E-Mobility in Simmering NW

Report on new e-mobility services and activities and their integration into a local mobility strategy

Deliverable 5.5.1

Version 1.0

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Revision Chart and History Log

Versions

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Deliverable quality review

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# Table of contents

1. Sub-Task Local Mobility Strategy ................................................................. 10
   1.1 Starting position on mobility in the district ............................................ 11
   1.2 Working out the strategy ....................................................................... 12
2. Sub-Task Mobility Survey ...................................................................... 16
3. Sub-Task E-Taxi feasibility study ............................................................. 19
4. Demo-Project SIMBIKE by SYCUBE .................................................... 21
   4.1 Baseline situation ................................................................................... 21
   4.2 Conception of the Project ................................................................. 21
   4.3 Implementation Steps ........................................................................... 22
   4.4 Resources Used .................................................................................. 26
   4.5 Current Status ..................................................................................... 27
   4.6 Business model .................................................................................. 37
   4.7 Experience and Outlook ...................................................................... 39
5. Demo-Project E-Carsharing by BWSG .................................................. 40
   5.1 Starting Point ...................................................................................... 40
   5.2 Implementation Steps ........................................................................... 44
   5.3 Current Status ..................................................................................... 50
   5.4 Experience and Outlook ...................................................................... 52
6. Demo-Project E-Logistic by Austrian Post ............................................ 53
   6.1 Starting Point ...................................................................................... 53
   6.2 Project Conception ............................................................................... 55
   6.3 Sub-Task: Equipping buildings in the Simmering project area with Post pick-up boxes free of charge 56
   6.4 Sub-Task Mobility Point - pick-up station (wall) letter and deposit boxes ............................................ 57
   6.5 Subproject: Product launch of the Flexibox in the Simmering project area .................................. 59
   6.6 Subproject: e-Logistics ......................................................................... 61
   6.7 Resources Deployed ............................................................................. 65
   6.8 Experiences and Outlook ..................................................................... 65
7. Demo-Project E-Mobility at Siemens ..................................................... 66
   7.1 Starting position: .................................................................................. 66
   7.2 Project-concept .................................................................................... 67
   7.3 Steps of implementation ...................................................................... 68
   7.4 Resources used .................................................................................... 79
   7.5 Current status / savings ....................................................................... 79
   7.6 Experience and perspective .................................................................. 81
8. Conclusion ............................................................................................... 83
List of figures

Figure 1: Overview of all mobility actions in Smarter Together Vienna .............................................................9
Figure 2: Map of project area with major public transport and bike infrastructure ...........................................12
Figure 3: Overview of all proposed measures and improvements on mobility in the district incl. future locations of mobility points and services ...........................................................................................................14
Figure 4: Example of SWOT analysis for all modes of transport: weaknesses of bike infrastructure - connections, crossovers, street design and parking for bikes ...........................................................................15
Figure 5: Extract of the measure portfolio produced as an annex to the Local Mobility Strategy, summarizing measures along priority, responsibility, financing and topics ..................................................................................15
Figure 6: Possible E-Taxi ranks in the project area .............................................................................................20
Figure 7: Commissioning SIMBIKE Wiener Zentralfriedhof © Friedhöfe Wien, Tobias Natter .........................24
Figure 8: Terminal at Mobility Point with additional E-Cargo rank developed by Sycube .................................24
Figure 9: Terminal Light with 2 x 6 Bikeholder .....................................................................................................28
Figure 10: Sycube Lock of the Bikeholder ...........................................................................................................29
Figure 11: Terminal Light with 1 x 6 Bikeholder .................................................................................................30
Figure 12: E-Bike model BESV CF1 .....................................................................................................................31
Figure 13: E-Bike model I:Sy Bike .......................................................................................................................32
Figure 14: Screenshots Simbike APP ..................................................................................................................33
Figure 15: Screenshot Simbike integration in the Wien Mobil APP ......................................................................33
Figure 16: AXA Wired Lock and control board case (3DPrint) ...........................................................................34
Figure 17: SYCUBE Control Board Version 1 (Lock&Charge.me) .....................................................................34
Figure 18: SYCUBE Control Board Version 2 (in-house development) ...............................................................35
Figure 19: SYCUBE Control Board Version 2 (in-house development) ...............................................................35
Figure 20: Rendering Station with a station sign ..................................................................................................36
Figure 21: Symbolic representation of a stele ......................................................................................................37
Figure 22: Users and project partners at parking places of E-Cars in the housing estate .................................40
Figure 23: Meeting the tenants for an inspiring exchange of ideas .................................................................49
Figure 24: Information and testing e-cars ..........................................................................................................49
Figure 25: Image of a receiving box installed e.g. at residential buildings .......................................................57
Figure 26: Letter and deposit boxes (test operations of two combined letter and deposit boxes in the Simmering project area – Mobility Point) ..................................................................................58
Figure 27: Illustration of the new b2c logistic service “flexi box” at the housing unit entrance door ..................60
Figure 28: Picture of one IVECO daily e-Van operated in the project area .........................................................62
Figure 29: Production hall at Siemens for train wagons directly at the Lighthouse district .............................66
Figure 30: Map of the Siemens industrial site – between the different halls a lot of transportation is necessary ...............................................................69
Figure 31: E-forklift by Linde was chosen as best option ..................................................................................70
Figure 32: Siemens Factory Simmering - e-car charging station with BWSG Smarter Together vehicle; J. Girardi-Hoog and S. Hartmann in front of the new charging stations for e-cars .................................................72
Figure 33: E-Crafter at Siemens plant Lebenstrasse / by the VHS Simmering .....................................................74
Figure 34: The new Fronius charging device ......................................................................................................74
Figure 35: BEFORE: Bulk good is delivered at 4 different places on the site (see transportation routes) ...........75
Figure 36: TARGET-Solution – only one central warehouse .........................................................................75
Figure 37: Dismantling high-bay warehouse – Start platform construction – Finishing platform .......................76
Figure 38: Construction stage window installation – Facade opening before / after .......................................77
Figure 39: Finished platform – upper area ..........................................................................................................77
Figure 40: Before – Diesel-powered electric vehicle from Summer 2018 on .....................................................78
Figure 41: Similar transportation vehicle for small vehicle parts in testing phase ............................................78
List of tables

Table 1: User figures for the E-Carsharing BWSG-Hauffgasse in 2018.................................................................50

Glossary

<table>
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<tr>
<th>SUMP</th>
<th>Sustainable Urban Mobility Plan</th>
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<tr>
<td>GB</td>
<td>Gebietsbetreuung Stadterneuerung</td>
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<tr>
<td>MIT</td>
<td>Motorized Individual Traffic</td>
</tr>
<tr>
<td>CUG</td>
<td>Closed user group test</td>
</tr>
<tr>
<td>RAL</td>
<td>colour code system used in Europe that is created and administrated by the German RAL gGmbH</td>
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<tr>
<td>RFID</td>
<td>Radio-frequency identification</td>
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<tr>
<td>SYC Share SW</td>
<td>Sycube Sharing Software (Software protocol for shared mobility services developed by Sycube)</td>
</tr>
<tr>
<td>BLE</td>
<td>Bluetooth low energy</td>
</tr>
<tr>
<td>Nm</td>
<td>newton metre</td>
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<tr>
<td>EDP</td>
<td>Electronic data processing (automated)</td>
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In 2017, Smarter Together Vienna got the award of the Austrian mobility and climate NGO “VCÖ” for its integrated approach in the category “Active Mobility and Public Space”. Picture of the Task 5.5 partners at the awarding ceremony.
EXECUTIVE SUMMARY

This Deliverable is dedicated to all smart (E-)mobility actions carried out within Smarter Together in Vienna (The installation report of the Mobility Point will be handled in an own Deliverable).

The qualitative added value of Smarter Together is to combine different energy and urban renewable actions within one approach and to demonstrate new integrated solutions. For Vienna, the big opportunity is to connect refurbishment and energy actions or citizen’s engagement and local activation actions with mobility solutions. Because of this, synergies can be fostered, and it was even possible to develop an additional dynamic in the implementation process. This is most evident in the E-Carsharing at the social housing site of the limited profit housing association (LPHA) BWSG in the Hauffgasse or within the Co-Design processes for the E-Bikes as well as the Mobility Point. A Local Mobility Strategy within this Urban Renewable approach pinned mobility very high on the agenda and created a commitment by different Stakeholders. In Vienna, the cooperation with industry (Siemens and Post) brought relevant new insights for solutions on CO₂-free logistics. During the project, additional ideas came up, very relevant for the objectives of the project. A mobility survey delivered important data for conception of services and monitoring, and an e-cargo bike deployed through the actors of the Urban Living Lab promoted a new mobility service.

The Deliverable is a comprehensive overview of 7 sub-projects implemented by different partners. It provides information, facts and figures as well as learnings in order to understand the nature of the solutions and their major business case outlines. In Smarter Together, the present Deliverable is providing useful content to support the replication and dissemination of the solutions. The main content of the sub-projects by Sycube, Siemens, Post and the BWSG-E-Carsharing directly came from the partners! Because of this and the different nature of the actions, the chapters are slightly adapted. More data according to the operation, usage and impacts of the solutions will be provided through the Deliverables in Monitoring (WP6 of Smarter Together), after a sufficient time of measuring and operations.

In total about 2,246,000 Euros have been invested until end of 2018 for (e-)mobility projects in the context of Smarter Together incl. the mobility point. These investments are directly triggered by Smarter Together and its funding. Therefore, different first of its kind solutions that would not have existed this way or that soon without the joint project have been realized.
Figure 1: Overview of all mobility actions in Smarter Together Vienna
## Overview on Demonstration Outcomes

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<th>Number</th>
<th>Infrastructure deployed</th>
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<td><strong>E-Cars</strong>&lt;br&gt;(3 at Hauffgasse by BWSG + 1 at Siemens)</td>
</tr>
<tr>
<td>6</td>
<td><strong>Charging Points for E-Cars</strong>&lt;br&gt;(3 at Hauffgasse by BWSG + 2 at Siemens + 1 at Mobility Point)</td>
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<td>9</td>
<td><strong>Special E-vehicles</strong>&lt;br&gt;(6 forklifts at Siemens + 1 heavy load carrier at Siemens + 2 E-Vans at Post)</td>
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<td>7</td>
<td><strong>Charging stations for special E-vehicles</strong></td>
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<td>14</td>
<td><strong>E-Bikes</strong>&lt;br&gt;(13 at Sycube System + 1 E-cargo-Bike via Urban Living Lab)</td>
</tr>
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<td>19</td>
<td><strong>Charging points for E-bikes</strong>&lt;br&gt;(6 at Siemens + 13 at Sycube System)</td>
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<td>1</td>
<td><strong>Mobility Point</strong></td>
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<td>450</td>
<td><strong>Parcel delivery boxes</strong></td>
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<th>Other Outcomes</th>
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<td><strong>APPS</strong>&lt;br&gt;• SIMBike App by Sycube,&lt;br&gt;• WienMobil App by Wiener Linien</td>
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<td><strong>Studies</strong>&lt;br&gt;• Local Mobility Strategy,&lt;br&gt;• Mobility Survey,&lt;br&gt;• Feasibility Study on E-Taxi (Research study on motivations at E-Carsharing Hauffgasse done 2019)</td>
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<td><strong>Business Model concepts</strong>&lt;br&gt;• E-Carsharing at Social Housing with active groups of tenants&lt;br&gt;• Delivery boxes by Post&lt;br&gt;• Mobility Point as a platform for mobility services&lt;br&gt;• E-vehicles, charging stations and logistic improvements at Siemens – saving money and CO2!&lt;br&gt;• E-Bike Sharing system by Sycube</td>
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<td><strong>Co-Design solutions on Mobility</strong>&lt;br&gt;• Involvement of citizens at Local Mobility Strategy&lt;br&gt;• Prosumer und active user approach at Hauffgasse&lt;br&gt;• E-Bike testing and evaluation with possible users&lt;br&gt;• Employees participation at Siemens</td>
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1. Sub-Task Local Mobility Strategy

From the beginning of the demonstration activities in Vienna, it was a dedicated objective to develop a local mobility strategy for the lighthouse district. The lead of this project was carried out by the Department of Urban Development and Planning (MA 18) and their unit of Mobility Planning. The background for this action was also the goal, postulated by the Sustainable Urban Mobility Plan (SUMP) of Vienna, to define which Mobility Points should be set-up in coherence with such a local mobility strategy. Also, it’s a big added value and step forward to develop a local mobility strategy closely aligned with urban renewable and refurbishment actions.

1.1 Starting position on mobility in the district

Vienna’s Smart City Lighthouse area is part of Simmering, the 11th and one of the outer districts in the South-East of Vienna. Simmering is a traditional workers’ district. The area selected for Smarter Together is located in its North-West. It is an area “in between” vast redevelopment sites (Vienna main station, Mautner-Markhof Areal). The area covers about 1.5 km² with some 21,300 inhabitants, hosts 12,000 jobs and is characterized by important social housing from between WW1 and WW2 and post war areas. With 14,200 inhabitants per km² it is a rather dense area, with many foreign people and migration backgrounds and less education levels than the city average.

The project area is well connected with public transport. Several years ago, the Metro Line number 3 (orange lines) was extended to Simmering, the Light rail and 2 tram lines plus 3 bus lines were going through the area.

Nevertheless, the area is fragmented by heterogeneous structures of industries and mayor traffic lines as barriers. The area is not inner city, which also means it’s out of the range of the public bike sharing system and at the edge for the free-floating carsharing areas. Most of its different residential neighborhoods have close access to daily needs and consumables. Because of this and good public transport connections, an urban life without private car ownership and usage seems plausible, although potentials have not been realized. With additional mobility services, Smarter Together have found a very good testing and Lab area for new mobility solutions, which is representative for huge parts of Vienna because of its position between inner city and the outer suburbs.
1.2 Working out the strategy

For the Strategy in the WP5 of Smarter Together, the following targets were defined at the beginning as for Vienna:

- Elaboration of a comprehensive analysis that integrates and coordinates all local modes of transport in the district
- Definition of priorities and setting the ground for the demonstration projects in Smarter Together Vienna
- Elaboration of future perspective for mobility topics in the district, in connection with urban renewable.

From the start of the project in February 2016 until End of October 2016, the strategy was developed as foreseen in the Description of Action. During this Process the following steps were carried out:

- Conception:
  Project Description and work plan, coordination with local program management WP5, Starting Workshop together with Urban Renewable Office to analyze baseline data and Status Quo, bilateral interview, district walking tour
- Overview and Status Quo mobility relevant information (Inventory of mobility service, relations and mobility demands, mayor facilities like bike lanes, walking routes, transport lines, etc.)
- Coordination with other demonstration projects in WP5. This also includes participation and contribution at citizen's involvement and co-design activities, such as the bike testing events, SIM mobile activities, etc.
- Consideration of targets groups and different mobility demands. This was partly done in the social analysis and the long-time experience of the Urban Renewable Office (Gebietsbetreuung Stadtenerneuerung, GB*), partly covered by the local mobility survey (see Sub-Task in next chapter)
- Definition of the content and framework of the strategy (Mappings, SWOT overview, text, list of possible measures, possible locations of mobility services)
- Working out strategy together with relevant stakeholders, local institutions and citizens, WP5 partners, other municipal departments

The final result was a report summarizing a broad range of mobility issues like: public space and pedestrian connections, situation and connection of possible Mobility Points, marketing and Information on mobility, public transport coverage, bicycle infrastructure, street network and parking space, consideration of linking green spaces (here an own sub-task was carried out on this topic, see Deliverable Integrated Infrastructure in Smarter Together WP5), school routes, logistics and financing of mobility measures.

The following map is giving a few impressions of the outcomes of the strategy:
Figure 3: Overview of all proposed measures and improvements on mobility in the district incl. future locations of mobility points and services.
**Figure 4**: Example of SWOT analysis for all modes of transport: weaknesses of bike infrastructure – connections, crossovers, street design and parking for bikes

Smarter Together - Local Mobility Strategy

**Catalog of Action**

<table>
<thead>
<tr>
<th>Action</th>
<th>Priority</th>
<th>Projectlead</th>
<th>Responsibility</th>
<th>Financing</th>
<th>Time</th>
<th>Notes</th>
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<td>Smarter Together</td>
<td>Vienna, Funding?</td>
<td>Part of Smarter Together, Feasibility Study</td>
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<td>Parking for Carsharing</td>
<td>Low</td>
<td>MA 28, 46, Bezirk</td>
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<tr>
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**Figure 5**: Extract of the measure portfolio produced as an annex to the Local Mobility Strategy, summarizing measures along priority, responsibility, financing and topics.
2. **Sub-Task Mobility Survey**

This additional Sub-Task was developed during the Kick-Off phase of the project and not intended originally in the project proposal. It turned out, that it’s crucial to receive data on mobility behaviour, demands or availabilities at the beginning of the demonstration phase and not at the end of the project during Monitoring and Evaluation. Main needs were a) that demonstration projects can build upon more local reliable data for their conception of implementation plus b) that there are better baseline data from the beginning of the project onwards, to receive better information about the mobility impacts and changes in the lighthouse district.

The first mobility survey in Vienna’s “Smarter Together”-project took place from August to December 2016. It was developed closely with all partners of Task 5.5., the task lead and AIT as the implementer. The survey was partially performed face-to-face and partially carried out as an online survey. Even though 482 people participated, only a total of 241 questionnaires were fully completed and therefore can be included in the evaluation. Although this is a crucial number of samples, the people are only partly representative for the district because of a certain bias and different demographic indicators like education level. Nevertheless, it gave some very local insights and trends for the project.

For the current use of mobility options and preferences towards certain modes, the following information could be extracted:

- 22% would like to walk more often if they were free to choose.
- The majority would be willing to walk at least partial distances to the grocery store or shopping facilities (82%), to the nearest public transport stop (76%) or to work (59%).
- 5% cannot imagine walking at least partial distances.
- A large proportion of respondents already walk on their daily routes (about 60% for both leisure and work). Usually, these routes are part of a longer trip which includes public transport.
- Many footpaths to workplaces take less than 15 minutes. Longer footpaths are only covered by a small number of people. In comparison, a length of 15-60 minutes in public transport is still accepted by almost 30% of the respondents to get to work.
- Walking is regarded as environmentally friendly, self-determined, conventional, spare time, an independent mobility option; it is hardly associated with unnecessary luxury, high income and laziness.
### Bicycle
- 81% live in a household with at least one bicycle.
- 51% indicate that they have cycle paths or bicycle-friendly roads available on their everyday routes. 59% have a parking space in the residential house and only 21% have a parking space in the residential area.
- 41% state that they would like to cycle more often if they were able to choose.
- The majority would be willing to cycle at least partial distances to the grocery store or shopping facilities (87%) followed by partial routes to work (41%) and the nearest public transport stop (22%).
- 22% cannot imagine cycling at least partial distances on bike or e-bike.
- Maximal duration of the trip varies between the respondents: 10% state less than 5 minutes, 23% prefer trips from 5 to less than 15 minutes, 29% cycle 15 to less than 30 minutes, and 17% 30 to less than 60 minutes. Trips taking more than one hour are accepted by 5% further 16% did not state their time limit.
- Cycling is regarded as environmentally friendly, spare time, independent, self-determined, conventional mobility option; it is hardly associated with unnecessary luxury, laziness and high income.

### E-Bike
- 4% live in a household with at least one e-bike.
- 20% would like to use an e-bike or scooter more often in the future.
- Maximal duration of the trip varies between the respondents: 10% state less than 5 minutes, 12% prefer trips from 5 to less than 15 minutes, 19% cycle 15 to less than 30 minutes, and 17% 30 to less than 60 minutes. Trips taking more than one hour or more are accepted by 7% 35% did not state their time limit.
- Using e-bikes is regarded as environmentally friendly, spare time, comfortable, independent, self-determined mobility option; it is hardly associated with high income, regarded as conventional and routine.

### Public Transport
- 88% have a public transport stop in 5-7 minutes walking distance from their residence.
- 77% have a commutation ticket for public transport which reflects in the usage.
- While public transport is used less often compared to walking, public transport is the prevailing mode for longer distances, with about 50% of respondents using the public transport system every day.
- It is regarded as environmentally friendly, necessary, conventional, a safe mobility option as well as a habit; it is hardly associated with unnecessary luxury, high income and privacy.

### Car/Motorcycle/Moped
- 75% of the respondents own a driving license but only 59% live in a household with one or more vehicles.
- 12% have one car per household, 46% have two or more cars and 41% have no car at all.
- 51% have a private space available while a public garage is available for 28% and parking spaces in the public space for 60%.
- 29% would like to travel more frequently with an electric car in the future.
- 9% live in a household with at least one motorcycle/moped.
- Two thirds of the households with more than two motorcycles/mopeds also have two cars.
- The car is regarded as comfortable, private, a self-determined, independent, time saving mobility option; it is hardly associated with environmental friendliness, money saving and low income.
• 15% have a membership and 9% use car sharing.
• 60% state that they are not able to use car sharing for work or leisure trips.
• Some use car sharing on a monthly basis with a more frequent use on the trip to work.
• Those who travel multimodal tend to use frequent car sharing offers; frequent car users are less likely to do so.
• The 14% would like to use frequent car sharing instead of their own car. In addition to other means of transport, 11% would like to use car sharing regularly.

Car sharing and e-bike sharing are neither well known nor established in the demonstration area so far though they could provide the residents with an additional benefit. Using e-bike sharing for short distances instead of the crowded public transport or the car could be an interesting mobility option.

Cycling is regarded as desirable transport mode by most of the participants. Most would like to increase the bike usage in the future. Infrastructure improvement is therefore needed since the surrounding structure does not encourage them to do so. Missing bike padlocks as well as cycling lanes are named as major shortcomings.

Public transport is already intensively used by most of the survey participant and well developed within the area. To link public transport stronger to other alternative modes could improve the usage of CO₂-friendly modes. Therefore, a Mobility Point is a suitable concept. In addition, the creation of cross-links in the area would provide even better accessibility.
3. Sub-Task E-Taxi feasibility study

As part of the activities to foster e-mobility for the Smarter Together implementation actions, a feasibility study for the realization of an E-Taxi station was included in the activities of the Mobility Task from the beginning.

Since 2016 the E-Taxi program was launched by the City of Vienna and Wiener Stadtwerke. Taxi companies can receive up to 8,000 Euros per car to buy a new E-Car. This program is co-financed by the national climate and energy fund. The objective was to get 250 E-Taxis running. Up until now the dedicated E-Taxi points with charging stations in public place were realized in Vienna. In Smarter Together the TLP NeuMo of Wiener Stadtwerke had the lead on the feasibility study. The aim was to assess possible variations of a stations for e-taxis in the Lighthouse area of Simmering.

2 realistic possible concepts were created:

- **Alternative 1**: Station for minimum 3 e-cars in public space. 2 of these parking spaces equipped with charging points with 3.7 kW, just to get some “upkeep charging”. Charging for E-Taxis only.
- **Alternative 2**: Station size variable and open, and in public space as well. Charging point after the last parking space with 11 kW. Charging open for everybody.

The alternatives and framework conditions were evaluated by NeuMo, to see if an implementation in Smarter Together would be possible. In a meeting with the decision body of Wiener Stadtwerke end of 2016 a direct implementation was not approved.

One part of the question was to integrate the e-taxis station in the Mobility Point project as an additional service. The following challenges were assessed: The Mobility Point is not an official taxi rank, defined as a place for taxis to make their service available in public. Along with this, on a taxi rank a mixed private and commercial use is not foreseen which includes both possible location of the Mobility Point (already defined at this time by the local mobility strategy). As a result, a joint implementation with the mobility point was skipped.

The approval procedure and the framework to install charging stations in public space were not ready at this time, and were highly depending on the program “1,000 charging points for Vienna” (note: they have been implemented in 2018 and the 2018 opened Mobility Point in Simmering was part of this roll-out). In addition, taxis have to always be ready to go to a taxi rank which is in conflict with charging of Alternative 1 mentioned above. High installation costs in public space are only profitable by very high usage rates. Alternative 2 above showed a better finance
calculation, but not many e-cars on the taxi market could deal with that kind of charging power.

**Basic business model:**


Incomes: selling of electricity with different tariffs (time based, flat rate, kW based).

![Figure 6: Possible E-Taxi ranks in the project area](image)

In 2016 many legal framework conditions were not clarified enough to start with the implementation of the e-taxi point.

More information on the e-taxi program Vienna on the dedicated website (see References).
4. Demo-Project SIMBIKE by SYCUBE

Short presentation clip in the References section (German) ii

4.1 Baseline situation

With a share of 7% of the distances travelled by all citizens of Vienna by bicycle (Modal Split), Vienna has a rather low share of cycling traffic compared to other European cities. With regard to the mobility behaviour of the residents, the share in favour of the environmental network should be postponed. This includes the bicycle, which can be part of a more sustainable overall transport system. Goals are to reduce the share of the Motorized Individual Traffic (MIT) of all trajectories to 20% by 2015 and 15% in the long term.

One of these measures is the introduction of a fully automatic year-round pedelec rental system in the project area Smarter Together. In Vienna since 2002 there are public bicycle rental systems with the support of the city. After trying out models, Citybike Vienna has been running successfully for several years. A total of 120 stations with over 3,000 bike boxes are available. However, only in the inner-city area, and without electric drive.

In the outskirts such as Simmering, individual decentralized (e-) bike rental systems are available. There is a need and potential to develop new models to drive sustainable mobility without the need for private car ownership. An example that has existed since 2014 is the "SeestadtFlotte" in the Seestadt aspern development area iii. For Smarter Together, the challenge is to develop a model in an existing city district.

4.2 Conception of the Project

4.2.1 The following key project goals have been defined in the project description

- Construction of finally 2 rental stations with 15 delivery points as well as 13 pedelec and a freight pedelec
- 1 station of which will be integrated with the Mobility Point of Wiener Linien (mobility project as part of Smarter Together) in the area of Simmeringer Platz / U3 Simmering
- Application of developed software and borrowing medium
- Product launch: marketing and public relations
- Gaining at least one additional cooperation partner for future operations
4.2.2 At the time of reporting, the following status has already been achieved.

- Construction of 2 rental stations with 13 delivery points and 13 pedelec
- The rental stations Wiener Zentralfriedhof and Wien Mobil Station / U3 Simmering are built.
- Development of the necessary hardware (frame lock including control electronics) has been completed.
- The Application of the developed software and borrowing medium - has been implemented.
- Product launch: marketing and public relations - was started with the commissioning of the station at the Central Cemetery and will be reinforced with the opening of the Wien Mobil Station at U3 Simmering
- Gaining at least one further cooperation partner for future operation - Could be achieved by the partner Friedhöfe Wien
- Additional objective: Set up 3rd terminal. Planning and negotiations ongoing. Either temporarily at SIMmobil or another central location, or fix for BWSG plant, Siemens employees, “Hörbiger Gründe” development area.

The Smarter Together Vienna project has been very dynamic right from the start. At the start of the project, coordinating the different project schedules created the biggest challenges.

An example of this is the integration of bike sharing into Mobility Point, the "WienMobil Station". Extensive planning work on the part of Wiener Stadtwerke as well as a complex approval process on the part of the responsible authorities of the city of Vienna resulted in the earliest possible launch of the WienMobil Station in autumn 2018.

4.3 Implementation Steps

4.3.1 Timing of Realization

The commissioning schedule was subject to various changes in the conception phase of the project. These changes were in both internal and external project factors.

Within the project, the longer planning horizon of the “Wiener Stadtwerke” during the construction of the “WienMobil Station”, as well as complex approval procedures in the design of the stations with regard to the urban public space, played a significant role.
After focusing on a uniform design of the WienMobil Station, Wiener Stadtwerke played a coordinating role in the implementation planning and defined an implementation plan in coordination with the project partners.

From the external perspective to the project, above all technical hurdles and quality problems in production at subcontractors (AXA) have led to delays in projects.

### 4.3.2 Launch at the Central Cemetery “Zentralfriedhof”

The construction of the station at the Vienna Central Cemetery enabled us to achieve a central project goal even before the ViennaMobil Station went into operation. By situating the station on private grounds otherwise required approval procedures could be excluded.

The facility at the Vienna Central Cemetery was financed by funds from Smarter Together. At the same time, Sycube receives an advertising allowance for the wrapping of the wheels as well as the provision of a time credit for the employees (details Business Case Forecast).

In mid-April 2018, the facility was built at the Vienna Central Cemetery. Structural conditions led to a mounting on a transportable steel plate.

The following 2 weeks were primarily a closed user group test (CUG) in the context of which only the employees of Vienna cemeteries were authorized to test the system and give feedback.

On May 2nd, 2018, the plant was put into operation.
Figure 7: Commissioning SIMBIKE Wiener Zentralfriedhof © Friedhöfe Wien, Tobias Natter

Figure 8: Terminal at Mobility Point with additional E-Cargo rank developed by Sycube
4.3.3 Commissioning Station U3 Simmering

The commissioning of the U3 Simmering station took place simultaneously with the completion of the Wien Mobil Station. Sycube has concluded a contractual agreement with the operator of WienMobil Station and project partners in Smarter Together Wiener Linien. This concerns both the design of the station on site and the integration of SIMBIKE in the Wien Mobil APP. The commissioning of the Wien Mobil Station is a key milestone, since on the one hand the system connection from Simbike to a high-class means of transport (subway) takes place. On the other hand, the charge can be put into operation at crowded stations (Fence Station).

4.3.4 Challenges during Implementation

The project implementation posed several challenges. The following describes those who had direct influence on schedules or budget resources.

4.3.5 Subcontractor AXA

As already mentioned in the technical description, the partnership with the world market leader in bicycle frame locks (AXA) proved to be a particular challenge. With regard to resource efficiency, the project decided to use a series product for the frame lock. The technical implementation of the frame lock together with the control board turned out that the technical documentation of AXA was inadequate and the quality of the delivered product proved to be inadequate.

After a documentation of the deficits AXA admitted the hardware problem and worked on the solution. After AXA had had a unique selling point with this product on the market, a change of the hardware supplier was not possible after the current state. With regard to the use of the technology in other projects, a development partnership with AXA with the appropriate contractual framework or the complete in-house development of a frame lock is therefore recommended.

4.3.6 Subcontractor Lock&Charge.me

Similarly, the cooperation with Lock & Charge.me proved in the context of the project as not effective. As with AXA, incorrect product and performance parameters led to deviations from the objectives of the frame lock functionality. As a result, the cooperation with Lock & Charge.me was terminated.
4.3.7 Harmonization of schedules with project partners

In retrospect, reconciling the different schedules of project partners represented a great challenge to Sycube. Its wish to start the project as early as possible could not be met due to the timetable of Wiener Stadtwerke for the construction of the Mobility Point "WienMobik Station". The delay in implementation has a negative impact on Sycube’s hardware cost recovery rate. The hardware was already procured at the start of the project in order to be able to start with the product development. Due to the changed implementation schedule, however, this could only be put into operation in autumn 2018 with the effect that the depreciation of the plant components is minimized.

4.3.8 Target group-specific product design

In the conception phase of the project, the main focus in the loan process was on the development of a customer APP. Since commissioning the station, it has become clear that the target group of foreign tourists and, in particular, those of the grave visitors at the Vienna Central Cemetery, for different reasons, prefer borrowing by means of a customer card. As a solution, the possibility of a prepaid card is now created with which the customer can use the system. It can be assumed that the use of the APP will increase over time due to demographic changes, provided the needs of pensioners in the design of the app is more in focus.

4.4 Resources Used

The SIM-Bike project involved high investment costs both in the development of new components and the necessary adaptation of the software. Likewise, the required hardware was already purchased at project start. These investment tips were made possible by the pre-financing amounting to 61,000 Euros (budget shift between the city of Vienna and Sycube).

At the time of reporting, all hardware components, with the exception of the e-cargo bike, have already been purchased. Further investment costs are not expected at the time of reporting in the hardware area. On the fly, however, software adjustments and improvements are expected. These primarily serve to improve the product and increase the usability for the end customer.

The mentioned person months were provided by own staff. The degree of complexity of the hardware and software solution required a shift of tasks from junior to senior employees. In addition, services were provided by external software employees. This measure mainly served to comply with the timetable (DOCON GmbH).

Furthermore, the internal project accounting structure had to be adjusted. This task was outsourced (TAG Consulting LAB GmbH). This explains an increase in staff costs.
At the time of the last reporting (31.01.2018) the following expenses have been incurred:

Person Month: 19.2 PM
Total Cost: 302,200 Euros
Equivalent EU Funding: 212,000 Euros

4.5 Current Status

4.5.1 Technical description of the bike sharing system

The bike-sharing facility that is currently being used at the Vienna Central Cemetery or will subsequently be used at the Wien Mobil Station at the U3 Station Simmering will be technically based on a station-bound charging bar (Bikeholder) with a physical rental terminal (Terminal Light) BESV CF1 and I: Sy bikes were specially converted for a Sycube bike-sharing system.

As a new technical development, a control board for the Axa Wired Lock was developed which is attached to the frame tube in a separate component. This control board offers the customer the advantage that he can safely close the vehicle in the event of a break (stopover) or deliver the vehicle in the vicinity of a filled station (Fence).

4.5.2 Description of the Bikeholder

The bike holder is on the one hand the mechanical housing for mounting and holding the charging point (or the locking system) and protects on the other hand against the physical stress caused by forces that occur when setting and removing the vehicles.

- Modular design
- Easy installation
- Max. 200cm length and 80cm height in coordination with the vehicles
- Distance between the individual vehicles is always 70cm, either measured centrally or defined as space requirement of the vehicle. This defines the position of the charging points along the bikeholder
- One or two sidedness
Figure 9: Terminal Light with 2 x 6 Bikeholder

4.5.3 Description locking system

For easy return, Sycube uses an insertion aid (plastic ring). This can be done in different RAL colors. In order to be able to uniquely assign the parking spaces or the locking systems, the parking spaces are numbered. The numbers are printed on self-adhesive label tags. The designated area on the plastic ring is slightly sunk.

As soon as a docking unit of the bicycle is in the locking system, this is closed and can only be opened by the authorized user or service personnel. Opening can only be
carried out if there is tension. The service personnel can unlock the locking mechanism mechanically by opening the maintenance flaps in the longitudinal beam also in an emergency, so that a removal of the bike is possible. The maintenance flaps are protected by appropriate locks. Each bikeholder is equipped with control electronics.

The lock is designed to match the exact size of the ball nose (the connector on the wheel). The bike can be easily pushed into the lock with the ball nose and without additional effort of the user. An RFID reader in the box detects the bike, which reflects a successful return by green, flashing light. Upon return of the bike, the ball is automatically locked so that direct removal is no longer possible. The mechanical part of the castle is responsible for this. Even in the event of a disruption or failure of the system, customers will be able to return their bikes to the stations, as the mechanical shutter automatically locks the bikes, but only after the failure has been repaired.

Additional functions of the charging point:
- Remote Firmware Update
- Fast Charging Function
- Automatic detection and charging of different voltages (24, 36, 48 V)
- Temperature range: -20 °C to +40 °C
- Saltwater resistant
- IP 54 protection class

Mechanical functionality:
Generally, the lock is resistant to vandalism so at least 10,000 N at the charging point are sustainable. The lock will reliably open at a tensile load of 300N. The offset of the vehicles from the centre axis of the charging point is a relevant measure, since in practice the vehicles are not always in flight despite guidance in the base plate. The lock can reliably open at an offset of 5 ° from the central axis.

### 4.5.4 Description of the Terminal Light

The task of these terminals is secure and encrypted communication with the vehicles and the SYC Share SW to ensure communication between the customer and the leading system. A corresponding monitoring and diagnostics tool will support this functionality during operation in order to be able to realize the highest possible availability in the field.

**Technical Specification**

- Router
- Diagnostic functionality of the power supply
- Interface to monitoring and configuration tools
- Industrial PC with I / O
- Remote SW update option

**Data Security**

The communication is encrypted to meet the security requirements for sensitive personal data. The Terminal Light impresses with its slim design and has a 7 “colour touch screen.

![Terminal Light with 1 x 6 Bikeholder](image)
4.5.5 Description of the E-Bikes

As part of the Smarter Together project, two different types of vehicles (e-bikes) are used. The vehicle BESV CF1 was rated as the best vehicle during the customer survey at the start of the project. This vehicle is a middle-price e-bike. It has been upgraded for use in a sharing system through alterations.

The vehicle I: Sy was tested in a configuration with smaller tires as part of the customer survey at the start of the project and reached the second place at a small distance. This vehicle was designed for use in a sharing system.
Within the framework of project operation, it is now possible to determine which vehicle proves best on the one hand from the customer's point of view and on the other hand from the operator's point of view. In addition, the borrowing behaviour of the users as well as the maintenance expenditure by vehicle type is supervised. The findings of this test are important in answering the question of whether a close-to-production e-bike can be used in a rental system and whether the components used to withstand operation over the project period.

4.5.6 Technical Innovation within the Smarter Together Project

The borrowing by the customer can be done via APP or customer card.

4.5.7 SIMBIKE APP

After a single entry of the user data (email, address, PIN), the customer will be released for the APP borrowing. In the APP, the station status (number of bicycles) is displayed visually and textually. The customer selects an available vehicle, confirms the borrowing request by entering PIN and starts the journey.
Sycube is currently working with Wiener Stadtwerke on the deeper integration into the Wien Mobil APP.

The aim of this integration is to offer SIMBIKE as a product in the APP to the registered users as well as to display the availabilities and prices. If the user decides to leave SIMBIKE for the Wien Mobil APP, it will be transferred to the Sycube APP. User data of the customer are transferred and only need to be supplemented with the payment data. This allows a significant reduction of the booking process and consequently higher conversion rates.

The final registration, payment and booking process takes place in the SIMBIKE APP.
4.5.8 Control Board Smartlock / Axa Wired Lock
For the frame lock, Sycube relies on a self-developed control board in combination with an electronic frame lock (AXA). As a borrowing medium, an RFID based customer card as well as the Sycube APP can be used. The controller board acts as a communication unit between the customer and the Sycube Operating Backend. High battery life and a high-performance board ensure short reaction times of the frame lock.

4.5.9 Control Board Lock&Charge.me Version1
In a first development step, a cost-efficient system was used for a control unit available on the market. This board was subsequently integrated into the Sycube backend. Likewise, during this development phase, 3D prints were used as the housing for the board.

Figure 16: AXA Wired Lock and control board case (3DPrint)

Figure 17: SYCUBE Control Board Version 1 (Lock&Charge.me)
However, field tests of this board showed deficits in real operation. Specifically, in terms of reaction speed, availability and battery life defined limits could not be achieved. This made the self-development of a control board unavoidable.

### 4.5.10 Control Board Sycube Version 2

In the in-house development, a special focus was placed on the power consumption of the components. The specifications of the final version show a high-performance board with minimal power consumption, which also enables the use of RFID cards. The board has its own battery, which allows up to 200 stops before using the e-bike battery as backup. This value was essential in view of the possibility of use in hybrid or conventional rental systems (bicycles only).

![SYCUBE Control Board Version 2 (in-house development)](image)

Figure 18: SYCUBE Control Board Version 2 (in-house development)

![SYCUBE Control Board Version 2 (in-house development)](image)

Figure 19: SYCUBE Control Board Version 2 (in-house development)
4.5.11 Fence Station/ Virtual rental station

The development of the control board for the frame lock offers further interesting possibilities to extend the functional spectrum of a bike sharing station. These are fence stations or virtual rental stations. A virtual rental station consists structurally of an electroless stele into which a BLE (Bluetooth low energy) Beacon is integrated. This beacon provides a "BLE bell" within about 20 meters of the station.

The station is powered by a CR17345 battery with a life of about 2 years. As a grading element a mark is placed on the ground within which the customer should turn off the wheel. A parking off the mark is possible as long as the vehicle is inside the BLE bell. In addition, the attachment of bicycle ironing is recommended as another organizing element.

As part of the STEVE project, both the station at the Vienna Central Cemetery and the Wien Mobil Station will be equipped with a fence. This is necessary because of load directions in e-bike use is assumed. In addition, the SIM mobile will be equipped as a virtual station.

Figure 20: Rendering Station with a station sign
4.6 Business model

The operational business of SIMBIKE started on May 2nd, 2018; within the first 4 weeks, around 700 rides were carried out; 100 people have the app installed. It can be assumed that the introduction of the iOS App will allow more people to be won over to SIMBIKE.

Use of the e-bike is free for 2 hours until the end of the year. The result is an adaptation. The business case is imperative for profitable operation. The BikeSharing system SIM Bike is since May 2nd in partial operation. A sustainable description of the business case is thus only possible based on the current empirical values of a corresponding fluctuation is currently expected. The u.a. Income / Expenses calculation represents a best-case scenario.

Inhibiting factors for a cost-effective long-term operation are currently:

- The system size of the project SIMBIKE
- high maintenance costs through outsourcing
- low price readiness of the customers

In addition, the revenue expenditure bill described below does not allow for the possibility of building a capital stock for system expansion or refinancing bikes.
### Forecast of Revenues and Expenses

#### 2018

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Assumption 500 registered App users until the end of the year, 10 Euros each

Assumption every 100 journey is payable, 700 journeys/month until October, the 350 journeys

14 Number of e-bikes

700 Calls per year, 5 Euros each

### Forecast of Revenues and Expenses

#### 2019

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<tr>
<td>Contribution to promotion costs cemetery, p.a</td>
<td>2,880.00</td>
<td></td>
</tr>
</tbody>
</table>
**4.7 Experience and Outlook**

On the one hand, start-up financing from the public sector or interested companies such as the Vienna Central Cemetery can be cited as a solution. The task of the project operator will then be to find companies that co-finance the location of a station with advertising subsidies or to acquire funding for system expansion.

Another sustainable step will be the expansion of the customer base. Cooperation with hotels and companies are planned here. A central role will be the willingness of users to pay in the coming years. It can be assumed that the tourists for the use of an e-bike at the Central Cemetery have a higher price readiness. An abolition or restriction of the free units at the central cemetery as shown in the Business Case Forecast 2019 can have a supporting effect here.
5. Demo-Project: E-Carsharing by BWSG

(see presentation video in References)

Figure 22: Users and project partners at parking places of E-Cars in the housing estate.

5.1 Starting Point

The residential complex of the BWSG in the Hauffgasse 37-47 was completed in 1985. The BWSG erected 485 apartments on 9 staircases. The facility is located in the 11th district of Vienna, in the area around the Geiselberg. The location has a very good public transport connection (subway, S-Bahn, tram).

As part of a holistic renovation, the idea was to carry out not only all necessary refurbishment and conservation measure, but to further develop the whole residential complex. These measures include e.g. a better accessibility, the redesign of the community centre, the addition of new apartments as well as the installation of additional bicycle storage rooms. Beyond that, by integrating the refurbishment project into the EU project "Smarter Together", new opportunities for mobility and green energy could be considered and implemented. In the housing complex there is also a community centre with a gymnasium and a sauna as well as a football cage. The E-Carsharing is situated just next to this centre, open visible in semi-public space and not in the garage underneath which would have caused higher efforts for accessibility.

The BWSG relied on sustainable mobility, which did not yet exist in this form in an existing social housing neighbourhood in Austria. The focus was placed on an e-car sharing project, which should allow a switch from private cars to shared e-cars. Thus, a contribution to a reduction of CO₂ emissions and private cars use should be made.
The conception of this first of its kind pioneering project was strongly based on the involvement of active residents, who were involved in the implementation and ongoing operation.

The detailed information on the project, the implementation steps and the current status of the e-car sharing project will be discussed in more detail below.

### 5.1.1 Conception of the Project

Since autumn 2017, residents of the residential complex of the BWSG in the Hauffgasse 37-47 have the opportunity to use fully e-cars at very affordable conditions. The e-car sharing project and the cost-effective use of the cars are made possible by the EU urban renewal initiative “Smarter Together”.

As a preparation and basis for the implementation project “e-car sharing” within the Horizon 2020 project “Smarter Together”, two key players were involve and tasked: “Caruso Carsharing eGen”, a carsharing provider active on the market, as well as “wohnbund: consult”, an on-site active mediation institute accompanying the dialogue with residents during the refurbishment process. Wohnbund: consults act as a subcontractor for the implementation and community involvement of this sub-project.

### Objectives

The primary objective of the project was to provide a mobility concept that was accepted, well used and continued to be self-organized by the local target group.

The overall goal of the e-car sharing project was to enable urban living without a private car or a second car. This saves the individual residents time and money, reduces long-term vehicle traffic and thus protects the environment.

### Process

In order to achieve the goals, conception workshops, events, resident talks and an online survey were conducted in advance. The results of this were designed to lead to a tailor-made concept for the housing estate of Hauffgasse and its inhabitants.

Car sharing projects usually take some time to gain widespread acceptance. Therefore, the essential offer of the BWSG and Smarter Together was to ensure a long term accompanying of the project process by Caruso and wohnbund: consult. However, the project would have no basis without the energetic and dedicated support of active e-car sharing users.
Roles in the Team

- Smarter Together initiated the process at its very beginning, finances its implementation and stands as innovation authority backed by a European vision for the global message and goal of the project. As such, it is involved in all field communication events and media communication and promotion.
- BWSG makes decisions and clarifies various framework conditions.
- Caruso provides the vehicles - expert for all technical and economic matters related to car sharing.
- wohnbund: consult communicates to tenants - informs and activates them for e-car sharing.

Design Workshops

In several design workshops between May and September 2016, the framework conditions were analysed, various implementation options discussed and the concept elaborated.

Events and communication with tenants

At the beginning of November 2016, a general information event on the "Smarter Together" project was organized in the residential complex of BWSG in the Hauffgasse. On the basis of brief presentations and table discussions, the residents present were informed about the project's goals and contact persons.

At the end of November 2016, a resident talk "Future of the Mobility in Simmering and in the Hauffgasse" was held. In addition to an e-car for test driving was also a Renault employee for questions around the topic of e-mobility available. Afterwards, impulse presentations and a panel discussion took place in which the inhabitants could contribute.
The feedback from the participants in these events was very positive. Many residents were very much open to e-mobility and could well imagine active use.

**Survey E-Carsharing (June-July 2017)**

In advance, all residents had the opportunity to participate in a survey on the future electric car rental (e-car sharing) in the residential complex of the BWSG. Thanks to the numerous answers and feedback, it was possible to adapt optimally the mobility offer to the needs of the residents. Also, a segment of the residents could be activated for the offer. In total, more than 120 people took part in the survey.

**Financing Model**

On the basis of this process, a basic financing model was elaborated: Several car-sharing vehicles would be made available to the inhabitants of BWSG-Haußgasse by a car-sharing operator (Caruso) for a monthly fixed price. The monthly fixed amount of money for car, insurance, car-sharing hardware & software, etc. is borne by the BWSG during the funding period. Revenue from use will be deducted from this fixed amount.
What is (E-)CarSharing?

Car sharing means being able to drive without owning your own vehicle. In this particular form of car rental, cars can be reserved and rented by the hour or over long periods directly through a booking system.

How does it function?

As soon as residents of the BWSG housing complex in Hauffgasse have personally registered for car sharing, they get a personalized chip card and access to the online booking system. Here they can reserve the desired vehicle with their smartphone or computer. With the smart card, they can unlock the vehicle and drive off. After the journey, they place the vehicle at the location in Hauffgasse and connect it to the charging station.

How much does it cost?

With the first start of the offer, occasional users pay € 1 per hour and additionally € 0.10 per kilometer. However, anyone who is involved in the so called "Active Group" ("vehicle buddy", contact person, etc.) can use the vehicles from € 0.50 per hour. These tariffs are also considered as activation in a test phase that currently shows a very high utilization.

Users are working on raising the tariffs for future cost recovery in line with the business model. The current cost recovery is approximately 30-50% depending on the electric car.

5.2 Implementation Steps

The objectives and implementation steps from 2017 onwards were, on the one hand, the construction of the necessary infrastructure (charging infrastructure, cabling, provision of parking spaces) and the purchase of e-cars. On the other hand, the activation and information of the residents was an important milestone for future use.

Aktive Group

In order for the project to last and be sustainable, the tenants had to be involved in the process and the design from the scratch. For this purpose, an "Aktive Group" was founded, which takes care of all matters relating to the organization, care and maintenance of cars. This enables active people to make even better use of the offer, to activate other residents and to secure the e-car sharing project on a long-term basis.
Project partner meetings

The establishment of a location-based e-carsharing service in an existing residential complex requires good and detailed planning. For this reason, regular and productive coordination between the project partners involved (Caruso, Smarter Together, BWSG and wohnbund: consult) was essential in order to be able to start the pilot project and successfully accompany the ongoing operation.
External Events & PR

Especially the e-carsharing project in Hauffgasse received great media attention due to its uniqueness (including extensive inclusion of the residents, EU-funded test time as activation of the residents, e-car sharing as a novelty in a subsidized housing estate). It was also necessary to transport the project idea and the contents to the outside world. Particular mention should be made of the VCÖ mobility prize in the category “Active mobility and public space”. Other events such as the IBA Talk or expert discussions of “Smarter Together“ in the VHS Simmering contributed to the external visibility of the project.

Documentation and tenant’s information

The project website was also an important source of information for all important events and activities for the “e-car sharing” project. By sending mail and posting in the stairwells, an attempt was made to inform as many tenants as possible about the offer and the possibilities of use.

On its side, Smarter Together also promoted the e-carsharing via its network including webpage and monthly newsletter. In addition, a short explanatory clip with interviews of tenants and all actors was also made and put online (the latter in November 2018).

Summer party (June 2017)

In addition to information events, sociable, community-promoting activities were an important part of reaching as many groups of residents as possible. For example, at a summer party in the facility, current concerns and questions could be discussed in a less formal setting. Offered were i.a. Info tables and contact for refurbishment, showcase electric cars for the upcoming electric car rental, information on the project “Smarter Together“ and a competition with small awards.
Start and Information Evening e-Carsharing (October 2017)

At the e-car sharing information evening in October 2017, the participants were introduced to the concept and future use. The e-car models, the costs and handling were also presented. After the informative part also registrations were possible, the cars could be tested, and first inhibitions and concerns diminished. The reactions of the residents were consistently positive. Important was i.a. answering the various questions about billing, functionality, booking and included services by the future users.

Workshop E-Carsharing (November 2017)

The first workshop for the "Active Group" was dedicated to acquainting and clarifying individual ideas. The first tasks were also distributed at the appointment and contact persons for the organization of the subgroups were found (such as vehicle cleaning, trips to the workshop, group coordination, contact person for interested parties, damage control, etc.). The participants showed great commitment for an active participation.
Meeting of the Active Group (December 2018)

As part of the annual final event, there was another meeting with the members of active Group. At the start, Caruso gave an overview of the usage and utilization of the BMW i3. Afterwards, the first experiences were discussed with each other, the assignment of duties was revised, details and necessities of use were considered, and the future communication was coordinated.

Punch and mulled wine (December 2017)

In December 2017, a cozy end to the year event was organized in winter temperatures and illuminated Christmas tree, which should also emphasize the appreciation for the tenants. Together with residents and project partners, glasses were clinked on the eventful year. Also, the event gave the opportunity to inform on the refurbishment and the e-car sharing project.
Self-Organisation of the Active Group (ab December 2017)

Since the last joint meeting in December 2017, the active group organizes itself independently. In monthly meetings upcoming topics are discussed and discussed. The current 13 members have been doing important volunteer work since then and are helping to bring the project into the future.

Open-door Day (February 2018)

In February 2018, all BWSG-tenants of Hauffgasse were again invited to a day of open doors. On that occasion, i.a. applications were accepted, questions about the E-car sharing clarified and test drives were made too. Afterwards a joint workshop with the Active Group was held.
5.3 Current Status

Currently (as of October 2018), all three electric cars are in operation. The usage figures are very good, also in comparison to other carsharing offers and are rising. 3 charging stations were built, and the wiring was made. Since the entire residential complex is being renovated, the area of the parking spaces of the cars will also be redesigned. Completion of the final charging stations, branding and ground markings will depend on the status of the refurbishment and is expected to be finalized by the end of 2019.

The Active Group continues to be very committed to the cause and makes it possible to look positively into the future. There is also a small increase in the number of active members since the beginning of the project.

The figures for use and utilization (until May 2018) of the cars can be found below. Up-to-date data is constantly transmitted via the Caruso interface to the AIT team.

| Number of cars | 3 |
| Registered users | ca. 70 |
| Active users per month | 15-25 |
| Users in April/May | 22 |
| Members of the Active Group | 13 |

<table>
<thead>
<tr>
<th>Current figures</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>Sept.</th>
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<tr>
<td>Kilometres driven [km] - BMW i3</td>
<td>1.772</td>
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<td>2.650</td>
<td>1.876</td>
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<td>796</td>
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<td>Kilometres driven [km]</td>
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<td>699.0</td>
<td>684.0</td>
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Table 1: User figures for the E-Carsharing BWSG-Hauffgasse in 2018
In this case Caruso Carsharing can access experiences and comparable data of other housing projects. These show a significantly lower utilization of vehicles than in e-car sharing in BWSG-Haußgasse. In summary, the utilization of the BMW i3 and Renault Zoe is at a very high level. The utilization of the Nissan E-NV200 Evalia still needs to be increased. However, it should be noted here that this vehicle is used only for certain purposes, such as for larger purchases, transports, removals and longer trips. This vehicle is not the classic city vehicle and thus a higher utilization is difficult to achieve.

5.3.1 Business Model

Through the promotion of the “Smarter Together” project, residents of the condominium can be offered a low-cost tariff. This should primarily lead to the promotion and use of existing e-cars. As already described in point 1.5, the utilization of the vehicles is very good. Nevertheless, with a price model of 1,- per hour and 0.10 per kilometre, no striving for a cost-covering scenario is possible. For the tariffs are currently too cheap. Currently, the difference is taken over from fixed costs less vehicle revenue from BWSG.

The further **conception of an operating and tariff model** after the expiry of the EU subsidies has been in progress since the beginning. To this end, various workshops will be held in coordination and with inputs from the active group - with the goal of being able to establish sustainable and affordable e-car sharing in Hauffgasse. Adaptations should optimize the business model for sustainable long-term operation and provide references for replication. Considerations are made regarding the offered cars, the possible tariff, the extended use of the active group members, etc. A supplemented operating model should go into the first **implementation phase by autumn 2019** at the latest.

The following questions are currently in the room:

- What capacities (utilization) are still available and how can the circle of users be expanded?
- What can a tariff model look like that will continue to enable low-cost use and at the same time cover costs?
- What other tasks can be taken over by the active group to reduce costs?
- Which lease variants are relevant in terms of usage costs?
- Which and how many vehicles can be offered in the long term? Which have proven themselves, which ones have less?
- Tariff:
  - Continue to use a combination of time and distance tariff?
  - Differentiation between occasional users and members of the Active Group
The questions and comments above should serve as a guide to the conception of a new pricing or operating model. For the project participants, this certainly poses a certain challenge: on the one hand, the probably rising tariff model for the residents and, on the other, the number of vehicles, which could possibly diminish with a cost-covering price model.

5.4 Experience and Outlook

E-car sharing in BWSG housing in the Hauffgasse has so far been very well utilized. This may be i.a. related to the very cheap costs. The critical momentum will certainly be the phasing out of the funding project and the transition to an independent operating model. What experiences have been made so far and what the future looks like will be briefly outlined.

The launch of the e-car sharing pilot project started in October 2017 with intensive involvement of the residents. For the first time, e-cars were available for shared use by residents of an existing non-profit housing complex.

Due to general supply bottlenecks in the e-mobility industry, the ordered cars could not be delivered on the requested date. Initially, only the BMWi3 was ready for use. Only in January 2018, the Nissan Evalia and in February 2018, the Renault Zoe could be presented to the residents and used.

The dedicated Active Group takes over essential vehicle maintenance tasks. Thus, the costs for future use after the end of the funding period could be kept relatively low. In addition, the individual persons of the active group also take on a "buddy function", inform their neighbours and introduce them into the car-sharing system.

The good cooperation with the participating project partners (BWSG, Caruso, wohnbund: consult, Smarter Together team) and the "Active Group" is to be emphasized and represents an important basis for the long-term success of the pilot project.

The completion of the final charging stations, branding and ground markings are the next milestones. From autumn 2018, work will increasingly be on a future operating model. These are i.a. Workshops and also another mobility survey in the BWSG-Hauffgasse take place. This process is moderated by wohnbund: consult in consultation with the BWSG, Caruso and the team of Smarter Together Vienna.
6. Demo-Project: E-Logistic by Austrian Post

6.1 Starting Point

The results of market analyses and surveys in the population increasingly and clearly show customer wishes for guaranteeing “face to face” delivery of mail items and 24/7 reachability. In order to not only fulfil customer requests but also to inspire customers, Austrian Post is working on different delivery options such as evening delivery, Saturday delivery, special courier services and the development of innovative products such as pick-up stations, post pick-up boxes and Flexiboxes. Austrian Post is pursuing two approaches. On the one hand, it is expanding its own infrastructure where this is deemed to be necessary and purposeful. On the other hand, it is closing the delivery cycle by including acceptance of returns and the mailing of items at every point of contact.

The project entitled “Smarter Together” enables Austrian Post to:

1. implement test and analyses existing services in a pre-defined project area as well as new products and gather the opinions of residents,
2. respond much more quickly and efficiently to changes and
3. Exchange experiences with other Smarter Together participants, both nationally and internationally.

In its capacity as a national Big Player, Austrian Post strives to position innovative services on the market, evaluate the services together with customers and steadily adjust them in accordance with customer needs. The EU project Smarter Together provides Austrian Post with all the pre-requisites to make use of its existing infrastructure and, at the same time, to test innovative products and implement them on the marketplace where appropriate.

Changing living environments (single households, employment of both people living together etc.) and the steady growth of e-commerce are the main reasons underlying the demand for flexible and individually tailored logistics services. The analysis of internal customer service data as well as external surveys conclude that one key reason for the prevailing dissatisfaction with the “yellow slip” (notification) is the effort customers have to undertake if a mail item cannot be delivered and it is subsequently deposited in the post office. Moreover, our customers consider simple options for returning parcels, especially to mail order houses, to be extremely important.
Up until now, customers have had the possibility to choose among the following options when picking up a mail item which could not be delivered: pick up in a postal service point (customer effort to travel there, limited to opening hours); pick-up in the self-service zone of the postal service point (customer effort to travel there); pick-up from the Post pick-up box (which can only be installed if the property management, owners and/or apartment owners’ association approves).

Various surveys came to the conclusion that more than 60% of customers have a significant interest in a **solution at their doorsteps**. For this reason, Austrian Post has resolved to also offer doorstep solutions (refer to section 3.3 on **Flexiboxes**) to residents living in the target area of Smarter Together in addition to self-service zones.

Furthermore, Austrian Post is committed to **delivering all types of mail items throughout the entire country in a CO₂ neutral manner**. One key factor is to equip the capital city of Vienna with electric powered vehicles in order to ensure delivery in a CO₂ neutral manner along the last mile (actual delivery of the mail items). In turn, this requires the use of **e-vehicles in parcel delivery** operations. This is being tested within the context of implementing Smarter Together, mainly to determine the viability of new vehicle models so that they can be deployed in normal postal operations on the basis of their operating efficiency (loading space capacity, battery capacity, mileage, etc.).

The biggest challenge in achieving the designated targets is to get all the players such as the residents, property management firms, public authorities involved and “on board of one shared boat” in order to succeed in reaching these goals.

Another challenge is to integrate the local Mobility Strategy (municipal authority MA18 in Vienna) and the Mobility Points (NeuMo) for installing the logistics infrastructure in public areas.

In this way, Austrian Post contributes towards achieving the project targets Z4 (implementation of best practice examples in the areas of energy supply, energy-related renovation, forward-looking mobility solutions and participation), Z9 (measures to reduce energy needs of buildings including mobility and energy generation and supply) and Z12 (smart mobility strategy).
6.2 Project Conception

The project objectives of Austrian Post were defined as follows:

**Equipping the project area with innovative services:**

1. Post pick-up stations
2. Post pick-up boxes (mail collection boxes)
3. Flexiboxes

**CO₂-free delivery:**

1. Deployment of (bigger) e-vehicles for freight transport.
2. Findings on the future deployment of electric powered vehicles in parcel delivery operations
3. Assessing the necessity of installing fast charging stations
4. The installation of infrastructure for parcel delivery and pick-up in the project area and evaluation of its use
5. Evaluation of new logistics options in the project area

**Non-objectives are:**

- Deterioration of the existing infrastructure
- Equipping the entire vehicle fleet and delivery staff in the project area with e-vehicles during the project duration

**Primary risks:**

1. Lack of acceptance on the part of players involved
2. No availability on the market of e-vehicles for parcel delivery services or delivery problems on the part of producers
3. Efficiency and profitability
6.2.1 Project environment

Inquiries were sent to suppliers of e-vehicles for the CO₂ neutral delivery sub-project. Accordingly, two vehicles supplied by IVECO Austria Gesellschaft m.b.H, namely the *Iveco Daily Electric 3.5t model*, have been deployed since January 2017. The two regular parcel carriers in the project area were equipped with these two Ivecos. On average, the two regular delivery staff employees delivered 896 parcels on 685 stops and 791 parcels with 656 stops respectively each week.

Residents of Simmering project area can be served by self-service zones installed by Austrian Post which are available on a 24/7 basis. Another important stakeholder in the project landscape are the property management companies who are evaluating the project steps which have already been implemented and exploring new possibilities within the context of an ongoing exchange of views with Austrian Post.

Sub-tasks were set up at Austrian Post to ensure the efficient and resource-saving implementation of the entire project in the Simmering project area. As a consequence, the necessary decisions could be made quickly and the allocation of costs in the Group were defined and clearly assigned from the very beginning, which in turn enabled an efficient realisation of project goals.

The following sub-tasks were carried out:

6.3 Sub-Task: Equipping buildings in the Simmering project area with Post pick-up boxes free of charge

The Post pick-up box enables mail items to be deposited directly at the recipient’s residence. If a mail item cannot be delivered, the mail carrier puts the mail item directly in the Post pick-up box and notifies the recipient. In turn, the recipient takes the notification slip out of the letterbox and can open the Post pick-up box with it. One pick-up box covers about twelve households.

The objective was to offer a 24/7 service to residents enabling them to receive their mail items around the clock immediately upon their return to their place of residence. In turn, this eliminates the need for them to travel to a postal service point, and they are no longer bound to its opening hours. Accordingly, the Post pick-up box provides an innovative solution for urban areas with a high rate of mail items deposited after unsuccessful delivery.

The Post pick-up box is equipped with a security system on RFID basis. The respective codes may be used again but have to be reprogrammed after the mail item is removed from the box. This system is unique in the EU and features an intelligent battery-driven lock developed especially for Austrian Post (high level of innovation).

Current status at Month 30 of project:
450 pick-up boxes have already been installed in the project area. The expansion of this service is being continued. The box will also allow for mail items to be posted starting at the end of 2019. It is possible to use the box by means of an App. A separate project was implemented for the related IT solution. On balance, about 28,000 Post pick-up boxes have been installed in Austria to date.

![Image of a receiving box installed e.g. at residential buildings](image)

Figure 25: Image of a receiving box installed e.g. at residential buildings

### 6.4 Sub-Task Mobility Point - pick-up station (wall) letter and deposit boxes

#### 6.4.1 Pick-up station

As an additional action during the conception phase, planning was made to integrate a logistic service into the Mobility Point also developed within Smarter Together in the project area.

For the Mobility Point a concept was made in correlation with the Local Mobility Strategy. The concept was completed by the City of Vienna in December 2016 and a decision was made to realise it at Simmeringer Platz in the Lighthouse district. In this regard, Austrian Post planned a pick-up station at the site as well as a letterbox with a deposit box at the site, declaring its willingness to assume the costs.
The objective was to offer a 24/7 service to residents near the site. The pick-up station would enable residents to pick-up mail items of which they were notified (parcels, registered letters and packets) and the letterbox would enable letters to be posted. One key additional advantage for residents would be the very short distances to the pick-up station, which could be largely reached by foot (smart mobility strategy).

In a further implementation step, the pick-up station could be used for posting mail items and the pick-up station could be used by means of an App.

The pick-up stations are online and integrated into Austrian Post’s IT system. Residents can follow the status of their parcel using the track & trace option (high level of innovation).

Current status at Month 30:

- This particular sub-task could not be realised due to legal conditions (e.g. lack of space, electricity supply).
- Also, there is a principal strategic discussion in Vienna, how to enable integrated logistics solutions between the different operator. Especially when it comes to installations in public space of private businesses.

Figure 26: Letter and deposit boxes (test operations of two combined letter and deposit boxes in the Simmering project area – Mobility Point)
Austrian Post is testing a new type of letterbox based on two prototypes which can also be used as a deposit box at the same time.

The combination boxes are fully functional letterboxes. Deadlines are normally visible, and the card typical for all other types of letterboxes is mounted at the front. About 15,000 letterboxes exist throughout the entire country. They can be used by customers for posting mail items, which are letters for the most part. The underlying idea is to more efficiently use letterboxes in cities, and also have them serve as deposit boxes for delivery purposes.

Innovation: the double use of boxes, also for depositing mail items. In this case, a mail carrier can assume mail items for their delivery routes for which he did not initially have sufficient space. This reduces the weight load and potential detours, and existing deposit boxes can be dismantled.

Current operations:

Test operations for combined letter and deposit boxes were initiated at two sites in Vienna’s 1010 and 1110 postal code areas. This particular sub-project could not be realised in the project area (Mobility Point) due to legal conditions (e.g. lack of space, electricity supply).

6.5 Subproject: Product launch of the Flexibox in the Simmering project area

The Post Flexibox is a pick-up and drop-off box which can be mounted or fastened directly at the front doors of resident and which reflects his or her individual needs. If a letter or parcel cannot be delivered, this mail item is to be deposited in the individual pick-up and drop-off box. Mail items can be removed around the clock on a 24/7 basis. This doorstep solution is designed to protect the mail items from being stolen, enable most mail items to be deposited and at the same time should be cost-effective.

The customer/recipient receives a personalised chip (electronic key) as a means of opening the Flexibox. Or else he can link the Post App to the product and then open the box. The pick-up and drop-off box are developed for customers with a high e-commerce affinity, and thus it is obvious that this installation also has to be designed for delivery purposes and for returning items.

Current status: The Flexibox was positioned on the market as of November 2016 and is being further developed in line with the company’s experiences. A campaign for residents of the project area in Simmering was carried out in December 2017 in collaboration with the City of Vienna. The inhabitants could purchase the Flexibox for a price of € 29.90 instead of the official sales price of € 124 at the post shop.
Some 20 of the approx. 700 Flexiboxes installed throughout the country are located in the Simmering project area.

![Illustration of the new b2c logistic service “flexi box” at the housing unit entrance door](image)

Figure 27: Illustration of the new b2c logistic service “flexi box” at the housing unit entrance door

The Post Flexibox, for which a patent application has already been submitted, represents a **new type of solution for posting and receiving mail items**, and also provides the features which customers want with respect to security, storage space and price. The Flexibox is available around the world, but only Austrian Post offers it in this configuration.

The Flexibox represents one of the world’s first products of this kind. This unique solution relies on a massive sheet steel box with a cut-resistant strap. The special feature of the new solution is that the massive box hides the cut-resistant strap after being mounted by the customer and thus protects it (in light of the fact that there is ultimately no complete cut resistance of a fabric or strap). The newly developed box prevents access from being gained to the strap and thus enormously increases security.

No solution which has existed on the marketplace up until now can compete with the access security of the Post Flexibox. The innovation of the Post Flexibox is the secure mounting on the front door of the apartment for which a patent application has been filed. Other producers try to overcome the challenge imposed by the conflicting goals of variability and security by using cut-resistant fabrics. All tested products failed when it came to security. For this reason, the logical consequence was to use a secure, stable box combined with a cut-resistant and hidden strap, but this did not previously exist. A cut-resistant strap is used which, when mounted between the door and doorframe, is hidden by the box and is thus no longer accessible. Moreover, the box can be removed simply by opening the apartment door and be kept inside the apartment. The massive steel sheet box and the cover made of robust Tenulan prevent anyone from gaining direct access to the mail items. Furthermore, the Post Flexibox provides an added value as it can be used as a storage area in a person’s wardrobe.
A further security feature is the fact that the Post Flexibox is free and can be carried away when the apartment door is opened. No additional step is necessary to remove it, thus comprising one more security feature.

6.6 Subproject: e-Logistics

In order to pursue the undertaking of ensuring CO₂-free delivery, the Simmering project area was provided with two e-vehicles for letter and parcel delivery services. The use of e-vehicles in parcel delivery poses a challenge to logistics companies in the case of large parcel volumes and/or sizes. This is because few e-Vans appropriate for such operations have been offered by automobile manufacturers up until now. Two new electric powered vehicle models are being tested within the context of the Smarter Together project in order to gain insights into parcel delivery, ensuring deployment of such vehicles on the basis of their operating efficiently (loading space capacity, battery capacity, mileage etc.).

Current status:

The two IVECO Daily Electric Transporters have been deployed for daily parcel delivery services since January 2017 within the context of the Smarter Together project. Both vehicles are being leased. On average, the vehicles cover a maximum distance of 55 kilometres in summer and 40 kilometres in winter, and about 130 parcels are delivered during each day of their deployment. Experience has shown that a loading infrastructure in the project area is not necessary considering that the mileage is about 70 kilometres. The findings gathered will be evaluated next year together with the manufacturer.

Already before initiating project implementation, parcel delivery has been carried out on a CO₂-free basis, either on foot or by using electric powered vehicles.
Detailed data on the Iveco Daily Electric 3.5t:

- IVECO Daily Electric 3,5t incl. quick charging device
- Maintenance-free, high-temperature sodium-nickel-chloride battery (100% recyclable)
- Recuperation (energy recovery)
- Traction battery under the loading floor, thus full use of the load compartment
- Load compartment of 11 m³
- Payload of about 1,200 kilograms
- Nominal engine performance of 40 kW, 130 Nm
- Battery performance of 28.2 kWh
- Manufacturer’s declared range of about 80 km
- Actual range: maximum of 55 km in the summer, 40 km in the winter
- Area of use: inner-city distribution traffic
The problems described below were reported while using the vehicles. At the beginning, notes were taken on the potential distances to be covered with the current battery status when leaving and returning. These records were compared with the actual distances covered:

Repeated significant deviations were shown, as the following example indicates:

Range upon departure (according to display): 70 km, and range upon return of 20 km -> actual number of kilometres driven: 37
Range upon departure (according to display): 70 km, and range upon return of 20 km -> actual number of kilometres driven: 38
Range upon departure (according to display): 70 km, and range upon return of 10 km -> actual number of kilometres driven: 36
Range upon departure (according to display): 70 km, and range upon return of 10 km -> actual number of kilometres driven: 30 – without heating and without light, driven in ECO modus the entire day
Range upon departure (according to display): 70 km, and range upon return of 20 km -> actual number of kilometres driven: 24, heating turned out upon departure. The display indicated “Please connect charging cable” immediately after departure.

Furthermore, problems with the battery and control unit were reported as well as the sudden deep discharging of the vehicle. Driving slightly uphill is more difficult if the vehicle is fully loaded because it can only reach a speed of no more than 45 km/hour. The vehicle could not be used at times in the winter of 2017 due to the extremely cold weather conditions (Display: empty battery) but could be used normally again a short time later. Moreover, the vehicle stood still in the middle of a traffic intersection and could first be started up again after about five minutes.

Mileage was enormously reduced when heating the vehicle during the winter, so that delivery operations were no longer possible as a consequence of the low mileage. For this reason, a decision was made that delivery would not be carried out using the electric powered vehicle in the months of November to March.

The advantages as summarised by the two mail carriers:

- Automatic transmission
- Batteries are not located in the load compartment
- Good handling performance when steering
- Easy parking

The two employees on the delivery staff reported on the following disadvantages:
- Heating cannot be used at all at low temperatures or without compromising on the range of the vehicle.
- Time-consuming start of the system (touchscreens require a long time to ramp up).
- Unreliable display of remaining mileage (20 km less on the remaining mileage display after just one minute).
- Slowing down of vehicle when going uphill (maximum of 30 km/h could be reached, leading to traffic disruptions).
- Slow acceleration when fully loaded (vehicle required a distance of 300-400 metres before reaching a speed of 50 km/h).

Excerpt from records on use of the Iveco brand e-vehicles:

<table>
<thead>
<tr>
<th>Date</th>
<th>Km display on departure</th>
<th>Km display on return</th>
<th>Actual mileage</th>
<th>Heating</th>
<th>Battery status</th>
<th>Heating Battery status</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 1</td>
<td>70</td>
<td>10</td>
<td>40</td>
<td>No</td>
<td>18%</td>
<td>on return</td>
</tr>
<tr>
<td>March 2</td>
<td>70</td>
<td>20</td>
<td>38</td>
<td>No</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>March 3</td>
<td>70</td>
<td>20</td>
<td>37</td>
<td>No</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>March 6</td>
<td>70</td>
<td>15</td>
<td>41</td>
<td>No</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>March 7</td>
<td>70</td>
<td>20</td>
<td>37</td>
<td>No</td>
<td>36%</td>
<td></td>
</tr>
<tr>
<td>March 8</td>
<td>70</td>
<td>20</td>
<td>38</td>
<td>No</td>
<td>34%</td>
<td></td>
</tr>
<tr>
<td>March 9</td>
<td>70</td>
<td>20</td>
<td>37</td>
<td>No</td>
<td>34%</td>
<td></td>
</tr>
</tbody>
</table>

The current mileage achieved with the IVECO electric vehicles does not allow them to be used for delivery during the entire year. Although inner-city mileage for each round of deliveries is low at 55 km, it is still not possible to complete the planned deliveries when using the heating or air conditioning of the Iveco vehicles. As showed in the table below the usage of electric powered vans has a positive environmental impact in terms of reducing CO2-emissions (CO2-reduction of 2.6 tons).

Austrian Post strives to expand its e-vehicle fleet; therefore, it is planned to test vehicles from same segment that are offered by other producers. Since the extension of parcel delivery by using e-vehicles is a declared as one of the main goals of the company the information gathered through Smarter Together project might positively impact further roll-out of fleet extension in similar urban settings.
6.7 Resources Deployed

6.7.1 Person months

A total of 6.42 person months were dedicated to the project up to and including July 2018. This means staff costs of EUR 53,296.54 were incurred by the project in the period February 2016 to end of July 2018. The division into subprojects also resulted in a division of competencies on a staff level. End Customer Initiatives (under the leadership of Andreas Grüneis) was responsible for the above-mentioned subprojects described in sections 3.1., 3.2 and 3.3. In contrast, Parcel Logistics Austria Department collaborated with Vehicle Fleet Management to handle subproject 3.4.

Project implementation is coordinated and administered by CSR and Environmental Management Department.

Costs of EUR 172,336.78 (incl. indirect costs) were invoiced for first reporting period of the project. This resulted in an application for funding to the amount of EUR 120,635.75, which was approved. Costs of 84,235.55 Euros for the 2nd reporting period.

6.8 Experiences and Outlook

6.8.1 Recommendations

Austrian Post is continuing to support the expansion and realisation of a smart mobility strategy in the Simmering project area. There is also a willingness to use Post products, 24/7 solutions etc. E-vans could be certainly used for parcel delivery purposes provided that higher mileage is possible.

6.8.2 Replication potential

The Post pick-up boxes, Flexiboxes, letter and deposit boxes and the pick-up stations could be rolled out in other urban areas. Tests with other electric powered vehicles fulfilling the challenging demands of the logistics sector are possible following a project-related exchange of experience.

6.8.3 Next steps

Austrian Post intends to monitor further developments in the field of e-vans in order to carry out tests in its delivery operations if new developments enable greater range on the basis of higher mileage. Furthermore, an exchange of views is planned with project partners (e.g. AIT) which analyse vehicle data. The company is also continuing its work in development and optimising doorstep solutions as well as smart digital services.
7. **Demo-Project E-Mobility at Siemens**

7.1 **Starting position:**

A high level of commitment to environmental protection, health management and safety has always been a high priority at Siemens. Siemens also tries to incorporate these aspects into its products. A product example is the until 2013 delivered Metro for Oslo, which is 98% recyclable. Furthermore, the Siemens City Vienna office complex, which opened in 2011, is part of the EU Greenbuilding program. The usage of geothermal energy with 120 deep piles under the Siemens City saves approx. 40 t CO₂ per year. 200 square meters of solar panels provide hot water in the restaurant and conference centres. Measures for saving energy and exhaust gas reduction are very important to Siemens. Therefore, Siemens decided very quickly to support and participate in the EU project.

![Production hall at Siemens for train wagons directly at the Lighthouse district](image)

*Figure 29: Production hall at Siemens for train wagons directly at the Lighthouse district*
7.1.1 General Information about the production at Siemens:

Since 1831, rail vehicle construction has been in progress at the Leberstraße site. (Simmering wagon factory, SGP, since 1992 Siemens AG) In Vienna Simmering, the Siemens factory at Leberstraße extends over an area of 140,000 m². This makes the site one of the world’s largest production sites for metros, railway passenger cars, trams and fully automated people movers. Well-known products are the Railjet, ULF, the new ÖBB commuter railway system as well as the underground railway in Vienna. Siemens possesses the know-how for the whole value-added chain – from research, development, engineering, logistics, bodyshell, surface, assembly, electrical and final assembly to commissioning. The bodyshell production process is supported by innovative robot welding technology. Especially innovative is the surface process, which is carried out by robot-controlled high rotation technology.

7.2 Project-concept

The project goal was to find and implement measures within the industrial location Siemens Leberstraße for the promotion and conversion to e-mobility in the areas of production, logistics and transport but also with regard to mobility to and from the workplace. One goal in Phase 1 was to change the e-mobility for the internal transport of the delivered goods. This required a conversion of the forklift truck fleet. Another point was the project planning of an e-charging station for e-cars for employees as well as for guests and customers. Finally, another internal mobility point was considered – by means of e-bike charging stations for the employees’ e-bikes. After the start of the project, additional project ideas (Phase 2 – Addendum 1), which were partly developed by employees, resulted in further energy savings. Replacement of the existing post vehicle (passenger car – diesel driven, year of manufacture 2000) for the internal factory mail traffic by an energy-saving e-car.

Another additional idea was the further exchange of chargers to energy-saving loading boxes for the production machinery fleet, as well as a new conceptual design, centralization and conversion of the bulk material warehouse and thus savings on internal transports by trucks and forklifts as well as savings on external transport for the delivery of bulk material parts. Finally (Phase 3 – Addendum 2) a concept for the conversion of the transport of the produced vehicles was presented.

So far, the semi-finished vehicles have been transported internally between the individual factory halls or process steps by means of a 25m long gasoline-powered corridor vehicle. In future, some of the transport will be carried out by an electrically powered transport vehicle.
7.2.1 Mayor involved persons

- **Georg Wolffam** - head of technics and logistics at Siemens Lebersstraße. Lead of Smarter Together sub-project,
- **Robert Knotek** - business lead in Smarter Together, controlling of Infrastructure, main contact
- **Roman Kriegler** - technical services for production
- **Franz Meitz** - manager for internal transportation
- **Uwe Jamnik** - Industrial Engineering, Layout logistic
- **Herbert Berl** - Industrial Engineering
- **Alexander Teuffl / Marcus Bischof** - Siemens Real Estate
- **Dragana Stijepic** - Communication Siemens Vienna
- **Roman Thamer / Robert Pölzl** - leading electric assembly, infrastructure

Project environment: Due to the differentiated and independent task and implementation area at SIEMENS (within the Smarter Together project), it was possible to obtain the basis for decisions relatively quickly and were also very well supported by the plant and site management. The project was also very well received by the employees and consequential new additional energy-saving topics were found and implemented. (Phase 2 +3)

7.3 Steps of implementation

7.3.1 Electric Forklifts

The project goal 1 was to reorganize the e-mobility of the internal transport of delivered goods. This required a reshaping of the forklift truck fleet.

This requires a brief explanation of the environment: A metro wagon consists of up to 50,000 individual components. Siemens produces approx. 200 – 300 wagons per year in Vienna. This means that up to 12 million individual components can be installed per year. According to the latest measurements, this means **approx. 100,000 movements of individual goods using a wide variety of logistic transport vehicles**. Overall, there are 45 different transport vehicles in action at the site Siemens Simmering. Based on previous experiences diesel-forklifts were mainly used for unloading trucks at the delivery yard, as there were no problems with low temperatures or access times. Negative side effect – high CO₂ output, high diesel consumption, noise and unpleasant odor for neighbours and employees. Not to forget are some considerable differences in level at the company premises (next to logistics building 250 – see plan), which must be taken into account when delivering goods.
After a precise analysis and measurement of the hours of operation from all forklifts and transport vehicles, it has been determined, that Siemens will exchange 6 forklifts for the unloading at the delivery yard. There the highest number of hours of operation can be reached and thus also the highest savings in CO₂ emissions can be achieved.

In spring 2016, all well-known suppliers of electric forklift trucks were invited by the Siemens purchasing department to a first bidding meeting. After this, an announcement including all necessary features (e.g. operating 8 hours without loading, winter capable, drive uphill …) was created and sent to the supplier. Some supplier did not fulfil the technical requirements or could not exhibit vehicles for testing.

In the end, three suppliers were left for the test phase / final negotiation – Linde, Jungheinrich and Toyota.

All bidders provided test vehicles for one week. These were tested in proper usage from the Siemens staff for a few hours.
Afterwards, the employees were asked and could vote for their favourite forklift. This selection procedure was of high importance, since the employees have to work with these vehicles on a daily basis. Hence, they can judge the handling better than an employee from the purchase or logistic department.

The result was clearly for LINDE vehicles, which could score with the best road performance. Because of the detached front axle, shocks and vibrations, which affect the cabin and driver, are reduced. In addition, the company Linde stated to train Siemens employees for fault clearance and maintenance work and also permits access to the Linde’s technical data via EDP for troubleshooting and analysis. Besides the price component, these were advantages which also reduced the costs after the warranty period. As a result, Linde was commissioned with the delivery in summer 2016.

![E-forklift by Linde was chosen as best option](image)

The new electric forklifts were delivered from November 2016 until February 2017.
Operating times from 8 to 10 hours are possible – Charging time takes place in the night hours. In winter 2017/2018, working till minus 12 degrees Celsius was no problem as well as working in snow conditions and gradients. The employees are very satisfied with the vehicles and highly motivated. Noise and unpleasant odor omit for employees and neighbours.

One experience that was made with the charging of the electric vehicles was the right dimension of the electric supply. It’s often underestimated how a constant high-power supply is stressing the electric installations. This was also the case at Siemens (they became very hot and fuse broke), so the electric installations had to be changed for the charging as well.

7.3.2 Car - e-charging stations

Within the premises there are approx. 50 parking spaces available for Siemens vans, company cars, service vehicles, guests and supplier cars and rental cars. In addition, there is a big parking deck with over 500 parking spaces for employees.

In order to raise attractiveness in e-mobility for guests as well as for employees, 2 e-car charging stations were installed in the front entrance area of the location directly in front of the plant management. After weighting up all possible locations, these two parking spaces in front of the plant management were selected for this purpose.

The installation of the charging stations was carried out by the internal Siemens assembly team. Various charging systems were analysed in advance, of course also in consultation with the Siemens fleet management in order to guarantee a synchronized charging system for all locations. One parking space is permanently used by a new e-car of the company (until now diesel-power). The second parking space can be used either by employees or guests, customers and suppliers.

Siemens is expecting an intense utilisation of the charging stations and depending on demand the number of charging stations will be increased in the next years.
7.3.3 **E-bike charging stations:**

At the entire Siemens premises there are more than 100 bicycle parking spaces available for employees, which are used very, very intensively.
At the Siemens site, approximately 30% of the way to work is covered by car, 60% by public transport and 10% by foot and bicycle. Due to the numerous bike rental companies in the city and the emergence of e-bikes, the number of employees who travel by bike increases from year to year. Especially in the engineering sector the proportion of cyclists is high. This is also where the largest parking area is installed and therefore it was easy to decide to set up the e-bike charging stations in this area. Siemens considers this also as a further contribution, which underlines the engagement for the environment. Due to the present e-bike boom in Austria, Siemens is expecting an intensive utilization of the e-bike charging stations. Again, the installation was carried out by our assembly team. Altogether 6 charging sockets are available, including lighting on the porch roof.

7.3.4 Addendum 1) e-car for transportation

After defining the measures for the original funding application, new measures to make the Leberstraße site even more energy-efficient arose from the ideas of the employees and the thought of energy-saving. Siemens submitted these measures in the Addendum 1. Until 2016, a 16-year-old diesel vehicle Skoda Oktavia was used for the internal postal service on the factory premises. The distribution of parcel- and letter post into the different halls and buildings is extremely time consuming on an area of 140,000 m². This is the reason why an e-post-car - Brand E-Crafter - was rented. This is meant to replace the previous diesel vehicle. 2,500 internal location kilometres are now covered annually electrically and completely quietly. A small measure with a great effect, since the electrical motor drive brings operating costs of just 2.50 euros per 100 km. The CO₂ savings per year amounts to almost 1 ton. Additionally, it serves as an attention getter at the weekly customer visits or factory tours. Also, the mayor of Vienna, Mr. Dr. Ludwig was impressed by the E-Crafter during his factory visit in November 2016.
7.3.5 Addendum 2) Exchange of charging devices

This measure arose by a suggestion of improvement from an employee from the maintenance team. With around 800,000 working hours a year at the Simmering plant, a lot of electrical tools are required. However, many machines, some of them very complex, must also be serviced and maintained. A lot of them are equipped with the original charging devices, which function properly but are no longer state of the art. Hence, two charging devices with transformers were exchanged with new electrical devices from the company Fronius for test purposes.

The technical advantages are:

These devices are quieter, use less electricity, do not need distilled water and have a longer period of life. According to the manufacturer’s specification, for example, when a forklift truck is loaded (usually approx. 8 hours) a charger with old technology consumes approx. 70 KwH, with new technology only 53 KwH. This corresponds to an energy saving of 25%. In 2016, the testing phase started with two devices. From 2018, the chargers will be replaced continuously.
Addendum 3) Bulk good warehouse - Logistics

At the Siemens factory Vienna up to 3,000 different small components (e.g. screws, corners, etc.) at different storage areas are managed. As a result, the administrative and logistic effort is very high.

Figure 35: BEFORE: Bulk good is delivered at 4 different places on the site (see transportation routes)

The goal of the analysis or the new bulk good warehouse concept (proportion of funded project) was on the one hand the saving of transportation routes (= reduction of CO2 emission), and on the other hand to gain space.

Figure 36: TARGET-Solution - only one central warehouse
An important factor for increasing the area productivity is the conversion of the existing logistics centre object 250 (Photo). The gain in space is achieved by building a further level (additional floor in grating design). This enables to clean up the storage structure (assembly material), increases the storage density and the degree of space utilization, and there is only one central storage area (SGL = Schüttgutlager).

*This is the reason for considerable savings on single forklift runs.*

The new bulk material warehouse is an important contribution to the logistics and environmental balance. Within the plant small parts such as screws and other small components for the individual work teams are assembled in such a way that they correspond to the work processes in production. Hence, the service quality for the employees in production increases, the work gets easier and the overall working efficiency grows at the same time. This goes hand in hand with the international competitiveness and attractiveness as a location.

*Figure 37: Dismantling high-bay warehouse - Start platform construction - Finishing platform*
By reducing and centralizing supplier deliveries, further not inconsiderable quantities of daily truck trips and CO$_2$ emissions could be saved. Delivery is now once in a week. Elimination of 4x weekly deliveries corresponds to approx. 100 truck-km per week = **reducing 5,200 km/truck/per year**

### 7.3.7 Addendum 4) new electric transport carrier

In order to move the undergrounds within the different plant buildings, Siemens has been using a diesel-powered “heavy-haulage” engine (“Transport-UMSETZER”, product Fa. Scheuerle). This heavy haulage transports up to 25-meter long shell vehicles. The strategy is to replace them through an e-transporter.
The acquisition of the battery-operated haulage vehicles serves for the internal transport of wagon bodies in production halls as well as on the open-air ground. The wagon bodies are lifted by means of transport racks and the battery-powered pushing vehicle underneath and are moved from one production site to the next production site. This should be emission-free as possible. This vehicle replaced the current diesel-powered one up to 50%. 6 to 8 hours a day are spent on the haulage. The maximum weight of the wagon bodies amounts to 50 tons.

The planned savings are calculated in the amount of approx. 13,000 l diesel per year = 40.2 t CO2 according to the federal environment agency calculator.

7.3.8 Photovoltaic power plant

As described in Task 5.5 of the proposal, a PV power plant was intended to be implemented together with the e-vehicles and charging stations. The big factory roofs are a potential field for solar energy at the very first glance. Although it is not possible to install solar energy devices at all roofs there are potential spaces at Siemens available.
This action was a joint approach by the proposal between Task 5.4 - beneficiary Wiener Stadtwerke/ TLP Wien Energie and Siemens. During spring and summer 2016, a project conceptualization phase was implemented. Wien Energie made offers to Siemens. The involved party was Siemens Real Estate, who is managing all properties of Siemens beyond the factory site in Simmering. A major issue why the PV power plant hasn’t moved forward to implementation was different view on contracting times and duration. There was no possibility on the property owner side to provide the factory roofs for rent to the energy company for a sufficient time period of minimum 15 years. Wien Energie on the other hand needs a certain agreed duration to economically justify its investment. An alternative model of direct investment and maintenance by Siemens resp. the property owner could be found.

7.4 Resources used

To date, approx. 3,200 hours have been invested in project work, which corresponds to about 22.5 person months (14 MM reporting period, 1.8 MM reporting period 2 to July 2018) including all submitted supplementary projects.

The total investment of the forklift trucks alone amounts to more than 300,000.00 Euros (depreciation over 4-5 years). For the changes of the logistic centre 200,000 Euros, for the transport carrier 300,000 Euros have been invested. Together with the e-delivery car and the different charging devices a total investment of over 1,000,000 Euros was triggered by the project.

7.5 Current status / savings

The above-mentioned measures are all successful implemented and operation.

This applies to the e-car for delivery, new charging stations, bulk material storage and e-forklifts. Operating model

The following savings could be noted:

E-forklifts: The new electric forklifts were delivered from November 2016 (1 peace) until February 2017 (5 p.) - the last forklift is starting in autumn 2018.

- A Monitoring until May 2017
  Until May 2017, Siemens used the forklifts during 2,700 operating hours. It’s a distance of about 12,000 km! The old forklifts have a diesel consumption (by also the same distance) from 3,875 litres. This approximately corresponds to 3,875 l diesel economies p.y = 11,1 t CO2 in conformity with the federal environmental agency calculator Start 9 /2018). Operating times from 8 to 10 hours are possible - Charging time takes place in the night hours.

- B Monitoring until March 2018
Total operating hours 8,592 h = 38,100 km. Charging times ca. 5 h. per charge = ca. 50 KWh

<table>
<thead>
<tr>
<th>Fabrikat</th>
<th>Bj.</th>
<th>Operated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linde 4,0t</td>
<td></td>
<td></td>
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<tr>
<td>Jovanovic S.</td>
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</tr>
<tr>
<td>Sum</td>
<td></td>
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</tr>
</tbody>
</table>

- **E-car:**  
  Siemens rented an e-car (brand: E-Crafter) for the internal postal service, which replaced the old one (Skoda Octavia). Skoda Octavia – kilometre reading per year approximately 2,500 km - consumption, because of short distances approximately 12 L per km. By the use of phase drive the operating costs are merely € 2.50 per 100km. CO₂ economies per year 0,9 t p.y in conformity with the federal environmental agency calculator (since 8/2016).
Logistic:
Siemens Simmering administers up to 3,000 different consumables (for example screws) at various storage areas in the factory. Thereby, the administrative and logistic expenditure is very high. Therefore, Siemens built a central bulk storage at the central logistic centre, which contains all consumables. That leads to considerable economies on single forklift rides. The savings during full operation are approximately 2 operating hours (diesel forklift) per day = approximately 500 p.y. This approximately corresponds to 2,050 l diesel-economies p.y = 7, 7 t CO₂ in conformity with the federal environmental agency calculator (since 11/17).

The new bulk storage is only supplied by one supplier, who delivers once a week. Thereby the transports by other suppliers dropped. Calculation-slips 4 deliveries per Week approximately 100 lorry-km per week = 5,200 lorry-km economies per year.

Electric transport carrier
In order to move the undergrounds within the different plant buildings, Siemens uses an “heavy-haulage” engine (“Transport-UMSETZER”, product Fa. Scheuerle), which is diesel-powered. This heavy haulage transports up to 25-meter long shell vehicles. The strategy is to replace them through an e-transporters. 50% of the previous transports can be made in a more environmentally friendly way in the future (Start 2018). This approximately corresponds to 13,000 l diesel economies p.y = 40, 2 t CO₂ in conformity with the federal environmental agency calculator Start 9/2018).

7.6 Experience and perspective

The participation in an EU project in a partner role is always recommended. Here one gets to know the different points of view of the other partners. A defined area and performance definition are essential here. This means that decisions and implementation can be made quickly and without detours.

This project clearly shows the good cooperation between the project partners from the municipal administration and industry sector. The participation of employees contributes to an increased efficiency as well as global competitiveness of the industrial site.

The Smarter Together project strengthens the attitude towards energy-saving, efficiency and sustainability topics.

This helps Siemens to invest in energy efficiency for future production and infrastructure projects.

Future topics could be - photovoltaic at the company premises, LED lighting, further e-mobility in the warehouse vehicle fleet, convert to e-tools, etc.
Unfortunately, no solution could be found for the photovoltaic installations at the roofs of the Siemens factory. Once more a longer time of usage of the properties by an energy company or investor for renewable energy installations could be agreed on with the property owner. This turned out as a mayor point also for the waste heat integration of data centres to the district heating grid as a big obstacle.
8. Conclusion

In general it was a very successful approach to integrate (e-)mobility demonstration projects in the project and in case of Vienna into a Urban Renewable Lab. Important synergies on Co-Creation, citizens and user integration or management and public relation resources could be activated. Clear and solid business cases can be observed in commercial logistic and business fleet management. In case of an industrial complex like Siemens, e-mobility can reducing costs, improving service and handling and contribute on energy efficiency and Co2-reduction at the same time. Fleet adaption to e-vehicles at logistic will be the same case, although the market is lacking behind with solid vehicle products. Here a demand and feedback towards the supply side (e.g. European vehicle industry) is important (also for different special vehicles like busses etc.).

At mobility services for private users (b2c) business cases are harder to predict. With the E-Carsharing at Hauffgasse a complete new model was created, which is lucrative in the portfolio of the housing developer BWSG and is foreseen to set-up economic liveable on its own at the same time. For services like E-bike rentals like city bike schemes, there will also be in future the need to cross-finance with public or private partners. The case with the cemetery in Vienna was a nice example how interest could match very well for partnerships. In the case of the Mobility Point (WienMobil Station – see different deliverable) the business case is seen as an addition to the portfolio a traditional public transport – as in longrunning positive effect of society and economy.

Smarter Together in Vienna very well showed, that smart mobility is more than e-vehicles and data. High quality urban design or public space as infrastructure for mobility is a main layer. Also the relation of active mobility like walking and biking and health prevention or social inclusion is important.

Conclusions targeted to Replication

Local Mobility Strategy

To create an own Mobility Strategy at an Urban Renovation and Refurbishment Area is an improvement to the status quo and fitting into the vision of a Smart City were different field are closely connected to each other. The Strategy was important to observe and lay down all mobility issues in the district to target the new services adequate. It was also important for the different activities with the citizens, to understand their needs and their neighbourhoods. It created a common picture of project partners and Stakeholders and was providing baselines for later demonstration of solutions. For future Urban Renewable at district level or Urban Living Labs, a Local Mobility Strategy (accompanied by activities
like the mobility survey and the Co-Design, participation activities like in Smarter Together) should be prioritized.

**E-Bike rental system by Sycube**

This local E-Bike service can serve to solve missing links of existing public transport or other mobility services. It’s definitely promoting cycling and especially E-Biking. Very relevant for Replication is cooperation with local partners. With the example of the Central Cemetery a partner with self-interest to provide services to its visitors could be found. Replication should be focus on other cultural, recreation, touristic, municipal or commercial organization with interest on mobility of their Stakeholders. The new developed lockers and Software for stops during the ride and the possibility to establish virtual or temporary stations are relevant for Replication and have already be deployed at another project.

**E-Carsharing at the social housing estate of BWSG in Hauffgasse**

It turned out that Carsharing is receiving high demand and usage at tenant housing estate level. Also, the deployment of E-Cars is fitting very well in this sharing model. Some users are willing to participate and could be engaged to have an active role in service and maintenance work. Relevant are Carsharing operators or specialized car leasing companies who are providing their services on this scale. Co-working with the future users was the key to inform, get familiar with the service and actors and finding the right operation model. There is high replication potentials and many aspects of this solution can serve as blueprint. Very similar models based on the successful implementation in Smarter Together are going to be implemented. BWSG as developer is very interested to expand shared mobility services for their tenants of 30,000 flats in Austria.

**E-Mobility at the industry site of Siemens**

The E-forklifts and the deployed E-Cars are a great success and highly relevant for Replication. They are economical feasible and have measurable contributions on CO₂ reduction. It’s worth it, to look at the potentials E-mobility could trigger at industrial processes, where the change of fossil vehicles or machinery could save crucial amounts of CO₂. The change of vehicles is a good window of opportunity to improves logistic cycles as well to further improve efficiency. Interesting was the close participation of the employees directly working with the equipment at Siemens, who also made own suggestions, which was relevant for a successful change process. Charging points for Bikes and Cars should be standard for future business sites.

**E-Mobility and mobility services by Austrian Post**

The first deployment for bigger e-vans for the delivery of parcels was an important novel solution to test. In 2016 there was very limited product supply on the market. The IVECO turned out to be insufficient on battery performance and conception. The handling and
principal usage of e-vehicles for this purpose turned out to be very good. For the vision of fossil-free city logistic appropriate vehicles will be needed and further procurements are planned. In the field of b2c logistic services the postal receiving boxes turned out as a very interesting business case and sufficient solution for efficient delivery. The market for new solution is still very vibrant in this field, although the flexibox turned out as not very needed by costumers and a box station at the mobility point couldn't be implemented direct in public space.
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i Vienna e-Taxi programme website: https://www.wienerstadtwerke.at/eportal3/ep/programView.do/pageTypeId/71282/programId/4401692/channelId/-51285

i S IMBIKE presentation video (in German): https://vimeo.com/264938520

ii More details on the "SeestadtFlotte" in the Seestadt aspern development area on the dedicated website: https://www.aspern-seestadt.at/en/lifestyle_hub/mobility

Smartphone app is available on the Google Play Store: https://play.google.com/store/apps/details?id=at.sycube.geiselberg&hl=de_AT

v BWSG e-carsharing presentation video (in German): https://www.youtube.com/watch?v=RLDsE-Bfc-s&feature=youtu.be

vi These goals have been defined during project Kick-Off for all WP5 projects. For more details, please refer to SMARTER TOGETHER, Deliverable D5.1.1 Detailed Implementation Plan Vienna, available on SMARTER TOGETHER project website (https://www.smarter-together.eu/deliverables).

vii Austrian Post shop: www.post.at