E-mobility in urban planning
<table>
<thead>
<tr>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 INTRODUCTION 1</td>
</tr>
<tr>
<td>2 E-MOBILITY IN STUTTGART 2</td>
</tr>
<tr>
<td>3 FORMAL PLANNING TOOLS 4</td>
</tr>
<tr>
<td>4 CHARGING INFRASTRUCTURE 6</td>
</tr>
<tr>
<td>5 PARKING PERMITS 7</td>
</tr>
<tr>
<td>6 SUMMARY 7</td>
</tr>
<tr>
<td>IMPRINT</td>
</tr>
<tr>
<td>CONTACTS</td>
</tr>
</tbody>
</table>

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Source: CIVITAS Initiative
E-mobility in urban planning: The case of Stuttgart

1 INTRODUCTION

Electric vehicles (EVs) such as electric cars or bicycles are expected to play an important role in the transition towards more sustainable ways of urban mobility. In recent years, an increasing number of cities has committed itself to promoting the use of EVs within their strategic mobility planning.

This document shows the role and scope of urban planning for the promotion of EVs based on the extensive experience obtained by the City of Stuttgart in recent years. With a large electric car- and bike-sharing fleet as well as a scooter sharing system and approximately 600 charging points for electric cars in the metropolitan region, Stuttgart's approach is a case worth studying.

To reach this point, the city has analysed and tested different electric mobility solutions using a range of existing planning instruments, such as land use plans or development contracts. At first, the options may seem limited to measures such as the implementation of charging infrastructure in housing developments. However, it is evident that urban planning is a significant pre-condition for the provision of alternative mobility options, especially when it creates a walkable and bike-friendly urban grid combined with mixed-use developments. In such neighbourhoods, light trains, electric car-sharing vehicles, e-bikes or e-scooters become a viable transport option.

Another important lesson from Stuttgart is the strong emphasis on cooperation with stakeholders. Including EVs into urban planning requires negotiation and powerful alliances.

Together, the use of formal and informal tools characterises the planning practice in Stuttgart. With this document, the extensive experience made in Stuttgart becomes accessible to more cities and other innovators.
2 E-MOBILITY IN STUTTGART

Stuttgart, home to approximately 600,000 inhabitants, is the capital of the German state of Baden-Württemberg. It is the center of the Stuttgart Region, with a total of 2.7 million inhabitants and 1 million jobs. Europe’s strongest region in terms of exports supports its strength mainly through the automotive and mechanical engineering sectors.

The demand for mobility generated by this economic power puts high pressure on the city’s transport infrastructure. Stuttgart’s city basin is characterised by an excess of traffic jams, stress, noise, fine dust particles and nitrogen oxide. One cause of the traffic jams, in addition to the numerous building sites, is the high number of vehicles driving into the city and in particular the valley basin each day. Some 800,000 vehicles cross the borders of Stuttgart every day. In addition, the city lies on challenging topographical landscape. This obliges public transport and road users to share a limited transport infrastructure, resulting in congestion on main roads, high noise levels and deficient air quality.

As a result, the city requires a coherent transport policy that takes social, environmental and ecological aspects into account. Wherever possible, the city of Stuttgart seeks to tap the potential of electric vehicles (EVs) in order to lower the load of motor traffic on urban roads, improve air quality, reduce noise pollution, and improve the quality of life in general.

Joining efforts in a showcase for e-mobility

Stuttgart is well known as home to some of the world’s biggest car manufacturers and suppliers. At the same time, many research institutes, technology firms, car-sharing providers and a major power company are also based in and around Stuttgart. Numerous stakeholders are engaged in developing solutions for sustainable mobility in the Stuttgart region.

Acknowledging its importance as an innovative region and its ongoing efforts in the field, in 2012 the State of Baden-Württemberg was selected by the Federal Government as one of four German regions to act as a showcase region for electric mobility. In this context, the Federal Government allocated a total of 180 million euros in funding to this programme, which tested electric mobility and how it interacted with energy systems, vehicles and transport systems.

Under the initiative “LivingLab BWe mobil”, the State of Baden-Württemberg and the region of Stuttgart supported around 40 projects concentrated in the region of Stuttgart and the city of Karlsruhe.

Read more: www.livinglab-bwe.de

Hybrid bus
Making e-mobility visible in the city
The City of Stuttgart has been encouraging the use of electric vehicles throughout the last decade. Backed by a strong regional network, the projects increased in number and intensified in scope. Today, electric mobility in the region comprises:

- 7 regional commuter train lines, 13 tram lines and 18 hybrid buses
- 520 electric car-sharing vehicles (e-car2go)
- 100 electric rental bicycles (e-call-a-bike)
- more than 30 electric taxis
- 75 e-scooters (beginning from March 2017) in a free floating sharing system of the public utility company “Stadtwerke Stuttgart”
- more than 600 charging points on public and private premises in what is Germany’s densest regional network of charging infrastructure for EV’s
- free parking for electric cars and plug-in hybrid vehicles
- the “polygoCard”, an electronic ticket and smart card for public transport, e-car-sharing, rental bikes, charging points and municipal services
- a pilot project with electric cargo bicycles used in city logistics
- prototypes of electric light trucks and plug-in-hybrid street sweepers
- and an ever growing share of electric vehicles involved in car and bike pooling schemes of the city and of municipal companies

Defining a framework
The broad range of electric vehicles operating on Stuttgart’s streets is not a coincidence. The promotion of electric mobility represents a tool to strengthen the whole system of sustainable transport. As the City of Stuttgart also aims at reducing congestion, freeing up parking space for other uses and improving road safety for pedestrians and cyclists, it cannot only focus on electric cars.

Thus, the strategic importance and role of electric buses, light trains, e-cars and electric bicycles within the transport system has been thoroughly outlined in the Stuttgart Urban Transport Plan (Verkehrsentwicklungsplan 2030, short: VEK 2030). The plan offers a comprehensive presentation of the guidelines of transportation planning for the city. It is linked to urban and regional land use plans, the regional transport plan, noise protection plans and clean air action plans. All municipal departments sharing the responsibility for urban mobility have participated in its elaboration, supported by representatives of the municipal council and other experts.

Read more:
http://www.stuttgart.de/nachhaltig-mobil
3 FORMAL PLANNING TOOLS

Urban planning aims at guaranteeing sustainable development of the built environment. Both the design and construction of new buildings or neighbourhoods, as well as adaptations to the existing building stock, fall under the competence of urban planning.

In Stuttgart, the municipality steers urban development mostly as a licensing authority. Based on the German Building Code (Baugesetzbuch) and the State Building Regulations (Bauordnung), the city applies a set of formal planning tools when approving, negotiating or declining a project. It enjoys considerably more leeway when it owns the land to be developed.

Although formal planning has its limitations when it comes to promoting electric vehicles, the city of Stuttgart operates with a more diverse and innovative set of tools and instruments to advance its e-mobility goals.

Development Plan (Bebauungsplan)
The statute known as B Plan regulates the use of determined plots of land. This instrument is legally binding and allows, for example, to determine whether a specific area may be built or whether a building can be used as a residence, office building or commercial property.

The urban makeup of development plans is entirely defined by the German Building Code without mentioning or making room for e-mobility. This is why the options to anchor electric mobility as part of the development plan are very limited.

Stuttgart has not considered the targeted promotion of electric vehicles in its development plans so far. However, the B-Plan is currently being used to foster walkable, dense and functionally mixed neighbourhoods. This supports sustainable lifestyles and mobility patterns in which electric vehicles can be easily accessed, be it light trains, electric bikes or cars. Development plans can also be used to allocate light train corridors or commuter cycling highways, or eventually to designate car-sharing stations.

Urban Development Contract (Städtebaulicher Vertrag)
Cooperation with private actors in urban planning is also regulated under the Building Code. The urban development contract is commonly used as a more flexible and collaborative tool, but it still has the benefit of being legally binding.

Urban development contracts can complement a development plan in order to clarify, for example, possible land uses or to share the costs of the planning process with the investor. Contrary to the
development plan, the parties involved in an Urban Development Contract are free to agree on any content and contract type.

It is possible, for instance, for an investor to agree on
• creating charging infrastructure in a building
• constructing ducts for future introduction of charging infrastructure or
• providing mobility management and e-car-sharing in a new residential area

Penalties may apply if these requirements are not met within the allotted time.

The main limitation of this instrument is that a municipality needs to be in a strong enough position to negotiate with an investor. Renegotiating existing building rights, for instance, is not possible. The required legal expertise may also come at higher costs than the usual planning practice. Lastly, it is necessary to verify compliance with the contract’s stipulations within a reasonable period of time.

The City of Stuttgart frequently undertakes urban development contracts. In the case of publicly owned land, sales contracts may contain similar agreements. In a recent construction project, the contract included the goal to strengthen sustainable mobility. It also acknowledged challenges such as poor air quality, noise emissions and unmet parking demand in the area. This ensured that neighbourhood would become a model area of sustainable urban development. To illustrate, the project partners had agreed that the developer provides parking spaces for electric cars, car-sharing vehicles and electric bicycles, along with charging infrastructure.

A subsequent evaluation of the mobility concept and the specific mobility behaviour of the residents and other users of the project may be required by the city of Stuttgart.

Parking Statutes (Stellplatzsatzung)
Many German cities adopt municipal parking statutes which are based on state building regulations (Bauordnung) and define maximum or minimum parking requirements for cars or bicycles in a specific area.

In principle, it is also possible to include requirements for charging infrastructure for EVs in a municipal parking statute. This could help authorities determine the number and quality of charging infrastructure in new construction projects in advance. However, the current state building regulations for Baden-Württemberg do not allow the inclusion of municipal bylaws in this regard.

Depending on the respective state building regulations, this possibility may exist in other federal states in Germany.
4 CHARGING INFRASTRUCTURE

Approximately 600 publicly accessible charging points for EVs are located in the Stuttgart metropolitan region, of which approximately 400 lie within the city borders. Together, they represent Germany’s densest network of charging infrastructure. Within a consortium formed by the regional energy company EnBW, state of Baden-Württemberg, City of Stuttgart and other cities in the region, this network has been growing since 2012.

A significant part of the demand for the charging points is generated through the world’s largest electric car-sharing fleet, consisting of 520 car2go Smart Electric Drive vehicles and powered with green electricity.

A proposal submitted by the Committee on Environment and Technology of the City Council in 2010 led to the participation of the Municipality of Stuttgart in the consortium. The city’s main task in the consortium was to approve charging infrastructure in public spaces. Quantifying the demand for charging points and determining appropriate locations for both the charging poles themselves and the parking lots in front of them became a central challenge for the administration.

**Determination of demand**

Between 2012 and 2013, the city initially assessed the demand for charging infrastructure based on available information from the Statistical Department, including:

- population density
- net income per taxable person
- level of motorization and availability of cars
- density of retail outlets
- density of workplaces

An additional study also looked into:

- commuting behaviour
- parking demand
- points of interest

The data was broken down to the 23 districts of Stuttgart in order to determine the required number of charging stations per district. It was followed by an in-depth examination of potential sites in the districts.

**Location profiles**

The city developed a matrix to test the suitability of a potential site for charging infrastructure. This helped the participating authorities for public order, urban planning and public works to outline essential requirements, ranging from the provisions of the Road Traffic Act to the pipeline network or monument and nature conservation.

The criteria used in practice at the micro level are as follows:

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<th>assessment</th>
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<th>impairment</th>
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<tr>
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<td>wastewater</td>
<td>Yes / No</td>
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<tr>
<td>surface and subgrade</td>
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<td>telecommunication</td>
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<td>cityscape</td>
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<td>monument protection</td>
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<tr>
<td>total</td>
<td></td>
<td>park</td>
<td>Yes / No</td>
</tr>
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</table>

**Assessment matrix**
5 PARKING PERMITS

Parking management has many implications on the use of urban space and mobility choices. In addition, regulating and monitoring parking is crucial for the use of publicly accessible charging infrastructure. Given the lack of legislation regarding this matter, Stuttgart began to experiment with a special parking permit for owners of electric vehicles in 2012. This gave free on-street parking to all fully electric and plug-in-hybrid cars who were equipped with a small identification badge placed behind the windscreen.

However, the recent federal Electric Mobility Act created a dedicated license plate for EVs. Also, municipalities were now officially granted the right to privilege electric vehicles in public space. Therefore, the special parking permits developed by the City of Stuttgart will no longer be in use. In exchange, all EVs equipped with the new E-license plate will enjoy free parking until the end of 2017.

Guaranteeing the accessibility of charging points is another critical issue for public parking management. The privilege to use parking positions at charging points only applies to holders of EVs and also only for the time the vehicle’s batteries are effectively being charged. This regulation is highlighted at the parking lot with the blue “P”-sign for parking and the exception “only for EVs while charging” (“Elektrofahrzeuge während des Ladevorgangs”).

The Office for Public Order frequently controls compliance with the parking regulations. Still, some motorists do not comply with the parking ban for regular vehicles. Currently, a more precise signposting is discussed within the city administration, making it clear that “parking” is not allowed in front of the charging poles, only “charging”.

6 SUMMARY

Compared to other cities, Stuttgart can be seen as pioneer of promoting and using electric vehicles. Through numerous projects and measures, a comprehensive network of charging infrastructure, various rental and sharing options for electric vehicles and an integrated booking and payment system have been established.

This document describes the experience Stuttgart has made with regards to the integration of EVs into the processes and instruments of urban planning. Overall, it becomes clear that urban planning instruments such as development plans have only limited influence on the promotion of electric mobility. Urban development contracts provide more possibilities, but these are concluded only in selective cases.

Regarding the inclusion of requirements for charging infrastructure in new construction projects, no legal possibility has been seen at the moment. However, this could change, once the State Building Code provides a framework for this practice.

Stuttgart has also been a pioneer in the facilitation of charging infrastructure in public space. Recent changes in the federal legislation made parking privileges for EVs, as already in practice in Stuttgart, easier for all German municipalities.

From an overall perspective, it may appear important to stress the limited possibilities of urban planning in order to contain growing expectations. Nonetheless, networks of environmentally-friendly mobility require consistent urban planning. The use of light rail and regional commuter trains, of e-carsharing-vehicles and electric bicycles best takes place in a city where mixed-use and highly walkable neighbourhoods provide a good setting for sustainable lifestyles.
LEssonS LeArnT

- Urban planning is a main pre-condition for the provision and use of electric mobility options (light trains, electric bicycles, e-car-sharing, ...).

- Formal and informal urban planning instruments provide only limited influence on the promotion of EVs, especially in the existing building stock.

- Urban development contracts are the most powerful instruments in this context. The involved parties may agree on the installation of charging poles, mobility management or similar measures.

- The implementation of publicly accessible charging infrastructure requires broad consultation and acceptance by citizens and politicians.

- Fostering EVs benefits from powerful alliances with stakeholders such as car-sharing companies or power suppliers.
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