Project Acronym	e-MOTICON
Project Title	e-MObility Transnational strategy for an Interoperable COmmunity and Networking in the Alpine Space
Project Number	413
Work Package	WP T3 STRATEGY TEST
Deliverable	e-MOTICON GUIDELINES for integration of Electric Charging Stations (E-CS) interoperability in local and regional policies.
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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 with respect to e-mobility requirements in an Alpine Space transnational strategy 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!

Cristina Cavicchioli
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Lead Partner

European Regional Development Fund

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1 Background: What is e-MOTICON?

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.

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e-MOTICON brings together 15 partners from 5 countries, involving 41 observers from the entire Alpine area. They represent managing authorities, regional bodies, research centres and private investors.

The project partners namely are:

Institution	Country	City/region
Research on Energy System – RSE	Italy	Milano/ Lombardy
Provincia di Brescia	Italy	Brescia province
Regione Piemonte	Italy	Piemont region
Veneto Strade S.p.A.	Italy	Veneto
Regione Lombardia	Italy	Lombardy region
City of Klagenfurt	Austria	Klagenfurt
Posoški Razvojni Center	Slovenia	Soča Valley
Business Support Center, Ltd.	Slovenia	Kranj
Pole Vehicle du Futur	France	Bourgogne-Franche-Comté / Étupes
Auvergne-Rhône-Alpes Energie Environnement	France	Auvergne-Rhône-Alpes region
Wirtschaftsförderungsgesellschaft Bertechesgadener Land	Germany	Berchtesgadener Land region
Hochschule für angewandte Wissenschaften Kempten	Germany	Kempten
B.A.U.M. Consult GmbH	Germany	Munich
Alpine Pearls	Austria	Supra-regional
Bayern Innovativ	Germany	Supra-regional

2   A step-by-step approach

Taking a lead 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, here is a proposal for a generic action plan:

Supporting electric mobility on a local and regional level:
a 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 the responsibility, referring them to respective background-information and bringing them in contact with peers. For basic information on electric mobility and charging infrastructure check chapter 3.

2. **Define the role your authority wants to play**. Chapter 4 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 6 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 spots in residential and tourist areas). Chapter 5 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 stand 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 the town or region (check chapter 7).

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 8, Public Authorities can refer e-car drivers to comprehensive information systems. They can give advice with respect to powerful and trustworthy service providers.

7. **Help increasing convenience and usability**. Chapter 8 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**

3   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 e-mobility today and the near future.

3.1   What is the situation and prognosis for the availability of electric vehicles?

The global market for electric vehicles is very volatile and one can find considerable differences between national markets. The McKinsey's Electric Vehicle Index strikes out that on the market side, which represents the share of electric vehicles, Switzerland is the top ranked Alpine Space country. France is situated in the mid ranks, whereas Germany and Italy are located in the least part. Even though Slovenia and Austria have not been examined by this study we can state that the situation for electric mobility is very different in the e-MOTICON countries.

It is very likely that the availability of electric vehicles influences the market enrolment of electric mobility. Often people are willing to buy a specific electric vehicle but the manufacturers are not able to deliver as many cars as demanded. [1]Fostering the availability of electric engines therefore remains a major challenge for politics all of the Alpine Space and EU.

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. Not only the charging stations of that network accept the charge card, but the network is also 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 users. Of course, a web-portal and an AllgäuStrom app allows 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 had started early in preparing for the future mobility systems, e.g. in Alpine Space projects CO2NeutrAlp, AlpEnergy and AlpStore. No need to say that all AllgäuStrom charging stations deliver renewable energy from regional sources.

Not only the market for EVs but the technology as well is quickly growing. While today hybrid and small to medium sized electric vehicles with lithium-ion batteries prevail with a range of up to 300 km, the near future will see vehicles with a range of up to 600 km. New battery technologies (such as solid state or redox flow) are evolving and being tested in prototypes of cars. These technologies will not only allow extended range but

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[1] https://www.ucsusa.org/sites/default/files/attach/2016/08/Electrifying-Vehicle-Market-executive-summary.pdf

also new potentials for faster charging. At the same time, new players in the automotive industry bring powerful and affordable electric vehicles to the market at prices below 15.000 EUR. With the advent of such new technologies and the evolving market the entire need for charging infrastructure may change:

- Longer range allows less frequent charging events. More charging events can happen at home or at the office parking places thus reducing the need for public charging.
- Barriers to buy and use electric vehicles get lower. The number of e-cars and the demand for charging them will quickly increase. Not only early adopters but a broad part of the society will soon have such vehicles – and in many cases no own garage and no opportunity to charge at home.
- Charging high capacity batteries at fast speeds cannot be achieved with distributed charging infrastructure. Most probably we will find ever more "electric filling stations".

3.2 What are the key technologies and standards for the 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 positions in the Alpine Space countries.[2] The vast majority holds 1-2 connectors for AC charging with up to 22 kW. DC fast charging in the range of 50 kW is 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 as such are (see chap. 3.2.1):

- AC and DC chargers together with respective cables for public and semi-public charge spots
- AC chargers deployed via Wall Boxes for charging at home or at office places
- Mobile charges, i.e. adapter-Cables with an in-cable control box that connect e-vehicles to a big variety of 230 V / 400 V outlets.

All these technologies come in various flavours and combinations to meet requirements of an ever-increasing set of vehicles. Future may see faster charging technologies and even unplugged versions with conductive/inductive charging where cars will be charged while placed on a parking spot or while driving.

In addition to the electrical charging technologies there are ICT technologies to ease and manage the use of charging spots. Amongst those are
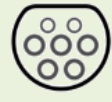
- Mapping services: internet browser or app-based maps displaying the location of charge-spots
- Access services: mostly RFID cards or apps asking for user credentials to provide at given E-CS and checked against the database of the Charge spot Point Operator (CPO)
- Payment services: direct payment (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.

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[2] (https://www.eafo.eu/fuel-map) (in German; 30.01.2019)

Except when it establishes and operates charge spots on its own, a PA has little influence on the technology and the implemented IT solutions of the very supplier. However, whenever E-CSs are to be established in the public area, the PA in its permit can foster specific technologies to be used. Such requirements can go beyond general requirements (e.g. can call for a specific charging standard or direct payment solution). But they should not ignore the business realities and the users' expectations. For more information and means off assessing the feasibility and capabilities of various technologies see chap. 8):

3.2.1   Cables, Plugs and Connectors

Tab. 1,   Commonly used charging plugs

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 or 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" and so made 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 charge E-CS in Europe

Tab. 2,   Commonly used chargingmodes and respective cables

Type name	Standard	Characteristics	Usage
Mode 2	IEC 61851-1	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. ICCB often allows to select and control energy flow
Mode 3	IEC 61851-1	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	cable fixed in a charging station, often with Type 2 plug for the car	Used for >= 50 kW DC charging

Tab. 3,   Typical charging times and e-vehicle ranges[3]

Model	battery capacity	max. range	charging power	fast charging	max. at public E-CS	max. at 220 V	plug type	consumptiion [kWh/100km]
BMW i3 (94 Ah)	27,2 kWh	300 km	3,7 | 11 | DC 50 kW	25 | 80 | 180 km in 1 h	8 | 3 | h	12 h	Type 2 | CCS	12,6 kWh/100km
Nissan Leaf (40 kWh)	40 kWh	378 km	3,3 | 4,6 | 6,6³ | DC 50 kW	17 | 25 | 35 | 300 km / 40 min	12 | 8 | 6 h	18 h	Type 2 | CHAdeMO	17,0 kWh/100km
Opel Ampera-e	60 kWh	520 km	7,4 |DC 50 kW	150 km in 30 min at 50 kW	8,5 h	26,5 h	Type 2 | CCS	14,5 kWh/100km
Renault ZOE R90 (Z.E. 40)	41 kWh	403 km	22 kW	180 km in 1 h	2,67 h	25 h	Type 2	13,3 kWh/100km
Smart fortwo electric drive	17,6 kWh	160 km	4,6 | 22 kW	30 | 160 km in 1 h	4 | 1 h	8 h	Type 2	13-13,5 kWh/100km
Tesla Model S 90D	90 kWh	550 km	11 | 16,5 kW	40 | 65 km in 1 h	8,5 | 6 h	40 h	Tesla Type 2	21 kWh/100km
Volkswagen e-Golf	35,8 kWh	300 km	7,2 kW	60 km in 1 h	5 h	16 h	Type 2	12,7 kWh/100km

Source: B.A.U.M.	Source: ETREL	Source Schneider	Source: B.A.U.M.
Fig. 1 home charging with cable control box (ICCB)	**Fig. 2** Private charge-spot with wall-box	**Fig. 3** (Semi-) public single system charge-spot	**Fig. 4** Public multi system fast charging station

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[3] (https://www.mobilityhouse.com/de_de/ratgeber/ladezeitenuebersicht-fuer-elektroautos)(in German; 30.01.2019)

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3.2.2   Connectivity and Interoperability

Today, electric 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 Charging-Point-Operator can connect to the E-CS for monitoring or maintenance purposes.
- The users connect to the E-CS to identify themselves, to 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.

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Getting E-CS ready for the future

The E-CS operator Freshmile, along with other means, allows users with an internet link to launch and pay for the charge through online payment. The corresponding web page is directly accessible via a label with a QR code stuck on the E-CS.Advantages:

- Anybody with an internet access may use the E-CS: fully interoperable without any need to contract roaming agreements, no need for an RFID card or a specific app.
- No need to pay for credit-card access for each E-CS, only one centralized system on the web site.[4]

3.2.3   Minimum requirements

For an up-to-date E-CS and for practical purpose an E-CS should provide:

- **Interoperability:** According to IEEE, 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 charge spots
- **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 a 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.

The following chapters and chapter 8 concentrate on up-to-date connectivity that is relevant and should be considered by users and PAs that want to offer utmost convenience in using charging infrastructure. The future will see yet another level of connectivity and interoperability: E-CS will via the cable directly communicate with the on-board communication system of the vehicle and relieve the drivers from identifying themselves or entering payment data at the E-CS. Mainly home-charging-systems and advanced mobile chargers (for an example see **Errore. L'origine riferimento non è stata trovata.**) may communicate with energy market places to allow for "controlled charging", e.g. when spot prices are low or the energy system remunerates the flexibility to postpone a charge event.

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[4] www.freshmile.com

3.2.4 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 also closely linked in most cases. For **access and identification typical methods** are (also see chapter on Charging Networks and Roaming):

- **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 to the CPO / EMP.

For the EV user it would be most convenient to access an E-CS before arriving, i.e. reserve it in advance. Some E-CS operators now provide such in-advance booking. The user can then preselect a charge spot and be sure that it will be available when needed. Due to the legal situation in Austria it is not possible to reserve public space.

Please note: The charging station can give the feedback that a charging point is free. But is the parking lot also free? It could be that someone is blocking the charging station with a motorized vehicle!

source: AURA-EE
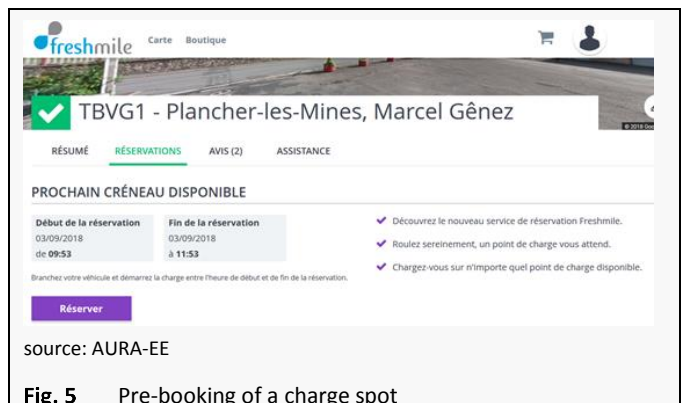
Fig. 5 Pre-booking of a charge spot

- **Zero payment**: Operator of shopping centres, super-markets 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 need not register and display their personal financial data to any of the operator or service providers. Mostly used methods are

  o 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

  o General online payment systems (such as PayPal, Mobile Money Wallet)

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

> 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.

- **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.[5]

- **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.

- **Contract-based payment** links the payment to an existing contract with the operator of the charge-spot or the provider of the mobility service. Management of the charging event and the related financial claims normally is with a charging network or roaming provider (see below). Multiple models are implemented:
  - o If the EMP is the user's energy provider (see example "Seamless Mobility in the Allgäu Region") the charge costs will show up on the energy invoice.
  - o 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.
  - o Some providers allow for accounting charge costs to separate accounts of employees of a company.

3.2.5   Networks of Charging Providers

Except from private and home cases, electric charging stations and their operators today come 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 point at their stations (e.g. ASFINAG in Austria with fast chargers every 100 km).

- Sometimes, a group of CPOs forms a local or **Regional EMP network** (see example "Seamless Mobility in the Allgäu Region") 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 allow 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 together 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.

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[5] (www.smsandcharge.de) (in German, 30.01.2019)

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- Meanwhile large networks of CPOs are growing on national or international level (e.g. Chargemap, Plug-surfing). 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 cases, they offer specific access and payment means for their registered users.

- For the user it is most convenient to have access to a national or international **e-Roaming Platforms** (e.g. GIREVE, Plug-surfing 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 of personal and process data of other charging events. The user receives an invoice listing all charge event from the EMP he has a contact 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.

> 💡 **LESSONS LEARNT**
>
> **Experiencing electric mobility in the Alpine Space**
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> Within the pilot **Klagenfurt** lesson learned was that the costs of implementation are highly dependent on which interfaces are provided by the individual mobility partners. Basically, there is the willingness of the individual partners to participate. Especially the IT area is very sensitive and it takes a longer start-up time to get the corresponding data. The new privacy policy also had to be taken into account. Thus, the personal data of the users are encrypted passed on to the individual mobility partners.

3.3   What are the responsibilities and the key players in implementing electric mobility?

Change is often met with mixed reactions and thus also restrained. Therefore, transitioning from combustion engines to electric mobility is no sure-fire success but will need ongoing effort from different key players. Key players in implementing electric mobility can commonly be assigned to one of the following groups: Policy and Public Administration, industry, science and general public. The following table gives an overview of key players, their responsibilities and the possibility of local Public Administrations to influence them.

Tab. 4,   Key players and possible influence from PAs

Group	Key Player	Responsibility	PA Influence
Policy and Public Administration	National level	Favourable laws for electric mobility Legal security Financial incentives Tax benefits	Depending on the general code-termination in the different states

Policy and Public Administration	Regional level	Favourable laws for electric mobility Legal security Financial incentives	Depending on the general code-termination in the different states, usually higher than on the state level
Policy and Public Administration	Local level	Legal security Financial incentives	Can be directly influenced by the PA
Industry	Automotive industry	Supply with electric vehicles Research and Development	Influence usually low, might be higher in regions with strong local ties to the industry
Industry	Automotive suppliers	Supply with electric vehicles Research and Development	Influence usually low, might be higher in regions with strong local ties to the industry
Industry	Energy sector	Energy supply Network stability CPO	Some energy providers are public utilities, here influence is possible, influencing international private energy companies is particularly harder
Industry	CPO – charge point operators	Responsible for installation, operation and service of electric charging stations. Occasionally electricity supply and payment processing	on local level, e.g. through tenders
Industry	EMP – electric mobility provider	Manages access to charging stations), payment processing (via app, cards, direct payment)	on local level, e.g. through tenders
Science	Universities	Research and Development	Interaction through local ties or research projects
Science	Research and Development	Research and Development	Interaction through local ties or research projects
General Public	Local companies	Employers	Through informational, financial and technical support
General Public	Inhabitants	citizens	Through informational, financial and technical support

3.4   What is the legal framework for the establishment of E-CS and how is it going to be changed?

In its "Communication for a clean power for transport" (COM (2013) 17), the European Commission (EC) was underlining the fact that the "lack of recharging points with a common plug was a major obstacle to the market uptake" and that the Member States did not deploy enough publicly accessible charging points neither announced specific policies and legislation on this topic. Following the Alternative Fuels Infrastructure Directive (2014/94/EU), the European Union published specific objectives linked with the deployment of an effective charging infrastructure for EVs. Needless to say, the promotion of electric mobility matches perfectly with the objectives defined by the EU to achieve the Energy Union (COM (2015) 080):

- It helps increasing the energy security.

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- It offers new solutions to deepen the achievement of the internal energy market.
- It allows a better usage of the energy.
- It is a major driver for decarbonisation.
- It pushes innovation forward.

Meanwhile, all Alpine countries have a decisive legal and regulatory framework for e-charging. While a comprehensive overview of the legal and funding framework for electric mobility and charging infrastructure is available in e-MOTICON document "WPT1 state of art", the following list refers to the key elements of the respective national strategies:

- In Austria, the "General Transport Plan" issued in 2012 states that "electric mobility is a major solution for the development of a modern and efficient transport system" and the National Strategy on "Clean Energy in Mobility" (#mission2030) focuses on e-mobility as well.
- In France in June 2016, the Ministry of the Environment adopted its "Strategy for the development of a clean and green mobility" which is a part of a bigger strategy, the "Multiannual Planning of Energy".
- In Germany, the government approved the national strategy framework for the deployment of infrastructure for alternative fuels (Nationaler Strategierahmen für den Aufbau der Infrastruktur für alternative Kraftstoffe, NSR) in November 2016. This national framework lays down federal goals and measures for the setup of infrastructure for the alternative fuel technologies electricity, hydrogen and natural gas.
- In Italy, the *Piano nazionale infrastrutturale per la ricarica dei veicoli alimentati ad energia elettrica (PPNIRE)* describes the evolution of the EV market up to 2020 and sets the roadmap for the public authorities: The latest version issued in 2016 foresees the development of a national charging points registry, directly managed by Italian Ministry of Infrastructures and Transport
- In Liechtenstein in 2013, the government revised its "Strategy for the Energy 2020". The Government is willing to make low-carbon mobility possible and to promote a sustainable mobility - electric mobility as well as the transition from individual transport to public transport.
- In Slovenia, National Alternative Fuels Strategy was adopted in October 2017. The Strategy proposes sets of measures for each alternative fuel, on the basis of which a detailed Action plan for 2018–2020 was prepared. Priority is given to measures that establish a charging infrastructure for electric vehicles and for vehicles using compressed and liquefied natural gas; this will enable the government to promote the increased popularity of vehicles that run on alternative fuels. Measures are envisaged for all areas, from financial incentives, co-financing of the construction of alternative fuels infrastructure and amendments to legislation, to the promotion of innovative solutions, the acceleration of economic development, public information and the removal of administrative barriers.
- In Switzerland in May 2015 the Federal Council has published a report which can be seen as a roadmap, stating that electric mobility can contribute to a more sustainable mobility and allows fulfilling challenging objectives for an energy and climate policy.

BEST PRACTICE

Project SYANE

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

In Haute-Savoie, cars are the main mean of transport. They account for 80% of vehicles in travel. While the national average of vehicles per 1000 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 e-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 operating 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 1750 electric and rechargeable hybrid vehicles at the end of 2017. By 2030 23,000 rechargeable vehicles are forecasted.

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3.5   Where do I find practical and trustworthy knowledge about electric mobility?

- In **Austria**, comprehensive information on e-mobility is provided by the Federal Ministry of Transport, Innovation and Technology. These are available online at https://www.bmvit.gv.at/verkehr/elektromobilitaet/index.html (in German). The homepage is available in German and in a reduced version also in English. In addition to tools and national guidelines, legal framework conditions and funding information, information on training opportunities in the field of e-mobility and various publications are collected on the webpage. Current facts and figures on e-mobility and FAQs complete the e-mobility offer. Further the platform www.e-connected.at (in German) "Initiative for e-mobility and sustainable energy supply" of the National Climate- and Energy fund contains a good overview of e-mobility in Austria. It is only available in German.

- In **France**, electric mobility addresses major environmental, public health and economic development concerns. The association AVERE Auvergne-Rhône-Alpes (http://www.avere-aura.org/fr/accueil-avere-auvergne-rhone-alpes.html) (in French), member of the Avere-France (http://www.avere-france.org/), is dedicated and aims to promote electric mobility in the region to all publics, searchers, professionals and individuals. For instance, the NGO managed some events to raise awareness about e-mobility (November 2017) with around 100 people involved in electric mobility: public authorities, fleet managers, builders, equipment and car manufacturers, installers, local authorities, NGO, energy providers, research centers, etc.

- In **Germany**, the **"Nationale Plattform Elektromobilität (NPE)"** (National Platform Electric Mobility) was founded in 2010. NPE orchestrates the development of electric mobility in Germany. The advisory body of the German Federal Government brings together 150 representatives from industry, science, politics, unions and associations to jointly engage in strategic dialogue. Together, they explore the economic, social and ecological potentials of electric mobility and deliver recommendations for action for politics and the economic sector. http://nationale-plattform-elektromobilitaet.de/en/. (in German)
  Bavaria maintains a knowledge platform with a **"competence atlas"** (with profiles of suppliers and researcher) and a **"charging atlas"** (http://elektromobilitaet-bayern.de/; (in German).
  The **private** and sponsored **platform** www.goingelectric.de)(in German) contains a widely used blog as well as a comprehensive map of charging stations and a list referring to dozens of other charge maps.

- In **Italy**, the main document to find information on electric mobility is the "Piano Nazionale Infrastrutturale per la Ricarica dei veicoli alimentati ad Energia elettrica (PNIRE)". The document describes the evolution of the EV market up to 2020 and sets the roadmap for the public authorities. Another important document is Dlgs 257/2016: the Italian official act of transposition of Directive 2014/94/EU, containing also some details on smart meters positioning. Besides some Regions, as for example Lombardy, have published regional Guidelines for Electric Vehicle Charging Infrastructure. The Guidelines contains precise information on the methodology and priorities to be considered in the implementation of the infrastructure as well as technical requirements. There is not a single platform for managing information related to electric mobility. Electric vehicle users who want information about electric recharging stations must use global database of EV charging stations, managed and populated by EV drivers from all over the world (openchargemap.com, chargemap.com, colonninelettriche.it, ...) which often report data partially.
  Cei-CIVES (founded in 1979 as the Italian Section of the European AVERE Network) is an institutionally recognized structure which aggregates the operators of the e-mobility sector and provides a comprehensive framework of the economic, technical, environmental and energy aspects.

- In **Liechtenstein** no national platform for e-mobility exists. The energy provider "Liechtensteiner Kraft-werke" is a public company that builds the charging infrastructure. Information on their charging infra-structure are available on their website https://www.lkw.li/angebot-und-leistungen/elektromo-bilit%C3%A4t/%C3%B6ffentliche-ladestationen.html. (in German)

- In **Slovenia** no national platform for e-mobility exists. There are several service, infrastructure and elec-tricity providers who offer certain information about charging infrastructure and EVs on their webpages. E.g.: http://www.polnilne-postaje.si/vrste-polnilnic-prikljuckov-in-polnjenja-in-elektricnih-avtomobilov, https://www.elektro-ljubljana.si/e-mobilnost, http://www.petrol.si/na-poti/za-vozilo/elektromobilnost-na-petrolu. (in; Slovene)
  There are also several different portals with E-CS maps (www.gremonaelektriko.si, www.polni.si, www.napolni.me) (in Slovene) and web pages of different associations in the field of e-mobility (www.dems.si) (30.01.2019; Slovene only).
  Within the e-HUB pilot, Posoški razvojni center and BSC Kranj established e-HUB platforms that gather relevant information about e-mobility from different sources with emphasis on infrastructure planning and roles of PAs (e.g. Goriška region e-HUB https://projektemoticon.wixsite.com/e-moticon) (in Slovene).

- In **Switzerland** the platform https://www.energie-experten.ch/de/energiefranken.html#c666 provides information on the individual support programs from the cantons, cities and municipalities as well as campaigns from regional energy companies. The data is updated daily and is available in German, French and Italian.
  The Swiss Electro Mobility Association https://www.swiss-emobility.ch/de/index.php is available in German, French and Italian and gives extensive information on the topic.

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4 Possible Roles of Public Authorities

Choices of PAs concerning-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 on the role of PAs generates an inhomogeneous environment, with the risk to hinder e-mobility diffusion and also to have 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 act homogenously and 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 consider generally inefficient the direct involvement of the PA as infrastructure owner or as e-mobility service provider. 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 on it) or in the case of public funding legally reserved only to public bodies.

In the next sections, some practical hints are provided, in order to help the readers to actually put in place a comprehensive charging infrastructure and support for electric mobility as a whole.

4.1 How can PAs influence the legal, regulatory and technical framework for electric mobility?

Public intervention on e-mobility can happen on many different levels. Considering long-term strategies, roadmaps or pan-European technical rules, it is quite clear that local authorities can only slightly intervene, as decisions are taken by European or national institutions. On this level, politicians and representatives of Regional and Local administration can anyhow express their will to support the development and implementation of national/European roadmaps in their territories.

If we consider short/medium-term planning and technical aspects that are still not covered by EU regulations, on the other hand, local authorities can play an interesting role, leveraging their administrative powers and responsibilities.

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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 in use.

Besides, **Climate Change Funds Programme**, operated by Ministry of the environment and spatial planning of the Republic of Slovenia offers funds for co-financing installation of electric charging stations in protected areas and for purchasing EVs for supervisors in protected areas for carrying out tasks of public nature protection services.

Some of the Allgäu utilities had started early in preparing for the future mobility systems, e.g. in Alpine Space projects CO2NeutrAlp, AlpEnergy and AlpStore. No need to say that all AllgäuStrom charging stations deliver renewable energy from regional sources.

More in particular, Regional PAs can:

- Impose infrastructure requirements on new buildings and new fuel stations, directly through regional laws.
- Suggest technical requirements and localization criteria through the development of "Regional Guidelines", which could generate good infrastructure examples and to some extent motivate upper governance levels to follow the regional models.
- Impose technical requirements and localization criteria (or also exact localization) when co-financing the infrastructure conveying regional/national/European funds.
- Set economic benefits for EV users leveraging regional traffic rules and regional car taxes (if any).

When considering Municipalities, they can:

- Impose technical requirements and localization criteria to operators as a compulsory condition in order to obtain public-ground usage permission.
- Foster technical solutions and specific localizations as a condition to obtain discounts on public ground usage fee.
- Impose technical requirements and localization criteria (or also exact localization) when co-financing the infrastructure conveying regional/national/European funds.

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- Set economic benefits for EV users leveraging parking and traffic management in the municipal area.

All these solutions can be more and more effective if the PA is not working by itself, but is proceeding together with other PAs of the neighbouring territories and according to common roadmaps and strategies (e.g. the "Covenant of Mayors" or e-MOTICON Strategy itself)

Regional and local e-mobility initiatives area part of building a complex and integrated system. EVs need to cross borders and the infrastructure has to be able to charge them everywhere. While it cannot be the role of regional and local authorities to set common rules, PAs can well express their intention to support the development of a favourable supra-regional framework. Politicians and representatives of Regional and Local administration can express their will to support the development and implementation of national roadmaps. They can contribute good examples and to some extent motivate upper governance levels to follow their role models.

4.2 How can a Public Authority support the implementation of charging infrastructure?

Regional Authorities such as an Italian Region, an Austrian Land or a Bavarian Bezirk or Landkreis can mainly take roles to set a framework and coordinate activities of the cities and towns in their region. Such roles are:

- Set minimum technical rules on infrastructure deployment

  Regional bodies should identify a set of technical rules according to the most effective technological situations and the international regulation and should transpose them into a "Guideline" document or directly into a "Regional Law". e-MOTICON partners strongly suggest that each Regional PA in the Alpine Space adopt and transpose in their area the technical rules presented in the following section "set supra-regional common minimum rules on infrastructure access".

- Define requirements for new buildings and new fuel stations

  Regional bodies should analyse the potential diffusion of e-mobility in their territory and identify a coherent percentage of needed charging points in new buildings and new fuel stations. While imposing the percentage, also a specific attention to technical requirements has to be paid, following the rules set according to the previous section.

- Funnel economic resources to "market failure areas"

  Regional PAs can quite often rely on funds coming from European or National plans. PAs should choose to use these resources favouring (in public tenders) projects focused on still neglected and "market failure" areas, in order to guarantee a full coverage of the territory. The presence of the co-financing should smooth out the economic disadvantage for the involved service provider.

- Organize educational activities and coordinate the actions of different stakeholders and operators

  Regional PAs should organize educational events both public and specifically reserved. They should present themselves as a "connection hub" for many different stakeholders and as facilitators and catalysts of e-mobility activities within the regional boundaries. In order to support PAs in this complex task, e-MOTICON proposes specific tools and solutions developed in the e-Hub pilot, presented in the document "e-HUB pilot report"– available at the following link https://www.alpine-space.eu/projects/e-moticon/en/work-packages/deliverables.

- Coordinate the different planning activities within the Region

Regional PAs should create a dedicated sub-structure devoted to e-mobility, able to monitor the activities of the different divisions and able to detect possible synergies. A constant communication should be pursued and periodic plenary meetings should take place, in order to obtain a systemic and constantly updated view.

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Piedmont Region

The Piedmont Region has recently provided support to the City of Turin in preparing a call for the expression of interest to install and manage E-CSs on public field for private users. This support has been essential to ensure that E-CSs in the regional capital would be interoperable with all the other E-CSs which will arise on the territory in the coming years (i.e. the interoperability with the BIP card, the contactless smart card used for regional mobility). The indications Public Authorities can give become more effective in case it also has funds to allocate to CPOs and EMPs, since the constraints to access the founds can be more specific (for example a guideline on the protocols to be used can become an obligation).

Roles of Municipalities

Activities of cities and towns depend on many aspects. In general, the roles are related to planning, defining favorable ordinances and motivating partners to establish an interoperable charging infrastructure. In addition, municipalities may take roles in building capacity and motivating their citizens in adopting new low carbon technologies. Typical roles are:

- Act as a stimulus for the infrastructure deployment, without a direct intervention on realization and management.

Municipalities should perform preliminary studies on e-mobility demand in their area, including the identification of key points which could be optimal to serve a high number of EV drivers. They should then involve potentially interested service providers which could develop the infrastructure at their own expenses but with the benefit of PA agreement and coordination.

- Facilitate the installation of charging stations both in public and private areas with permissions, public-ground usage regulation and technical support.

- Simplify existing procedures, identifying special rules and requirements for the charging infrastructure. It has to be considered, for example, that the charging infrastructure serves as a "public service" and the use of public ground should therefore be privileged with respect to other potential uses. Moreover, technical offices within the public body should be well prepared to answer to service providers questions and should give easy and exact references to the "in force" regulation.

- Include e-mobility and infrastructure development in the planning activities, leveraging on Sustainable Urban Mobility Planning instruments.

Follow National Rules on Sustainable Urban Mobility Planning and include the topic of e-mobility and infrastructure development into the activity. 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. Refer also to international reference documents, as the Guidelines proposed by ELTIS, "Developing and Implementing a Sustainable Urban Mobility Plan".

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- Keep constant attention to Regional regulations, guidelines and suggestions and actively answer to the requirements.
- It is necessary that both by the side of Municipality and of the Region, an effective communication is created (see the previous section). In order to do that, the instruments proposed by e-HUB pilot could be extremely useful, as well as the clear identification of a devoted structure/office within the Municipality organization.
- Intervene on traffic/parking management and green public procurement to increase EV adoption and generate more profitable conditions for e-mobility service providers.

Municipalities can leverage many instruments in order to stimulate EV adoption. The most commonly used are related to traffic and parking management, where EVs could benefit of special permissions or special discounts. In addition to that, a good way to create the "demand" is to adopt a "Green Public Procurement" approach and to progressively convert public (and public-related) fleets to e-mobility.

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Charging station Offensive Wienerwald

As a best practice example for the support of the implementation of charging infrastructure, the currently ongoing project regarding the charging station offensive Wienerwald can be mentioned. The region Elsbeere Wienerwald in Lower Austria is responsible for this project. The project deals with the planning of a uniform and cross-community e-charging infrastructure in the Elsbeere Wienerwald region, whereby tourism companies are strongly involved. Some charging facilities are also being built at central points within the communities or at touristic points of interest (e.g. at car parks as starting points for hikes). The Elsbeere Wienerwald region creates one of the densest public charging station networks in Europe by summer of 2019 with 30 public charging stations in 13 municipalities within the project. The primary objective is that the costs and benefits of the planning and implementation are always in a good relationship with each other. The charging stations are uniformly equipped throughout the region and can be operated interoperably, the charging activities can be started and charged without membership of the provider (for example via PayPal). The implemented charging stations are powered entirely by green electricity (partly from own production of the charging station operators).

5   Identifying the need for 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 for potential operators of E-CS.

5.1   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?
  - What are their characteristics in terms of power, accessibility (private, public, semi-public), utilisation rate?
  - What infrastructure is already planned in the near future?
- Existing and predicted electric cars:
  - How many electric cars are currently 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,

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- o Per capita income
- Touristic data:
  - o Attractiveness of the region,
  - o Number of touristic attractions,
  - o Number of tourists (day visitors and overnight stays)
  - o Number of hotels, gastronomy, etc.
- Transport and Mobility data:
  - o Modal split,
  - o Registered cars,
  - o Public transport availability,
  - o Availability of carsharing options,
  - o Number of parking spots and private parking spots/total parking spots ratio
- Energy infrastructure:
  - o Power supply provider,
  - o Grid operator

This list is a first overview – depending on the local situation some of these parameters might be more important to a PA, while others could be left out or added. Key factors which in any case should be included are the forecasted number of electric vehicles and the residential structure. Additionally, a lot of these parameters are closely interlinked and mutually dependent.

5.2 How to assess a reasonable spread and localization of charging stations?

The analysis performed according to the previous section is crucial to understand the demand for charging infrastructure in a certain area and is the basis for a first localization process. In parallel, multiple approaches, such as desktop research, on-site inspections, geoinformation system and stakeholder workshops can be used or combined.

The following list gives a first overview of the criteria that should be considered when choosing a location:

- Private ground: as public space is limited there might be an option to install the charging infrastructure on available private ground
- Road safety: an unobstructed spot should be used to guarantee road safety
- Accessibility: easy and unproblematic access should be possible
- Grid infrastructure: a connection to the grid should be available or possible and reasonable
- Grid capacity: grid capacity needs to be sufficient to not overcharge the system
- Frequency: the location should be frequented sufficiently by private cars
- Length of stay: the location should be a place where people like to spend some time
- Intermodality: the location should be connected to public transport
- Parking spaces: amount of existing parking spaces should be considered to reduce conflict of use
- Integration into the urban environment: the infrastructure should be integrated into the urban image
- Visibility: for recognition and awareness purposes the charging infrastructure should be located where it has a high impact on the public

Typical locations, where most of the above-mentioned criteria is generally fulfilled are:

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- Tourism and Leisure: touristic destinations and attractions, theme parks, swimming pools
- Events: stadiums, concert halls, congress centres
- Health: hospitals and medical centres
- Education: schools and universities
- Retail and shopping: malls, hardware stores, shopping streets
- Traffic hubs: train stations, park + ride facilities.

It has to be underlined that, despite Public Authorities can intervene only on public infrastructure, the planning phase (definition of number and localization) must take into consideration also the presence of semi-public and private charging infrastructure which already answers to a part of the charging demand of the considered area. Semi-public and private charging infrastructure are highly suitable in several locations, such as:

- Households: the clear majority of private electric vehicle owner will charge at home if they have the possibility as this is the most accessible (as always available) and cheapest option
- Companies: if companies have their own electric fleet they will most likely implement their own charging infrastructure, as for companies in most cases it will be even more time crucial to be able to use a drivable car for economic reasons. After core working hours companies might make the charging infrastructure publicly available to reduce operating costs. Additionally, they might provide charging infrastructure for their employees, which in most cases will not be open for public access as well.
- Hotels: Already today and even more in the near future it will crucial for hotels and other forms of accommodation to provide their guests with an electric charging infrastructure, these might be semi-public or for guests only.
- Shops: To attract customers more and more shops will provide charging infrastructure for their customers. This charging infrastructure will be highly likely to be semi-public to attract more customers.

The **electromobility concept** may also contain recommendations on the individual charging capacities for the different charging stations. Normal charging stations should be the norm and fast and ultrafast charging stations the exception. This might change in the future as these options, which so far are a lot more expensive and thus often not profitable, might profit from decreasing costs. As a rule, it can be said, that the longer people stay somewhere the less a fast charging infrastructure is needed. With shorter stays, e.g. restaurants fast charging stations might be more useful.

5.3 Which are the most relevant technical requirements that an "up-to-date" infrastructure must fulfil?

5.3.1 Power Level

The choice of the power level is not fixed, as it depends on the aim for which the infrastructure is set up. It can be said that two levels are nowadays widely adopted:

- "Normal power": 22 kW AC (32 A – 3 phases)
- "High power": 50 kW DC (and more)

The first power level implies quite long stops and can be considered mainly as an alternative to home/work charging for users that do not have availability of a private box. An infrastructure with this power level should be carefully planned according to the analyses described in the previous sections.

The second solution, commonly referred as "high power charging" (or "fast charging"), will instead have as main objective to allow longer daily mileage to the vehicles. The chargers will be used mostly as "fuel stations"

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during mid-range missions and their localization should therefore be planned according to that (highways, city rings, etc.).

A reasonable public infrastructure should include both the power levels, localized after a careful planning and taking into consideration the different aims.

5.3.2   Connectors and communication

The choice of connectors and communication protocols between the charging station and the cars, which was a big issue in the past years, is today clearly defined by European regulations. It is therefore sufficient that the charging stations are compliant with the most recent regulation.

Only the communication between the charging station and its backend is still an open issue, as no definitive choices have been made on the protocol to be used. At present, many manufacturers adopt proprietary solutions as they often represent both the charging station and the backend sides. In a future, more complex, environment, it will be advantageous to have a common standardized solution and many efforts are on-going to develop and identify a common protocol.

In absence of a univocal standard, it is anyhow recommended that the communication between the charging system and the control system takes place through a protocol that is as open, flexible and shared as possible and that already has a significant market diffusion, so as to facilitate the progressive implementation of a fully interoperable infrastructure. Moreover, the control system should perform at least the minimum following functions in real-time:

- Verification of correct functioning
- Verification of availability (free/occupied)
- User identification
- Activation / inhibition of the charge
- Measure and reading of electrical parameters during charging

An example, now widely recognized around Europe, is the so-called OCPP (Open Charge Point Protocol) by OCA (Open Charge Alliance).

5.3.3   Accessibility, interoperability and roaming

In order not to hinder the drivers' experience, and therefore the EV market development in the area, it is crucial that the charging process is sufficiently simple and that the charging points allows the possibility to access, charge and pay to all the drivers.

Considering the aspects already described in section 3.2, the most important aspects to allow a complete accessibility of the infrastructure can be so summarized:

- All the charging stations must provide "Ad-hoc" access/payment systems, as required by law.
- The technical solution chosen to perform the ad-hoc payment should carefully consider both the additional cost for the operator and the comfort for the user. It is suggested to look for the most up-to-date technologies, as mobile-based universal payment solutions, avoiding the need to download specific apps or fill-in complex registration forms.
- E-mobility service provider should adopt a "roaming" scheme, at least on a local level.
- All the charging stations must be equipped to have comprehensive connectivity, essential to fulfil access/payment procedures both in "ad-hoc" and in "contract based" schemes.

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- As the access/payment process could require the exchange of a sensitive amount of data, it is recommended to put a particular care in "protecting" the drivers, developing/applying an effective privacy legislation and providing user education about this issue.

5.4   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 mountain 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 it is a duty of Regional Public Authorities to 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 quite simple:

- Conduct a census to exactly identify number and density of charging stations in their 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 a specific attention to guarantee continuity across regional and national borders.

Once this analysis is performed, it is a task of Regional PAs to guarantee a fast coverage of the unequipped areas. Regional PAs can quite often rely on funding coming from European or National plans and they should choose to use these resources favouring (in public tenders) projects focused on still neglected areas, in order to guarantee the full coverage of the territory. The presence of the co-financing should indeed smooth out the economic disadvantage for the involved service provider.

5.5   Key documents and guidelines to support regional and municipal planning and ordinance:

Austria

- Guideline for e-mobility for Public Administrations: Austriatech (2013): E-Mobilität für Kommunen. Elektromobilität als Chance für die kommunale Entwicklung. Ein Handbuch für Gemeinden.[6] (in German)
- Guideline for E-CS for Austrian cities: Österreichischer Städtebund (2018): Leitfaden "Städtische Ladeinfrastruktur für Elektrofahrzeuge".[7] (in German)

Switzerland

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[6]https://www.austriatech.at/files/get/c16f6fe26b8d00a9af5c99c294e18ab2/handbuch_e_mobility_2013_final_v2.pdf
[7]https://www.staedtebund.gv.at/services/publikationen/studien-oestb/studien-im-auftrag-des-oesterreichischen-staedtebundes-details/artikel/leitfaden-staedtische-ladeinfrastruktur-fuer-elektrofahrzeuge

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- Electromobility for municipalities. Guideline with best practices: EnergieSchweiz, Bundesamt für Energie BFE (2017): in [German](#)[8], [French](#)[9] and [Italian](#)[10]

Germany

- Electromobility in Municipalities. Guideline: Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie (2014): [Elektromobilität in Kommunen. Handlungsleitfaden.](#)[11] (in German)
- Electromobility in Municipalities :Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie (2015): [Elektromobilität in der kommunalen Umsetzung](#)[12] (in German)

France

- Technical guideline for E-CS: République Française (2014): [Guide technique pour la conception et l'aménagement des infrastructures de recharges pour véhicules électriques et hybrides rechargeables](#)[13]. (in French)

Slovenia

- Development strategy for E-CS: Republic of Slovenia (2017): [Strategija na področju razvoja trga za vzpostavitev ustrezne infrastrukture v zvezi z alternativnimi gorivi v prometnem sektorju v Republiki Sloveniji](#)[14] (in Slovene)
- Action Program for Alternative Fuels: Republic of Slovenia (2018): Action Program for Alternative Fuels: Republic of Slovenia (2018): [AKCIJSKI PROGRAM ZA ALTERNATIVNA GORIVA V PROMETU](#)[15] (in Slovene)
- Development strategy for E-CS: Republic of Slovenia (2019): [Strategija na področju razvoja trga za vzpostavitev ustrezne infrastrukture v zvezi z alternativnimi gorivi v prometu](#)[16] (in Slovene)

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[8] https://www.mobilservice.ch/admin/data/files/news_section_file/file/4305/energieschweiz-2017_leitfaden-elektromobilitaet-de.pdf?lm=1510069236
[9] https://www.mobilservice.ch/admin/data/files/news_section_file/file/4306/energieschweiz-2017_leitfaden-elektromobilitaet-fr.pdf?lm=1510069236
[10] https://www.mobilservice.ch/admin/data/files/news_section_file/file/4307/energieschweiz-2017_leitfaden-elektromobilitaet-it.pdf?lm=1510069356
[11] https://www.starterset-elektromobilität.de/Infothek/Publikationen/elektromobilitaet-in-kommunen-handlungsleitfaden/elektromobilitaet_in_kommunen_-_handlungsleitfaden.pdf
[12] https://www.xn--starterset-elektromobilitt-4hc.de/Infothek/Publikationen/elektromobilitaet-in-der-kommunalen-umsetzung/elektromobilitaet_in_der_kommunalen_umsetzung.pdf
[13] https://www.economie.gouv.fr/files/files/PDF/guide_irve.pdf
[14] http://www.energetika-portal.si/fileadmin/dokumenti/publikacije/alternativna_goriva/strategija_alternativna_goriva_final.pdf
[15] http://www.energetika-portal.si/fileadmin/dokumenti/publikacije/alternativna_goriva/an_alt_goriva_jun_2018.pdf
[16] http://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/strategija-za-alternativna-goriva/

6 Creating a favourable regional framework

6.1 What can spatial planning and municipal ordinance achieve with respect to e-mobility?

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 "Developing and Implementing a Sustainable Urban Mobility Plan", proposed by ELTIS (The urban mobility observatory, www.eltis.org). As an example, the following list gives an overview of municipal means used in Germany to promote and steer the development of electric mobility.

- **Land-use Planning** (Bauleitplanung)

  This instrument has limited potential to influence e-mobility infrastructure. In Germany, charging infrastructure can be an element of a land-use plan ("untergeordnete Nebenanlagen und Einrichtungen"). It can also reserve special areas for e-vehicles, car sharing or so-called blue-zones, i.e. areas with reduced traffic emissions. In general, an E-CS can be seen as a special case of energy supply device and can be treated as such in a land-use plan.

- **Off-street ing Ordinance** (Stellplatzsatzung)

  Such ordinances define number and quality of reserved parking spaces when a building is newly built. The municipality can e.g. call for a reasonable number of spots (e.g. 25%) to be equipped with an electricity supply for e-charging. As building owners tend to reduce the necessary amount of reserved parking space, the municipality may reduce the number of required spaces when the building owner in turn equips a big number of the spaces with charging facilities.

- 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 means 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 means would be a parking fee model that drastically privileges electric vehicles.

- **Special Civil Authorisation Ordinance** (Sondernutzungssatzung) or Special Civil Authorisation Contract (Sondernutzungsvertrag)

  Such an instrument can exempt special spaces from the normal permission

Source: StVO

Fig. 6   Parking only for e-cars in charging station

procedures or at least ease the use of such public spaces. However, this instrument is of limited use since in case of streets the use must be directly linked to street purposes and it cannot restrict the right of public interest. Nonetheless, a municipality can use such an instrument to attribute a space to an E-CS and open it for a private operator to establish the infrastructure.

- **Urban Development Contract** (Städtebaulicher Vertrag)

  This is a key instrument to steer urban development projects. Such a contract is closed between a munici-pality and the investors of a new building or city quarter. It can contain whatever regulation as far as they are in line with the ruling municipal plans. Typical elements are the obligation to install wall boxes in the garage.

- **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.

> It is easier to tow a parking offender from a private parking spot in comparison to a public parking spot, since the first case is an infringement of the right of ownership.

6.2 How can a PA create synergies among territorial planning, urban planning, traffic planning, environmental planning etc.?

Regional PAs should create a dedicated sub-structure devoted to e-mobility, able to monitor the activities of the different divisions and able to detect possible synergies of municipalities and enterprises in the region. A constant communication should be pursued and periodic plenary meetings should take place in order to obtain a systemic and constantly updated view.

Whether it be inside a municipality or with neighbours, the following plans and concepts need to be matched so to display a consistent message and lay ground for further municipal planning and ruling:

- Urban or rural development concept
- Land-use plans
- Climate and energy concept
- Traffic development plan
- Public transport concept
- Clean air ordinance
- Noise reduction ordinance

6.3 How can a Public Authority reduce barriers for establishing E-CS in private buildings?

Germany: As of today, establishing charging infrastructure in a jointly owned garage needs the approval of the entire building community. There is a pending legislative initiative (Drucksache 19/401) to change the respective paragraph § 22 Abs. 1 WEG) so a single e-car owner can build his/her charging station without the consent of the neighbours.

Italy: From 2018 new buildings in all Italian municipalities must be equipped with a connection to recharge electric vehicles. The obligation concerns:

- Non-residential buildings with a usable area of more than 500 square meters (and their wide restructuring measures). In this case, the recharging infrastructures must allow the recharging of one car per covered or uncovered parking space and for each garage spaces in the building

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- Residential buildings with at least 10 residential units (and their wide restructuring measures). In this case the recharging infrastructures must be not less than 20% of the total parking spaces and garage spaces in the building.

France: On March 14th 2016 the French Government approved the ADVENIR programme ("helping the development of electric vehicles through new charging infrastructures") whose goal is to ease the installation and the partial financing of smart and private (i.e. installed by a private person) charging points with a public or private access (parking spots of factories, shared housing, shopping malls). The ADVENIR programme is supported by the energy supplier EDF and initially sought to install 12.000 charging points by the end of 2018. It was then extended until 2020. http://advenir.mobi/ (30.01.2019; French only)

According to §57 of the law of July 12th 2010, French co-owners are legally required to deliberate during each annual general assembly about the opportunity to install one or more E-CS. A 50% majority is enough.

In collective housings, E-CS are eligible to a bonus from ADVENIR ranging from 600€ (individual use) to 1300 € (shared use), and an additional bonus of 360 € if the E-CS has a smart energy management. The ADVENIR scheme covers up to 50% of purchase and installation costs of the E-CS.

Switzerland: The government has no regulations for the consideration of charging infrastructure in private or residential buildings. The "Schweizer Road Map zur Elektromobilität" of the Suisse e-mobility Forum (2011) sets a measure for 2020 to clarify and simplify building regulations for the construction of charging infrastructure.

Link: http://www.forum-elektromobilitaet.ch/fileadmin/DATA_Forum/Weissbuch/CH-RoadMap_End-fassung.pdf

Slovenia:
In Slovenia establishing E-CSs in private buildings, namely in multi-dwelling buildings, is foreseen as one of the measures of National Alternative Fuels Strategy Action Plan. The measure proposes to local communities to prepare a long-term plan for placement and installation of E-CSs, which will adapt to the growth trends in the EV market and will be coordinated with system operator and distribution networks. For the efficient implementation of the measure, the key parking spaces may be selected and among them, those which require the least interference in the electricity grid, in order to provide a connection to electricity, and also to allow the construction of preparation elements for further expansion of E-CS network at that specific location.
Action Plan recommends and encourages local communities to install charging infrastructure at public parking lots of multi-dwelling buildings and anticipates installation of 500 E-CSs by year 2020 with foreseen financial burden of little over € 700.000. Slovenian specialized public financial institution for the promotion of environmental protection Eco Fund offers local communities favourable loans for E-CS installation and also subsidies (3.000 € per AC E-CS and 5.000 € per DC E-CS) if the community is within protected area of nature or within Natura 2000 site, where the installed E-CS doesn't need to be in the protected area itself. Slovenian legislation needs amendments in order to ease and boost installations of E-CSs in private multiple-dwelling buildings (amendments of Construction Act, Housing Act, the Rules on management of multiple dwellings, etc.). The provision of public E-CSs is indispensable for the expansion of the use of EVs among inhabitants of multi-dwelling neighbourhoods, which are dominated by multi-apartment buildings with common parking spaces and where the installation of private E-CS and reserved parking spaces for BEV and PHEV is a demanding task.

Austria:
Please refer to the study published in October 2017 entitled "Retrofitting of charging stations in existing large-volume buildings" (Federal Ministry of Transport, Innovation and Technology; e7 Energy Market Analysis GmbH, Vienna University of Economics and Business). The final report can be found at

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https://www.bmvit.gv.at/service/publikationen/verkehr/elektromobilitaet/downloads/nachruestung_ladesta-tionen.pdf (30.01.2019, in German).

The installation of e-charging infrastructure for electric vehicles in new buildings is already becoming increasingly standard in Austria. The retrofitting of charging stations in existing residential buildings, however, involves some challenges, for example on a technical as well as legal level. The study dealt with technical options and implementation options for the construction of charging infrastructure in existing residential buildings, energy management aspects and residential law implementation (for example, according to Tenancy Law/Mietrechtsgesetz).

In the individual laws of the federal states in Austria (building regulations) for new buildings there are in part given statutory provisions with respect to the implementation of charging stations at parking facilities. In §64 of the Lower Austrian Building Regulations 2014 "Design of the parking facilities for motor vehicles" for example, the following point is mentioned with regard to residential buildings: "For parking facilities for buildings with more than 2 apartments it must be ensured that half of all mandatory parking spaces for the apartments can be equipped with a charging point (at least 3 kW charging power) for electric vehicles in retrospect (empty piping, space reserves for power metering and distribution, and suchlike) "(Lower Austrian Building Regulations 2014 §64 (3)). "For all other non-public parking areas with more than 10 mandatory parking spaces, it must be ensured that at least one parking space can be equipped with a charging point (at least 3 kW charging power) for each 10 parking spaces or per 25 mandatory parking spaces at least one parking space can be equipped with a charging station for accelerated charging (at least 20 kW charging power)." (Lower Austrian Building Regulations 2014 §64 (4)). Also, for publicly accessible parking facilities there are statutory provisions included in the building regulations.

This question comprises the following types of private buildings:

- Owner charging on private residential ground
- Owner charging at multi-family houses
- Customer charging at car parks owned/operated by (outdoor and parking garage)
- Customer charging at Park & Ride places
- Employee charging at company parking facilities
- Customer charging at retail parking facilities
- Customer charging at hotel parking facilities

BEST PRACTICE   **E-CS in rental flats and commercial buildings**

Decision of the City Senate of Klagenfurt am Wörthersee on 1 Oct. 2014

- Applied to all newly submitted residential projects: 10 % of all parking lots need to be supplied (at least one parking lot) with 230V/400V power connections for use as an e-Charging station

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- Applied to all newly submitted commercial projects: For every 100 parking lots at least on e-charging station with 2 parking lots have to be constructed[17]

6.4   How can Public Authorities get in contact and learn from each other?

To create a favourable and homogenous environment for e-mobility development, there is a strong need of communication and coordination between regional and local PAs. Communication is needed in order to:

- build capacity and jointly learn in this quick evolving field of innovation,
- align views, plans and solutions and avoid reinventing the wheel and
- get early warnings to anticipate future development.

Many possible solutions exist in order to foster communication and to spread knowledge, such as workshops, seminars, conferences, training courses, video tutorials, newsletters, social medias, forums and web communities, etc.

While most governments have published national plans and maintain platforms for developers, planners and users some platforms have reached a special level of quality and adoption. The e-MOTICON project was able to add a platform dedicated especially to public authorities. It is called "e-HUB".

For a more complete list of references check an example of e-HUB platform here http://e-mobility.provincia.brescia.it/en_GB/e-hub/ and for a complete vision of e-HUB instruments, check here the e-HUB pilot report https://www.alpine-space.eu/projects/e-moticon/en/work-packages/deliverables (30.01.2019).

6.5   How can Regional Public Authorities become a reference point for education and cooperation on e-mobility?

Education, social aspects and governance are key factors to enable e-mobility diffusion. To increase final users' trust in this new technology, education and formation activities have to be carried out. Moreover, the interest in e-mobility could come from many different actors (e.g. tourist centres, Taxis, Local Public Transport companies, airports and multimodal hubs managers, commercial operators, etc.). Regional PAs should maintain a systemic view and promote synergies among all the involved stakeholders. To do that, they should organize educational events both public and specifically reserved. They should present themselves as a "connection hub" for many different stakeholders and as facilitators and catalysts of e-mobility activities within the regional boundaries.

In order to support PAs in this complex task, e-MOTICON proposes the specific tools and solutions developed in the e-Hub pilot (e-HUB report, available here: https://www.alpine-space.eu/projects/e-moticon/en/work-packages/deliverables)

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[17]https://www.klagenfurt.at/_Resources/Persistent/aef5b1e68781a2417239f318f47c3b255b86ad1e/SV%20-%20Stellplatzrichtlinien%20-%20170405.pdf (30.01.2019; German only)

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7 Becoming an EMP: planning, building and operating an interoperable charging infrastructure

Charge Point Operator (CPO)

Charge point operators are responsible for the installation, operation and service of electric charging stations. Electricity supply and the payment processing can but doesn't have to be handled by the CPO. Through roaming systems, a large number of users can get access to the charging station.

E-Mobility Service Provider (EMP)

The e-mobility service provider manages the access to the charging station) and payment processing (via app, cards, direct payment. The EMP usually pays the CPO a monthly fee for the used charging infrastructure. EMPs can be part of a larger roaming network and broaden their customers access.

BEST PRACTICE

The deployment of E-CS infrastructure in the Allgäu region

The energy provider Allgäuer Überlandwerk GmbH (AÜW) situated in the Allgäu region has realized a continuous row of projects in the field of E-CS infrastructure for electric vehicles since 2009. During the first project "eE-Tour Allgäu" (2009-2011) with focus on tourism and e-mobility, the build-up of a first infrastructure for e-mobility in the Allgäu area had been a strong goal. A major challenge in this project was the lack of electrical cars from OEMs and the variety of different plugs for charging.

The determination of the number of E-CS necessary and their location took place in cooperation with the University of Tübingen and followed an area-covering approach based on traffic flow data and tourism in the region as well as the evaluation of relevant statistical data. An evaluation matrix elaborated indicates the expansion of the public and semi-public charging infrastructure. For the evaluation of the quality of a potential location the traffic flow, the technical feasibility as well as the touristic, gastronomic and intermodal transport offers (bus, train, carsharing, bikesharing) nearby are considered, with different weighting. During the project, 16 locations have been identified and equipped with E-CS.

Subsequent projects - "econnect eE-Tour Allgäu" (2012-2015) and "3connect" (2016-2019) concentrated on connecting the single systems of e-mobility via information and communication technologies as well as the interoperable connection between commercial e-mobility, agricultural e-mobility, grid and energy economics. Challenges thereby have been the not standardized interfaces between the single systems and also the use of e-mobility in a real economic application (carsharing for students). An updated charging infrastructure concept for the whole region will be elaborated in 2019.

7.1   How to decide on an implementation path?

The role of an **electromobility concept** is to determine how many charging stations 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 systematic and develop an implementation plan. During the e-MOTICON project this 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.

These **regional action plans** contain a description of the area and the electric mobility situation building upon the knowledge gained in electromobility concept and beyond, followed by a comprehensive SWOT analysis. After establishing a local vision and considering existing plans, local objectives were elaborated. The core part of these plans is an action list based on the **supra-regional strategy pillars** in the e-MOTICON project:

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

These actions can focus on how to build and operate charging infrastructure but beyond that can contribute to reaching the local objectives such as provide support to the local PA (municipalities), achieve complete interoperability of electric charging services, reach an adequate territorial coverage for electric charging services, make the information on the charging network available to regional and transnational users, facilitate contacts between PAs and stakeholders (companies, private investors, private citizens, …) and integrate public transport and private transport

For each planned action an action table, which serves as an overview is prepared. This action table includes inter alia the strategic objective, a description, the role of the PA, expected results, estimated costs, funding method, current state, work plan, impact on e-mobility and the environment.

BEST PRACTICE

Jointly from Paperware to Hardware

Two Bavarian districts Traunstein and Berchtesgadener Land jointly developed a concept for the promotion of electric mobility. The finalization of this "Elektromobilitätskonzept"[18] took about a year and received around 80.000 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

While the concept is very clear on the needs and even the location of charge spots, 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.

7.2   How to select technology and business partners?

This step is depending on the recommendations in the electromobility concepts and the derived actions in the implementation plan. The following questions need to be answered:

- What kind of partners have to be involved? (supplier and operator of the charge spot, supplier and operator of the frontend IT for access and payment, operator of the background IT, …)
- What influence has the PA on the operators that build the infrastructure?

The PA should only build and/or operate the charging infrastructure if no other way is possible, as this will not only use up present predictable resources, but also unpredictable resources in the future.

- The best way would be to find a charge point operator (CPO), which commits to building and operating the charging infrastructure as formulated in the electromobility concept and not only on locations where it is the most profitable. This charge point operator may also function as an e-mobility service provider and manage the access and payment. But these two functions are often separated from each other. The best model is probably to have an established regional player establish the infrastructure (e.g. energy utility, mobility provider).

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[18]https://www.lra-bgl.de/fileadmin/user_upload/content/doc/Umwelt_und_Natur/Energie_und_Klimaschutz/E-Mobilitaetskonzept_Ergebnisbericht_final.pdf (30.01.2019; in German)

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For the selection of access and payment methods we refer to the tables in chapter 8. In e-MOTICON pilot region BGL they try to find a way so whoever builds and operates the infrastructure has to link to the same backbone IT.

The EC directive on the deployment of alternative fuels infrastructure (AFI Directive) calls for a competitive market with private operators to invest on the deployment and management of a charging infrastructure for electric vehicles (EV). At the same time, it is a shared vision that EV charging stations are a key enabler to e-mobility diffusion and could be seen as a "public service" provided to citizens. Today, many private operators are investing in the infrastructure, but only in specific areas and at spots that promise economic success. Public Authorities should try and stimulate the installation of charging stations in all areas. However, if private operators refuse to supply the infrastructure, the PA may have to stand in and build and operate it on their own. In many cases they may rely on local energy or mobility utilities to take over this task and gradually turn it into a business case.

BEST PRACTICE

Comprehensive e-mobility offer at Hotel Kaiserhof in Anif-Salzburg

The Hotel Kaiserhof, a flagship company in the field of mobility, awarded by the Austrian Federal Ministry of Sustainability and Tourism is located in Anif just outside the city of Salzburg in Austria. The Hotel makes a significant contribution to the reduction of CO2 emissions through various measures in the area of mobility and at the same time offers its guests a comprehensive range of e-mobility services, such as 26 charging options, located just two minutes by car from the motorway on the main road to Salzburg. The hotel has its own photovoltaic system and a connected battery storage, which can cover a significant part of the electricity needs of the hotel and which also helps to stabilize the power grid. A part of the charging stations was installed under a carport and is therefore roofed, which makes the charging experience very comfortable. While staying at the hotel, guests can charge their electric vehicle at one of the standard charging stations (type 2, high voltage or household power socket) under the carport free of charge. Furthermore, there are some fast charging stations in the hotel parking lot. A Tesla Supercharger offers Tesla electric vehicles at six charging stations the opportunity to recharge their batteries with up to 120kW of power. In addition, a so-called „triple-charger" (one Type 2, one ChaDeMo and one CCS connection) of the provider SMATRICS is part of the charging infrastructure on site. Charging at the SMATRICS charging station with up to 100kW connection power is possible with existing SMATRICS membership. The city of Salzburg is located about six kilometers away with numerous sights and cultural destinations. The guests of the hotel have the opportunity to leave their e-car at the hotel car park, load it here and at the same time go by bus to the city. A bus stop is conveniently located only 150 meters from the hotel, during the week the buses run about every half hour.

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For guests who do not have their own electric car or want to try other models, the hotel offers its own e-cars for hire. The hotel's fleet includes, among others, a Tesla Model S and a Tesla Model X. In order to be able to experience e-mobility while on vacation, the hotel has created.

7.3 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 be different. Therefore, in this chapter we 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 participate in proofing the assumptions. Thereby you could use the very specific knowledge and avoid conflicts on the methodology later on. In the process. Moreover, an active engagement of interested citizens could be used for defining possible locations of E-CS.

BEST PRACTICE   **Getting electric mobility on the ground? Ask your stakeholders!**

Active stakeholder involvement is crucial in or-der to get the strategy on electric mobility widely accepted among the citizens. A proven and tested approach for defining potential locations of E-CS integrates the future users and their knowledge about the specific local situation via suitable workshop formats. Participants were invited to name potential locations within their neighbourhood. Afterwards all locations were described using standardized profiles. After the workshops all citizens had the possibility to rate and comment on proposed locations and to add new ones via online-tools. This approach resulted in a great number of possible locations, which could not have been identified via desktop research. Moreover, the active involvement of citizens ensures a successful implementation phase and avoids conflicts in the construction phase of E-CS.

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BEST PRACTICE   **Blue Torino Carsharing**

As often happens, technology pioneers are the ones that make more investments before starting collecting significant revenues, but also the ones to get more of the market share as soon as the market itself reacts to the new technology. The case of e-mobility is not different, with some constraints, mainly related to the infrastructure: E-CSs have to be well positioned, fast to charge and with a good reservation system (to keep them charging as long as possible). A good way to foster the use of EVs, both making customers used to them and giving to potential EVs owners more chances to charge their EVs is through electric car sharing.

In Torino the existing car sharing (Blue Torino) plans to expand, reaching 560 parkings and 330 EVs, demonstrating a consolidation of the market. However, a similar project of the same company (but with a strong public component, differently from the approach in Torino) ended differently, showing that even a co-financed approach may present risks.

BEST PRACTICE

Stakeholder-network e-mobility

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-CS. 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 get 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)

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 beginning on. Thereby, you ensure the active engagement of those stakeholder 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 at a certain location there is enough capacity in the network in order to install E-CS. Both stakeholder groups should be invited to participate in the stakeholder network electric mobility. 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.

BEST PRACTICE

Making electric mobility a business

In Austria a cooperation between a food chain (SPAR Österreichische Warenhandels AG) and the regional energy service provider (KELAG – Kärntner Elektrizitäts-Aktiengesellschaft) has been established. KELAG installed E-CS at the parking spaces of SPAR locations.

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7.4   What funding and financing models exist for planning and implementing charging infrastructure?

Within the Alpine Space there are many different funding schemes on national, regional and municipal level. A comprehensive overview on funding has been developed in e-MOTICON State of Art (WPT1,available here: https://www.alpine-space.eu/projects/e-moticon/en/work-packages/deliverables). Depending on the spatial area there are financial supports for the infrastructure itself (public, semi-public and private) but also for electric vehicles and associated costs such as installation and maintenance.

- In Austria, on national level the federal ministry grants direct support for publicly accessible charging infrastructure at the moment (Status Quo October 2018): 200€ for wall-box, 1.000€ for charging station attached to the ground (up to 22kW), 2.000€ for charging station for accelerated charging (22kW to 43 kW) and up to 10.000€ for quick chargers. There is also a direct support for private wall-boxes and smart charging cables: 200€ from federal government (only once with the simultaneous purchase of an e-car). Requirement for all funding opportunities: 100% electricity from renewable energy sources, funding levels are flat rates, which are limited to a maximum of 30% of the eligible costs. In addition, there may be subsidies at the federal province level („Bundesländer").

- In France, the ADVENIR programme ("helping the development of electric vehicles through new charging infrastructures") partially finances smart and private (i.e. installed by a private person) charging points with a public or private access (parking spots of factories, of shared housing, parking spots of shopping malls). The ADVENIR programme is supported by the energy supplier EDF and initially seeked to install 12.000 charging points by the end of 2018. It was then extended until 2020. http://advenir.mobi/ (30.01.2019)(French only).

  - Private buildings: 600€ (max 50% of the cost) for individual use, 1300 € (max 50% of the cost) for shared use + 360€ if smart energy management

  - Companies: 1000 € (max 40% of the cost) if only internal use, 1500 € (max 40% of the cost) if publicly accessible + 360€ if smart energy management

  - Publicly-accessible E-CS: 1860 € (max 40% of the cost)

- In Germany, the "Nationale Plattform Elektromobilität" provides the latest overview of all funding programmes.   http://nationale-plattform-elektromobilitaet.de/anwendung/foerderung-oeffentlicher-ladepunkte/ (30.01.2019; German only). Public authorities can get 3.000€ for charging and 12.000€ for fast charging stations with national funding programmes. If the station provides more than 100kW they can be funded with 30.000€. The Share of funding reaches up to 40 % of the costs. Additionally, they can apply for the financial support for connection to low- and middle voltage networks. Moreover, the Bundesländer provide different fundings. For Baden-Württemberg you can find the financial support of electric mobility under the tile of „Landesinitiative Elektromobilität III" and for Bayern the programme is named "Bayerisches Ladeinfrastrukturförderprogramm".

- In Italy, With the Executive Decree n. 503 (December 2015) the Ministry of Transport assigns the public resources which have to be allocated to programs for the development of E-CSs. It shares a total of over 28 million of Euro among 20 Italian regions and it make explicit the evaluation criteria for admitting projects to co-financing (consistency with the PNIRE).

- In Liechtenstein, there is no public funding for the installation and deployment of E-CS.

- In Slovenia, the Government grants municipalities with subsidies in order to invest in E-CS that will be located in municipalities within protected areas of nature and labelled Natura 2000 areas: 3.000 € per AC E-CS and 5.000 € per fast charging station.

European Regional Development Fund

- In Switzerland, the federal level is active as it plans and coordinates the deployment of the E-CS; however, the federal authorities let the private hand installing and operating the E-CS. There is no national public financing for the deployment of a publicly accessible charging infrastructure

8 Convenience and Usability: making it easier for the user

8.1 How to help residentials and guests to find charging stations in the region and town?

The simplest means for advertising E-CS is signage with local road signs. Local road signs fit properly into the townscape. Therefore, they will not disturb city image 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.

Source: im-plan-tat

Fig. 7   E-CS road sign example

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

As a service to the drivers of EV public authorities should refer to the most relevant and complete charging maps on their homepage. The quality of charging maps is regionally differing and the decision on the most qualitative map needs to be made for each region separately. Criteria for the assessment of local charging map quality can be:

- reliability
- real time information
- comprehensiveness
- usability
- no ads
- data privacy and protection

In case there is a national or regional mapping tool that meets the described criteria, you may refer citizens and guests to the respective website or app.

A very comprehensive overview can be found at: https://openchargemap.org/site

8.2 How to help EV owners when 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 is not in every case possible. At the moment there is no clear legislation which allows tenants the installation of charging infrastructure. In the case of 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.

source: B.A.U.M.

Fig. 9   Private charging spot – always available using one owns electricity

source: B.A.U.M.

Fig. 8   The Swiss Knife of the electro mobilist: a mobile charger with cables and adaptors

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.

> Select mobile chargers with detachable rather than fixed Type 2 cable so it can be used for public charging as well!

Charging electric vehicles via mobile chargers and an outlet is not dependent of any hardware other than the right cable and in-cable control box (for an overview check chap. 3.2.1). 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 buildings energy network. If there is the possibility to buy and to install a wall-box we strongly recommend to do so in order to spare the network from too much stress and to save energy costs.
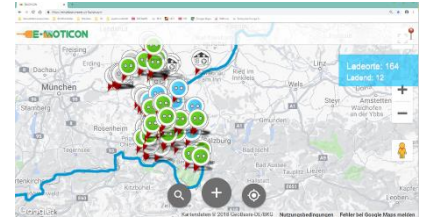
BEST PRACTICE

Mapping regional e-mobility activities

The aim of this online tool is to promote and increase the visibility of e-mobility in municipals by mapping all stakeholders, activities, information centers of public authorities and service provider dealing with electromobility. The tool is based on a google map locating all charging stations in the region.

Target group are users of electric vehicles as well as fleet managers as well as public authorities. For the PA it has the advantage to show their commitment to e-mobility and to promote the region.

Furthermore, the system allows the PA to analyze the usage of the charging stations in the region in order to make decisions for further extension of the charging infrastructure.

The system is planned to be maintained by the public authorities.

source: https://emoticon.viewer.cit-fusion.com/

BEST PRACTICE

Venezia municipality

All these stations are equipped with TYPE 2 socket, available with 7kW power per station.

The access to the charging service is free, it is possible to create a temporary access with a temporary log in at: https://www.emobilityvenezia.it/ or alternatively by scan the QR code.

www.emobilityvenezia.it(30.01.2019; in Italian)

source: unkown (SCAMME PARRE 1)

BEST PRACTICE

Corporate design of E-CS in Italy
EVBILITY (Electric Vehicle moBILITY)

One of the main bottlenecks to widespread adoption of electric cars is the lack of infrastructure to service and recharge vehicles. The Italian government, recognizing the need for such infrastructure, has mandated local authorities to install electric cars charging stations in their jurisdiction. This puts a financial obligation onto local councils already strained for resources, thus markedly slowing the installation of new charge stations and thence hindering the adoption of a desirable new technology.

Evbility is a startup born in 2013 that aims to play key role in sustainable mobility market, has started a project to provide a solution to the issue: offering ad-supported quick charge station installation and maintenance.

EVbility offers to set up and install fast charge stations for free in public spaces and high traffic locations in exchange for outdoor advertising space on site. Installation and maintenance costs are paid by the sales of outdoor advertising slots, visible to both pedestrians and by customers recharging their vehicles. Electric car owners can rely on a state of the art network of locations where they can charge their batteries at a small fraction of the cost of a tank fill and at comparable speed. Companies placing ads enjoy access to a ready audience in high passage locations and customizable ad formats.

The sponsor logo is visible, both on the company website www.evbility.eu and also on the video touch screen inserted in each column, connected via internet 24/7 so as to be an info point.

Source: http://www.evbility.com (30.01.2019; in Italian)

9   Fostering e-mobility

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

Companies – as employers, service providers, but also fleet operators, - play a special role in the context of electric mobility and the expansion of the charging infrastructure.

First of all, public space is very limited and its use usually entails a long approval process whereas companies and especially industrial areas display large parking areas that don´t require authorization to install E-CS. For that reason alone, their involvement and support - capable of lowering the demand for public infrastructure - is of high relevance for Public Administrations when it comes to urban planning.

Besides, companies can also count on a range of benefits when providing E-CS as a service, especially a competitive advantage. As a study of the German programme "Electric Mobility Showcase" revealed, the provision of a semi-public charging infrastructure at shopping malls, shops or supermarkets for example offers a great potential to attract new customer groups. The majority of e-vehicle drivers stated that they would change their point of sale based on the existence of charging infrastructure[19].

Moreover, companies are also capable of increasing their attractiveness as employer by providing E-CS for their staff. For reasons of comfort – e.g. the vehicles can be left connected over several hours during the standing time-, there is a great deal of interests of e-vehicle users to charge at their work place[20]. Private charging infrastructure – at home or at work - currently constitutes the most important and most popular charging opportunity. In Germany, around 48 % of all charging activities are realized at home, 20 % at work whereas public and semi-public E-CS are being used complementary[21].

Finally, commercial fleets themselves exhibit a great potential for the integration of electric vehicles. Vehicles used solely for commercial purposes present a big share of newly registered vehicles – 65 % in the case of passenger cars in Germany [22] - and thus a large market potential; high utilization rates, regular routes and conventional pool cars to revert to for long distance tours make the integration of electric vehicles an interesting and potentially also cost-efficient option. Apart from the good preconditions, the electrification guarantees a (higher) independence of fossil fuels, the reduction of CO_2 emissions, the possibility to an image boost as sustainable company, noiseless deliveries at night up to the possibility to enter in restricted environmental zones or inner cities.

However, despite those benefits, companies are still hesitant concerning the transition to electric mobility. A reason for that may be the anticipated additional costs, but also the apparent complexity of the new technology, requiring a good knowledge on the topic to secure the actual suitability of electric vehicles or the charging infrastructure to be purchased. Consultancies regarding business models demonstrate how an infrastructure can be operated in a cost-efficient way or can even serve to make profit. Companies situated in industrial areas can establish and benefit from cooperation regarding the installation of a common private or semi-public E-CS infrastructure. Networking workshops represent a constructive way to initiate such collaborations. Apart from that, consultancies regarding electric mobility as means of corporate mobility management or the analysis

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[19] https://schaufenster-elektromobilitaet.org/media/media/documents/dokumente_der_begleit__und_wirkungs-forschung/EP35_Studie_LIS_online.pdf, S. 58

[20] http://nationale-plattform-elektromobilitaet.de/fileadmin/user_upload/Redaktion/NPE_AG3_Statusbericht_LIS_2015_barr_bf.pdf, S. 7

[21] https://schaufenster-elektromobilitaet.org/media/media/documents/dokumente_der_begleit__und_wirkungs-forschung/EP35_Studie_LIS_online.pdf, S. 15

[22] https://www.kba.de/DE/Statistik/Fahrzeuge/Neuzulassungen/Halter/2016/2016_n_halter_dusl.html?nn=2055734

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of the mobility pattern of a fleet to determine the suitability regarding the transition to electric mobility are great instruments to support the decision-making process.

To foster the commitment of companies, Public Administration can provide information on external experts in this area to companies. Apart from that, the public funding of private and semi-public charging infrastructure, including connection and installation costs, is highly recommended.

💡 **LESSONS LEARNT**

Business models, the role of networks and how to work with companies

Recommendations derived from the e-MOTICON pilot-activity "P&L":

- Make exchange between companies possible – foster the regional company network with networking events
- Provide information that is of real interest for the companies – know their needs by asking them
- Find companies that go ahead – and others will follow
- Individualize your offer/service to companies and industries – thus companies can relate and see the real benefit for themselves
- Support the role of companies also in providing private and semi-public charging stations – thus the pressure on the public infrastructure is reduced
- Bring employees on board and put commuting in the focus – raise acceptance and diffusion of e-mobility on the whole

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9.2 How can private households and building operators be motivated to adopt e-mobility?

📢 **BEST PRACTICE**   **Amendment of legal framework conditions for e-mobility in new buildings**

On 1st October 2014 the city senate of Klagenfurt am Wörthersee has decided to integrate e-mobility in all building projects. Applied to all newly submitted residential projects it means that 10% of all parking lots need to be supplied (at least one parking lot) with 230V/400V power connections for use as an e-Charging station. Applied to all newly submitted commercial projects it means that for every 100 parking lots at least on e-charging station with 2 parking lots have to be constructed. www.klagenfurt.at

Source: City of Klagenfurt

BEST PRACTICE

On offers for house owners

In Austria the installation of a wall-box for private households is supported with a one-time subsidy of 200 € if at the same time a new electric car is bought. A further condition for the subsidy is that the electricity used for charging is only produced by renewable energy sources. [23]

BEST PRACTICE

Campaign "Testing an e-car for 6 days for 60 EUR"

As part of a funding campaign by the Province of Lower Austria, private individuals with their main residence in Lower Austria can test an electric car for 60 € for 6 days. The campaign ran from 1st March 2017 to 31st December 2018. Numerous car dealers in Lower Austria are partners in this campaign and provide various e-car models for testing. Private individuals thus have 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,

Source: im-plan-tat

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.[24]

BEST PRACTICE

AVERE Aura: a tool to raise awareness about e-mobility

Electric mobility addresses major environmental, public health and economic development concerns. The association AVERE Auvergne-Rhône-Alpes, member of the Avere-France, is dedicated and aims to promote electric mobility in the region to all publics, searchers, professionals and individuals. For

Source: AURA-EE

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[23]https://www.umweltfoerderung.at/privatpersonen/foerderungsaktion-e-mobilitaet-fuer-private/navigator/strom-2/foerderungsaktion-e-mobilitaet-fuer-private.html(30.01.2019; in German)

[24]   https://www.ecoplus.at/interessiert-an/cluster-kooperationen/elektromobilitaetsinitiative-e-mobil-in-niederoesterreich/6-tage-60-euro; (30.01.2019; in German)

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)

instance, the NGO managed some events to raise awareness about e-mobility as in November 2017 with around 100 people involved in electric mobility: public authorities, fleet managers, builders, equipment and car manufacturers, installers, local authorities, NGO, energy providers, research centers. [25]

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.[26]

Source: Bayern Innovativ GmbH

BEST PRACTICE

e-Station

A suitable example for both, households and building operators is reflected in **e-Station**'s commercial policy. E-Station is one of the first Italian e-solutions companies. The approach they follow is customer-oriented. Regarding house-holds they offer **free solid consulting** services on e-mobility: according to the client's need they can advise which one is the most **suitable EV**, how to manage the **installation of an E-CS** in the common areas, when it is worth to try and make an E-CS profitable, how to make estimations on expected costs and benefits. Similar remarks can be made in the case of house owners: the consultants try to understand with the customers which solution will best meet their mobility needs, advising on EVs (if not yet bought) and charging system (portable adjustable stations, home charger or wall box).

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[25] http://www.avere-aura.org/fr/accueil-avere-auvergne-rhone-alpes.html (30.01.2019; in French)

[26]http://www.bayern-innovativ.de/elektromobilitaet/Wanderausstellung (30.01.2019; in German)

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

BEST PRACTICE **Charging Stations of Grand Hotel di Abano Terme 5* (PD)**

N.3 wall charging stations, called Dual Wall Box, inaugurated on 2017. Stations are located in the internal parking of the Grand Hotel di Abano Terme 5* Via Valerio Flacco, 1, 35031, which belong to Abano Terme, belonging to Padova's municipality, Veneto Region, Italy.

Source: ScammeParre

The stations are all equipped with TYPE 2 socket, two of them are available with 7kW power charging, one can reach 22kW of power. The access to the charging service now is free for the hotel guests, visitors need to ask for the card at the hotel reception.[27]

BEST PRACTICE **E-Grand Tour of Switzerland**

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

Source: E-Grand Tour

In summer of 2016, 50.000 guests traveled 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 this facts, the Grand Tour of Switzerland is one of the top 5 road trips in the world.[28]

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[27] https://www.gbhotelsabano.it/it/hotel-collection/abano-grand-hotel/ (30.01.2019; in Italian)

[28] https://www.myswitzerland.com/de-at/e-grand-tour.html
http://www.alpiq-e-mobility.ch/de-ch/unsere-produkte/e-grand-tour/uebersicht-ladestationen.html (30.01.2019; in German)

9.4 What is the overall role of electric mobility in future intermodal systems and how can PAs promote it?

The best option for PAs at this moment is to find and exploit the best possible synergies between e-mobility and public transport. A good planning of EV charging infrastructure could indeed sensibly affect the interactions and the integration of the two sectors.

The Alpine Space Programme provides contributions in answering to the question of future intermodal systems in the frame of regional development. The following Alpine Space projects approach that challenge from different directions:

BEST PRACTICE **ASTUS**

ASTUS[29] assists local authorities in identifying and adopting an adequate local low carbon strategy and action plan, in order to foster long term low carbon options.

One of the project partners - the public transport provider of the greater Munich region (Munich Transport and Tariff Association, MVV) – works on improvements of intermodal chains in two pilot sites:

Public Transport / CarSharing in the district of Ebersberg

Public Transport / BikeSharing in the district of Munich

BEST PRACTICE **MELINDA**

MELINDA generates a participative development of a low carbon and sustainable urban, suburban and transnational mobility by smoothing the way to citizen awareness and engagement, through a better understanding of user demand.

It aims at inducing a behavioural change in the mobility; such change is targeted thanks to a very innovative bottom-up initiative that includes:

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[29] http://www.alpine-space.eu/projects/astus/en/home

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Increasing citizen awareness through the real-time suggestion of more sustainable styles and modes (by means of a mobile app to represent information, offer alternative solutions, give evidences on carbon impacts)

Supporting the development of value-added services for multimodality and modal shift

MELINDA is about to start, web-reference is not available yet; e-MOTICON partner B.A.U.M. Consult, being also MELINDA project partner, may make contacts.

10 List of abbreviations

AC	Alternating Current
CCS	Combined Charging System
CPO	Charge spot Point Operator
DC	Direct Current
E-CS	Electric Charging Station
EMP	Electric Mobility Service Provider
EV	Electric Vehicles
EVSEID	Electric Vehicle Supply Equipment ID
ICCB	In-Cable-Control-Box
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
kW	kiloWatt
kWp	kiloWatt peak
NGO	Non-Governmental Organization
OCA	Open Charge Alliance
OCHP	Open Clearing House Protocol
OCPI	Open Charge Point Interface
OCPP	Open Charge Point Protocol
OEM	Original Equipment Manufacturer
PA	Public Administrations
PHEV	Plug-in Hybrid Electric Vehicle
RFID	Radio-Frequency IDentification
SME	Small and Medium-sized Enterprises
SWOT	Strengths, Weaknesses, Opportunities and Threats

European Regional Development Fund