional territory without any limits and would allow accessibility also to rural and mountainous areas, often linked to touristic attractions (skiing, wellness, lake sailing, trekking, hiking…). The possibility to travel easily on the whole territory is a crucial motivational aspect for new potential EV users.

The process to detect “black areas” is:

- conduct a census to exactly identify number and density of charging stations in the territory;
- cross-check charging infrastructure data with mobility data and regional road structure;
- identify and locate the minimum infrastructure in order to ensure drivability in the whole regional area;
- put specific attention to guarantee continuity across regional and national borders.

5 Planning, building and operating an interoperable charging infrastructure

5.1 Creating a favourable regional framework

This chapter gives answers to what spatial planning and municipal ordinance may achieve with respect to e-mobility. Above all, the local administration should create a cooperative framework among different technicians and offices within the municipality and promote events including e-mobility as a relevant aspect in urban planning. It may help to check national and international reference documents, such as the guidelines proposed by ELTIS, "Developing and Implementing a Sustainable Urban Mobility Plan". **E-Parking Management**: within the given legal framework, the municipality is in full control of managing public parking spaces. It can reserve special places for electric vehicles – theoretically even if they are not equipped with an E-CS. The typical mean to do this is the use of a sign "parking prohibited except electric vehicles" or "parking prohibited except electric vehicles while charging" if such a sign is foreseen in the national catalogue of road signs. In case of abuse car owners can be fined, though not necessarily towed. The latter is normally only allowed in cases of danger. A monetary mean would be a parking fee model that drastically privileges electric vehicles. **Privileges for e-cars**: as long as laws do not stand against it, a PA may grant special rights to low carbon vehicles, e.g. using the bus lane, free parking or parking closer to the city.

Figure 5: Parking only for e-cars in charging station
Source: StVO

How to decide on an implementation path?
The following major steps give an orientation to public authorities while defining their implementation path. They are derived from the e-MOTICON strategy:
1 / Define the best possible roles of PAs;
2 / Set common minimum rules on infrastructure access;
3 / Complete the minimum infrastructure;
4 / Adopt an integrated supra-regional mapping tool;
5 / Empower communication among public authorities;
6 / Guarantee synergy among private and public transport.

Electromobility Concepts and Regional Action Plans
The role of an electromobility concept is to determine how many charging points are needed, where they should be located and what criteria they need to fulfil. This is a fundamental step which forms the local basis for electric charging infrastructure. However, how can these recommendations be put into practice? The next step might be to jump straight into action or to proceed systematically and develop an implementation plan. During the e-MOTICON project the latter was done by developing regional action plans. As the name indicates these were carried out in regions and not municipalities, therefore pursue a more general approach but can easily be adapted to a local level.

5.2 Setting a conceptual regional framework

On a conceptional level public authorities are challenged with defining their path of implementation. Proven means for laying down that kind of framework are electromobility concepts and action plans on regional level.

It is easier to tow a spuriously parking car from a private parking place, since this an infringement of the right of ownership.

BEST PRACTICE

JOINTLY FROM PAPERWARE TO HARDWARE

The Two Bavarian districts Traunstein and Berchtesgadener Land jointly developed a concept for the promotion of electric mobility. The finalization of this “Elektromobilitätskonzept” took about a year and received about 80T EUR funds from the German Government. The concept displays:

- Initial situations
- Method
- Location recommendation
- Technical and organisational conditions
- Funding
- Tendering and awarding approach
- Further procedure

https://www.lra-bgl.de/lw/umwelt-natur/energie-klimaschutz/elektromobilitaet/
(29.01.2019 - In German)

While the concept is very clear on the needs and even the location of charging stations, it does not describe the responsibilities and the concrete actions to establish them. A Regional Action Plan (RAP) was built throughout the e-MOTICON project to describe and decide on the next steps. It considers that in multiple cases private partners (e.g. hotels) will build their own E-CSs but not open them to the public.

5.3 Who can help the PA in developing and implementing an e-mobility strategy?

How can the involvement of stakeholders be achieved in a proper way?

Depending on the role of the stakeholder, the way of involving him or her properly may differ. Therefore, PAs have to distinguish between different stakeholder groups and suitable participation formats.

Interested citizens - The definition of the number of E-CS bases upon many assumptions regarding e.g. demographic development or development of car ownership rates. PAs could give interested citizens the opportunity to proof the assumptions, used as an input for the calculations. Thereby, you could use the very specific knowledge and avoid conflicts on the methodology later on. Moreover, an active engagement of interested citizens could be used for defining possible locations of E-CS.

Investors and operators - Both stakeholder groups should be informed steadily throughout the whole process. Therefore, PAs should consider them to participate in the stakeholder network electric mobility. As members of this group they do have the chance to shape the action plan or strategy from the start. Thereby, you ensure the active engagement of those stakeholders also in the implementation phase, in which investors and operators are needed the most.

Energy utilities and network operators - These two stakeholder groups are crucial when talking about the location of E-CS. After all, only the network operators do have the knowledge to proof if a certain location has enough capacity in the network in order to install E-CS. Both stakeholder groups should be invited to participate in the electric mobility stakeholder network. Moreover, it is very important to integrate them into the spatial planning parts of the strategy. They should check all proposed locations regarding network capacity and costs for wiring if necessary.

Active participation of different stakeholders in the development of an electric mobility strategy reveals many benefits and synergies for PAs. In the development phase you can use the stakeholder's networks and knowledge in order to improve the concepts. During implementation your stakeholders may serve as operators, investors or could help you with building E-CSs. Therefore, it is crucial to build up a systematic network with all relevant stakeholders for electric mobility within your PA. The network should consist of participants from all involved administrative departments, energy utilities, network operators, large employers, companies in the field of electric mobility. During the development of the strategy the network should meet regularly at least 4 times a year. After finishing the concept, in the implementation phase meetings could be carried out less often but still should take place at least twice a year in order to evaluate the goals, stated in the concept or regional action plan. The region Ebersberg near Munich is a good example how to involve your stakeholder-network in the preparation and elaboration of the E-CS strategy via forums and specific working groups.

https://www.energieagentur-ebe-m.de/Kommunen/Mobilitaet
(29.01.2019 - In German)

6 Convenience and usability: making it easier for the user

BEST PRACTICE

SEAMLESS MOBILITY IN THE ALLGÄU REGION

In the most southern region of Bavaria, 9 public utilities have joined to make e-driving easy. As one option in their joint AllgäuStrom portfolio they offer a new product: AllgäuStrom mobil.

E-car owners can open an account with their local energy utility and get an RFID card to charge at any station operated by the 9 partners. Together with 150 other local and regional utilities, they form the ladenetz.de charging network throughout Germany. Not only the charging stations of that network accept the charge card. The network is directly linked to various other networks (e.g. chargeIT, Innogy, Allego, VKW in Vorarlberg) and to even more operators via the international roaming partner Hubject. In any case: registered AllgäuStrom users access the charging station with their AllgäuStrom mobil charge card. And they find the costs of their charging activities on the monthly or yearly energy bill of their trusted local energy utility. Only the trusted local energy utility has all data of the user.

Of course, a web-portal and an AllgäuStrom app allow users to display their own charging activities and to access the charging station with their smartphone in case they lost their little charge card. Tourists and locals that do not like to carry their smartphones or charge cards can charge at AllgäuStrom charging stations by scanning a QR-code or entering the EVSE-id printed on the station. In this case charging will be charged via a credit card or PayPal. Some fast charge stations are even equipped with a reader for EC and credit cards. Some of the Allgäu utilities have started early in preparing for the future mobility systems, e.g. in Alpine Space projects CO2NeuTrAlp, AlpEnergy and AlpStore. Additionally all AllgäuStrom charging stations deliver renewable energy from regional sources.

6.1 How to help residentials and guests with finding charging stations?

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The simplest means for advertising E-CS is a signage with local road signs. Local road signs fit properly into the townscape. Therefore, they will not disturb the townscape but are also less visible than more striking special signs. Regarding purpose-build signs for E-CS, public authorities may consider several questions on how to design the sign. A local or regional branding for all

electric charging infrastructures gives the opportunity to apply a logo with local signature features. Whereas, the development and implementation of a local signature system is relatively complicated, a global solution can be easily adopted and implementation can be done more quickly and with less effort for development. Memorability is a very important factor for the visibility of E-CS. This can be reached using consistent features at all E-CS signs.

Visibility of E-CS is not only an important topic because drivers need to find the E-CS but can also strengthen the function of E-CS as advertising surface – a not to be neglected source of income for the E-CS operator. Applying advertisements on E-CS reveals the opportunity for new business cases and therefore should be considered by PAs.

In addition to the signposting for E-CSs, public authorities and operators of E-CSs should ensure that all E-CSs in the municipality or region are added in relevant charging maps. If necessary, E-CSs and their features should be complemented in such maps by the public authorities and operators.

6.2 How to help EV owners building their own and using public charging infrastructure?

For private e-vehicle owners the best charging opportunity is their own infrastructure. However, the installation of a wall box, which should be used for regular charging, is not in every case possible. At the moment there is no clear legislation which allows tenants the installation of charging infrastructure, apartment owner communities experience the same lack of legislations. At the moment tenants and flat owners in a community are dependent on the good will of the landlords and house owners if they want to install private E-CS.

But if one has the possibility to install his or her own charging infrastructure it is the cheapest and most comfortable solution for charging EVs. Many energy utilities offer special energy rates at night, which can be used to charge the vehicles. Those rates are usually cheaper than the daytime rates at private households and a lot cheaper than energy at public charging stations. Moreover, you can be sure that your private charging station is not occupied by another vehicle.

Charging electric vehicles via mobile chargers and an outlet is not dependent on any hardware other than the right cable and in-cable control box (for an overview check Tab. 1, and Tab. 2). You can easily use this charging approach at more or less every building. Wall-Boxes on the contrary need to be installed and cost additional money. Wall-boxes allow for faster charging than the use of mobile chargers and cause less stress within the building's energy network. If there is the possibility to buy and to install a wall-box we strongly recommend doing so in order to spare the network from too much stress and to save energy costs.

Figure 6: Private charging station - always available and using ones own power
Source B.A.U.M. Consult

Figure 7: The Swiss Knife of the electro mobility: a mobile charger with cables and adaptors
Source B.A.U.M. Consult

7 Fostering e-mobility

Whether it be public authorities, enterprises or private persons – they all need to adopt climate friendly mobility solutions. This chapter takes the discussion beyond charging infrastructure and describes how PAs can motivate and support different groups in adopting the new mobility age.

7.1 How can companies and industrial areas be motivated to adopt electric mobility?

Lessons learnt: the role of networks and how to work with companies

- Make exchange between companies possible - foster the regional company network with networking events
- Provide information that is of real interest for the companies (business models, practical help) - know their needs by asking them
- Motivate and support companies to involve their staff (i.e. through surveys) - know more about their attitude and willingness towards electromobility
- Find companies that go ahead - and others will follow

7.2 How can private households & building operators be motivated to adopt e-mobility?

BEST PRACTICE

CAMPAIGN "TESTING AN E-CAR FOR 6 DAYS FOR 60 €"

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As part of a funding campaign by the Province of Lower Austria, private individuals with their main residence in Lower Austria could test an electric car for 60 € for 6 days. The campaign ran from March 1, 2017 to December 31, 2018. Numerous car dealers in Lower Austria were partners in this campaign and provided various e-car models for testing. Private individuals thus had the opportunity to try an electric vehicle extensively and cost-effectively in their everyday life or during a vacation. One year after the funding campaign was launched, it was already concluded that 1,500 private individuals / households took advantage of the offer and 11% of the participants ordered their own e-car after the test week.

https://www.ots.at/presseaussendung/OTS_20180314_OTS0054/6-tage-um-60-euro-elektrisch-unterwegs-ein-erfolgsprojekt-geht-in-die-verlaengerung (30.01.2019 - In German)

BEST PRACTICE

TRAVELLING EXHIBITION ELECTROMOBILITY

The travelling exhibition “Elektromobilität Bayern” offers up-to-date information about electromobility. Seven modules present the most important topics, inviting the visitors to try out and participate. Thus, the exhibition offers the general public and in particular young people, a technology-oriented access to the mobility of tomorrow. The

touring exhibition is an offer of Bayern Innovativ GmbH to Bavarian municipalities and public institutions to make electric mobility on-site tangible and playful. In addition, municipalities can use the exhibition as an opportunity to promote other regional activities in the field of electromobility, such as discussion forums, driving events, kick-off events with lectures or similar.

https://www.bayern-innovativ.de/elektromobilitaet/seite/wanderausstellung (30.01.2019 - In German)

7.3 What are the potentials and benefits of electric mobility in tourism?

BEST PRACTICE

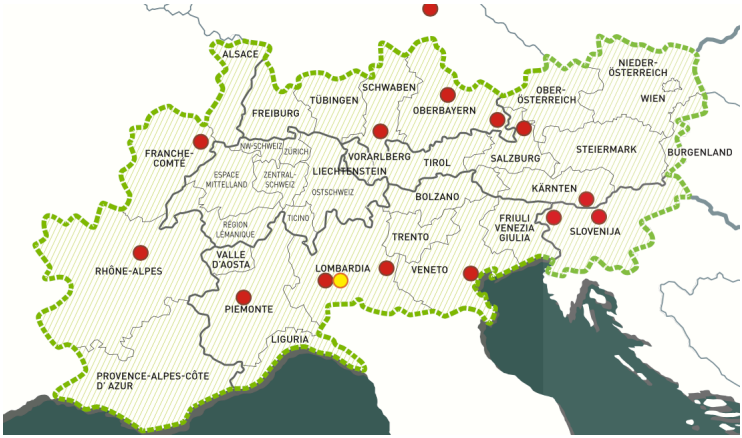
E-GRAND TOUR OF SWITZERLAND

The E-Grand Tour of Switzerland is the world's first official touring route, which can be travelled completely by an electric vehicle. To ensure this, a correspondingly well-developed charging infrastructure network along the route is necessary.

The total of about 300 charging stations along E-Grand Tour of Switzerland are positioned at a distance of max. 100 kilometres to each other and in max. five minutes distance away from the route (20 minutes for hotels). Thus, the 1,600-kilometer route, which leads over five alpine passes, through 51 cities and past 22 lakes and twelve UNESCO World Heritage Sites, can be comfortably passed by guests with their electric cars. In summer of 2016, 50,000 guests travelled along the route. The generated value of Grand Tour guests in the summer season 2016 was around CHF 25 to 31 million. Since April 2017, the implementation of a dense charging station network has made it possible to drive in an environmentally friendly way along the route. From 2021 on, the Grand Tour Switzerland is expected to attract around 200,000 guests a year and to generate a value added of around CHF 225 million. Due to these facts, the Grand Tour of Switzerland is one of the top 5 road trips in the world.

- **https://www.myswitzerland.com/de-at/e-grand-tour.html** (30.01.2019 - In German)
- **https://www.myswitzerland.com/de-at/facts-about-the-grand-tour-of-switzerland.html** (30.01.2019 - In German)
- **http://www.alpiq-e-mobility.ch/de-ch/unsere-produkte/e-grand-tour/uebersicht-ladestationen.html** (30.01.2019 - In German)
- **https://top.oberbayern.de/wp-content/uploads/2016/10/DieTourismusinnovation_E-GrandTour_PeterArnet.pdf** (30.01.2019 - In German)

8 Project facts & figures



2M€ | **5 partners** | **42 observers** | **30 months**

Project website
https://www.alpine-space.eu/projects/e-moticon/en/home

Networking Platform
https://www.e-moticon.eu/how_to_use.html

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