

Deliverable 10.7

Policies and good practices to foster electromobility roll-out at the local, national and European level

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Date: 20 April, 2015

Version: 1.0

Document Information

This report is registered at ECN under number ECN--15-011.

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Distribution

Dissimination level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Revision history

Version	Date	Author	Description
1.0	October 2014	Koen Straver	Draft
	December 2014	Francesco Sechi	Improved draft
	December 2014	Hilke Rösler	Improved draft
	January 2015	Jamilja van de Meulen	Improved draft
	February 2015	Hein de Wilde	Improved draft
	February 2015	Omar Usmani	Improved draft
	February 2015	Thomas Gereke	Improved draft
	February 2015	Dominique Breuil	Final draft
	April 2015	Heike Barlag	Final draft

Status

For Information	
Draft Version	
Final Version (Internal document)	
Submission for Approval (deliverable)	x
Final Version (deliverable, approved on)	

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List of Abbreviations

AC	Alternating Current
BEV	Battery Electric Vehicle
BM	Business Model
CA	Consortium Agreement
CH	Clearing House
D	Deliverable
DC	Direct Current
DoW	Description of Work (Annex I of Grant Agreement)
EC	European Commission
EMC	Electro Magnetic Compatibility
EV	Electric vehicle
EU	European Union
EVSE	Electric Vehicle Supply Equipment
EVSP	Electric Vehicle Service Provider
ICE	Internal Combustion Engine
ICEV	Internal Combustion Engine Vehicle
ID	Identification
ISO	International Organization for Standardization
OEM	Original Equipment Manufacturer
O&M	Operation and Maintenance
TCO	Total Cost of Ownership
TOU	Time of Use
TSO	Transmission System Operator
T&D	Transmission and Distribution
WP	Work Package

1 Executive Summary

This document provides guidance to policymakers at the local, national and European level to foster the large-scale roll-out of electromobility. It is still too early to draw final or firm conclusions about best practices. Therefore, this guidance document is not a fixed recipe. Rather, it is meant to inform and inspire policymakers in selecting the policies that best suit the local conditions. Local, national, and EU policymakers all have an important role in the large-scale deployment of electromobility.

Local policymakers directly steer the deployment of electromobility, either by directly managing projects, or by supervising/authorising them. They integrate electromobility within their general urban mobility planning, for example within a Sustainable Urban Mobility Planning (SUMP) effort. They can help to make electromobility grow by:

- **Stimulating the uptake of electric vehicles** by providing individual purchase incentives, by setting up procurement rules (for themselves or their suppliers), and they can support the use of electric vehicles with other financial and non-financial incentives, like free parking at prime locations, or use of local bus lanes.
- **Supporting the deployment of the various forms of charging infrastructure**, namely home charging, public charging (which includes hotspot charging), employer/company charging, and car-sharing charging. The support will depend on the nature of the charging infrastructure, and includes elements such as information provision, setting of subsidies, clear requirements for granting of individual permits and concessions, or installing of an own network.
- **Reaching out towards citizens**, e.g. by acting as a hub/central point of information about electromobility, setting up knowledge platforms and organizing test drive campaigns.

National policymakers can support deployment of electric mobility by:

- Developing a national vision on sustainable mobility and the associated transition trajectory, and adopting a clear role for electromobility within the wider mobility transition.
- Setting clear targets over time for deployment of vehicles and charging points.
- Developing and implementing an action plan that addresses regulation and coordination issues, engagement with stakeholders, promotion of electromobility, support of the uptake of electric vehicles, and the roll-out of charging infrastructure, and monitoring and evaluating progress of electromobility deployment.
- Setting up regulations and legislation that provide clarity about safety requirements, and foster the development of standards for hardware and software.

European policymakers play a crucial role in fostering and enabling the electromobility roll-out, by providing guidelines, norms and directives.

- **For cars and vans:** Provide ambitious and long term CO₂ emission standards for cars and vans in line with the trajectory towards 60% CO₂ reduction in transport by 2050, as this will incentivise the market uptake of ZEVs in general, and electric vehicles in particular.
- **For charging infrastructure:** Support the Member States in achieving their national ambitions for rolling out charging infrastructure with the directive on alternative fuels infrastructure and other incentives.
- **Low carbon fuels:** Extend the Fuels Quality Directive as an incentive to adopt low-carbon fuels in transport, or use a similar kind of instrument to foster the use of renewable electricity in transport.

2 Introduction

Air pollution in cities, is a persistent problem, caused mainly by motorised road traffic (Carmichael, 2011; Parkhurst, 2004). Many European citizens often breathe air that does not meet the European standards. This is an urgent and important problem as air pollution is considered a growing health issue in Europe (EEA, 2013). Following the EU targets for air quality improvement, notably through the Air Quality directive, cities are obliged to improve local air quality.

To tackle the air quality issue in cities, the focus must be on making changes in the transport sector (Carmichael, 2011). Principal options are reducing the traffic volume, e.g. by promoting the use of public transport instead of using a car, and stimulating the use of more efficient and clean vehicles. Electric vehicles, which have zero tank-to-wheel emissions, are an important option in the latter category. In addition, to solving air pollution, electromobility is one of the key options to reduce CO₂ emissions from transport. Vehicle charging may be gradually shifted to electricity from renewable sources, especially sun and wind. On the long term electromobility therefore has the potential to enable fully climate-neutral transport. This is an additional policy driver for incentivizing electromobility.

The transition from a conventional vehicles based system to an electric vehicles based system is a complex process. It will require well-coordinated action at EU, national, regional and local level supported by additional activities including: sharing of experiences, showcasing best practices and fostering of public, private and public-private cooperation. Learning from, and being able to build on each-others experiences may speed up the process significantly. Guidelines or examples from other cities that were notably successful and that can be replicated are therefore of great help and prevents us 'from re-inventing the wheel' and losing a lot of time and finances.

This current document provides guidance to policymakers when rolling out demonstrations or full introduction of large-scale infrastructure for EVs in cities and regions. The material is mainly intended for policy makers and practitioners at the municipal/city level. In addition, the document contains relevant information and recommendations for EU and national policymakers. This is especially relevant as the efficient rollout of electromobility requires that policy frameworks, strategies, action plans and involved regulatory frameworks are well aligned at all levels.

However, it is too early to draw final or firm conclusions about best practices. Developments are just starting. Only few cities, if any, have tested various approaches, after the first approach did not deliver the anticipated success. The current data from GeM regions, is sometimes dispersed, sometimes not comparable, and demonstrations are often on-going and not yet in a stage of thorough evaluation. Many lessons are still learned from qualitative experiences and ad-hoc observations, because hard quantitative and comparable data is often lacking. Sharing experiences and collecting best practices is therefore key for local policy makers who are starting or want to expand. Therefore, the current document should not be read as a recipe. Rather it is meant to inform and inspire policy makers to choose the most suited policy implementation when it comes to electromobility for his or her city, knowing that no two cities are alike.

The document provides:

- A general approach to making plans
- Overviews of EV related policy measures at various policy levels
- Illustrative examples and experiences from demonstration projects in various regions
- Recommendations for development of a balanced set of policy measures to support the rollout of a charging infrastructure and deployment of electric vehicles.



The chapters focus on different topics and separately address the various administrative levels of policy making involved. For the local level of policy making the focus is on best practices and implementation. The chapter on national policy making contains an overview of what national governments are currently doing to foster national rollout. The chapter about the EU level of policy making summarizes the most recent directives with relevance for electromobility, and show the implications of these directives at city level. Thereby bridging the interaction of all levels of policy making, with the aim to show where policies block, intersect or strengthen each other. For a clarification of the terminology used in this document (such as EVSP, EVSE operator, and others), see [D7.10](#)¹.

¹ Not available as of publication of this report, but will appear at the page linked.

3 Urban Electromobility planning

Local air pollution, traffic congestion, parking problems and noise require a shift to a more sustainable mobility system within cities and municipalities. This shift is incentivized and enforced by National and European requirements such as emission reduction targets for air pollution. Electromobility is a key element of such a sustainable transport system. Sustainable mobility covers a wide range of important aspects such as reducing the ownership of vehicle and supporting the use of public transport, cycling or walking. The focus of the current document is on realizing the rollout of electromobility. For a successful introduction of electromobility, it is effective for cities develop and implement a plan. Such a plan should address several questions with the aim to sharpen and concretize the plan, by giving guidance for decisions that need to be taken. Key questions include: What is the general aim? What are the needs? What are the ambitions? Which role does the city want to play? Which stakeholder should be involved? Which barriers are foreseen? Which policy measures are best for our city to stimulate the uptake of EV and develop a sufficient network of charging points? How do we want to monitor progress?

This chapter will deal with the best practices local authorities should follow, where electromobility-specific practices will be shown in a more general best practices context. It won't discuss a set of best practices² in detail. Rather, it will explain what local policymakers need to know about electromobility (stakeholders, issues and solutions they can set up). This will give them the knowledge to integrate electromobility in their general mobility practices, as it should be done, since electromobility should be approached as one component of such a general strategy.

² Such as Sustainable Urban Mobility Planning (SUMP)

3.1 Electromobility specifics of best practices in urban mobility

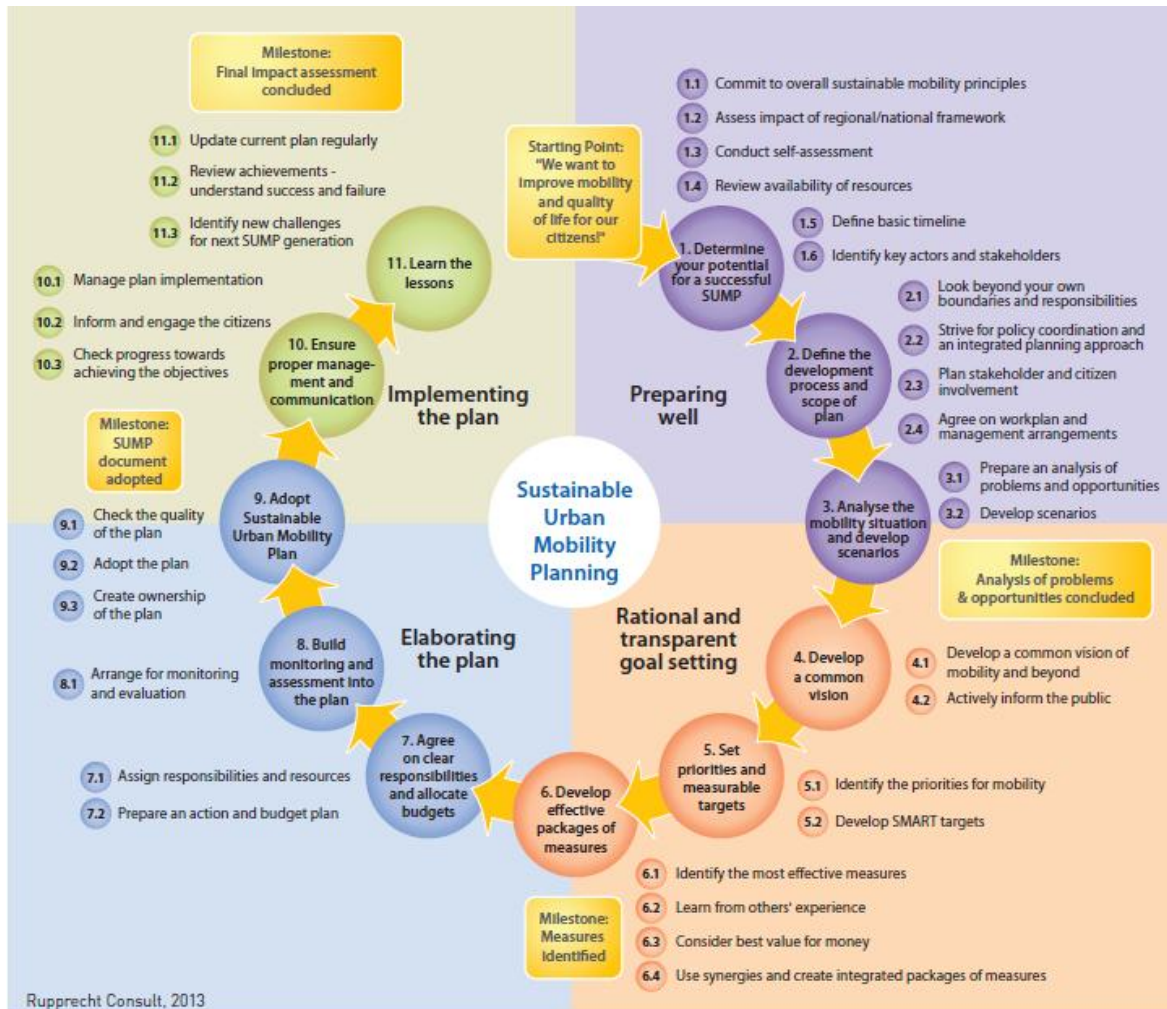


Figure 3.1: Sustainable Urban Mobility planning (Source)

Several excellent examples exist of what steps to take and how to implement a sustainable urban mobility plan. Two of these examples are described below.

Developing and implementing a Sustainable Urban Mobility Plan (SUMP)

European Platform on Sustainable Urban Mobility Plans

Developing and implementing a Sustainable Urban Mobility Plan should be understood as a continuous process which comprises eleven essential steps. In practice these activities can run partially in parallel or include feedback loops. A detailed description of all the steps and activities can be found in the Guidelines "Developing and Implementing a Sustainable Urban Mobility Plan". The Guidelines include good practice examples, useful tools and references that further illustrate the entire plan making process. The guidelines can be downloaded at www.mobilityplans.eu (or [here](#)):

Policy Pathway – A tale of renewed Cities

International Energy Agency (IEA)

Another inspiring example comes from the IEA, which produced a policy pathway to improve energy efficiency in urban transport systems. This policy pathway highlights the holistic transport energy efficiency, city planning and traffic management. In addition it describes the approaches of local and national leaders that are aggressively pursuing sustainable transport, with examples from Belgrade, New York City, Seoul and more than 30 other cities across Asia, Europe and the Americas. Drawing on these “real-life” case studies, this pathway offers national and local decision makers concrete steps on how to plan, implement, monitor and evaluate key urban transport system policies in order to improve not only energy security, but also quality of life.

<http://www.iea.org/publications/freepublications/publication/name,39940,en.html>

Most of the elements of best practices in sustainable urban mobility (such as a SUMP, illustrated in Figure 3.1) are not specific to electromobility. Rather, they are best practices that are valid for mobility in general (and even for other similar subjects). There are, however, some elements that are specific to electromobility. These elements are who the stakeholders are (EV users and charging services), what the goals/needs are (to achieve the large-scale deployment of electric vehicles and charging infrastructure), the issues that need to be overcome, and the solutions/actions to do so. [Deliverable 9.7](#)³ actually puts all these elements together (as illustrated in *Figure 3.2*). An extended summary of this deliverable is written in sections 3.2 (stakeholders), 3.3 (matches between users and charging services), 0 (needs and issues), and 3.4 (solutions) below, to help policymakers and regulators in the process of producing a SUMP understand electromobility and integrate it in their SUMP. It will give some general context (in terms of users, charging services, and general needs), but will focus on actions that are relevant to local policymakers.

³ Not available as of publication of this report, but will appear at the page linked.

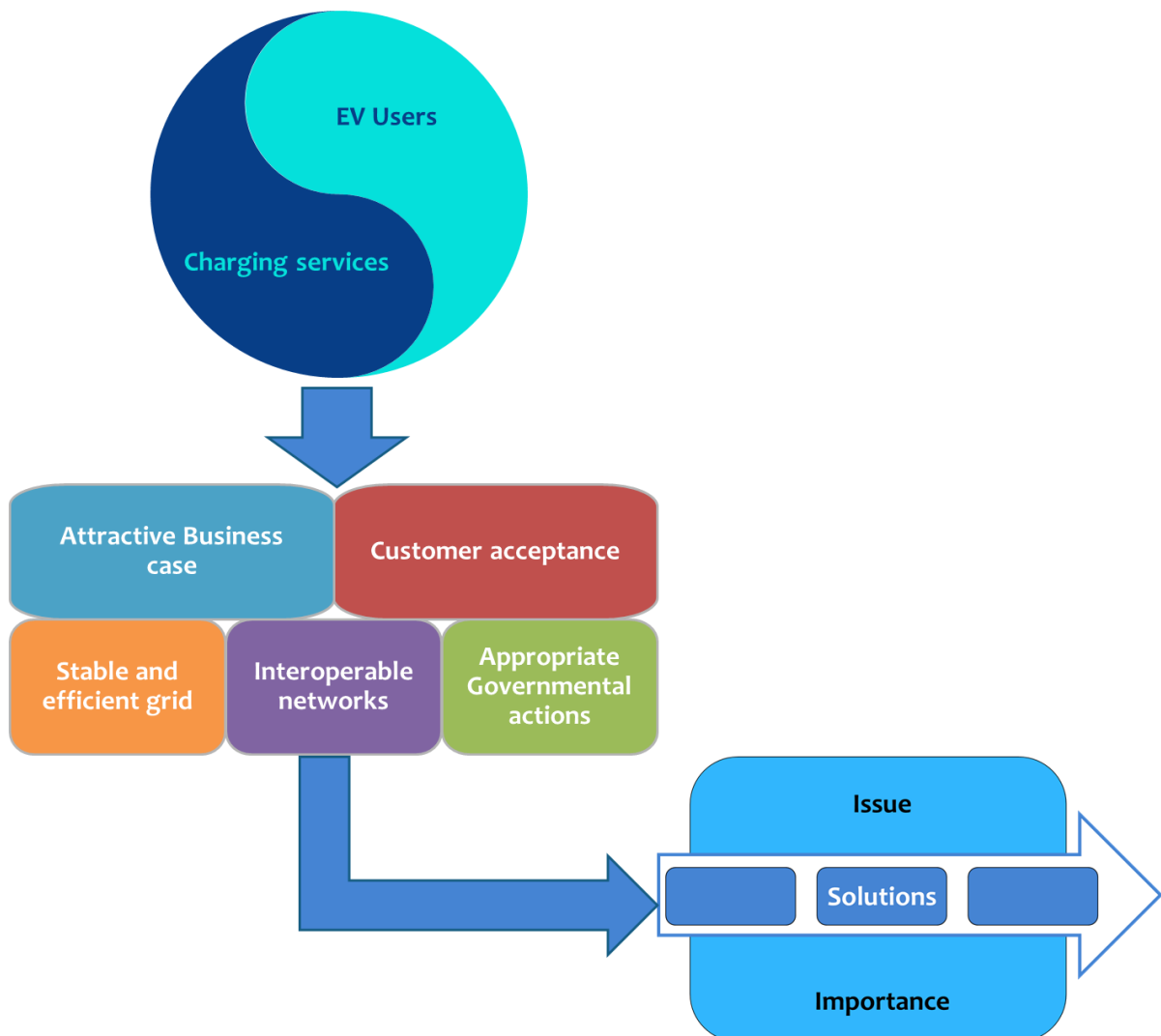


Figure 3.2: From EV users and charging services to issues and solutions (D9.74)

3.2 Identify and engage stakeholders

Stakeholders play an important role in the successful implementation of electromobility. First of all their needs and positions need to be taken into account when defining objectives. Moreover, with their knowledge and experiences they can give valuable input and feedback on electromobility plans. They can also help to identify possible barriers and define and carry out actions to overcome them. Also in the implementation phase the stakeholders play an important role, since they are the ones that need to take actions such as buying EVs or investing in charging infrastructure. Their actions can also increase awareness about electromobility by others. The main stakeholders for electromobility are the EV drivers, local companies, charging pole operators, grid companies, and different departments within the municipality. Their needs are given in *Table 3-1*.

⁴ Not available as of publication of this report, but will appear at the page linked.

	Stakeholder	Role	Electromobility need and profit
EV Users	Private drivers	<ul style="list-style-type: none"> Private person that consumes e-mobility services using an electric vehicle, including electricity and charging services. Can be either private car owner or driver of lease/company car. 	<ul style="list-style-type: none"> Possibility to charge their vehicle when necessary: dense enough network of charging facilities at home, at work; in addition sufficient public charging points.
	Company fleet drivers (and fleet managers)	<ul style="list-style-type: none"> Owner of company EVs Providing charging points for company fleet and/or employees. Electromobility as business opportunities. 	<ul style="list-style-type: none"> Electromobility should be a business opportunity. Charge EVs when necessary, either at company or at public charging points.
	Car-sharing drivers (and fleet managers)	<ul style="list-style-type: none"> Special type of company, owning EV fleet which can be used by customers that have a contract car-sharing contract with them. May have their own charging infrastructure network (then acting as EVSE operator) 	<ul style="list-style-type: none"> Clear vision of municipality giving input for business case analysis City wide parking license Reserved parking places with charging infrastructure
Providers	Charging point operator (EVSE ⁵ operator)	<ul style="list-style-type: none"> The company managing the physical charging equipment: maintenance and control. Offers charging services (access to charging infrastructure including energy) to the EVSP⁶ through a B2B contract May own charging points but alternatively may manage the operation only. For example in a service contract with shops, car park owners, restaurants or municipalities. 	<ul style="list-style-type: none"> Need licenses to place poles in public space. Gain profit from usage of poles. Or from the service contract they have.
	Grid company (distribution system operator, DSO)	Responsible for operating, maintaining and developing the electricity distribution system and so responsible for the connection between the distribution grid and the charging equipment.	<ul style="list-style-type: none"> Stable network without congestion of the grid. Vision on when, how much charging points will be installed can help the grid company to ensure good quality of the grid.
	Electric vehicle service provider (EVSP)	<ul style="list-style-type: none"> Legal entity that the customer has a B2C contract with for all services related to the EV operation. For example: <ul style="list-style-type: none"> Charging services: 	<ul style="list-style-type: none"> Gain profit from service contracts.

⁵ EVSE = Electric Vehicle Supply Equipment

⁶ EVSP = Electric Vehicle Service Provider

		<p>providing the actual charging service to the EV driver, by having a contract</p> <ul style="list-style-type: none"> • Search services: service to EV driver for finding free charging point • EVSE-operator (the EVSP has a B2B contract with one or several EVSE operators for EV charging services) 	
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Table 3-1 Roles and needs of electromobility stakeholders

Within the municipality the transport, environmental, economic and communication departments are usually involved in the roll-out of electromobility. It is recommendable to create an (imbedded) EV taskforce with the task to monitor the action plan and progress in carrying it out. Preferably a clearly recognizable taskforce. The taskforce, should have an internal EV coordinator and include representatives from the different departments. And the task force should have the authority and budget to make decisions and execute plans. It should be known by the public and other departments.

How to engage stakeholders

There are already good examples of successful practices that other cities/regions can benefit from. For example, the success of the above mentioned local electromobility task force will highly benefit from a moderator/coordinator who understands the perspective and position of all stakeholders. This person can also develop solutions and trade-offs. Another example that will be useful for cities starting to roll-out electromobility are the free to use tools, models and trainings for multiple stakeholders from Urbact (European exchange and learning programme): participating cities set up local groups, and engage with government, businesses, energy providers and SMEs to conduct peer exchange⁷. A third example was by a local policy maker from Stuttgart; 'Create a shared agenda among stakeholders, together with coordinated support, that made the Car2GO in Stuttgart a success. It is very popular and the utilisation of the infrastructure is higher than elsewhere.'

There are two specific elements to electromobility that (local) policymakers need to keep in mind when engaging with stakeholders: and it **mixes players with different focusses**.

The first element is that electromobility is a **new value chain with an unsettled field of players**. For example, different types of players might want to take an EVSP role: In addition to wholly new companies, existing companies might be interested in using their existing customer relations to enter the market. Electricity retailers could build on their electricity sales, OEMs on their vehicle sales, and oil companies on their sales of transport products. In fact, all three of these types of companies are either already active as EVSPs or exploring such a role in an active manner. This uncertainty means that (local) policymakers need to be thorough in their engagement with stakeholders, to avoid missing stakeholders with a currently low visibility profile (such as oil companies as EVSPs).

The second specific element is somewhat related to the first: The electromobility stakeholder field is a **mix of players with different focusses**. Some players (such as EVSPs) have a strong consumer and profitability focus, whereas others such as DSOs do not interact much with customers, and focus much more on reliability than profit. This distinction changes quite a bit from one country to another, depending on the structure of the electricity market, which can be more or less open and/or fragmented. This mix of focuses means that some attention needs to be paid on bringing all stakeholders on the same page, as it will not come as naturally as for other markets (especially existing ones).

⁷ http://urbact.eu/fileadmin/general_library/URBACT_Toolkit_online_4.pdf

3.3 EV users and charging services

As seen in in *Table 3-1.*, there are essentially three categories of EV users: private drivers, company fleet drivers, and car-sharing drivers. **Private drivers** are people that own a car and people that use a company lease car. They mostly use their vehicles for commuting, shopping, and leisure purposes. Most of their trips are relatively short, i.e. within the range of (current) electric vehicles. **Company fleet drivers** drive taxis, delivery vans, busses and garbage trucks. They are a good target for the early introduction of electric vehicles because they make many relatively short trips, combining a high total use (which makes electric vehicles more attractive), but still attainable by electric vehicles (as the individual trips are quite short). They also often ty return to a given location to pick up passengers or products. Such locations are ideally suited to serve as charging hubs. Another interesting aspect that differentiates company fleets from individual cars is that purchase decisions are made for numerous vehicles at the same time by a fleet manager that will look at the cost performance on a more rational basis than a consumer, by looking at detailed Total Cost of Ownership (TCO) figures, for example. **Car-sharing drivers** are subscribers of a car-sharing scheme. There are essentially two types of such schemes. Station- (or hub-) bound schemes involve picking up a car from a hub and returning it to a hub (which might be different form the first one). Charging will mainly take place at those hubs. For free-floating-schemes, vehicles can be left and picked up anywhere, meaning that they will have to rely on (semi-) public charging. A certain number of electric car sharing schemes have started, mostly in highly urbanised areas. Examples of such schemes are Autolib' in Paris and Car2go in various places such as Amsterdam, Berlin and Stuttgart.

These users can charge their vehicles at a combination of various charging services. These services have a set of general (shown in *Table 3-2*) and technical characteristics (shown in *Table 3-3*). The first general characteristic is the accessibility of the infrastructure, which can private, or publically accessible (or something in between).The second general characteristic is the business model of the EVSE operator. If charging is a positive business proposition on its own (as needs to be the case for highway charging, for example), then charging is the primary business of the EVSE operator. If, on the other hand, charging is an incentive to increase volume of a related service (for example to incite customers to stay at a mall and shop there), which is the primary source of income for the EVSE operator, then charging is a secondary business. In some cases (private charging at home, or at an employer), there is no business model as such. The final general characteristic is the necessity of interoperability/roaming with other providers. The technical characteristics of charging services are the duration, energy amount, frequency, power and accounting basis of charging.

Charging services	Access	Business model for EVSE operator	Interoperability / Roaming
Private home charging	Private	None	No
Employer parking charging	Private	None	No
Public charging spot for street/car park parking	Public	Primary business	Yes
Charging at shopping malls	Public	Secondary business	No
Traffic hotspot charging at places of interest	Public	Primary business	Yes
Highway fast charging	Public	Primary business	Yes
E-car sharing charging network	Semi-public and Public	Secondary business (for own cars)/Primary business (for other cars)	Yes
Company charging hub for fleets	Private	Charging of company fleet (no business)	No

Table 3-2: General characteristics of charging services

Charging services	Charging duration	Charging energy amount	Charging Frequency	Charging power	Charging accounting basis
Private home charging	Long	Low/High (at night time)	Every day	Normal	n/a
Employer parking charging	Long	Low-high	Every working day	Normal, Accelerated	Employer incentive
Public charging spot for street/car park parking	Short and Long	Low	Twice a day	Normal, Accelerated	Time- and energy-based
Charging at shopping malls	Short	Low	Twice a day	Normal, Accelerated	Time-based
Traffic hotspot charging at places of interest	Short	Low	Depending on POI characteristics, from 1-2 per day to 1 per month	Normal, Accelerated	Time-based
Highway fast charging	Short	High	3-5 times per day	Accelerated, Fast	Time- and energy-based.
E-car sharing charging network	Short /Long (at night time)	Low/High (at night time)	Once-Twice per day	Accelerated	Included in car-sharing fee
Company charging hub for fleets	Long	Low/High (at night time)	Every day	Normal	n/a

Table 3-3: Technical characteristics of charging services

These services will be of different importance for the various user groups. This is shown in *Table 3-4*

Charging services	Private Drivers	Company Fleet Drivers	Car Sharing Drivers
Private home charging	Primary source for people with access to home charging	Useful complement for topping off at customer home/site	Not relevant
Employer parking charging	Useful complement for commuters living at longer distance	Not relevant	Not relevant
Public charging spot for street/car park parking	Necessary for people without home charging	Useful complement for topping off at customer home/site	For free-floating schemes
Charging at shopping malls	Incentive to go shopping at a given location if price is attractive	Not relevant	Not relevant
Traffic hotspot charging at places of interest	Useful complement for longer trips	Not relevant	Not relevant
Highway fast charging	Necessary for long trips	Necessary for long trips	Not relevant
E-car sharing charging network	Useful complement while in the city	Not relevant	Primary source for station-/hub-bound schemes
Company charging hub for fleets	Not relevant	Primary source	Not relevant

Table 3-4: Matching charging services to user groups

Needs and issues

Combining these elements with the insights from a number of other reports⁸, leads to the conclusion that there are essentially five categories of needs necessary for the large scale deployment of electromobility and its underlying infrastructure. The first two are key business elements of the electromobility proposition, while the latter three are related to the underlying infrastructure and frameworks that support electromobility:

- Attractive business cases: Several users groups will rely on the existence of a public charging infrastructure (to varying degrees), as explained above. For operators to deploy and operate that infrastructure, they need an attractive business case. (See [D9.4](#), [D9.6](#))
- Consumer acceptance: Having a good case on paper does not ensure that consumers purchase EVs: They need to be sure that they can perform the same activities as before, without prominent constraints. They also do not necessarily base their decision on purely rational criteria. (See [D9.1](#)⁹, [D9.6](#))
- Stable and efficient grid: Managing the charging process and designing the charging infrastructure in order to minimise the impact of EV charging on the electricity grid. This will reduce the amount of extra grid investment needed and ensure electric vehicles can charge at a competitive price. Electric vehicles can even be a means to improve grid reliability and efficiency. (see [D2.4](#), [D4.2](#), [D4.3-A1](#), and [D9.2](#))
- Interoperable networks: The various players in the charging infrastructure grid need standards in order to offer discrimination-free access to their services. This is a complex element that involves many stakeholders. It mixes technical, business and consumer-facing elements. It is a main focus of Green eMotion, which aims at allowing EV drivers to charge in any EU country they visit. (See [D2.4](#), [D3.2](#), [D3.8](#), [D7.5](#)¹⁰, [D7.8](#)¹¹ and [D3.9](#))
- Appropriate governmental actions: plans, laws and procedures need to be aligned to support electromobility. Policymakers and regulators of all levels (EU, national, local) need to set up a supporting framework and take efficient supporting actions. (See [D2.1](#), [D2.4](#), [D9.6](#))

In order to satisfy these needs, as number of issues will need to be overcome. These issues are listed in Table 3-5, which also assesses how much local policymakers need to take action. Issues that require strong local policymaker actions are marked in green and discussed in the next section, together with a list of solutions and actions relevant for local policymakers. Issues with medium involvement of local authorities are marked in orange, and issues where the involvement of local authorities is inexistent or very low are marked in grey.

⁸ These deliverables can be found on the GreeneMotion website: <http://www.greenemotion-project.eu/dissemination/deliverables.php>. Links to relevant reports are shown in the needs lists, as well as within the text of this report.

⁹ Not available as of publication of this report, but will appear at the page linked.

¹⁰ Not available as of publication of this report, but will appear at the page linked.

¹¹ Not available as of publication of this report, but will appear at the page linked.

Issue	Degree of required actions by local policymakers
1) The hardware used by charging points is expensive	Very low. This is mostly the domain of DSOs, equipment manufacturers, and EU and national policymakers and regulators. Local authorities might have some small role in collaboration platforms (as a supporter or a participant) that develop standards, which reduce hardware costs.
2) Installing hardware at charging points is expensive	Local authorities can have a significant role by putting requirements for renovations and new constructions to integrate (the possibility of) charging stations.
3) Operating EVSEs does not scale down easily	None. This is the domain of service providers, who can outsource some activities that they could not perform at the right cost for the scale they operate at.
4) Combining charging with other services is not always an easy sell	None. It is up to charging stations operators and their potential partners to find the right matches.
5) The utilisation levels of public infrastructure are expected to be low	Average. Local authorities can provide some advantages to operators and drivers, such as subsidies, and free or discounted parking/access to certain areas.
6) The purchase price of EVs is considerably higher than for comparable ICEVs	Average. Local authorities can provide some advantages to operators and drivers, such as subsidies, and free or discounted parking/access to certain areas.
7) Consumers have range anxiety issues	None. This is mostly about developing and implementing information systems, which are done by OEMs, EVSPs, EVSE operators, with support of national and European policymakers (it would not make sense to develop local versions of such systems).
8) Driving habit data privacy issues are more visible for EVs than ICEVs	None, The development of privacy rules and information about them is done at national/European/service provider level.
9) Higher electricity costs due to sharp peak demand	None. Smart charging to spread demand is something lead by electricity suppliers and DSOs, EVSE operators, and equipment manufacturers, with support from national and European authorities.
10) Pockets of high EV uptake may create low-voltage grid congest	Relatively low. Deploying and operating smart grids, and developing forecasts is a task for DSOs, with support from national and European authorities.
11) Harmonic distortions might impact the grid	None. Developing and implementing proper designs is and EVSE operator task, with some support from national and EU authorities.
12) Gaps in standards prevent interoperability	None, standardisation efforts are made at International, European, (and national levels).
13) In some cases, there is a need to support competing standards	None, standardisation efforts are made at European (and national) level.
14) Operators might not be willing to open their networks	Important. Local authorities can set openness requirements when attributing concessions/authorisations to deploy infrastructure.
15) Various policy departments with	Key role, as local authorities are this is about local authorities

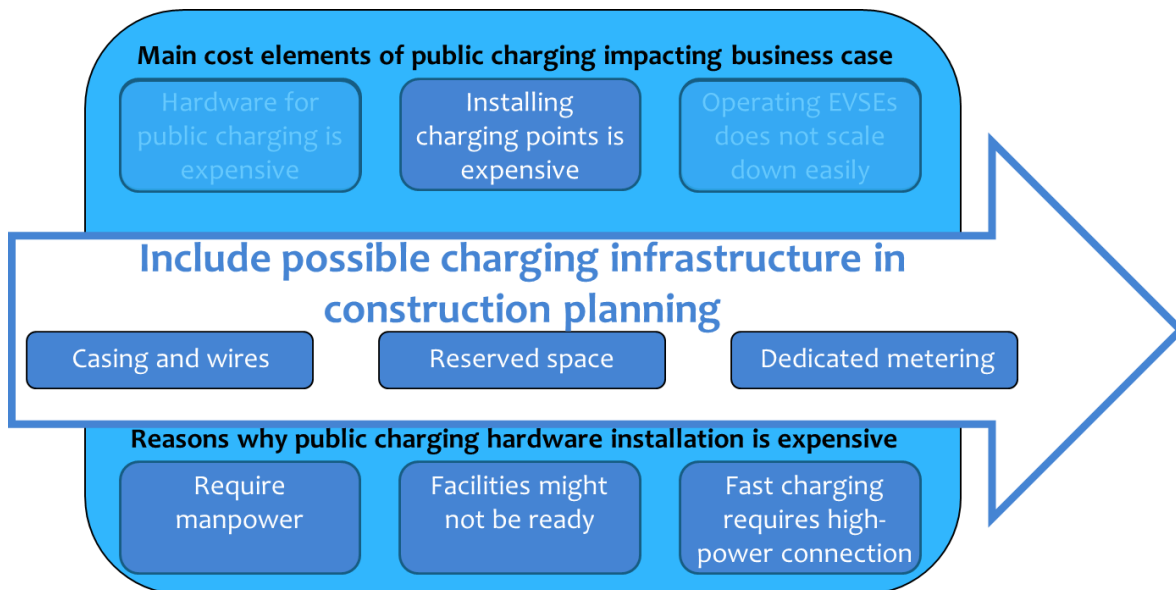
possibly conflicting interests are involved	Key role, as local authorities are the ones attributing such authorisations, and they are the ones that will need to improve their own processes.
16) Authorisation processes are unclear and difficult	
17) Authorisation processes are not harmonised	Key role, as local authorities are the ones attributing such authorisations, and will need to participate in harmonisation processes.
18) Legal frameworks are not adapted to e-mobility needs	Medium: Local governments are a participant stakeholder in an effort lead by national authorities to adapt legal frameworks.

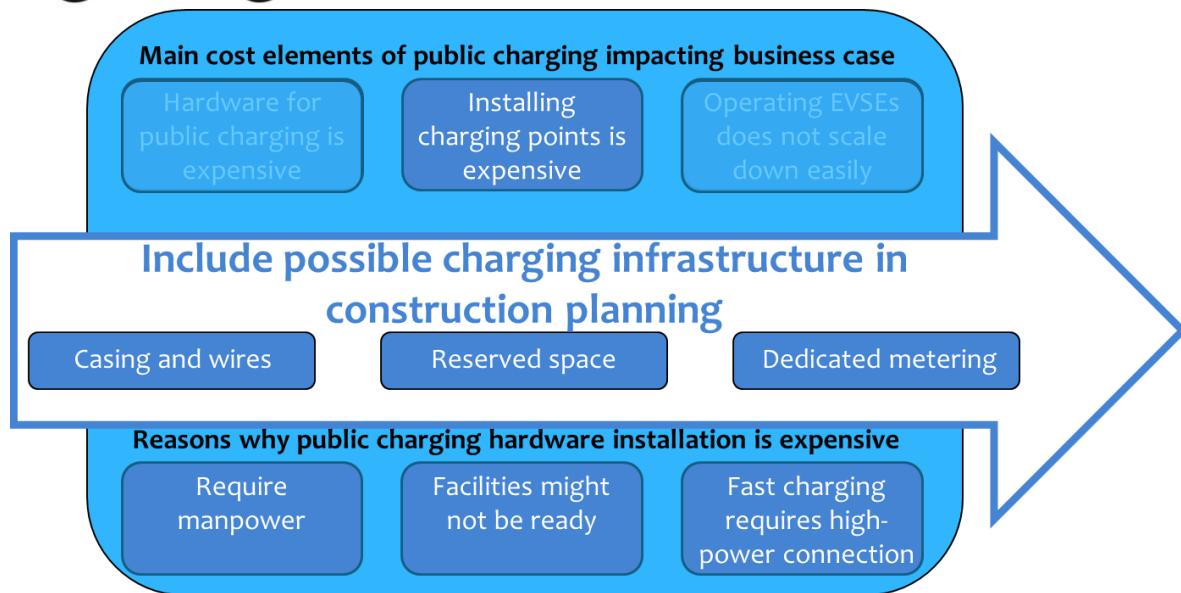
Table 3-5: Issues and their degree of required actions by policymakers

3.4 Solutions to the most important issues

This section explains the most relevant issues for local authorities selected in the previous section. For each issue, it shows a figure that summarises what the issue is, what its impact is, and what solutions exist. An explanation of the issue is also given, together with solutions that require local authority support.

3.4.1 Solving hardware installation costs





What is the issue?

Buying hardware only represent one part of the investment costs EVSE operators incur when setting up a charging spot. Current hardware installation costs for a public charger are about 4'500 euro (2013 price, from NPE 2014¹). The reasons for these costs being so high are the fact that they require costly manpower and that the layout of facilities, where chargers are installed, such as parking spaces, might not be made by taking the possibility of installing chargers into account. This can manifest itself by the lack of space to install chargers or the lack of wiring to connect devices. These costs are not expected to drop on their own (see [D9.4](#)), because these issues won't be solved by the expansion of electric mobility or standardisation. Special attention should be paid to fast charging facilities, as a key enabler for regional mobility, due to the higher power requirement from the distribution network. New technologies such as storage-supported fast charging stations will contribute to reduce these costs, due to their lower grid impact (see [D4.5](#) and [D8.5](#) for further details on this technology).

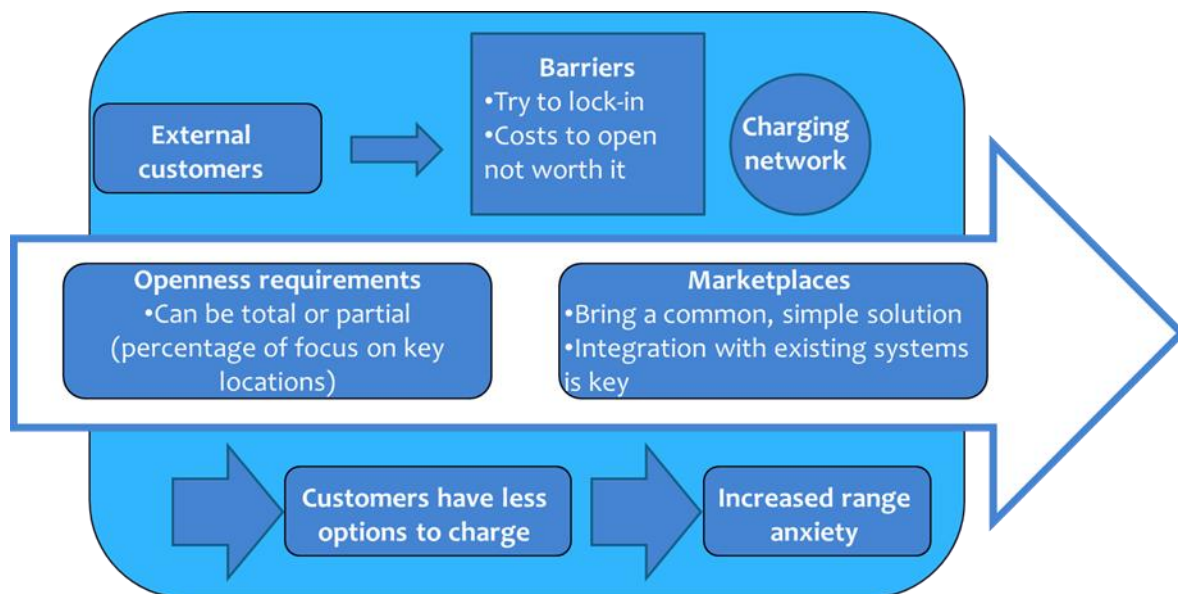
What can local authorities do about it?

The key to save money on installing hardware into existing facilities such as parking spots in buildings is to have some form of preparedness to the possible integration of hardware. This should happen at the design and building phases of facilities, both for new constructions and for renovations. Policymakers can ensure that this happens through building code legislation and conditions to tenders. California has already made such requirements by requiring that new housing and parking lots have conduit and service panel capacity starting in 2015. In that same state, the City of Palo Alto has mandated that all new homes are prewired and are now moving on to charging and parking requirements for apartments, hotels, and commercial buildings. According to estimates cited by the Mayor of Palo Alto, the cost of wiring an EVSE outlet in a new home is four times lower than into an existing structure, so such measures clearly have interesting saving potential. Similar rules are in place in Portugal and Ireland.

These requirements can be of three levels/stages:

- I) **Pre-facilitating:** Install empty tubes for future cables and reserve space for meters and chargers.
- II) **Passive infrastructure:** Install wires (prewiring) and have a centralized metering room for the facility
- III) **Active infrastructure:** Build the actual infrastructure, including chargers

3.4.2 Solving lack of charging network openness



What is the issue?

EVSE operators that are also EVSPs may be reluctant to open their networks to customers from other EVSPs for two reasons: to increase their market share, or because it might be too complex to be financially interesting. The former would be operators trying to force a monopoly situation in a given geographical market. This is less likely to happen if EVSE operators are independent entities from EVSPs. Independent EVSE operators have an increased utilisation rate as their main objective, whereas having EVSP activities might push them to try and lock-in customers. This is because a customer that wants to charge at a given location has to be a customer of the EVSE operator managing this location, but could be the customer of any EVSP. This same issue can apply for clearing house activities. The former reason is because EVSE operators might be in a situation where the extra revenue from outside their customer base does not cover the expense of implementing and running the necessary software and communications systems.

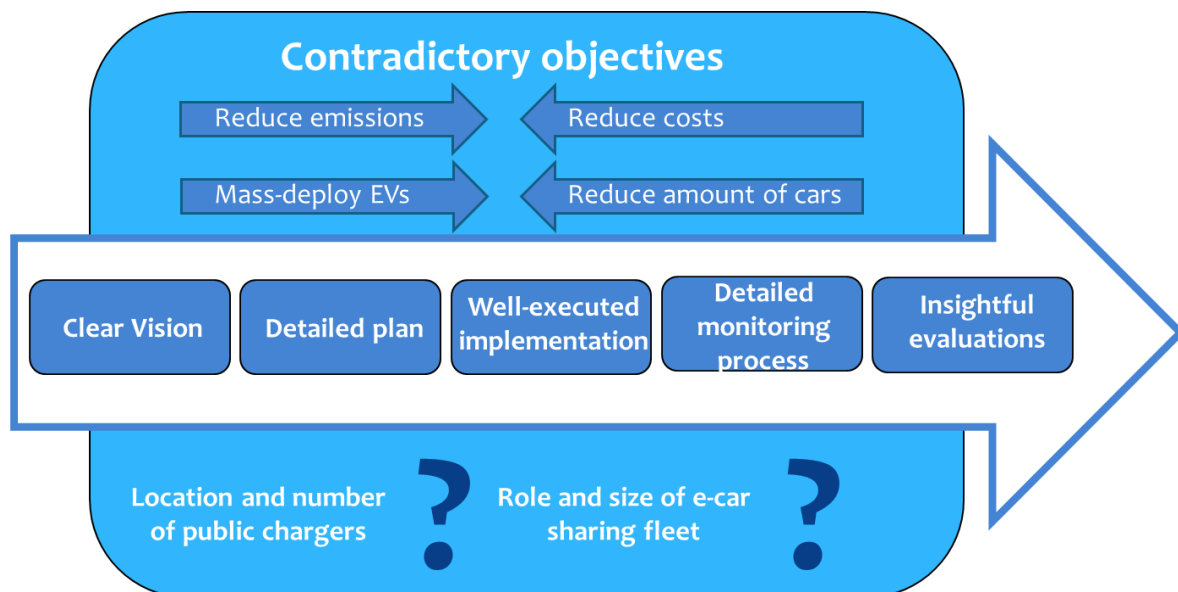
Evidence for this lack of willingness can be found in Tesla's superchargers. This network of fast chargers will only be accessible to Tesla vehicles (see [D7.5](#)).

What can local authorities do about it?

Local authorities can put openness requirements in their authorization processes for deploying charging infrastructure. These requirements can be of total openness, or can involve a given percentage of charging locations, with a focus on key locations. These key locations would typically be locations where several EVSE operators would want to serve their customers. Imposing such requirements should ideally occur at an early stage, before authorisations are even requested. This solution also involves action from EU and national authorities (for example to set up the basis upon which local authorities can make such requirements). Local authorities need to coordinate with them to ensure the right choices are made.

Local authorities are not really involved in the other solution to openness, namely the creation of a marketplace (i.e., a roaming platform) that can facilitate this openness.

3.4.3 Solving conflicting interests



What is the issue?

Cities generally have a positive attitude towards electric mobility, given its local environmental benefits in terms of noise and pollution. However, its implementation is complex. It involves many stakeholders that need to work together to achieve a common goal of sustainable transport as part of a healthy urban environment. The different stakeholders, however, sometimes have objectives or interest conflicting with e-mobility. Even within a given municipality, these interests might be different. For example the large scale roll-out of electric vehicles might be seen as contradictory to the objective of drastically reducing the number of cars in the city. Another source of conflict is the fact that sometimes investments in electric mobility need to be made by departments which have other aims than reducing local emissions. The purchase of electric buses might be seen as a good initiative by the environmental or energy department, but it needs to be paid from the budget of the transport department which objective might be delivering qualitative transport at low as possible costs.

Moreover, without a plan how to come to the common vision it is also not always clear which projects actually contribute to achieving the goal. For example without a vision on how many infrastructure is necessary and where and when it needs to be placed, it is difficult to judge requests for placing charging poles. The same holds for requests for starting e-car sharing initiatives, which require the city to have a vision on the role and size of e-car sharing in the future transport fleet.

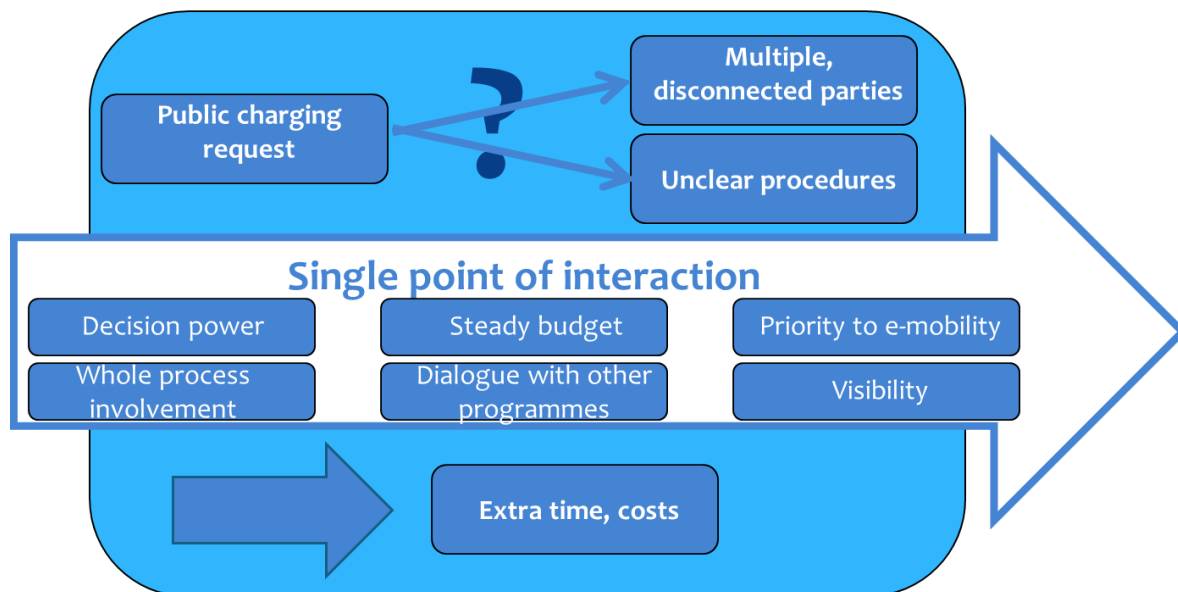
What can local authorities do about it?

Local authorities need to integrate electromobility into the general best practices for mobility. This can happen within a Sustainable Urban Mobility Plan (SUMP), for example (see section 3.1).

The key elements to have/keep in mind are:

- A **clear vision** that sets the city's ambition and help garner support for successful latter phases.
- A **detailed plan** that defines what the needs are: what is needed (in terms of infrastructure element types, as well as of scale), where and when, and who should deliver them. This plan should identify pitfalls and prepare contingency responses.
- A **well-executed implementation** of measures that engage all actors, raise awareness and ensure the required elements are delivered.
- A **detailed monitoring process** that provide the right data needed to follow the plan's progress and help identify issues and share successes.
- **Insightful evaluations** that produce recommendations for improvements and help identify success factors.

3.4.4 Solving unclear authorization processes



What is the issue?

Authorisation procedures are complex, because they often involve many disconnected parties, some of whom might not have a power to make a decision: in some cities, the groups promoting electric mobility do not have the power to deliver authorisations and the departments that have that power might not see electric mobility as a priority. Even in situations where the departments that have power to authorise might be on board, this fragmentation adds a layer of complexity and creates delays and additional costs.

What can local authorities do about it?

The main solution to this issue is for cities to centralise the authorisation processes by creating a single point of interaction for authorisation requests. Depending on the situation of the city and the magnitude of its ambitions, this can range from a simple information/coordination desk that redirects requesters to proper places and informs them about best practices to a full-sized department that takes over competencies related to putting in place electric mobility. This will reduce costs and efforts both for the city and the requesters. The Amsterdam/Malmö shows the value of such a structure: Interviewed Malmö stakeholders cite the dependency of the environmental department on collaboration with other departments as the main problem for the uptake of electric mobility, whereas the existence of a central contact point that could help with all processes (and requesting a city-wide parking permits in particular) was cited as a decisive element in the creation of Car2Go (an electric car-sharing programme). Another example is London, where Transport for London was in charge of installing charging points, but not of their promotion, resulting in very low utilization rates (two thirds are used for less than a minute a day).

This single point of interaction needs (see [D9.7](#)¹ for details):

Decision power to ensure charging stations are actually in operation.

A steady budget that allows immediate reaction on request

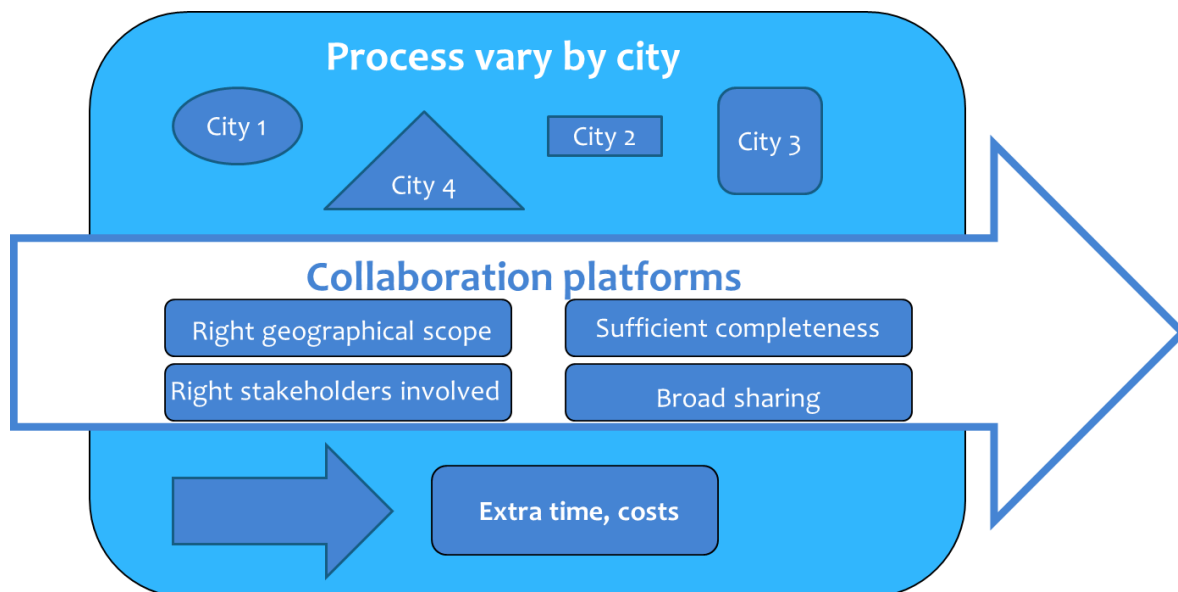
Priority to e-mobility to provide full support to electromobility and the retention of knowledge and capabilities.

Whole process involvement to help make the process of deploying and operating infrastructure more efficient, since it will be proactively driven by an organisation that prioritises e-mobility.

Dialogue with other successful programs to learn best practices

Visibility so that the organisation is known and used

3.4.5 Solving not harmonised processes



What is the issue?

Having cities that support e-mobility, know what the consequences are and adopt efficient procedures is one part of the effort required. There also needs to be consistency (both in terms of effort/knowledge and in terms of procedures), so that providers avoid a new learning process each time they start a new application in a new city. This will reduce their costs and learning time, making them more eager to start a project.

What can local authorities do about it?

They can participate in a collaboration platform that has:

The right geographical scope: The harmonisation effort should at least overlap with the range of cities a provider would want to operate. Typically, this would happen at a national level, but there are cases where users are mobile across national borders (examples are the Maastricht, Geneva, Basel or Bratislava regions). Providers would naturally want to follow their customers (and vice versa), so it is important to assess the particular situation of a region in order for the harmonisation effort to reach its natural target.

Right stakeholders involved: While the involved cities are the obvious stakeholder group that needs to be involved, it should not be forgotten that the groups (namely providers, all actors of the e-mobility ecosystem (including users) and other parts of the administration.) that will be impacted from this effort should be involved as well. This will ensure that their point of view is taken into account, resulting in greater benefits and reduced obstacles.

Sufficient completeness: One potential issue is that cities that are lagging in the development of their procedures (by lack of commitment or knowledge) might not get on board with harmonisation. In that case, national (or provincial) governments should step in and take the lead. Their presence as neutral parties is useful in any case. They can also help from a logistical, financial and knowledge point of view.

Broad sharing: It is also important that the harmonisation efforts are made public and that their contents are shared. This will ensure a higher visibility for e-mobility and will help share knowledge about best practices and elements to avoid. Even if the actual procedures differ from region to region, the harmonisation process should be quite universal.

4 Toolbox: local policy measures

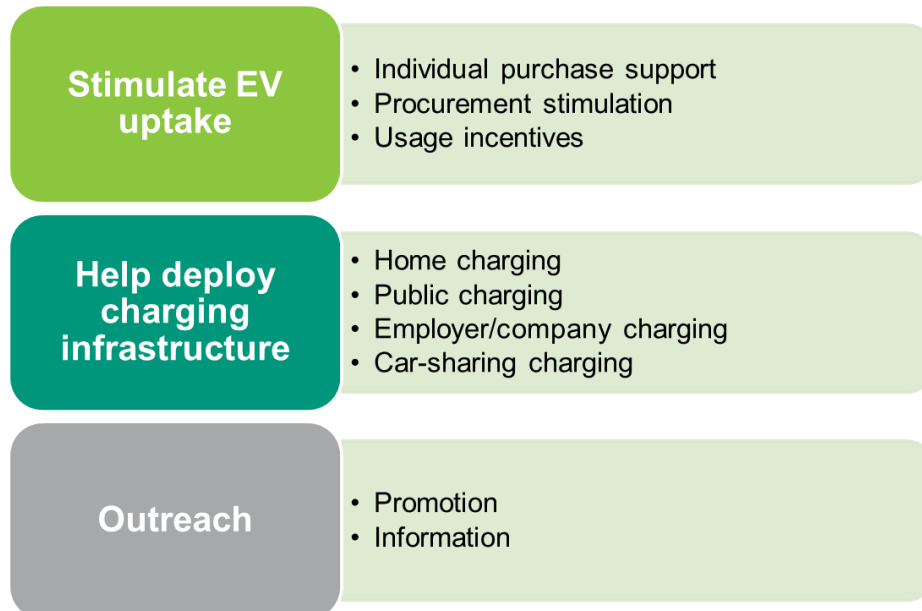


Figure 4.1: The three types of policymaker actions

There are essentially three ways policymakers can help electromobility overcome the obstacles listed in the previous chapter (see Figure 4.1):

- 1) They can **stimulate the uptake of electric vehicles** by financially supporting the purchase of individual vehicles, through procurement rules (for themselves or their suppliers), and they can provide EV users with usage incentives.
- 2) They **can support the deployment of the various forms of charging infrastructure**, namely home charging, public charging (which includes hotspot charging), employer/company charging, and car-sharing charging.
- 3) They can have an active outreach towards citizens in the form of EV promotion and by disseminating information about EVs.

The following sections will provide local policymakers with tools to accomplish these tasks.

4.1 Stimulate EV uptake

4.1.1 Individual purchase support

Subsidies

Fiscal stimulation, such as a registration tax exemption) is generally in the domain of national authorities. However, local authorities can offer some financial support through specific subsidies, e.g. a subsidy on purchase of an electric vehicle. Table 4-1 shows the subsidy levels applied by the city of Amsterdam. The focus of Amsterdam is on stimulating smart, efficient and clean transport for this target group of high-mileage corporate car users, because they were identified as driving a lot of miles with conventional fuels within the city.

Purchase subsidy for vehicles used by companies for commercial purpose in Amsterdam

The subsidies that the city of Amsterdam used in 2014 for the purchase of EV for company cars that drive a high amount of kilometers in the city:

- € 5.000 for an electric passenger car (high-mileage corporate car users)
- € 5.000 for an electric van
- € 5.000 for an electric taxi
- € 40.000 for an electric truck

Table 4-1: Purchase subsidies in Amsterdam

4.1.2 Procurement stimulation

Government as launching customer

Electrifying the municipality's car fleet is a common and logical step towards more EVs within the city. It sets a good example, contributes to the visibility of EV for citizens, and is so a good opportunity to promote EV driving. The message, visuals and signs to place on EV's, how this can look like, and what this can have for positive effects is underestimated. Thinking about this carefully and even using external parties to design these expressions can help.

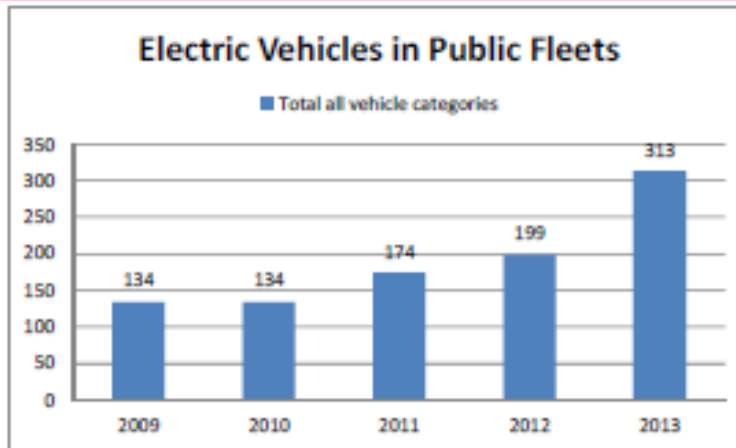
Copenhagen is electrifying municipalities' fleet

Since January 2011, all passenger vehicles bought by the City of Copenhagen have been either electric or hydrogen cars. The City of Copenhagen is switching its fleet of about 300 passenger vehicles to 85% electric and hydrogen cars by 2015. At the end of 2014, 57 % of the City's passenger cars and vans were electric or hydrogen. At the end of 2015, the City of Copenhagen is expected to have 278 electric or hydrogen cars. Petrol and diesel powered cars will be replaced with EVs and hydrogen cars when they need to be replaced any way.

Requiring electric vehicles in contractors fleet

In addition to electrifying their own fleets, local entities can also push their general suppliers and contractors active in the city to use EVs. This could for example be done by imposing requirement concerning the average emission level of the car fleet of the contractor, or demanding for inclusion of a certain percentage of electric vehicles in the fleet. Fleets to which this could apply are for example taxis, public transport busses, garbage trucks and street cleaning vehicles and parks and traffic signals maintenance. Barcelona has used this tool to increase the level of EVs in public fleets to over 30%, as shown in *Figure 4.2* :

Public (street utility) fleet procurement



Over 300 EVs (mainly vans) in public fleets, recharging at depot

Figure 4.2: Fleet procurement in Barcelona

Joint procurement

For smaller municipalities in particular, it might be a good idea to look at joint procurement tools, to leverage economies of scale, in order to ease problems with the extra costs of purchasing electric vehicles. It also reduces the effort needed into procuring electric vehicles, and allows for sharing experiences and insight.

Municipalities can either be fully active a in joint procurement effort (i.e. closely be involved at all stages), or they can piggy-back on existing efforts.

The following recommendations for joint procurement come from an EVUE report¹², based on the experiences of the Swedish government and the city of London, and from the European Commission's Green Public Procurement (GPP) Training Toolkit¹³:

- Being well prepared is essential
- Choose between having an own joint procurement effort, or piggy-backing an existing effort
- Service availability and maintenance requirements need to be included in the contracts
- Use a two-step procedure with
 - 1) Bidder prequalification
 - 2) Invitation to tender
- This two-step procedure allows for more attention and information about the requirements to vehicle retailers.
- The number of investors in a joint procurement should be limited, so that an agreement on specifications can be reached.
- Have parties that have joint procurement experience take the lead

¹² <http://insynsverige.se/documentHandler.ashx?did=94618>

¹³ http://ec.europa.eu/environment/gpp/pdf/toolkit/module1_factsheet_joint_procurement.pdf

- Have early engagements with vehicle manufacturers to inform them about the procedure, as they are not always used to public (joint) procurement
- Public procurement procedures can be complicated, consider using a procurement consultant.
- Be realistic, understand your market (small providers can have problems to participate in tenders)

4.1.3 Usage incentives

Access

There is a financial area that municipalities have direct control of: Access fees, such as the London congestion charge, which are primarily intended to reduce car traffic in certain areas. In order to offer a discount or an exemption from such a tax, municipalities need to put a system in place that couples the vehicle type to its payments, which is not a trivial task. Some systems already in place (such as the London one (see Table 4-2)), actually already offer that possibility, since they rely on cameras reading licence plates, which can relatively easily be coupled to a vehicle registration system. In fact, the city of London is in the process of creating low-emission zones by offering discounted access to certain areas to low-emission vehicles. Municipalities can also go a step further by banning vehicles with emissions above a given threshold from even accessing these zones. These access rules, either ones with (varying) fees or ones with access limitations, can also be time-based, i.e. active only during certain time windows. Having exclusive or discounted access would then be very valuable for delivery companies, as they would gain a flexibility advantage in their delivery options (for example by being able to provide their customers with evening deliveries of goods). As an aside, the electrification of the delivery of goods requires some extra effort, most notably in redesigning distribution to take into account the characteristics of electric vans, namely their range, by designing other delivery routes, most notably in terms of hub density (see Table 4-3).

Exemption of London Congestion Charge for EV and PHEV

The Congestion Charge is an £11.50 daily charge for driving a vehicle within the charging zone between 07:00 and 18:00, Monday to Friday. Electric vehicles are eligible for a 100% discount on the Congestion Charge. PHEV cars or vans (not exceeding 3.5 tonnes gross vehicle weight) which emit 75g/km or less of CO₂ and that meet the Euro 5 standard for air quality qualify also for a 100% discount on the Congestion Charge.

Table 4-2: London congestion charge

Urban freight vehicle in smart distribution concept in Copenhagen

The City of Copenhagen has taken part in the development of a concept for smarter and greener distribution of goods in urban areas using electric vehicles: 'Citylogistik-kbh'. A center is established on the outskirts of the city where transport operators can deliver their goods for the inner city. From this center Citylogistik-kbh delivers the goods to customers in optimized electric vehicles. This reduces uncoordinated freight transport in the city center, thus reducing congestion and negative environmental side effects of transport in the city center.

Table 4-3: Urban freight in Copenhagen

EVs allowed in Limited Traffic Zone in city centre of Rome

The city center in Rome is a Limited Traffic Zone (LTZ), where only authorized users can access with their private vehicles, paying a considerable fee for permission. Since March 2011, the access to the LTZ is free for EVs through registration, to support the diffusion of EVs. Furthermore, electric vehicles are allowed for free movement in environmental emergency days (air pollution exceeds certain limits) and in the 4 car-free Sundays when it is not allowed to drive with conventional, combustion engine cars.

Table 4-4: Access zones in Rome

Lanes and parking

Municipalities can provide their citizens with another kind of incentive: Discounted or free parking or priority lane access. The latter refers to special lanes reserved for taxis, public transport and for vehicles with multiple passengers. For parking fees, the decision to provide a discount is a balancing act between the strength of the incentive (i.e. the value of the discount) and lost revenue to the city. It can also create some backlash from other users, if they feel their own options are diminished, which would be the case if some of their usual parking spots were reserved for electric vehicles. This is the reason why the city of Malaga created additional free parking spots for electric vehicles. Such a solution might however go against a municipality's goal to reduce the total number of cars within its limits (see Table 4-5). Such measures also need some legal basis (made at the national level), as such they might be challenged in court (see Table 4-6). Another important point about parking: Reserved places for electric vehicles should also include chargers, coupled to a reservation system to enable drivers to top up their batteries.

Lessons learned from Malmö – measures conflicting with broader sustainable transport goals

Free parking for electric vehicles was introduced in 2007 but was already stopped in 2009. The incentive was not considered compatible with the higher policy goal of Malmö to reduce the car use in the city centre. This example clearly illustrates that support for electric vehicle not always fits within a wider vision on sustainable mobility.

Table 4-5: Malmö and broader goals

Lessons learned from Germany –national legislation not providing laws for local regulation

Sometimes local policies to stimulate electromobility are not supported by national policies. In Germany it was previously the case for reserved parking places. Federal law did not offer a legal basis to reserve parking places exclusively for electric vehicles at charging locations. Therefore it was not possible to enforce exclusiveness, and as a result conventional cars could occupy EV parking places and restrict access to charging points without consequences. On September 24, 2014, the Federal Government passed a law allowing local authorities to reserve parking at charging points for electric vehicles only, and to grant free parking for EVs, and for PHEVs that emit $\leq 50\text{g CO}_2/\text{km}$ or that have an autonomy of at least 30km on pure electric driving (40km from 2018). The law will also allow municipalities to grant passes to EV drivers to give them access to restricted areas such as low emission, congestion or low noise zones as well as allowing access to bus lanes. The law will expire

Lessons learned from Copenhagen – national legislation not providing laws for local regulation

EVs (excluding PHEVs) were allowed to park for free in **Copenhagen** in the pay-and-display zones until December 1st 2011. However this practice was stopped, because the Minister for Transport stated that the law does not give the City the necessary powers to exempt EVs from parking charges. For similar reason, it was not possible for Copenhagen to set specific EV-friendly environmental zones. It has taken some time to change this. It is expected that the Danish Parliament before the end of 2014 will pass an amendment to an Act which will give municipalities the necessary power to implement specific local policy concerning parking charges for EVs in public payment zones, and environmental zones.

Source: D2.4. The key features of successful implementation of Electromobility

Table 4-7: Copenhagen and parking laws

As for special lanes, they face similar complexity issues as the access rules from the previous paragraph (i.e. recognising the right type of vehicle) and could go against the original reason for creating such lanes, namely easier access for certain types of vehicles.

Malmö, Barcelona and Dublin ran into practical issues with this incentive: police complains that it is not feasible for them to identify which of the cars driving on the lanes are electric cars or conventional cars. A possible solution for this issue is to introduce a specific method of identification of EVs. This could be through the use of a special sticker, registration plate, or electronic tag where such is in use in the jurisdiction. Unless an electronic/camera surveillance system is in place it may also be necessary to consider how to communicate to other drivers that the vehicle is an EV to avoid the impression that the law is being flouted (source [D2.4](#)).

Road toll exemption/reduction

In the vicinity of major cities there are often tolled roads or bridges. Exempting for full electric vehicles and plug-in electric vehicles, or applying a reduced tariff, can be a significant incentive to stimulate people to choose for EV. In Norway where commuters face tolls on a daily basis this incentive is seen as significant. In Ireland there hasn't been any concession on tolls for EVs but at least one toll company has agreed to review its policy at least for a period. Given the typical driving pattern of in particular full electric vehicles (relatively short local/regional trips) special motorway tolls are usually not considered a significant incentive for EVs.

Exemption from Tolls on highways around Barcelona for EV, PHEV & HOVs

This measure is implemented as part of the Air Quality Improvement Plan (source: Generalitat de Catalunya, Departament de Territori i Sostenibilitat, Resum Situació Aplicació de les Mesures del Pla d'Actuació per la Millora de la Qualitat de l'Aire", 2013): Low-emission vehicles get a 30% discount, on 112 km of toll roads (56% of total) in 2012. In the first half of 2012, 0.29% of tolled vehicles benefitted from this discount.

Oslo: an impression by the former Head of EV Infrastructure in the City of Oslo, Marianne Mølmen

Since EVs had become almost mainstream by 2011, the politicians (mainly the Vice Mayor for Environment and Transportation) decided to continue with establishing public charging points. In 2012 another 100 should be built. In 2013 another 200 should be built, and in 2014 yet another 200 should be built. For various reasons the target wasn't met those years like it was in 2011, partially due to inadequate funding, time consuming public procurements and renewals of deals with charging station equipment and installers etc. By this time also new charging standards (type 2, 6 - 43kW AC, ChaDeMo, CCS) were pronounced to be the new preferred standard. All these factors delayed the outrol.

Would you say the successfulness is mainly related to a particular policy?

I believe it's a combination. The zero VAT and no registration fee make EVs able to compete in price at the dealership. The access to bus and taxi lane give you the possibility to save time. The free access on toll roads save you money on everyday driving. The public charging stations make people aware that there actually are places where you can charge your vehicle wherever you go. And even if you don't have toll roads or traffic congestion, the electricity is cheap while gasoline is expensive in Norway, so your average fuel costs will go down.

Did you have any problems that arose and when?

There has not been any backlash toward establishing public charging points. Even though we have converted more than 400 on-street parking spaces and reserved them for electric vehicles, I can remember only one phone call I got from a neighbour that complained that we had taken 4 parking spaces in his street and converted them to charging spaces for electric vehicles (which meant they were now unavailable to him). And usually people are much more prone to complaining to the Municipality about something rather than to praise them for anything. Often these available spaces would get filled up within a few months, as the neighbourhood became aware of the charging possibilities and possibly purchased the electric car they had been considering buying. Today the problem is rather that the charging points are occupied most of the time by EVs, because they have become too popular. Since the charging spaces are available for EVs, while you are not required to charge, there are also cases with EV drivers using the spaces only for parking, not for charging. This is not a good development.

Did the city of Oslo adapted/changed any of measures in the process?

There have been very brief conversations regarding free charging v. paid charging. The public charging stations are up until now free of charge This is because it would most likely cost more or it is too complicated to introduce a payment system, rather than have open, free and available spaces to all. On a personal note I would prefer to see the Municipality of Oslo start to charge a fee for the electricity consumed or just for access to the electricity, and have the revenue go to maintaining the existing charging stations and to establish more charging stations. Preferably the revenue could also go to establish faster charging stations that could be used by EVs in companies/freight services/taxi fleets to make the commercial vehicle fleets greener, and improve the product that is offered to the public.

4.2 Help deploy charging infrastructure

The various types of charging infrastructure require different roles and measures from local authorities. The following paragraphs begin by an explanation of the roles local authorities can take for a given type of infrastructure, followed by a table that lists measures they can take (divided in regulation/facilitation, support, and promotion roles).

4.2.1 Home charging

4.2.1.1 Roles for home charging

The various forms of home charging require different roles from local authorities:

- **Parking on private property with a private charging point.** Local authorities can provide information about charging to individuals and offer subsidies for investment in home charging points.
- **Street parking in a public place with a private charging point on private property.** In this situation, the power cable between the car and the charging point will be on the street during the charging process. This can lead to dangerous situations for pedestrians. The main role for local authorities is to provide safety regulations, which can range from an outright ban to information obligations, or extra precautionary measures.
- **Private charging point that is located on public ground.** This is called a private extended connection. The charging point is placed on public ground in the close vicinity of the house, but does not have its own connection to the grid. Instead, the charging point is connected to the electricity connection of the house ('after the electricity meter'). The costs of the charging point and its installation are for the owner, who is also responsible for the maintenance and management of the charging point. The actual maintenance and management would be delegated to the user's provider. The role of local authorities is to provide permits for this. They also provide parking spots for charging. The spot stays available for electric charging, and the charging point can also be used for public charging. The costs of this possible public charging would then be transferred through interoperability agreements, managed by the provider that takes care of operation and maintenance of the charging point.

Private charging point or common charging facilities in a private garage of a flat or apartment building. The installation may require permission of land lords, housing associations and homeowners' associations. In this case, the role of the local government could be to provide information on EV installation for the various stakeholder groups, and also to provide subsidy for investments in charging infrastructure.

4.2.1.2 Measures for home charging

	Policy Measure	Remarks
Regulate / facilitate	Take into account home-charging of electric cars and vehicles upon defining a program of requirements for new house building projects	Home charging is the simplest and cheapest, and therefore preferred way of charging of electric cars and vehicles. This should be facilitated as much as possible e.g. by maximizing the share of houses with a private parking area and by including cable ducts for the installation of home charging points in private garages of flats and apartment buildings.
	Standardize permits and optimize procedures to minimize the time between requests for placement of charging points garages of flats and apartment buildings, and actual installation	Optimizing procedures may involve establishing a central contact (office or portal) that manages the applications for a permit and all related issues (e.g. application of subsidy)
	Develop policy to regulate the use of charging points on private property to charge cars parked in the street	When charging the power cable between the car and the charging point will be on the street. This can lead to dangerous situations for pedestrians. Regulation of this situation could range from not allowing this type of charging, to prescribing of precautionary measures to prevent dangerous situations.
Support	Providing a subsidy for purchase and installation of a home charging point by individuals	A subsidy lowers the threshold for purchase and installation of a charging point and can be an additional incentive for people to choose an EV.

	Providing a subsidy for purchase and installation of charging points in private garages of flats and apartments by landlords, and housing and homeowner associations	A subsidy lowers the threshold for landlords, and housing and homeowner associations to meet requests for private or common charging facilities by occupants
Promote	Providing clear information by the municipality about options for charging of electric cars, local policy regarding the various options, and the possibilities of obtaining a grant	Various ways of dissemination of information are possible, e.g. through brochures, the municipality website and local newspapers. The information may include e.g. relevant regulations, where and how to apply for a permit and subsidy, lead time etc.

Administration and regulations for new buildings

To create EV charging options for residents that enter new apartments or houses, the EV charging should already be available to facilitate their choice to driving EV. This requires private parking space for new residents areas for which zoning & building codes should be used. This will realize the pre installation of wiring for EV sockets with new buildings. In addition, a municipality should create standardized CP approval permits to speed up these kinds of requests (flats and tenements).

Financial incentives for charging infrastructure

To support electro mobility local governments could provide a purchase subsidy for private charging points. There are several options on what incentives can be provided for private users, as can be found in the example of Amsterdam (see Table 4-8).

Different subsidies for private charging points: Amsterdam

For private CP's a maximum amount of € 500,- is available. A maximum of 50% of the costs for the purchase and placement of the CP are subsidized. The request for subsidy can be for the following:

- The purchase of the CP
- The necessary adaptations of the private meter installment
- The installment of the required cables
- The wages of personnel costs of private installment, adaption to meter, etc.
- The subscription fees of the central communication module: a technical provision for the exchange of the data with a central internet system

Table 4-8: Private charging points in Amsterdam

4.2.2 Public charging

4.2.2.1 Roles for public charging

There are basically three models for the roles of local authorities in the deployment of public charging infrastructure:

- I) **Procurement:** The local authority owns, maintains, and manages the charging stations. Market competition only plays a role in the procurement of the charging stations.
- II) **Concession:** The local authority enters into a franchise agreement with one commercial party, which is responsible for the charging stations for a concession period.
- III) **License:** The local authority delivers licenses/permits, based on a set of rules (through a general local ordinance, for example). This model maximises market competition and innovation.

Table 4-9 shows some aspects of these models. It is a translation of information available from the municipality of Leiden, the Netherlands, with some slight modifications.

Aspect	Procurement	Concession	License
Competition	Only at the procurement stage there is market competition. After that one party has the monopoly during the period of the contract.	Only at the tender stage there is market competition. After that one party has the monopoly during the period of the contract.	At all stages of the process there is market competition and new parties, also small parties, can enter the market as long they comply to the rules set by the municipality.
Costs for tender process	Costs are for municipality.	Costs are for municipality.	Not applicable.
Ownership charging points	The municipality is the owner.	The concessionaire is the owner.	Owners are market parties.
Costs for installation of charging point	Costs are for municipality.	Costs are for the market party.	Costs are for market parties.
Costs for layout of public space and enforcement	Costs are for municipality.	Costs are for municipality.	Costs are for municipality
Costs for managing and maintenance	Costs are for municipality.	Depending on the agreement either for municipality or market party. Latter can be a requirement of the tender.	Costs are for municipality.
Appearance/'the look' of the charging points	During one procurement phase there will be one type of CP. In next projects new types/models can occur. Similarity of appearance can be requested in tenders.	During the concession period there will be one type of CP. In next phases new types/models can occur. Similarity of appearance can be requested in tenders.	Different types of CP's can be placed at the public domain. For the appearance of the CP's several regulations can be enforced by the municipality, as to fit in the public 'streetscape'.
Price for charging EV	The municipality determines the price.	Granting of offer based on lowest charging price. Depending on the agreement the price for charging can be set for the period of the concession period or can be changed after interim evaluation.	Is completely regulated by the market parties. Market parties can be asked to be transparent on the electricity price that is offered to the EV driver.
Influence on charging price		The municipality can influence the charging price by providing subsidies per charging point or per used kWh.	The municipality can influence the charging price by providing subsidies per charging point or per used kWh.

Table 4-9 Charging infrastructure models

In the Netherlands, the association of municipalities made a 'model agreement' with terms and conditions on ownership, maintenance, etc. that can be used by all municipalities. This prevents 'reinventing the wheel' by the municipalities who start with EV, and creates a general national framework which makes roles and tasks clear for commercial parties who want to be active on the Dutch market. The public charging infrastructure must comply with the market model for the Netherlands, which standardized the following issues:

- The ability to take/purchase electricity from all public charging stations in the Netherlands with the charging card from your service provider.
- The ability to charge the purchase of electricity on an individual basis.

4.2.2.2 Measures for public charging

	Policy Measure	Remarks
Regulate / facilitate	Standardize permits and optimize procedures to minimize the time between requests from individuals and public charging network operators for placement of public charging points and actual installation	This facilitates the roll out of an infrastructure network, and speeds up requests from companies. Standardize licenses as to speed up the process.
	Identify the different situation where public charging is needed or can play a role, and develop clear policy and guidelines for these situations.	Public charging can be related to shopping areas and places of interest, in the street and on public parking lots, but also to individuals without a private parking area. People may want to have a charging point in the close vicinity of their house, in the public space, but connected to the electrical connection of their home. Municipalities need to have an answer ready for the various possibilities; allow or not allow, and what are the conditions that need to be met.
	Standardize charging signs and road making for EV	This makes clear for EV users where to charge, and what the rules and allowances are.
	Include interoperability requirements in licenses for operators of public charging points, and in the terms of reference of tenders for concessions for installation and operation of public charging networks	Interoperability of charging points increases the accessibility of the charging network. This reduces uncertainty about availability of charging points for customers, and about which systems to develop for charging equipment suppliers. This can contribute to a faster reduction of costs of charging equipment, faster development of public acceptance, faster uptake of electric cars, and better utilization of the public charging points.
	Sharing of experiences and collaboration with local, regional and national public and private stakeholders with the aim to improve and harmonize policymaking and to ensure that gaps and bottlenecks in policy and regulations are addressed at the appropriate policy level	Sharing of experiences and collaboration can greatly enhance policymaking and improve market development by reducing lack of clarity, uncertainty, and fragmentation
Support	Building a first network of public charging points by the municipality, whereby the municipality takes the role of operator of the charging points	The municipality organizes a tender for a large number of charging points, which are placed in strategic locations and at the request of companies and individuals. Municipalities could try to develop initiatives jointly with surrounding municipalities in trying to reduce costs and improve coherent market development
	Organise tenders for concessions for public charging infrastructure, giving an operator of charging infrastructure a license for providing and operating a certain amount of public charging points in a specific area	Tenders for concessions can be used to create certain economy of scale, thus lowering the cost which supports the business case for public charging. Additional financial support can be arranged as part of a concessions to create favourable conditions for an acceptable business case
	Provide subsidy for operators of a network of charging points (EVSE operators) to support the business case	Subsidy, or financial support, can take various forms, like an investment subsidy, or a contribution per kWh delivered, with or without a cap on the total support.
	Reserve prime parking space for public charging points at traffic	These measures could stimulate people to make more use of the charging points (better utilization),

	hotspots and/or allow free parking or reduced parking tariffs for electric cars at parking places equipped with charging points.	thus improving the business case. It could be considered, to apply, if possible, free parking or reduced tariffs only if cars are actually charging
Promote	Join electromobility demonstration and market development projects as part of which also public charging points are installed	Joining projects offers a way to build some infrastructure, to gain experience which helps to develop policy for a larger rollout, and is a way to show commitment to electromobility. This may attract the attention of interested private e-mobility stakeholders that are necessary for development and realization of follow-up initiatives and further rollout.
	Providing clear information by the municipality about options for charging of electric cars, local policy regarding the various options, who qualifies for a public charging point, and how to apply for such a charging point	Various ways of dissemination of information are possible, e.g. through brochures, the municipality website and local newspapers. The information may include e.g. relevant regulations, where and how to apply for a public charging point, lead time etc.

Administration and regulations

This relates to the amendment of licensing, as possible hurdle for public charging. There are four ways to speed up the process of administration for public charging:

- Provide fast licensing process for EVSE operators to connect to grid.
- Provide approval/ permit for citizen request private CP on public ground (CP on street in front of house, or in public space)
- Provide fast licensing process for EVSE operators to install CP in public area.
- Use zoning & building codes – require pre installation of wiring for EV sockets with new buildings

Copenhagen's local regulatory hurdle and regional cooperation

An example of a regulatory hurdle comes from Copenhagen: As the public land of the city is owned by different administrations, the departments have to rent each other's EV parking space. The 7 administrations (of the City of Copenhagen) may have to rent parking spaces from one another or rent spaces from an external provider, and licenses and permits must be applied for this (source [D1.6](#)). The procedure of requesting and placing a CP is slow because of the different departments owning parking spaces. The problem is that the CPs are placed at parking spaces on public land and there is no way to reserve this specific space for the City of Copenhagen's EVs.

The city is working with other Danish municipalities and Swedish municipalities in the Oresund Region to develop a common strategy for infrastructure for EVs. One example is the Interreg-funded E-mission project, which also entails the promotion of EVs. With this strategy a municipality can establish a first public municipality CP network infrastructure. It is an example of how a cooperation with commercial/private companies and neighbouring municipalities can work to create a CP network infrastructure

Local incentives for charging infrastructure

A commonly used incentive is the reservation of EV parking spaces in public places, preferably 'on sight'. Visibility helps with making people more familiar with EV. And it's attractive for EV drivers to use them if they are located at a busy area, seeing they have a bigger chance of finding a parking spot. Many cities allow free parking for e-vehicles. Examples include Barcelona, Madrid (from 2009 on), Malaga (from 2013 on), Malmö (from 2007 on), Rome (from 2008 on), and Milan. In addition to this, municipalities can introduce requirements for public parking spots to be available for public charging. In Stockholm, in addition to the development of a network of charging points, new parking facilities are going to be equipped with charging units.

Barcelona also requires that new public car parks reserve 2% of their spots for electric vehicles and that they plan for the future inclusion of charging points in the remaining parking spots. The Catalan government is also trying to strike deals with existing parking lot owners so that 1.5% of them include an electric charging point.

4.2.3 Employer/company charging

4.2.3.1 Roles for employer/company charging

Local authorities have no direct role in employer/company charging, as companies will manage this on their own. Support frameworks, such as additional tax breaks for company plans on electric vehicles, are in the national authorities' domain. There are, however, a number of measures local authorities can take to help.

4.2.3.2 Measures for employer/company charging

	Policy Measure	Remarks
Regulate/-facilitate	Active procurement policy that requires EVs to be integrated in supplier's fleets.	Pushes companies to install charging equipment on their premises, which can then be offered to employees.
Support	Subsidies for purchase and installation of charging equipment for companies	Decreases the threshold for companies to provide charging services to their employees
Promote	Build-up infrastructure at government buildings	Sets a good example
	Set up local/regional electromobility forum or platform, or organize network meetings to connect interested companies	Implementation of electromobility requires close collaboration of involved stakeholders. Thematic events, platforms and partnerships are valuable instruments for connecting stakeholders, exchanging experiences, and for organizing and structuring the development
	Information provision: municipality as 'knowledge broker about charging for companies	Knowledge broker for companies: provide information on benefits, needed actions, costs, etc. and bring interested companies together. Advise SME's about viability of EV and charging infrastructure investments

Local subsidies for employers and companies

Municipalities can provide subsidies for companies by discounts for CP purchase taxes, or road and toll tax reduction for company cars. In general many tax reduction benefits are offered by national governments. Fleets and company cars charge at company sites which can have public or private CPs, or at public CPs located throughout the city. There are two ways of looking at companies driving EVs. There are cars that are solely used for the work that has to be done, so the cars are used just for company purposes (garbage, cleaners, etc.) the benefits of the EV subsidies are in this case for the company. The local incentives are then focused on benefits for this company, and the city profits by cleaner healthier transport in the city. Reserving parking spots for e-fleets is a prerequisite to stimulate companies to electrify their fleet. Providing public (fast) charging spots for distribution is another good incentive.

The second 'angle' for companies driving EV is by looking at 'e-commuters', the commuters who can use their EV to drive to work as well. They will charge mainly at home, or in parking lots of flats where charging is made possible. So employers who drive an EV will use them outside their work, and use it for private purposes. These 'employer e-drivers' also charge at POI's, which mainly are public CP's. All in all municipalities can stimulate the types of charging related to the e-commuter group in several ways; e.g., by stimulating companies to purchase and charge electric, or by providing subsidies for employers home charging device for example. Together with stimulating a public CP network municipalities can aid in providing the necessary conditions to make EV attractive for e-commuters.

Built up infrastructure

Installing charging points at municipalities ground for charging one's own fleet, and at public ground, can help. The setting of quota of parking spaces for EV and charging stations at offices is done in France

Help with joint procurement

An example is in the province of Catalonia, where the Generalitat de Catalunya has a plan for realizing about 90,000 charging points by 2015, 1,500 of which are going to be public. The plan calls for providing credit to EV owners to set up their charging point, and subsidizing up to 30% of the initial investment to the private companies willing to provide the service to the wider public.

4.2.4 Car-sharing charging

4.2.4.1 Roles for car-sharing charging

Local authorities have a limited role in car-sharing charging, as companies will manage this on their own.

They can actively seek companies who want to start these initiatives in the European cities, provide city wide permits for parking and charging infrastructure, or create a central information point at the municipality. They 'hold the key' in providing access to the public areas that e-car sharing initiatives need to make use of. This is because stations are often built on public ground belonging to local authorities.

There are however cases where local authorities manage car-sharing schemes directly.

4.2.4.2 Measures for car-sharing charging

	Policy Measure	Remarks
Regulate / facilitate	Requirements regarding deployment of electric cars in car sharing projects	Municipalities may favour car sharing initiatives in view of sustainable mobility policy. Car sharing, however, does not involve electric cars by definition!
	Provide/reserve parking spots for e-car sharing projects	A condition for providing parking places for e-car sharing projects could be that part of the places equipped with charging points are made accessible for general public charging.
	Provide city wide parking license for e-car sharing fleet	Being able to park everywhere increases the flexibility of the e-car sharing scheme and may be a good incentive for attracting customers
Support	Subsidies for investment in charging infrastructure	Support can be organized in multiple ways: support for purchase and installation of charging equipment, but also a €/ct/kWh contribution
Promote	Join/start e-car sharing initiatives	
	Help with joint procurement of charging infrastructure	Procurement of specific charging points for the e-car sharing scheme could be combined with other procurement initiatives, thus reducing the overall cost.
	Set up local/regional electromobility forum or platform, or organize network meetings to connect interested companies	Implementation of electromobility requires close collaboration of involved stakeholders. Thematic events, platforms and partnerships are valuable instruments for connecting stakeholders, exchanging experiences, and for organizing and structuring the development
	Municipality as 'knowledge broker'	Provide information, e.g. information on mobility movements in the city

Join/start car-sharing initiatives

Administrations can promote the new launch of EV-sharing initiatives, both alone and in partnership with private entities with the goal of creating the initial "critical mass" considered the necessary condition for the diffusion of electromobility on a large scale.

Sharing programs within which electric vehicles, alone or together with conventional ones, find space, are a reality in many cities. Some examples:

- In Amsterdam, for instance, the all-electric car sharing platform Car2Go, was launched in 2011¹⁴, with 300 vehicles that customers can leave at any station in the network (O'Connor, n.d.).
- Barcelona, along with a private consortium is defining a system of car sharing, using the first Sharing with electric vehicles based on "Mobility on Demand" concept.
- In Paris, EV is essentially synonymous with Autolib', the largest electric car sharing system of its kind (Le Figaro, 2013). Conceived as a parallel service to the existing Velib' bike sharing system, it currently uses 4,000 charging points in Paris and 3,000 smartphone-reservable electric cars to serve up to 10,000 rides per day. Alone, it makes up for around a third of all French all-electric EVs (IEA, 2013).

¹⁴ O'Connor MC. *Car2go: a case study for electric carsharing. EV Update*.
[<http://analysis.evupdate.com/commercialization-evs/car2go-case-study-electric-carsharing>]

- In London, the Bolloré Group, developers of a small electric car (Bluecar), is expected to supply the vehicles for an upcoming London version of the Autolib', the all-electric car sharing system currently existing in Paris.
- In Stuttgart, the EV car sharing system Car2Go is active since 2012, with a fleet of 500 vehicles. The users of the service are about 12,500.

Place public charging infrastructure that can be used by e-car sharing fleet

In Netherlands, for example, local initiatives aimed at creating favourable conditions for the promotion of electromobility, owned or shared, through the development of a charging network, both on private and public property, is supported by the national government that is very active in this sense. Amsterdam has one of the highest rates of charging stations per capita (OECD/IEA, 2012) in the world, with over 350 public stations for around 780,000 residents in 2012.

Several cities, among which Rotterdam, Hamburg, Stockholm, have programs to create or improve their charging network installing charging stations at strategic locations in strategic points of the city centres and in public parking areas.

Rome's plans on e-car sharing

More over Rome City Council already approved in January 2014 the Public Tender to identify private subjects for new Free-flow Car Sharing service in the city Rome, defining the minimum standards that expects specific incentives for services made with e-vehicles like the free license and a reduced operating perimeter (35 skm instead 70 skm). An e-vehicle operator was found compliant with the tender and was selected by the Municipality. Its initial service will put up to 50 small e-vehicles (Renault Twizy) should be available for public service since beginning of 2015.

E-car sharing in Amsterdam

- The city of Amsterdam has provided city-wide parking licenses for Car2go. The cars can be parked everywhere in the city, without the necessity of returning them to a fixed rental station. Even recharging of the electric vehicles is not mandatory after each rental, because the range of the smart-for-two electric drive is eight to ten times higher than the average operating distance of a car2go rental - The cars make use of the already existing charging infrastructure.
- The city's program office 'air quality' played a facilitating role, especially by obtaining the city-wide parking license. Users pay a fixed price, depending on the duration of the rental.

Paris e-car sharing Autolib' user data:

More than 37,000 people have already joined the system, and Autolib' enrolls another 1,200 every week. The Bluecars have been rented 550,000 times in 10 months, covering more than 3 million miles (5 million km) in total. They are rented 4,000 to 5,000 times a week, with highest usage on the weekends.

And who is renting them? It seems that users were predominantly men at first, but more women are catching on. Most users are 25 to 39 years old, and 70 percent of them do not own a car.



4.3 Outreach

4.3.1 Roles

Municipality as ‘knowledge broker’ about charging

Municipalities can offer information about best practices in charging, as well as general information about the benefits and drawbacks of electric vehicles, so that private citizens and companies can make informed decisions in their vehicle purchases. They can also help inexperienced companies with their joint procurement,

Organizing introduction or network meetings on this can bring interested companies together who are willing to work together. In The Netherlands for example there are initiatives of municipalities that advise mainly SME's about the viability of investments in EVs. It is also possible to show examples of other companies and their experiences to create enthusiasm and provide practical and suitable benefits for companies and employers.

Local/regional electromobility forum or platform

The successful implementation of a new technology such as electromobility requires close collaboration of involved public and private stakeholders. Thematic events, platforms and partnerships are good instruments to inform stakeholders about plans and policies, to bring stakeholders together with shared interest and ambitions, to exchange experiences and monitor progress, and to identify and discuss barriers and possible solutions. Local/regional governments could take the initiative for organizing events and setting up a platform with regular meetings, but may also participate in and support private initiatives.

Central communication point

To stimulate or even start the local uptake of EV, practice has proven that centralized contact points within a municipality can play a large facilitating role. Amsterdam is a good example of why a central communication point works. The responsible department/group was specially formed for EV in the city. All planning, communication and responsibilities are grouped here. This makes it easy for colleagues from departments to find and organize the right persons and activities. The additional benefits are that for citizens it is clear where they have to go, and this also goes for the interested organizations interested in implementing or requesting charging infrastructure.

An example of this is the Car2Go e-car sharing project in the city of Amsterdam. The car company in question looked for a city to deploy their EV cars, and found Amsterdam because the central contact point, with whom they could discuss and ask all matters and activities. This project was realized relatively quick, and turned out successful: As of October 2014, 1,840,000 kilowatt hours had been transferred using charging points in the public network. This is equivalent to 10 million emission-free kilometres¹⁵.

An example of why separate responsibilities can hamper EV comes from Malmö: there is an environmental department that focusses on strategic sustainable topics and realizations, and a traffic and infrastructure department, responsible for the building activities. If the environmental department misses a meeting for a certain project, they do not have the opportunity to integrate their suggestions or request for e.g., placing charging points. The responsibilities of the planning department do not include the environmental friendly strategy and can cause opportunities for EV to be missed if environmental department is not invited/or aware of certain building or traffic constructions.

A best practice that entailed a solution for not having the possibility of creating a single contact point/department comes from Lisbon. Instead of a single contact point a cooperation of members from different departments meeting regularly on EV can work as well. In Lisbon the agency Lisboa Innova was charged with implementation of the infrastructure strategy. In order to achieve the targets and deadlines a multi stakeholder working group was created, including water, utilities, parking companies and the city hall. The group met every week at the same time, to review progress, identify sites, solve problems, share information, and keep the process on track.

4.3.1 Actions

Providing information

The lack of information is often considered as one of the main obstacles to the diffusion of the electromobility. Some measures can help to fill this gap. Provide e.g., info on mobility movements in the city. Through the already mentioned platform LIVE, Barcelona has partnered with Chargelocator to enable users of its mobile app to find the cheapest/nearest available charging stations in the city. Users can also get general information and data about vehicles' charging history and billing.

Within the **EV positive factors dissemination**, special attention is drawn to the municipalities and cities as these are essential for the rollout of EV regarding the associated policy making, regulatory needs and incentives. The Public Administration should inform the potential users about the following aspects¹⁶:

- Advantages of the EVs in terms of environmental performance. EVs have improved environmental performance, manifested in reduced CO₂ emissions and reduced local emissions, compared to the ICE car.
- Available technologies.
- Total cost of ownership. Currently the purchase price of an EV is significantly higher than an ICE car but if you add maintenance costs etc. the total cost of ownership might be at least comparable or lower. Currently incentives and policies of the public administration related to the EV.
- Public and private charging infrastructure.
- Doubts and responses about the related problems such as the recharge in a homeowners association, what to do when you are left with no battery on the street, the repairs, the assurance, etc.
- How to drive efficiently, optimize its use and when and how to recharge the vehicle.

Test drive campaigns such as pilot demos and trial driving allow people to test an EV for a period of time so drivers can tell others about their experiences. Moreover, a possible way to reduce costs for

¹⁵ <http://www.iamsterdam.com/en/media-centre/city-hall/dossier-electric-transport/electric-transport-facts-figures>

¹⁶ Green eMotion report [D2.4](#),: The key features of successful implementation of Electromobility

the user could be for private operators to organize EV rentals in cooperation with cities. Other kind of test drives could be the implementation of car-sharing initiatives and the creation of electric driving schools to familiarize people with this kind of vehicles¹⁷. An extension of such campaigns would be longer-term tests, where users have an electric car at their disposal for several months, so that they can get a feel not only for the driving experience, which is usually seen as a positive, but also managing charges. A detailed description of such a scheme is given in [D9.1, where participants drove an EV for 3 months](#). Local authorities can draw on experiences from various cities in Europe to optimise their test drive efforts. They can also combine their efforts with other local authorities to reduce costs and efforts.

Making EV visible and familiar

There are several benefits of good for local visibility of EV. Dutch research¹⁸ has shown that three factors contribute to the local uptake of EV, of which one is the heightened visibility of CP's and EV. This causes people to get used to the street view of the infrastructure, and makes it more familiar to them.

With the electrification of its own car park, the municipality can create this needed visibility. With demanding electrification of fleets active in the city the visibility gets higher as well. Copenhagen is an example of a city that takes this seriously; they hired a communication company to think about how and where the logo's on the e-cars and CP's should look like. In the Netherlands a standardized logo is used by all levels of government so it is easily recognized.



Dissemination campaigns, public events and promotional activities should be frequently organized. As an example, different actions such as EV days, EV rallies and races, demonstrations of infrastructures and international congresses have taken place under the Green eMotion project. These campaigns need to show the community the benefits and importance of electric vehicles.

¹⁷ <http://www.electricdrivingschools.co.uk/>

¹⁸ http://www.appm.nl/downloads/289_Onderzoek%20effectiviteit%20gemeentelijke%20EV-beleidsmaatregelen.pdf , Boonen, A. (2012)

Information and experiences

Joining EV projects or roll outs can be beneficial for local governments because it creates experience and knowledge about EV and its infrastructure. This can give early insights about future choices and investments concerning the roll out of EV in a municipality. A second reason for joining is that it can become more appealing for possible partners to join. It can create trust, certainty and professionalism that makes it easier for others to invest. A third reason is the heightened local visibility of EV. When a municipality engages in a project or roll out and communicates this to its citizens, it can add to a more trusted and recognized image for EV and public charging. A municipality can also help find viable cooperation or business models for local companies at hot spot parking place.

Placing information on EV on the municipality website can help citizens answer their questions and/or know where to go for what services.

Physical and virtual initiatives have been launched to promote electromobility in cities. Information points and websites should integrate all these strategies and offer different communication local plans to show public promotions and create a brand image.

5 Toolbox: national policy measures

Structure of this chapter.

Chapter 5 is written in a 'pyramid structure', implying that each paragraph starts with a table of key recommendations on the topic, followed by a supportive explanation, discussion, highlights and examples.

5.1 Summary of key recommendations for national policy makers

As a summary at the start of this chapter the table below provides an overview of the key recommendations for national policymakers to foster electromobility. These recommendations follow from the rest of Chapter 5 that describes in separate paragraphs the various roles and activities of the national government to foster the roll-out of electromobility.

Summary of recommendations for national policy makers

- **Develop a national vision on sustainable mobility and the transition trajectory associated**
- **Indicate how electromobility fits within this wider mobility transition.**
- **Set clear targets over time for vehicles and charging poles, by back casting from the longer term goal.**
- **Develop and implement an action plan, to reach the goal over time, specifically addressing:**
 - **Regulation and coordination issues to enable electromobility**
 - **Setting up platforms to engage stakeholders and to synchronize their activities.**
 - **Promotion and campaigning planning**
 - **Support vehicle market uptake by bridging the financial gap with the conventional alternative**
 - **Support the roll-out of charging infrastructure and enable competitive charging costs**
 - **Monitor and evaluate progress and adapt policies if necessary**
- **Actively involve stakeholders in the entire trajectory of: (1) vision development (why); (2) target setting (what); (3) the development of an action plan (how).**
- **Set regulations and laws that:**
 - **Provide clarity over safety regulations**
 - **Facilitate and enforce standards on hardware and software**
 - **Require readiness for installation of charging points for new buildings**

5.2 Introduction

National governments play an important role in fostering the roll-out of electromobility. National policies and activities need to start with the development of a national vision on clean, efficient and low-carbon mobility, including electromobility as one of the key elements. Next, targets for the roll-out of vehicles and charging poles over time have to be defined. Finally, these targets need to be supported with an action plan, to foster electromobility uptake in multiple ways. Such a national action plan has to provide regulatory frameworks as well as fiscal incentives to foster the roll-out of both

electric vehicles and charging facilities. Obviously, progress in rollout of vehicles and charging points needs to be monitored to adapt strategies if necessary. Moreover the national government needs to take an inspiring role as ambassador for electromobility.

The key roles for the national government that can be distinguished include:

- ***Vision development (paragraph 5.3)***

National policies and activities need to start with the development of a national vision on clean, efficient and low-carbon mobility, including electromobility as one of the key elements.

- ***Target setting (paragraph 5.4)***

Next, targets for the roll-out of vehicles and charging poles over time have to be defined.

- ***Developing an action plan (paragraph 5.5)***

As a next step, the targets for rolling out vehicles and charging poles over time need to be supported with an action plan involving the support to roll-out vehicles as well as charging infrastructure. The action plan and supporting actions associated cover most of this chapter and are divided in separate sections on vehicle support (§ 5.5.4) and infrastructure support (§ 5.6).

5.3 Vision development

⇒ **Recommendations on developing a national mobility vision:**

- **Indicate and describe the need for (why) and goals (what) of a national vision on mobility and fuels, especially regarding national ambitions for CO₂ reduction, air quality improvement and increased oil independency.**
- **Indicate how electromobility fits within the wider transition path to a future sustainable transport system.**
- **Actively involve stakeholders in the entire trajectory of: (1) vision development (why); (2) target setting (what); (3) the development of an action plan (how).**

National policies and activities need to start with the development of a national vision on clean, efficient and low-carbon mobility, including electromobility as one of the key elements. Next, targets for the roll-out of vehicles and charging poles over time have to be defined. Finally, these targets need to be supported with an action plan, to foster electromobility uptake.

Developing a vision on future mobility and fuels is a crucial step in the large scale roll-out of electromobility. This process requires the general approach of a planning cycle, that includes: creating a vision, planning the actions, implementations, and monitoring and evaluation the first phase should address and answer the questions why a country would stimulate electromobility and what it wants to achieve. Naturally, the roll-out of electromobility is part of the transition to a sustainable transport system with the aim to reduce greenhouse gas emissions and improve the quality of life in cities. Therefore the vision for electromobility is part of broader vision, that usually described in a strategy document.

The development of a national vision on sustainable transport, is usually driven by the ambition to: (1) reduce CO₂ emissions; (2) improve air quality; and (3) be less dependable on imported fossil fuels. The various EU Member States will develop their own visions on mobility and fuels, taking into account the specific regional conditions. Nevertheless, the visions on mobility and fuels of the different member state will have many elements in common as the EC calls for a European wide 60% reduction in CO₂ emissions in transport by 2050.

Reaching this target implies that national governments need to take their share in this. In order for the transport sector to reach its overall 60% CO₂ reduction target, the light-duty sector (i.e. cars and vans) will need to be virtually emissions-free by 2050. Aviation and long haul trucking cannot easily use

electricity or hydrogen and will therefore require the vast majority of sustainable biofuels, and in addition still use some fossil fuels. This implies that it is likely that sustainable biofuels won't be available on the longer term option for cars and vans. Consequently cars and vans inevitably need to switch to other low CO₂ fuels, notably (renewable) electricity and hydrogen. This means that all new cars and vans sold from 2035 on need to be either EVs or FCEVs (as it will take about 15 years from then to phase-out the vehicles with internal combustion engines). In addition PHEVs are an option given that they need to predominantly use electricity, implying that gasoline or diesel use will be limited to exceptional journeys such as holiday travel.

Several member states have already developed extensive national visions on mobility and fuels including electromobility as one of the key solutions. Key examples include:

- The “vision on sustainable fuels for transport”¹⁹ by the Netherlands.
- The Mobility and Fuels Strategy of the German Government²⁰
- “Making the Connection - The Plug-In Vehicle Infrastructure Strategy” (2011) of the UK²¹.

5.4 Setting targets for vehicles and charging points numbers

⇒ Recommendation on setting targets:

- **Set clear targets over time for both vehicle numbers and charging poles, by back casting from the longer term (2035) targets for zero emission vehicles as identified in the national mobility and fuels visions.**
- **Also consider projected growth in future transport volumes.**
- **Actively involve stakeholders in the entire trajectory of: (1) vision development (why); (2) target setting (what); (3) the development of an action plan (how).**

After the development of a national vision on clean, efficient and low-carbon mobility, including electromobility as one of the key elements it is crucial to set clear targets for the roll-out over time of vehicles and charging poles. As explained above, reaching 60% CO₂ reduction in transport by 2050 implies that all new cars and vans sold from 2035 on need to be either (PH)EVs or FCEVs (as it will take about 15 years from then to phase-out the vehicles with internal combustion engines). In order to reach this challenging 2035 target it is inevitable to define clear intermediate targets for both vehicle numbers and charging poles. These intermediate targets follow from back casting from the longer term (2035) targets for zero emission vehicles as identified in the national mobility and fuels visions. Setting these targets also requires to consider the projected growth in future transport volumes.

¹⁹ www.energieakkoordser.nl/~media/23cf7dd343ec4d7f86be7cba33ad5f36.ashx

²⁰ www.bmvi.de/SharedDocs/EN/Anlagen/UI-MKS/mfs-strategy-final-en.pdf?__blob=publicationFile

²¹ www.gov.uk/government/uploads/system/uploads/attachment_data/file/3986/plug-in-vehicle-infrastructure-strategy.pdf

5.5 Action plan

⇒ General recommendations on making an action plan:

- **Develop and implement an action plan, to reach the goal over time, specifically addressing:**
 - **Regulation and coordination issues to enable electromobility**
 - **Setting up platforms to engage stakeholders and to synchronize their activities.**
 - **Promotion and campaigning planning**
 - **Support vehicle market uptake by bridging the financial gap with the conventional alternative**
 - **Support the roll-out of charging infrastructure and enable competitive charging costs**
 - **Monitor and evaluate progress and adapt policies if necessary**
- **Actively involve stakeholders in the entire trajectory of: (1) vision development (why); (2) target setting (what); (3) the development of an action plan (how).**

The above general recommendations follow from the evaluation of the portfolio of roles and related activities and policies for the national government to foster electromobility roll-out. These activities and policies are described and explained in more detail in the next sections.

After having developed a vision and having set targets, the next step is to develop and implement an action plan, to foster electromobility uptake in multiple ways. Action plans of different member states will differ, accounting for the specific regional situation. Nevertheless, the various national action plans in the member states will involve the same key roles for the national government, notably:

- Regulation and coordination (§ 5.5.1)
- Engagement and synchronization of stakeholders by setting up platforms (§ 5.5.2).
- Promotion and campaigning (§ 5.5.3)
- Supporting the roll-out of vehicles (§ 5.5.4)
- Supporting the roll-out of charging infrastructure (§ 5.6)
- Monitoring and evaluation (§ 5.6.4)

Following the above categorisation, the next sections provide in separate paragraphs concrete policy measures, examples and recommendations on how to develop and implement an action plan.

5.5.1 Regulation and coordination

⇒ Recommendations on regulation and coordination

- **Create clarity over regulations for installation of charging points**
- **Facilitate and enforce standards on hardware and software**

By creating or adapting national laws and regulations the national government can remove barriers, set standards, provide a national policy framework supporting local initiatives and so facilitate the deployment of electromobility.

Regulation mostly involves issues related to enabling and regulating vehicle charging. Key examples include the need for:

- Create clarity over regulations for installation of charging points
- Facilitate and enforce standards on hardware and software
- Allow tariffs that enable uptake of smart charging
- Laws that force fuel stations to install fast charging stations

5.5.2 Engagement and synchronization of stakeholders

Recommendations on engagement and synchronization by setting up platforms:

- **Engage all relevant stakeholders allowing to: (1) consider and balance the various interests and needs; (2) make use of their experiences and (3) create awareness and support and strengthen capabilities.**

This role involves engaging key stakeholders as well as the synchronization of the plans and actions of the national ministries involved in electromobility, especially through establishing interdepartmental teams and public-private platforms.

When creating a view on the future, and a strategy and action plan on how to get there it is important to engage relevant stakeholders. A way of doing this is by creating a national platform. By inviting all relevant stakeholders one can take into account the different interest and needs, make use of their experiences and creating awareness and create support. This approach ensures a coordinated development of policies and implementation of electromobility. Organisations involved can be representatives of fuel producers, vehicle manufacturers, energy companies, transport companies and shipping companies, community umbrella groups and NGOs, knowledge centres and local, regional and national government entities.

The deployment of electromobility is complex and many parties are involved. Therefore it is important to coordinate actions and have platforms that can discuss progress, identify bottlenecks and jointly find solutions for those. There exist two kinds of platforms: (I) the inter-governmental and (II) the national public-private platform.

I) Inter-governmental platforms

An inter-governmental platform or taskforce should coordinate and prepare national e-mobility related policy. For example, in the Netherlands the taskforce, the POWER-team, is coordinating actions between the Ministry of Economic Affairs, the Ministry of Infrastructure and the Environment and the Ministry of Finance. In Germany this is done by the “Gemeinsame Geschäftsstelle Elektromobilität der Bundesregierung” (GGEMO) a joint agency of the departments of Transport, Building and Urban Development, and Economy and Technology, that supports the federal government and the National Platform for Electromobility in implementing and developing the National Development Plan for Electromobility.

II) A national public-private platforms

A national public-private platforms consists mostly of stakeholders that are involved in the real implementation: take decisions, make investments and carry out projects. In the Netherlands the Formula E-team, includes representatives from industry, research institutions and government. The Formula E-team discusses progress and provides advice to the government and other stakeholders with the aim to stimulate policies for clean vehicles and the development of a basic network of charging stations. Next to that its aim is to fulfil an ambassador's role and inspiring parties to work together on creative solutions to problems that arise (<http://www.nederlandelektrisch.nl/thema/formule-e-team/>).

UK – Office for low emissions vehicles (OLEV) an inter-governmental platform

OLEV currently comprises people and funding from the Departments for Transport (DfT), Business, Innovation and Skills (BIS), and Energy and Climate Change (DECC).

The core purpose is to support the early market for electric and other ultralow emission vehicles (ULEVs).

OLEV is responsible for:

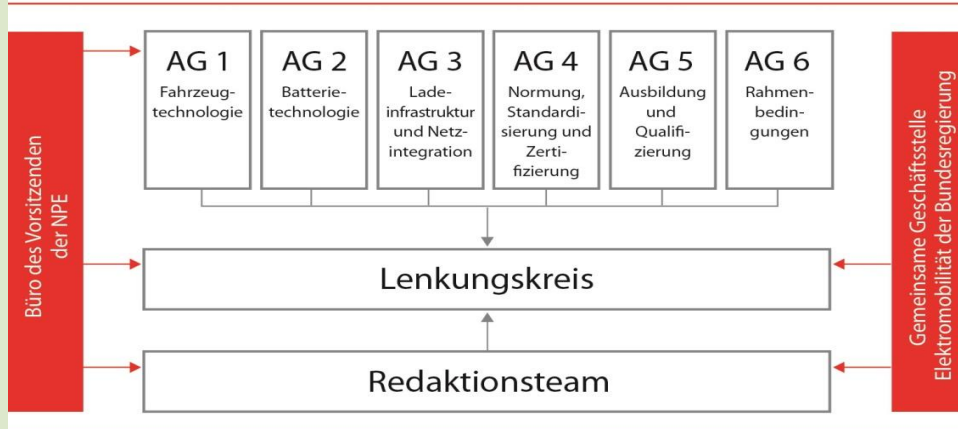
- grants to reduce the upfront cost of new ULEVs
- a programme of research through the Technology Strategy Board and supporting wider green growth opportunities
- encouraging UK businesses to seize commercial opportunities in the ULEV sector
- raising awareness, developing and strengthen the capability of ULEV manufacturing, demonstration and the associated UK supply chain
- a nationwide recharging infrastructure strategy, including funding to eight pilot areas under the Plugged-in Places programme
- contributing to the development of new carbon dioxide emissions standards

Source: <https://www.gov.uk/government/organisations/office-for-low-emission-vehicles>

NPE

The National Electric Mobility Platform (NPE) coordinates the development of electromobility in Germany. The NPE was founded at the initiative of the Federal Government to organize the creation of a lead market in the areas of infrastructure, products, standardization and training. It brings together 150 representatives from industry, research, government, trade unions and associations for a strategic dialogue. Together they explore the economic, social and environmental potential of electromobility and give recommendations to policy policymakers and the market.

The NPE consist of 6 working groups, a steering group and receives government support from GGEMO . The GGEMO (Gemeinsame Geschäftsstelle Elektromobilität der Bundesregierung) is a cross governmental office of the federal ministry for Transport, Building and Urban Development and the federal ministry of Economics and Technology.



The NPE identifies success topics for research and development at the crossing borders of different sectors and disciplines. It also evaluates national and international activities in the field of electromobility. Findings and recommendations are reported and continuously monitored. Necessary steps are defined in roadmaps on issues such as standardization, education and skills. Studies such as the market run-up of electric vehicles form the scientific basis for these roadmaps

In the future, the NPE will strengthen the sector and interdisciplinary cooperation for electromobility. Source: <http://nationale-plattform-elektromobilitaet.de>

5.5.3 Promotion and campaigning

⇒ Recommendations on promotion and campaigning

- **Education and awareness is essential for both local authorities and the public, focusing on:**
 - **Explaining societal benefits of electromobility**
 - **Practical information, notably for EV drivers on charging point locations.**

National governments can inform and promote. Taking up their role as an inspiring role ambassador, is another way for the national government to foster electromobility roll-out. Promotion of electromobility includes providing general information on electric driving and charging to inhabitants. In addition national governments can provide guidelines and practical information on how to start with electromobility for specific target groups such as municipalities, companies and housing associations.

National policy makers have an important role in informing and stimulating electromobility by providing information for home charging is important. This role involves for example setting up of widespread information or campaigns on possibilities of where and how to request CPs and/or linked subsidies.

Another example is the provision of information brochures for housing associations on CP installation and process. As illustrated by the Netherlands example, the national government is involved in the promotion of smart charging.

As the Green eMotion report D9.1 summarises in the annex on the Irish demonstration region: A comprehensive public education and awareness is essential. The communication should educate the relevant (local) authorities and the public about the societal benefits of electromobility. This general awareness provides the backdrop against which awareness campaigns on the benefits to the individual are developed. There is also a need for practical information for EV drivers on charging point locations. In addition there is a need for national governments to provide regulations to service providers.

Activities, campaigns and information centres

The “E-Mobility NSR” project Work Package 6: involves the setting up of a Transnational Electricity Mobility Information Centres (EMIC) <Add better reference / weblink>. The objective of this project is to identify and map the main public and private information gaps and awareness needs. The new E-Mobility Information Centre (EMIC) will address these issues and will help ensuring that the final EMIC recommendations have a true transnational relevance for the North Sea Region. Within EMIC four main information categories are distinguished:

- Information related to driving and charging an electric vehicle
- Environmental information
- Information about E-Mobility options in the market
- Economical information

5.5.4 Supporting the roll-out of vehicles

⇒ **Key recommendations for supporting vehicle roll-out**

- **Lower EV purchase prices by tax reductions or subsidies, to be complete with the conventional alternative**
- **Lowering vehicle running costs by road tax reductions and provision of competitively priced charging facilities.**
- **Set up and support electromobility demonstration projects, including the government as launching customer.**
- **Privilege electromobility on national roads, e.g. by providing toll road exemptions or access to specific lanes.**

These key recommendations follow from the rest of this paragraph that describes, categorised in different topics, the policy options of the national government to incentivize the uptake of electric vehicles. Note that supporting infrastructure roll-out is addressed separately in paragraph 5.6.

Rationale for governmental support of electromobility roll-out

Electric mobility is one of the key options to reduce transport CO₂ emissions, to improve air quality and to lower dependency on oil imports. However, these large benefits for the society will not reduce the initially high costs for rolling-out electromobility. Costs will initially be high because of: (1) the limited economies of scale in vehicle production; and (2) underutilization of charging infrastructure installed. To break this “split incentive” governments at all administrative levels (EU, national, local) have to bridge the gap between the huge future benefits for society and the initial insufficiently competitive business case for electromobility (compared to the conventional alternative). For business cases see also [D9.4](#), [D9.6](#).

National governments play a crucial role in stimulating the uptake of both private and company-owned electric vehicles. This section lists relevant national measures to foster that uptake. The number of

overviews of policy incentives is increasing. Nevertheless, at the same time there is a lack of information about the effectiveness of the various measures taken by national authorities. The two main reasons for this lack of information on effectiveness are the recent character of most measures, and the fact that measures are mostly combined with other measures, which makes them difficult to evaluate on their own.

The support by the national governments to foster electromobility involves many issues. The following key issues are subsequently discussed in the next sections:

- lowering vehicle purchase prices by tax reductions and/or subsidies (§ 5.5.4.1).
- lowering vehicle running costs by road tax reductions and supporting charging facilities at competitive costs (§ 5.5.4.2).
- setting up demonstration projects (§ 5.5.4.3)

Following the above categorisation, the next sections provide in separate paragraphs concrete policy measures, examples and recommendations on how to develop and implement an action plan.

5.5.4.1 Lowering vehicle purchase prices by tax reductions and/or subsidies

The mechanisms to stimulate private EV uptake (private purchase/lease or company car) include:

Purchase tax exemption/reduction

There are several types of taxes at the purchase of a car, including VAT, registration taxes. The basis for such taxes is on one or more of the following parameters:

- Open Market Retail Price of a Vehicle
- CO₂ emissions per kilometer or fuel use²² or other emissions
- Engine displacement or power and vehicle weight.

Such taxes can be significant (VAT is about 25%, registration taxes can approach or exceed the vehicle price), and, as put by the ICCT²³, “*National fiscal policy is a powerful mechanism to reduce the effective total cost of ownership and entice vehicle consumers to purchase electric vehicles*”. Such mechanisms are indeed used in a number of countries, sometimes with a qualifying CO₂ emissions threshold (e.g. a maximum of 50 gr CO₂/km, effectively meaning that only EVs and PHEVs can qualify).

Purchase price subsidy

Apart from exempting drivers from (part of) the various taxes related to purchasing a vehicle, governments can also provide outright subsidies. For example Belgium used to have a tax credit for the purchase of an electric car²⁴, but this is no longer the case²⁵. In Spain there is for example a subsidy for 15% of the market price with a maximum of €7,000 (with regional differences), and in the UK PHEV and BEV with less than 75 g CO₂/km qualify for a one-time bonus up to €5,900.

Incentivizing company fleets by accelerated capital allowances

Accelerated Capital Allowance (ACA) schemes are typically used to stimulate businesses to buy more energy efficient products, which include electric vehicles and their associated charging infrastructure. Capital Allowances are reductions in a company’s taxable income by an amount equal to the pre-tax value of equipment including vehicles. Companies are said to “write down” such assets against profits. They normally have to do this over an 8-year period, or 12.5% (=1/8) per year for eight years.

²² Austria collects a purchase tax based on fuel consumption (up to 16% of the purchase price). Electric vehicles are exempted at the moment (see:

http://ec.europa.eu/taxation_customs/resources/documents/tax_inventory_18_at.pdf)

²³ <http://www.theicct.org/driving-electrification-global-comparison-fiscal-policy-electric-vehicles>

²⁴ Tax credit of 30% of the vehicle value, capped at €9510,
<http://www.minfin.fgov.be/portail2/fr/themes/transport/vehicules-electric.htm>

²⁵ http://finances.belgium.be/fr/particuliers/transport/vehicules_electriques/

ACA schemes allow businesses to write down up to 100%²⁶ of the asset value in the first year. Companies are interested in such schemes because they stimulate a greater cash flow: they can choose a moment that is optimal for them to get more liquidity or better interest rates.

Incentivizing company fleets by deduction of company investment tax

Some countries offer companies with fiscal deductions if they invest in environmentally-friendly technologies. For example, the so called MIA scheme in the Netherlands provides a net advantage up to € 4500²⁷. In the UK, companies can fully deduct costs of electric cars or vans from the taxable results in the year of purchase. In Belgium²⁸, companies can deduce 120% of the purchase price for electric vehicles (and 100% for PHEVs).

In Portugal, electric vehicles do not pay the 5%-10% company car tax rates which are part of the corporation income tax²⁹.

²⁶ The VAMIL scheme in the Netherlands limits that to 75% in a given year
http://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/zakelijk/winst/inkomstenbelasting/inkomstenbelasting_voor_ondernemers/investeringsaftrek_en_desinvesteringsbijtelling/milieu_investeringsaftrek_mia_willekeurige_afschrijving_milieu_investeringen_vamil

²⁷ <http://www.rvo.nl/subsidies-regelingen/elektrisch-vervoer>

²⁸ <http://www.climat.be/fr-be/politiques/politique-belge/politique-federale/aides-financieres/>

²⁹ <http://www.eltis.org/discover/case-studies/mobie-portuguese-programme-electric-mobility>

5.5.4.2 Lowering vehicle running costs by road tax reductions and favorable charging costs

Exemption/reduction road tax

National governments can also foster the uptake of electric vehicles by lowering vehicle running costs, especially by providing a favorable tariff for road tax (i.e. circulation tax). In Portugal, EV drivers do not pay the yearly road tax. This is also the case in the UK, the Netherlands, and in Denmark (for BEVs). In Germany EVs get a 5-year road tax exemption. Austria exempts BEV from the monthly vehicle tax. The magnitude of those exemptions varies greatly by country, ranging from €20 (Germany) to about €1,700 (Netherlands³⁰) per year.

5.5.4.3 Setting up demonstration projects

This can be support for research and development of technologies, and as well for demo projects. The scope of the demo projects can be diverse. Demo projects may focus on different vehicles types such as passenger cars, buses, trucks. Alternatively, demo projects may focus on infrastructure, or infrastructure related services. The aim of such demo projects is to gain experience with the integration of electromobility, identify barriers and find solutions to remove these barriers.

Electrifying governmental fleets

Governments can also enhance electromobility by purchasing EVs themselves: In 2011, the French government ordered 18,700 EVs for public bodies and companies from Renault and PSA Peugeot Citroen. Regulations on electrifying fleets is another way of stimulating fleets at a national level (not included in table 1). In Belgium, there is a public procurement program for local authorities in the Walloon region; 75% subsidies for EVs, with caps €15,000 for a car and € 25,000 for a commercial vehicle.

For more detailed examples of overviews on policies for specific nations, some good examples are the INTERREG North Sea Region Electric Mobility Network e projects (<http://e-mobility-nsr.eu/>).

Compilation of policy measures for fostering electric vehicles Table 5-1 provides a (non-exhaustive) compilation of possible measures to foster electric vehicles. Most of these measures have already been discussed in more detail in the previous paragraphs.

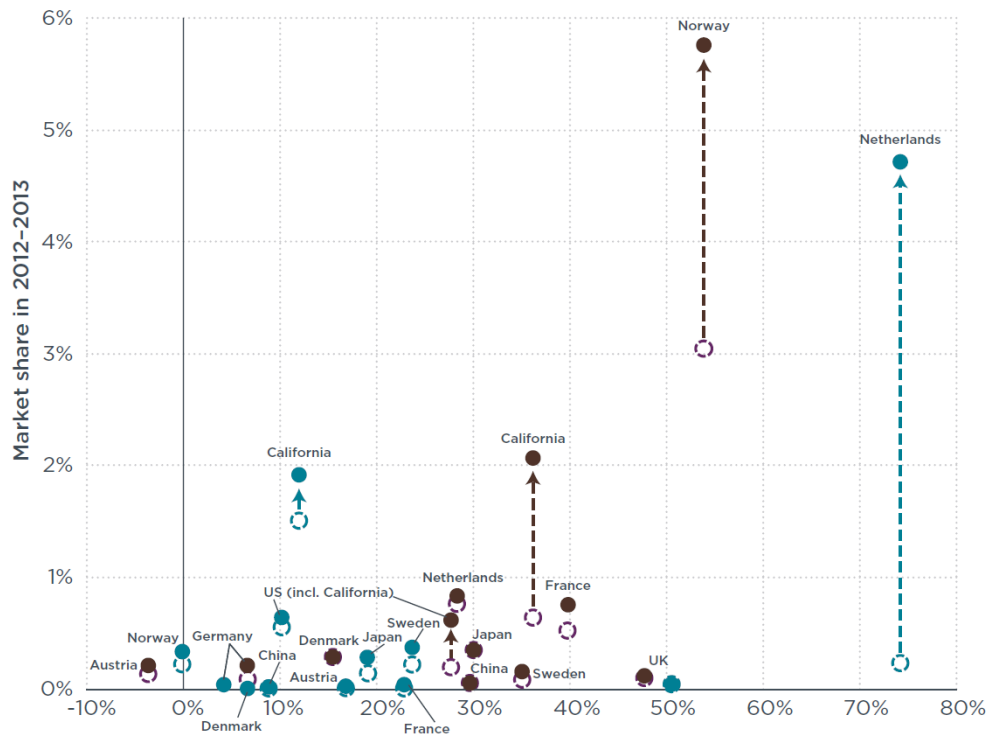
³⁰ Road tax for a 1500 kg diesel car in South Holland,
<http://www.belastingdienst.nl/rekenhulpen/motorrijtuigenbelasting/>

	Policy Measures	Remarks
Regulate / facilitate	National governments have to implement the European Air Quality Directive	
	Financial (co)support for show case projects to start the development	Gain experiences, to learn from this, and to inform future policies to support the uptake of vehicles
Support	Financial support in the form of either reduced taxation or subsidies for purchase of electric vehicles (and/or registration tax)	Once only measure
	Exemption or reduction of road tax (i.e. circulation tax)	Annual tax. Could be defined for a specific period of time.
	Exemption or reduction of toll for roads, tunnels and ferries	
	Favourable tax scheme for private use of company cars	No or reduced addition of the price of the vehicle to the taxable income
	Favourable tax scheme for deduction and depreciation of investments in EVs by companies under company tax	Favourable deduction of investment for EVs from the taxable result
	Taxation level of fossil fuels relative to electricity, enabling to improve the energy costs for electromobility vs. conventional vehicles	
Promote	Dissemination campaigns, public events and promotional activities	To raise awareness and reduce unfamiliarity with electric driving
	Central information points	Create or support one or more national reference points for information about electromobility where all interested parties can go to find data, information and examples
	Establishing regional or city networks	Connecting cities and regions active in the field of electromobility to exchange experiences and stimulate cooperation
	Establishing national platforms	A national public-private platform of stakeholders for e-mobility, which should play a role in ensuring a coordinated development of policies and implementation of electromobility

Table 5-1: National policy measures for EV uptake

5.5.5 Impact of policy measures for vehicles in different members states

Over the past few years the efforts and incentives of member states to foster electromobility differed widely. As a result electromobility uptake per member state differs substantially. The International Council on Clean Transportation (www.theicct.org) recently issued a report drawing the following conclusions from Figure 5.1: *The research findings indicate that fiscal incentives matter, but are clearly not the only factor that influences today's electric vehicle market growth. For example, despite a relatively high level of fiscal incentives, the current market share of EV in the United Kingdom (UK) was found to be low in comparison with other markets. Many confounding factors mean that a clear direct relationship remains elusive between national fiscal incentives and electric vehicles' early market growth across each of the major vehicle markets—as seen in the spread of the data and the lack of an obvious trend line in Figure 5.1. This indicates both the limitation of fiscal policy and also the limited understanding of all the underlying factors and other policies that could help drive and sustain the electric vehicle marketplace.*



Total fiscal incentive provided (percentage of vehicle base price)

● BEV 2013 ○ BEV 2012 ● PHEV 2013 ○ PHEV 2012

Figure 5.1: 2012-2013 EV market share as a function of fiscal incentives (ICCT 2014)

5.5.6 Highlights and examples of national policies for vehicles

EV uptake Ireland

Since Irish Local Authorities have very limited resources, the support of electromobility in Ireland is mainly centrally organised. The main national (financial) incentives for EV uptake are:

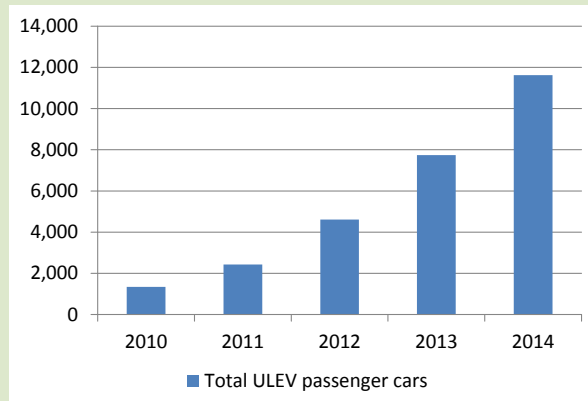
- A grant of €5000 for every new sold plug-in vehicle. These grants are given to car dealers, which deduct this in the price offer. The car type and the dealer must be pre-registered and is only paid after the customer buys and registers the vehicle. The administrative burden is not seen by the customer and is managed entirely by the dealer.

All vehicles sold in Ireland for the first time (either new or second hand imports) are subject to a Vehicle Registration Tax. This tax is calculated on the Open Market Selling Price (OMSP) of the car in its year of production and is also based on the vehicle emissions. For instance cars that emit more than 225g CO₂/ km pay 26% of the OMSP while cars that emit less than 80 g CO₂/ km pay 14% of the OMSP. All full electric cars are exempt from the first €5000 of this tax. PHEVs receive an exemption of €2500 and an ordinary hybrid receives €1500. For second hand PHEV and ordinary hybrid imports the exemption is reduced for a sliding scale until a 10 year-old plug-in vehicle receives no exemption. There is also an accelerated capital depreciation which allows companies to write off in one year. The need for some additional incentives such as Benefit-in-Kind taxation for company officials who receive an EV is recognised but has not been agreed yet. So far however the uptake of EVs has been rather limited, around 1000 EVs by the end 2014. The main reasons for that are not per se the effectiveness of the measures or problems with policy implementation but more of broader kind:

- First of all the recession which effected especially the purchase expensive goods such as of houses and cars. The vehicle market dropped by over 60% between 2007 and 2009.
- The small scale/size of the Irish market. Right hand drive cars form a 20% of the European vehicle market, of which the Irish market only has a share of 3%. Large OEMs do not offer all of their conventional vehicles for sale in Ireland and some who offer EVs or PHEVs in other European countries do not do so in Ireland. Structure of the Irish market. In Ireland many of the car importers are franchisees that buy the cars themselves before selling them to dealers. They don't want to buy more cars than they are sure of can be sold. Many cars including EVs are now sold on Person Credit Plans (PCPs) whereby the residual value of the car is effectively guaranteed to the customer. The Importer is a small company and transfers the risk of the guaranteed residual value to the dealer. The dealer minimises his risk by only selling a limited number of EVs in any month (based on his forecast of the number of second hand EVs he will be able to sell in three years when the customer is entitled to return it. This doesn't make them very active in promoting and selling EVs. While for example in the UK, the Importer is part of the European OEM they carry the risk but in Ireland it is the dealer who carries the risk. Still there has been a lot attention to promotion of electric driving to increase people's awareness of electromobility. Information campaigns and the built-up of public infrastructure are contributing to people getting used to idea of electromobility and being prepared for when the car market will improve.

Plug-in car grant in the UK

The plug-in car grant in the UK funds 25% of the cost of a car up to a maximum of £5,000. The scheme came in place in January 2011 and will run until May 2015 with a total budget of 300 million British pounds. For the period 2015-2020 there is also budget available for ultra-low emission vehicle of which £200 million for cars and £30 million other vehicles.



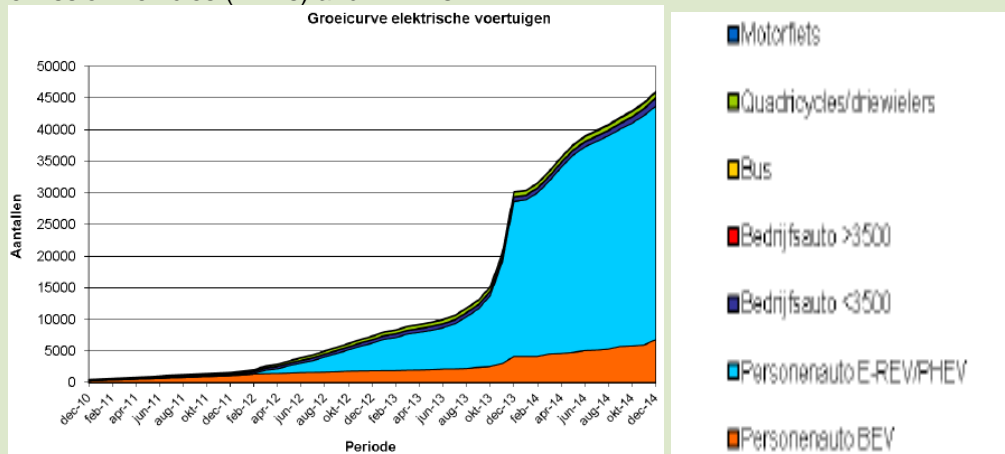
Sources: <https://www.gov.uk/plug-in-car-van-grants/overview>; Source: <https://www.gov.uk/government/statistical-data-sets/veh01-vehicles-registered-for-the-first-time#table-veh0130>

Experience Dutch fiscal support measures

The advantage of the private use of a company car is seen as an annual in-kind income. To account for this benefit a certain percentage of the list price of the car is added to the drivers' taxable income. The standard percentage is 25%, for efficient vehicles the rate is reduced depending on the emitted CO₂ per kilometer. The rate is valid for a period of 60 months and continues to apply if the car changes hands or if another employee is going to use the car. The rules for reduced rates got stricter over time, so to receive reduction the norms of CO₂ emission per kilometer increased. Until 2013 cars emitting less than 50 gram per kilometer received a completely exemption of the value added income. From 2014 on this percentage has increased to 4% for zero emission cars. For cars emitting 50 g/km or less but more than zero, i.e. plug-in hybrid vehicles, the rate was 7% in 2014 and 2015. From 2016 this rates will increase to 15%.

This measure combined with some other fiscal stimulation measures such as exemption of road (circulation) tax and the registration (purchase) tax and in addition for companies a tax deduction for small and green investments, has been a very successful fiscal incentivizing package. It increased the number of electric vehicles to slightly above 30.000 by end of 2013 of which the major part are plug-in hybrid passenger cars. The graph below shows a steep increase at the end of 2013 just before the supporting schemes were about to become less favourable. In 2014, the numbers steadily grew and reached 45,915 electric vehicles by the end of the year. These numbers are far ahead of the Dutch target number of 15.000 to 20.000 electric vehicles by 2015.

A weak point of the measure was that PHEVs could be bought relatively cheap but that many of these cars are predominantly using gasoline. To avoid this effect in the future a sharper distinction has now been made between the fiscal deduction percentages for zero emission vehicles (BEVs) and PHEVs.



5.6 Supporting the roll-out of charging infrastructure

- ⇒ **Key recommendations on supporting roll-out of charging infrastructure**
- **Home charging:**
 - Provide support to (co)fund home charging points
 - Set building codes that require readiness for installation of charging points for new buildings
 - **Fast charging:**
 - Facilitate the roll-out of a fast charging network along highways, by:
 - Laws that force fuel stations to install fast charging stations
 - Clarity over safety regulations the installation of fast charging points
 - Facilitate and enforce standards on hardware and software
 - Allow tariffs that enable uptake of smart charging.
 - **Company charging:** enable tax reductions on investments made for charging facilities.
 - **Timely start to monitor progress in roll-out of all charging point types, as the EU requests this information.**

These key recommendations follow from the rest of this paragraph that describes, categorised in different topics, the policy options of the national government to the roll-out of charging infrastructure. Note that supporting infrastructure roll-out is addressed separately in paragraph 5.5.

Infrastructure roll out

As the number of electric vehicles grows, obviously the number of charging points needs to increase too. The installation of charging points literally takes place at the local level, thus requiring support and actions at the local level, as explained in Chapter 4. At the same time the EU plays an important role in boosting roll-out in general, as well as in synchronizing national actions and ensuring trans-European interoperability (see Chapter 6). Nevertheless planning and support for infrastructure roll-out at the national level is crucial too. Charging may be distinguished in three categories, each requiring specific policies:

- Home charging
- Public charging
- Company charging

These three categories, each requiring specific incentivizing policies, are discussed separately in the next sections.

5.6.1 National policy measures incentivize home charging

Subsidies for home charging

Ireland Home Charger Incentive: In Ireland it was decided that the first 2000 purchasers of an EV would be given a free home charger. This was done for three reasons

- As an aid to help the development of the market
- To promote safe charging standards (there was a risk that customers might try to use extension leads with domestic sockets even if advised not to do so)
- To e-establish a direct relationship with the purchasers so that could be approached directly about participation in surveys etc., without any data protection complications.

In Denmark there is a program for charging infrastructure roll out mainly at homes; budget > €9M for 2013-2015.

In the UK a granting scheme was established for domestic charge point (£13.5 m). **Homeowners may receive up to 75% (capped at £1,000, including VAT) off the total capital costs of the charge point plus associated installation costs. New scheme October 2014.**

Regulations facilitating home charging

Building codes need to require readiness for installation of charging points for new buildings. In this way it will be much easier and cheaper to install charging facilities at a later time. For example in France the national government sets requirements for developers of blocks and flats for charging installation on the request of residents. For a proper market roll-out of electromobility every EV driver should have, wherever possible, a proper mode 3 charger available for overnight charging. This would be greatly facilitated if all new dwellings were fitted with such a device. A second best solution would be that all new dwellings would have the wiring for such a charger installed at construction. The prospective EV driver then would at least only have to provide the charge point itself.

In Spain the private selling of electricity had to be realized in order to regulate home charging: the Movele 2008-2012 plans created a special tariff for charging at night. Amendment of the electricity regulation has allowed consumers to sell electricity to charge vehicles, so that placing of charging points in public and private sites would be enabled.

5.6.2 National policy measures for public charging.

Several member states have initiated national incentives to support the roll-out of public charging infrastructure. These incentives not only include charging points on streets but also at traffic hotspots, places of interest, and highways.

Incentives:

Subsidies for developing public CP's

UK grants for public charge point

Budget of Infrastructure grants, including domestic charge point grant: £37 mln, feb 2013-2015

- **residential on-street charging points** (£13.5 m): scheme gives local authorities access to a grant fund which can be used to part fund the procurement and installation of such infrastructure. Install on-street charging for residents who have or have ordered a plug-in vehicle but do not have off-street parking - authorities can apply for up to 75% of the cost of installing a chargepoint
- **residential on-street and fast charging points for local authorities**: The funding available is for 75% of the capital costs of procuring and installing the charging point and an associated dedicated parking bay, up to a maximum of £7,500 per installation. For **rapid chargers** funding 75% of the capital costs of installation of rapid chargers, up to a maximum of £37,500 per point averaged out across the charging points in a project
- **train station car park charging points** (£9 m): fund 75% of the capital costs of procuring and installing charging infrastructure, capped at £7,500 per installation
- **charging points on the public sector estate** (£3 m): fund 75% of the capital costs of procuring and installing charging infrastructure, capped at £7,500 per installation

Built up infrastructure:

Roll out nationwide fast charging network

Portugal: Financing of new charging infrastructure network; rural network with 1,350 charging points in the 25 biggest towns and cities and along main roads

Rolling out Irish charging infrastructure network

The Irish government chose for the pragmatic approach to organise the roll-out of public infrastructure centrally. The utility company ESB, 95% state-owned, installed over 900 chargers in the country, meaning coverage of at least one public charger in every village with more than 1500 inhabitants and a maximal distance between highway fast chargers of 50 km.

The costs of the public charging infrastructure are socialized and paid as part of the electricity bill of all inhabitants. Although the infrastructure is built-up by one single company it is open accessible for all companies that want to offer EV services. Since the utilisation is not so high yet and there is not a business case so far infrastructure there are no commercial parties active in public infrastructure business. In the future this might change therefore by 2017 the future developments of the public charging network will be reconsidered. Since in Ireland more than 80% of the dwellings are one family houses, and even in a city as Dublin 70% of the houses is one family, the share of vehicles that will make use of home charging will be very high compared to the usage of public charging infrastructure.

Home chargers: first 2000 people EV with grant receive home charger for free. So far around 1000.

Financial support for show case projects to start the development

UK plugged-in Places - Subsidising demo-projects

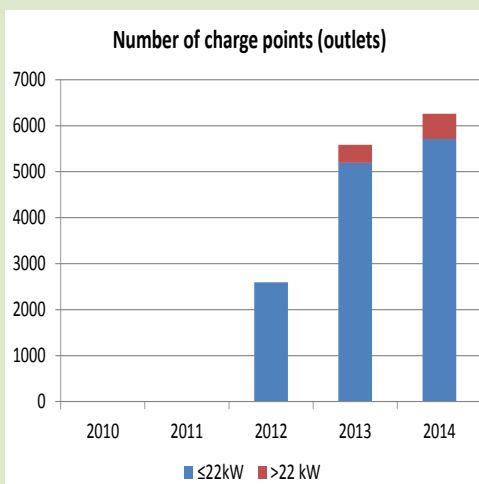
- Launched in 2010
- up to £30 million in matched funding
- eight pilot cities and regions
- over 5,500 chargepoints (to the end of June 2013), of which some 65% are publicly accessible.

two primary aims:

- to support the initial rollout of recharging infrastructure in the UK,
- to learn from this to inform future policies to support the uptake of vehicles.



Most of the currently available public accessible charge points are installed under the Plugged-in Places project.



Creating national frameworks with standardized requirements for service providers creates clarity and helps local authorities. For example in the Netherlands all public charging infrastructure must comply with the market model for the Netherlands, which standardized regulation for the following issues:

- The ability to take/purchase electricity from all public charging stations in the Netherlands with the charging card from your service provider
- The ability to charge the purchase of electricity on an individual basis

Highways with fast charging points are an important way of creating trust towards a nationwide covering infrastructure network. National governments can encourage and/or support the roll-out of charging infrastructure along highways as in most countries the national government has at least a controlling role regarding highways.

Regulation:

Monitoring and setting targets for nationwide fast charging highway network

- Laws that force fuel stations to install fast charging stations (as a condition to obtain a concession)
- Create clarity over safety regulations for installation of fast charging points at fuel station
- Facilitate and enforce standards on hardware and software
- Allow tariffs that enable uptake of smart charging

5.6.3 National policy measures for stimulating company charging

Company cars are an important target group for electrification, which is already mentioned in chapter 3. Several examples can be found of national policies that stimulate the uptake of company electromobility including charging points:

The Netherlands foster the uptake of company charging by allowing investment deduction of the amount for taxation and small-scale investment deduction. In addition arrangements ("Green Deals") were made between the government and business communities for: smart-grids tests in combination with EV, use of EV in transport and rural network of rapid charging stations. (Weeda, Kroon, Appels, 2012).

Norway: Grønn bil (Green Car) project with the ambition of having 200,000 BEVs and PHEVs on the road in 2020; informing and asking owners of large public fleets and local authorities to purchase EVs.

Belgium: For companies there is an extra deduction of 13.5% of investment in charging infrastructure for corporate tax.

Portugal: Lowering of corporate tax for companies with EVs in the vehicle fleet.

France: The government imposed the implementation of mandatory charging sockets to private operators in office parking lots and new apartments blocks, to be reached by 2012³¹. The National Assembly estimates that 25.000 charging stations were installed by private actors in France.

UK: Company car tax: benefit for employees and employers (from income and national insurance contributions)

Van Benefit Charge -> Exemption for employees and employers (from income and national insurance contributions)

Fuel Benefit Charge -> Exemption. Enhanced Capital allowances -> 100% first year allowance: for business

Belgium: Additional deductibility of 13.5% on the investment of charging infrastructure (for companies under corporate tax system)

³¹ Grenelle Law 2 – L. 111-5-2 of code construction and habitation.

5.6.4 Monitoring and evaluation

⇒ Recommendations on monitoring and evaluation

- **Set up timely a structure for data collection, as the EU requests this information.**
- **Timely start to monitor progress in roll-out of all charging point types, as the EU requests this information.**
- **Use this information to adapt strategy/policies – while maintaining stable long term conditions.**

Set up timely a structure for data collection, as the EU requests this information, whereas experiences so far indicate that data collection is sometimes challenging. The organisation of national monitoring structures is important to get insights in the progress of reaching national goals. The gained knowledge offers a way to assess the effectiveness of the measures and if necessary, propose new measures or adapt existing measures. For example insights on the average required number per electric vehicle of charging points (public and home charging) gives good insights in future need for the number of poles and necessary budgets. The alternative fuel directive (<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0094>) requests members states to monitor this progress.

Monitoring the progress of electromobility relates to data collection on vehicles as well as on infrastructure, i.e. the number of charging points and outlets. Usually vehicle data is relatively easy available in most member states. In contrast, collecting data on infrastructure is much harder. Charging infrastructure for which a grant is provided are regularly well registered. In the UK it is a requirement to register a charging point that has received a grant at the National Charge point Registry (<http://www.nationalchargepointregistry.com/>). For public charging points the distribution system operators could provide data since they connect the poles to the grid. Since poles can have more outlets they should be asked to provide these data. Accurate numbers on private home charging points are the most difficult to collect. Sometimes installation companies can provide such data. Otherwise one needs to try to find out by surveys. The Dutch Enterprise Agency (RVO) publishes every month numbers on electric vehicles and charging infrastructure. The monitoring together with the practical experiences can give valuable knowledge to the national platforms to evaluate the progress and take necessary actions.

5.6.5 Overview of policy measures to roll-out of charging infrastructure

The table below summarizes key policy measures for supporting electromobility infrastructure roll-out at the national level. Most of these measures have already been discussed in more detail in the previous paragraphs.

	Policy Measures	Remarks
Regulate / facilitate	Create an open and competitive market model for the development of the EV charging infrastructure	Important to have involvement of private parties in market creation
	Require readiness for installation of charging points for new buildings through building codes	Home charging is the simplest and cheapest, and therefore the preferred way of charging electric cars and vehicles. This option should be facilitated as much as possible.
	Create or adapt regulations to allow selling of electricity by other legal entities than electricity companies	Necessary to allow service providers to sell electricity. Not yet the case in all European member states (e.g. Spain)
Support	Financial support for show case projects to start the development	To support the initial rollout of recharging infrastructure, with the aim to gain experiences, to learn from this, and to inform future policies to support further development of the charging network.
	Provide subsidy (programme) for the purchase and installation of charging points	Grant can be given to private customers, companies or local governments
	Favourable tax scheme for deduction and depreciation of investments in charging infrastructure by companies under company tax	Favourable deduction of investment for charging equipment from the taxable result
Promote	Information provision regarding recharging infrastructure	Provides relevant guidance to local authorities, housing associations and other relevant stakeholders who are looking to implement recharging infrastructure.
	Central information points	Create or support one or more national reference points for information about electromobility where all interested parties can go to find data, information and examples
	Establishing regional or city networks	Connecting cities and regions active in the field of electromobility to exchange experiences and stimulate cooperation
	Establishing national platforms	A national public-private platform of stakeholders for e-mobility, which should play a role in ensuring a coordinated development of policies and implementation of electromobility
	Regulations on electrifying fleets	

6 Toolbox: EU policy tools

6.1 Introduction

The European Commission is working to improve citizens' quality of life and strengthening the economy by promoting sustainable urban mobility and increased use of clean and energy efficient vehicles. The objective is to enhance mobility, while at the same time reducing congestion, accidents and pollution in European cities. In view of this, the EC plays an important role in developing a strategic vision and action plan that provides a common guiding framework for European member states to shape the transition towards competitive and resource-efficient mobility systems in Europe in a coherent way. Zero-emission efficient electric vehicles are an important ingredient for such systems.

6.2 EU policy to stimulate EV uptake

There are two points of engagement for policymaking concerning electric road transport, i.e. vehicles that should become much more efficient and cleaner, and urban mobility systems that should become much more sustainable. In this section EU actions resulting from both starting points are addressed. First, the relevant overarching objectives regarding the transport sector and urban mobility are explained. This is followed by a description of how the EU intends to achieve these goals. Complemented with an overview of more concrete actions and measures that give further substance to the envisioned approach, and that provide guidance to national and local authorities, and the private sector, for targeted policymaking and development of suitable plans.

6.2.1 Objectives

The European Commission pursues developing a sustainable mobility system, i.e. an energy efficient and environmental friendly mobility system, within the member countries. The main goals are to reduce the dependence of the transport system from oil, and to deliver a significant contribution to reduction of CO₂ emissions and the emissions of air pollutants. At the same time the policy should ensure mobility services of high quality, using less and cleaner energy, leading to a reduction of the overall environmental externalities of transport ³².

In this context the European Commission has agreed with the international community on the need to drastically reduce global emissions of greenhouse gases in trying to keep the global temperature rise below 2°C, which is considered necessary to limit the impact of climate change to an acceptable level. This requires reducing global emissions by about 60% below 1990 levels by 2050. Industrialized countries would have to decline by about 80% by 2050. The EU regards this as a minimum and aims for at least 80% reduction up to possibly 95% reduction by 2050, compared to 1990 levels.

The overall target is translated into a sub-target for the transport sector of at least 60% greenhouse gas emission reduction by 2050 compared to the 1990 level, with an intermediate target to reduce emissions to around 20% below their 2008 level by 2030. Additional and complementary targets have been defined for road transport in urban areas. The EU calls on national and local governments to develop and implement policy with the aim to reduce by 50% the use of “conventionally-fueled” ³³ cars in urban transport by 2030, and work towards phase out of these cars in cities by 2050. Furthermore, governments should aim to achieve essentially CO₂-free city logistics in major urban centres by 2030. The objectives are summarized in the below table.

³² See ‘A resource efficient Europe’, flagship initiative of the Europe 2020 Strategy, and the new ‘Energy Efficiency Plan 2011’

³³ The term ‘conventionally fuelled’ refers to vehicles using non-hybrid, internal combustion engines (ICE).

System level	Target
Overall	Reduce EU GHG emissions by 80%-95% compared to 1990 levels by 2050
Transport Sector	Reduce GHGs to 20% below 2008 levels by 2030
	Reduce GHG emissions by 60% compared to 1990 levels by 2050
Urban Areas	Reduce by 50% the use of 'conventional-fuelled' cars by 2030
	Phase out 'conventional-fuelled cars' from cities by 2050
	Achieve CO ₂ -free city logistic in major urban centres by 2030

Table 6-1 Overview of high-level transport and road transport related EU targets

The EU actions in this field are aimed to establish a coordinated approach in, and between Member States, which should lead to a coherent European transport area, and well-balanced and effective market development of options needed to achieve the targets. Something to avoid, for example, is a situation that one part of the Member States invests exclusively in electrical cars and another part focuses completely on a system based on biofuels.

6.2.2 Strategies

The pillars of the strategies that the Commission has identified to achieve the goals, and on which recommended actions are based, are mainly three:

1. *Modal shift*: shift of ever larger shares of demand towards less polluting and more efficient modes of transport, in terms of energy, both for long-distance and urban travels. This includes the use of new segments of smaller, lighter and more specialized road passenger vehicles, like the Renault Twizy, but also refers to stimulating people to walk and use a bike instead of taking a car.
2. *Intermodal transport concepts*, that is the efficient combination of various modes of transport to complete the same journeys, both for people and freight. This refers to the need for new transport patterns, according to which larger volumes of freight and greater numbers of travellers are carried jointly to their destination by the most efficient (combination of) modes. Individual transport is preferably used for the final miles of the journey and performed with clean vehicles. The use of Intelligent Transport Systems and information technology contributes to real-time traffic management, leading to simple and reliable transfers, and to reduced congestion and delivery times for last mile distribution. Last mile distribution should preferably take place by use of low-emission vehicles.
3. *Efficiency improvement* of existing vehicles and propulsion systems, and development and deployment of alternative powertrains for vehicles and alternative fuels. The former category includes not only the optimization of combustion engines³⁴, but also development of new materials for lighter vehicles and tires with less rolling resistance, and improvement of the aerodynamics of vehicles. The latter category includes plug-in battery and fuel cell based electric vehicles, and the use of electricity, hydrogen and various types of liquid and gaseous biofuels as vehicle fuel. Plug-in battery electric, and hydrogen fuelled fuel cell electric vehicles not only reduce air emissions, but also reduce noise emissions. This can make it possible to widen the time window for distribution of goods within urban areas, thus reducing traffic intensity and congestion in the daytime. Public and private fleets of urban delivery vans and trucks, but also buses and taxis, are being considered particularly suitable for the introduction of alternative propulsion systems and fuels. They could make a substantial contribution in reducing the carbon intensity of urban transport, while providing a test bed for new technologies, and an opportunity for early market deployment. The latter is important for creation of a critical mass which is necessary as a basis for full market rollout.

³⁴ Optimization includes mild electrification by means of the application of start-stop systems, regenerative braking and hybridization with a small electric engine which mainly provides support in situations when the combustion engine operates least efficiently.

The Commission takes action in a number of ways, targeted at various topics to support the transition to a sustainable transport system in which electric vehicles will play an important role. The following table provides an overview of measures.

Policy measure	Description / remark
Regulation of CO ₂ emissions from passenger cars	European Union legislation sets mandatory emission reduction targets for new cars. This legislation is the cornerstone of the EU's strategy to improve the fuel economy of cars sold on the European market. The fleet average to be achieved by all new cars is 130 grams of CO ₂ per kilometre (g/km) by 2015 – with the target phased in from 2012 - and 95g/km by 2021, phased in from 2020. Further tightening of the targets to values in the range of 60-70 g/km is under discussion for the 2025-2030 period. lower CO ₂ targets favours electrification because lower targets will be increasingly difficult to achieve with combustion engines. If CO ₂ limits drop below the technical limits of conventional technologies, OEMs can only meet the limit by additional production of EVs (or FCEVs)
Regulation of CO ₂ emissions from light commercial vehicles (vans)	in 2011 the EU adopted legislation setting CO ₂ emission targets for new vans sold on the European market. This has subsequently been extended to cover the period to 2020. The Vans Regulation limits CO ₂ emissions from new vans to a fleet average of 175 grams of CO ₂ per kilometer by 2017 – with the target phased in from 2014 - and 147 g/km by 2020. Further tightening will force a change towards electrification because it gets increasingly difficult to meet the targets with application of combustion engines only.
Develop and implement harmonized standards essential to establishing an efficient (European) EV market	Definition of rules, guidelines and standards for the interoperability of charging infrastructure for clean vehicles, and for the interface for infrastructure-to-infrastructure, vehicle-to-infrastructure, and vehicle-to-vehicle communications.
Internalization of externalities	For passenger cars, road charges are increasingly considered as an alternative way to generate revenue and influence traffic and travel behavior. The Commission will develop guidelines for the application of internalization charges to all vehicles and for all main externalities. The long-term goal is to apply user charges to all vehicles and on the whole network to reflect at least the maintenance cost of infrastructure, congestion, air and noise pollution
Create regulatory framework for smart funding and financing schemes	Unlocking the potential of private financing and use of innovative financial instruments requires new and improved regulatory frameworks
Encourage formation of partnerships, networks and platform to stimulate (public-private) collaboration for development, demonstration and deployment of clean and efficient (i.e. sustainable) transport solutions	National and local authorities, and private stakeholders are invited to support each other in implementing and evaluating cost and benefits of new technologies and concepts. The transition from the conventional to an innovative mobility system is complex and time-consuming process. Sharing insights and learning from experiences of others could help to improve the efficiency of the process. Some examples are: <ul style="list-style-type: none"> - CIVITAS - European Innovation Partnership (EIP) Smart Cities and Communities - CLARS platform (Charging, Low Emission Zones,

		other Access Regulation Schemes) - European Green Vehicles Initiative ³⁵
	Alignment of project eligibility criteria with transport objectives	Ensure that EU-funded projects on vehicles, mobility and transport infrastructure comply with strict eligibility criteria reflecting the need for clean and efficient road transport, and consistent with the 2030 and 2050 targets for the transport sector
	Support R&D / innovation, including demonstration projects for electromobility	Provision of finance for research, applied research and demonstration activities in the field of sustainable urban mobility and electromobility, including recharging infrastructure and intelligent transport systems. Examples are: <ul style="list-style-type: none"> - 7th RTD Framework Programme and its successor, the Horizon 2020 programme - The Intelligent Energy Europe programme STEER - Interreg Europe - TEN-T Connecting Europe Facility, in particular calls with the objective of ensuring sustainable and efficient transport systems in the long run
	Initiate and coordinate development of smart funding and financing schemes	Increase and diversification of financing options is needed both from public and private sources. Examples are 1) better coordination of the Cohesion and Structural Funds with the transport objectives; 2) schemes for the internalization of external costs, and infrastructure use charges; 3) the EU project bonds ³⁶ initiative that can support Private Public Partnerships (PPP) financing on a bigger scale.
	Ensuring provision and exchange of insights and information at central points	Disclosing and presenting, in a structured way, information on electromobility and sustainable urban mobility projects, as well as practical experiences, news stories and training material in order to inform the public about the state of play concerning electromobility, raise awareness of technological progress and practical possibilities, and support interested private and public stakeholders in making plans and policymaking. Examples are: <ul style="list-style-type: none"> - EU Mobility and Transport website, and in particular the section on the transport theme 'Clean Transport & Urban transport' - Eltis – The European Urban Mobility Observatory - The Clean Vehicle Portal - EEO – The European Electromobility Observatory
	Organise promotional campaigns	Events specifically organized to raise awareness about the availability and possibilities of new types of vehicles and different modes of transportation. Examples are: <ul style="list-style-type: none"> - Do the right mix: campaign on sustainable urban mobility (http://www.dotherightmix.eu/) - European Mobility Week: annual campaign to encourage European local authorities to introduce and promote sustainable transport measures and to invite their residents to try out alternatives to car use.
	innovation and deployment	The Commission will devise an innovation and deployment

³⁵ <http://www.egvi.eu/>: The European Green Vehicles Initiative is established in the continuation of the European Green Cars Initiative (2009-2013). The European Green Vehicles Initiative is a contractual public-private partnership dedicated to delivering green vehicles and mobility system solutions which match the major societal, environmental and economic challenges ahead. With a focus on the energy efficiency of vehicles and alternative powertrains, the EGVI PPP aims at accelerating research, development and demonstration of technologies allowing the efficient use of clean energies in road transport.

³⁶ COM(2010)700.

strategy for the transport sector

strategy for the transport sector, in close cooperation with the Strategic Energy Technology Plan (SET-plan), identifying appropriate governance and financing instruments, in order to ensure a rapid deployment of research results.

6.3 Laws and regulations

Key legislation includes:

the CO₂ emission standards for cars and vans - The EC has set a CO₂ emission target for cars of 95 g/km by 2021. As the next step in this trajectory, the more stringent 2025 targets are currently under discussion. Meeting these increasingly lower CO₂ standards with ICEs becomes increasingly costly over time and finally impossible when the theoretical efficiency limit of the ICEs is reached. Along the same trajectory, the conditions for producing ZEVs become increasingly favourable, as technologies will improve and costs will go down, resulting from economies of scale.

EU directive on alternative fuels infrastructure – as adopted in September 2014, is important for electromobility roll-out as it provides guidelines and obligations for electric charging infrastructure (and in addition for the other alternative fuels: hydrogen, CNG and LNG).

The European Parliament recently issued the final Directive to establish a common framework of measures and user information requirements for the deployment of alternative fuels infrastructure (2014/94, 22 October 2014).

This Directive is addressed to Member States but since the cities, in most of cases, are the places where the electrical mobility must be implemented, the directive has a direct impact on measures and interventions planned by the cities itself.

The Directive 2014/94 is based on previous regulations and directives:

- Directive 2009/28/EC on the promotion of the use of energy from renewable sources
- 3 March 2010 - Europe 2020: A strategy for smart, sustainable and inclusive growth'
- 28 March 2011 – White Paper: Roadmap to a Single European Transport Area — Towards a Competitive and Resource Efficient Transport System
- Regulation (EU) No 1316/2013 - Connecting Europe Facility
- Regulation (EU) No 1291/2013 - Horizon 2020 — the Framework Programme for Research and Innovation (2014-2020)
- Regulation (EU) No 1315/2013 - Union guidelines for the development of the trans-European transport network.

In particular the Directive establishes that the national policies shall adopt a national policy framework that shall contain at least the following elements:

- an assessment of the current state and future development of the market as regards alternative fuels in the transport sector,
- national targets and objectives, for the deployment of alternative fuels infrastructure.
- measures necessary to ensure that the national targets and the objectives contained in the national policy framework are reached,
- measures that can promote the deployment of alternative fuels infrastructure in public transport services,
- designation of the urban/suburban agglomerations that are to be equipped with recharging points accessible to the public.

The Directive addresses “electricity supply for transport”, “user information” and “technical specification” in order to guarantee:

- an appropriate number of recharging points
- the possibility to upgrade the supply to the future technologies (notably wireless charging)
- the public access
- the use of intelligent metering systems (smart grid)
- the cooperation between distribution and owner system operators.

In the table below the relevant topics for e-vehicle passengers are summarized.

Topic	Subtopic	Address
Recharging points	Accessible to the public	Member States shall ensure, by means of their national policy frameworks, that an appropriate number of recharging points accessible to the public are put in place by 31 December 2020, in order to ensure that electric vehicles can circulate at least in urban/suburban agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States. The number of such recharging points shall be established taking into consideration, inter alia, the number of electric vehicles estimated to be registered by the end of 2020, as indicated in their national policy frameworks, as well as good practices and recommendations issued by the Commission. Particular needs related to the installation of recharging points accessible to the public at public transport stations shall be taken into account, where appropriate.
		Considering the development of the market for electric vehicles The Commission shall amend the Directive, in order to ensure that an additional number of recharging points accessible to the public are put in place in each Member State, at least on the TEN-T Core Network, in urban/suburban agglomerations and other densely populated areas
	Not accessible to the public	Member States shall take measures within their national policy frameworks to encourage and facilitate the deployment of recharging points not accessible to the public.
Technology	Normal power	Member States shall ensure that normal power recharging points for electric vehicles, excluding wireless or inductive units, deployed or renewed as from 18 November 2017, comply specific standards such as: alternating current (AC) normal power outlets or vehicle connectors of Type 2 as described in standard EN 62196 While maintaining the Type 2 compatibility, those socket outlets may be equipped with features such as mechanical shutters. Comply the specific safety requirements in force at national level.
	High power	Member States shall ensure that high power recharging points for electric vehicles, excluding wireless or inductive units, deployed or renewed as from 18 November 2017, comply at least with the technical specifications of Alternating current (AC) high power recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with connectors of Type 2 as described in standard EN 62196-2
	Intelligent metering system	The recharging of electric vehicles at recharging points accessible to the public shall, if technically feasible and economically reasonable, make use of intelligent metering systems.
	Upgrade	the development of infrastructures must guarantee the possibility to upgrade the supply to the future technologies (notably wireless charging)
Operators	Purchasing electricity	Member States shall ensure that operators of recharging points accessible to the public are free to purchase electricity from any Union electricity supplier, subject to the supplier's agreement. The operators of recharging points shall be allowed to provide electric vehicle recharging services to customers on a contractual basis, including in the name and on behalf of other service providers.

	Contract with supplier	All recharging points accessible to the public shall also provide for the possibility for electric vehicle users to recharge on an ad hoc basis without entering into a contract with the electricity supplier or operator concerned.
Price		Member States shall ensure that prices charged by the operators of recharging points accessible to the public are reasonable, easily and clearly comparable, transparent and non-discriminatory.
Cooperation		Member States shall ensure that distribution system operators cooperate on a non-discriminatory basis with any person establishing or operating recharging points accessible to the public.
Legal framework	Contract supplier	Member States shall ensure that the legal framework permits the electricity supply for a recharging point to be the subject of a contract with a supplier other than the entity supplying electricity to the household or premises where such a recharging point is located.
Standardization		Without prejudice to Regulation (EU) No 1025/2012, the Union shall pursue the development by the appropriate standardization organizations of European standards containing detailed technical specifications for wireless recharging points and battery swapping for motor vehicles, and for recharging points for L-category motor vehicles and electric buses.
Information		Member States shall ensure that, when available, the data indicating the geographic location of the refueling and recharging points accessible to the public of alternative fuels covered by this Directive are accessible on an open and non-discriminatory basis to all users. For recharging points, such data, when available, may include information on real-time accessibility as well as historical and real-time charging information.
		Member States shall ensure that relevant, consistent and clear information is made available as regards those motor vehicles which can be regularly fuelled with individual fuels placed on the market, or recharged by recharging points. Such information shall be made available in motor vehicle manuals, at refueling and recharging points, on motor vehicles and in motor vehicle dealerships in their territory. This requirement shall apply to all motor vehicles, and their motor vehicle manuals, placed on the market after 18 November 2016.
		where appropriate, when fuel prices are displayed at a fuel station, a comparison between the relevant unit prices shall be displayed for information purposes. The display of this information shall not mislead or confuse the user. In order to increase consumer awareness and provide for fuel price transparency in a consistent way across the Union, the Commission shall be empowered to adopt, by means of implementing acts, a common methodology for alternative fuels unit price comparison.

Figure 6.1 Relevant address for e-vehicle from directive 2014/94

6.3.1 Implications

Following the directive 2014/94, by 18 November 2019, and every three years thereafter, Members Countries must submit a specific report on the implementation of its national policy framework containing at least the following elements:

1. Legal measures

Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.

2. Policy measures supporting the implementation of the national policy framework

Information on those measures shall include the following elements:

- direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure,
- availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure,
- use of public procurement in support of alternative fuels, including joint procurement,
- demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes,
- consideration of the need for renewable jet fuel refueling points in airports within the TEN-T Core Network,
- technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.

3. Deployment and manufacturing support

- Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).
- Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.
- Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.

6.4 Tools and Programs

The European Union provide several “Tools” and “Programs” that allow cities to acquire information, learn from other experiences, promote actions and exchange knowledge. The table below lists a selection of these tools and programs, mostly aimed at cities and urban areas that are deemed relevant for the scope of this document.

	Topic	Typology	Description
Tools	Mobility and Transport web site	Web-based tool	Official web-site off European Commission for Mobility and Transport (http://ec.europa.eu/transport/index_en.htm)
	Clean Vehicle Portal	Web-based tool	The Clean Vehicle Portal is an important web-based tool provided by the European Commission to facilitate the implementation of the Clean Vehicle Directive in the European Member States. It provides reference data on vehicle life-cycle cost including the cost of environmental side effects in a manufacturer-neutral way (using internationally accepted vehicle test cycles)
	Eltis – The Urban Mobility Observatory	Web platform	Eltis facilitates the exchange of information, knowledge and experiences in the field of sustainable urban mobility in Europe. Eltis provides the information, good practices, tools and communication channels needed to help you turn your cities into models of sustainable urban mobility
Programmes	CIVITAS	Exchange and learning	The CIVITAS Initiative helps cities across Europe to implement and test innovative and integrated strategies which address energy, transport and environmental objectives
	European Innovation Partnership	Exchange and learning	The aim of the European Innovation Partnership (EIP) Smart Cities and Communities is to help cities and communities, business and civil society to implement smart city solutions at much greater scale and speed
	Intelligent Energy Europe Programme	Support Programme	promote a more sustainable use of energy in transport (i.e. increased energy efficiency, new and renewable fuel sources, and the take-up of alternatively propelled vehicles).
	CLARS (Charging, Low Emission Zones, other Access Regulation Schemes)	Web platform	CLARS platform allows good practice on Urban Access Regulation to be shared, to make schemes more successful and easier to implement
	Do the right Mix	Campaign of sustainable urban mobility	The campaign aims to highlight and advertise the fact that by using different modes of transportation for each journey as appropriate, people can improve their health, their finances and the environment.
	European Mobility Week	Campaign	Annual campaign running from 16 to 22 September every year, which aims to encourage European local authorities to introduce and promote sustainable transport measures and to invite their residents to try out alternatives to car use

Figure 6.2 Relevant tools and programmes

7 Conclusions and key recommendations

This document provides guidance to policymakers at the local, national and European level to foster the large-scale roll-out of electromobility. It is still too early to draw final or firm conclusions about best practices. Therefore, this guidance document is not a fixed recipe. Rather, it is meant to inform and inspire policymakers in selecting the policies that best suit the local conditions.

Local - Local policymakers should not approach electromobility as an independent element, but should integrate it within their larger efforts to make transport sustainable. To do this, they need to look at the specific demands of electromobility within their transport strategies, by looking what parts of their Sustainable Urban Mobility Planning (SUMP) require an approach specific to electromobility. To that effect, chapter 3 identifies the various stakeholders, most notably what the various EV users group need, what charging services the various providers will offer, and how those two elements match. The issues that result from trying to match these elements, and deploy electromobility on a large scale, are sorted according to the level of required involvement from local authorities. Chapter 4 lists tools local policymakers can use to stimulate EV uptake (through financial and non-financial support and procurement rules), help deploy charging infrastructure (for the various types of charging infrastructure), and reach out to citizens (promotion and information).

National – National governments play an important role in the roll-out of electromobility. In particular, they provide national regulatory frameworks and fiscal incentives. As a start, national governments need to develop a national vision on clean, efficient and low-carbon mobility, including electromobility as one of the key elements. Next, targets for the roll-out of vehicles and charging points over time have to be defined. Finally, these targets need to be supported with an action plan, to foster electromobility uptake. This action plan involves several roles for the national government, notably:

Organisation and facilitation: engaging key stakeholders, synchronisation of the actions of the national ministries involved in electromobility, especially through establishing interdepartmental teams and platforms.

Regulation and coordination: providing national laws and regulations, to facilitate the roll-out of electromobility and to remove barriers.

Supporting the roll-out of vehicles and charging points, as the business case for electromobility will initially not be competitive with the conventional alternative. This support needs to include: (a) lowering vehicle purchase prices by tax reductions and/or subsidies; (b) lowering vehicle running costs by offering road tax reductions as well as favourable conditions for electricity costs compared to the fossil fuel alternative; (c) supporting charging points; and (d) privileging electromobility, e.g., by toll road exemptions.

Monitoring and evaluation: Tracking progress in numbers of cars and charging points and use this information to adapt strategy/policies – while maintaining stable long term conditions

EU - The EC plays a crucial role in fostering and enabling the electromobility roll-out, by providing guidelines, norms and directives. Key legislation includes:

the CO₂ emission standards for cars and vans - The EC has set a CO₂ emission target for cars of 95 g/km by 2021. As the next step in this trajectory, the more stringent 2025 targets are currently under discussion. Meeting these increasingly lower CO₂ standards with ICEs becomes increasingly costly over time and finally impossible when the theoretical efficiency limit of the ICEs is reached. Along the same trajectory, the conditions for producing ZEVs become increasingly favourable, as technologies will improve and costs will go down, resulting from economies of scale.

EU directive on alternative fuels infrastructure – as adopted in September 2014, is important for electromobility roll-out as it provides guidelines and obligations for electric charging infrastructure (and in addition for the other alternative fuels: hydrogen, CNG and LNG).

The Fuel Quality Directive (FQD) – this directive, and its post 2020 successor, require a reduction of the greenhouse gas intensity of transport fuels, thereby incentivising the market uptake of low carbon fuels, including (renewable) electricity.

Key recommendations for local policymakers:

Local policymakers can help to make electromobility grow in three ways:

- They can **stimulate the uptake of electric vehicles** by financially supporting individual purchases, through procurement rules (for themselves or their suppliers), and they can provide EV users with usage incentives.
 - They can provide subsidies to companies and private citizens buying an electric vehicle.
 - They can purchase vehicles for their own fleets, using joint procurement if they are small. They can also have fleet electrification requirements for their suppliers,
 - They can offer free/discounted parking/access to certain zones/traffic lanes.
- They **can support the deployment of the various forms of charging infrastructure**, namely home charging, public charging (which includes hotspot charging), employer/company charging, and car-sharing charging.
 - For home charging, they can provide information, safety regulations, or permits, depending on the exact nature of the home charging configuration.
 - For public charging, they can setup and manage the infrastructure themselves, they can have a concession system, or deliver licenses to build infrastructure.
 - For employer charging, they can provide subsidies, information, or set a good example by having chargers in government buildings.
 - For car sharing, they can provide subsidies, provide/reserve parking spots to car-sharing initiatives, or have a promoting role.
- They can have an active outreach towards citizens in the form of EV promotion and by disseminating information about EVs.
 - They can act as a hub/central point of information about electromobility, or set up electromobility knowledge platforms.
 - They can set up test drive campaigns to increase familiarity with EVs, and make EVs and charging stations more visible.

Key recommendations for national policymakers:

- Develop a national vision on sustainable mobility and the associated transition trajectory
- Indicate how electromobility fits within this wider mobility transition.
- Set clear targets over time for vehicles and charging points, by back casting from the longer term goal.
- Develop and implement an action plan, to reach the goal over time, specifically addressing:
 - Regulation and coordination issues to enable electromobility
 - Setting up platforms to engage stakeholders and to synchronise their activities.
 - Promotion and campaigning planning
 - Support vehicle market uptake by bridging the financial gap with the conventional alternative
 - Support the roll-out of charging infrastructure and enable competitive charging costs
 - Monitor and evaluate progress and adapt policies if necessary
- Actively involve stakeholders in the entire trajectory of: (1) vision development (why); (2) target setting (what); (3) the development of an action plan (how).
- Set regulations and laws that:
 - Provide clarity over safety requirements and standards
 - Define or stimulate development of standards for hardware and software
- Require readiness for installation of charging points for new buildings.

Key recommendations for European policymakers:

Foster the market uptake of electric vehicles and the roll-out of charging infrastructure by directives and supporting actions aimed at cars, infrastructure and fuels:

- *Cars* - Provide ambitious and long term *CO₂ emission standards for cars and vans* in line with the trajectory towards 60% CO₂ reduction in transport by 2050, as this will incentivise the market uptake of ZEVs in general and electric vehicles in particular. More concrete: provide an ambitious 2025 target at the lower bound of the currently proposed range (68-78 g CO₂/km), followed by an annual decrease of the CO₂ limit at about the same pace.

- *Charging infrastructure* - Support the Member States in achieving their national ambitions for rolling out charging infrastructure by the *directive on alternative fuels infrastructure* and other incentives.
- *Low carbon fuels* - Continuation and extension of the *Fuel Quality Directive* as an incentive to adopt low-carbon fuels in transport, or use a similar kind of instrument to foster the use of renewable electricity in transport