

1. BACKGROUND OF EU-PROJECT GROWSMARTER:

The city of Cologne has in close collaboration with its subsidiary Rheinenergie AG and together with the cities of Stockholm and Barcelona as well as other 30 partners from industry and science successfully applied with the EU-project „GrowSmarter“ in the framework of the Research Program „Horizon 2020“ in the call „Smart Cities and Communities – SCC1. “ Horizon 2020 is the new Research and Framework Program of the European Union combining all other European programs in this field.

It is the goal of „Grow Smarter“ to comprehensively find sustainable solutions for the areas energy management, transport and mobility especially in an ever growing metropolis. Local problems in areas like environment, society and health should be tackled through this project. Information and communication technology is going to be the link between the different areas and therefore plays an important role.

The project intends to improve the air quality of cities, to lower the particulate matter emission and energy consumption. Moreover, it is going to contribute to sustainable mobility and take active part in reaching EU climate goals.

12 measures are planned in the areas mobility, energy and information technologies, in the Southern Area of Cologne-Mülheim (keyword „Klimaveedel“). The different areas are interconnected in order to establish a sustainable concept which could serve as a blueprint for the development of urban space with great industrial areas especially industrial wasteland.

The 8 different work packages in the project deal amongst other things with supervising traffic and energy streams and with developing an integrated local traffic concept replacing the existing fossil individual traffic by environmentally friendly and multi-modal traffic systems (e.g. public traffic, bicycle, car-sharing, e-bikes) and intelligent energy systems with specialized storage possibilities (virtual power plant).

Cologne´s partner in the project are the following firms: RheinEnergie AG, KVB AG, DEWOG, Cambio Köln, Ampido, AGT International, Urban Institut GmbH and Microsoft.

The intelligent solutions to be developed within the project have to be (partly) implemented by five so-called follower cities (Graz, Suceava, Valetta, Porto, Cork). The medium-term objective to be achieved is to supply also other cities with these solutions.

With this project the city of Cologne and its partners have committed themselves to carry out the measures determined in the contract with the EU.

The project has started in 2015 and runs for a period of 5 years.

„Grow Smarter“ is part and parcel of SmartCity Cologne.

For Cologne the project is an important step towards a sustainable and trend-setting town planning. The results could serve as a blueprint for further town planning projects. The experience from Stockholm and Barcelona as to climate protection is very important for Cologne.

2. WORK PACKAGE 4, MOBILITY

In the council order mentioned above the installation of 3 mobility hubs is determined.

2.1. Requirements for the installation of a mobility hub

Generally the mobility hubs can be equipped with following services

- (E-) Carsharing
- (E-)Bike sharing or similar micro vehicles, if applicable also rental of bike trailers
- (Online-) management and/ or planning of parking zone
- and much more

2.1.1. Legal basis

Besides the innovative development work legal requirements like prevailing legal norms, in particular the road traffic regulations and the law governing streets and routes of North Rhine-Westphalia (NRW), should be kept clearly in mind.

2.1.2. Guidelines

The mobility hubs should adapt creatively to the cityscape while installing.

2.1.3. Spatial requirements

An efficient mobility hub has got spatial requirements of several passenger car parking positions. Furthermore, there is an extra space requirement of a bike rental outlet, depending on size, for example, on a pavement with excess width or in a square, therefore passenger car parking positions must not be occupied compellingly.

The basic version of a mobility hub consists of

- 2 parking positions for car sharing electric vehicles with column load
- 1 to 2 parking positions for conventional car sharing vehicles
- 2 parking positions for private electric vehicles with public column load
- Packing position for lending pedelecs (depending on the number with different size)
- 2 parking positions with online management of parking space

The aim is to bundle as much as possible mobility offers at one location.

The whole spatial requirements extend to quite a few parking positions plus free areas. If the services find acceptance in future, as well an expansion is intended.

2.1.4. Position

The mobility hub should have a connection to the public passenger transport, be centrally located and easily visible.

2.1.5. Signposting

Currently the city of Cologne is in touch with the Ministry of construction, housing, urban development and transport of North Rhine-Westphalia to develop a uniform signposting for a mobility station. The signposting will be upgraded only after the existence of a coordinated design and scope at a later date.

2.2. Goals

The basic goals for work package 4, mobility, are:

- groundbreaking solutions in the field of mobility and energy
- reduction of fine dust pollution
- fostering of a tolerable climate in the city
- development of alternative traffic concepts
- development of forward looking integrated concepts to solve future questions in relation to traffic
- and much more.

All in all the administration expects further synergy effects.

2.3. Evaluation

In order to access the EU funds, the city of Cologne as well as the industry partners have committed themselves to evaluate the project. Here also requirements of the EU Commission must be observed.

First of all, proof of Co2-savings have to be furnished.

As regulations, standards, etc. do not exist for all areas for an evaluation, values must be determined by calculation.

Thus, the industrial partners have access to customer data, partly mileage and consumption benefits. Because of existing privacy regulations, however, all data such as geo-referenced information and therefore motion profiles cannot be evaluated.

All information should be provided regularly throughout the evaluation period (from implementing the mobility hub respectively mobility point to the end of 2019).

Once first exploitable results of the evaluation are available, the administration will report about it.

2.4. Modules (system descriptions)

2.4.1. Online-management of parking lots (project partner Ampido)

At critical points mobility stations are built with the possibility of producing transfer points from one to another mode of transport. The more variations are offered, the greater the acceptance. This is regulated by supply and demand.

A mobility hub includes the service of a number of variants, however, at the mobility points first only 2 services are considered. Retrofitting is not excluded when needed. Its proximity to public transport is not always given to the mobility points, mobility points are partly in purely residential areas.

The parking seeker (customer) reports the need of a parking lot for the requested period and the location via an application (App), telephone or email. The costs for parking will be announced or can be independently viewed in the app. The next available parking lot for the given dates is reserved for the customer. He receives the GPS data of the parking lot with a detailed description and is able to find the parking lot without detours via navigation system. This navigation system is integrated into the application. A reservation is immediately possible or up to 30 days in advance.

Billing is effectuated between the customer and the company Ampido and includes the parking costs according to the actual duration of use, the minimum waiting time is 15 minutes.

The company Ampido balances accounts with owner of the parking lot separately, for example, according to exact revenues minus a commission or after an agreed (rental) fixed price.

As with this system parking search traffic can be reduced, the proof of this is provided in the context of the evaluation; the customer saves time and reduces costs. For the general publicity the environmentally friendly aspect is highlighted, but also the reduction of the general traffic flow. Besides a better utilization of the parking space exists also the possibility of a dynamic price adjustment according to the demand.

However, as the basic principle is that public space is to make available to the public, there are legal problems for commercialization of public space by a private company.

2.4.2. Station-bounded (E-)Car-Sharing (Project partner cambio Köln)

Car sharing distinguishes between station-bounded and not station-bounded car sharing.

Station bounded means that each car sharing car has a fixed parking position. 85% of these parking positions are in Cologne on private space. It is not absolutely necessary to build the stations in public space, also private garages can be used, for example, in underground car parks or parking garages. The corresponding contracts are concluded between the car

sharing company and the respective operators or owners. Through the dedicated parking space these long-established car sharing form can be planned in advance. Through this planning station-based car sharing is also used by companies and institutions: In Cologne, the colleagues in the city administration do around 12,000 business trips per year. For this, car models of various sizes are available. Their average CO₂ emission is with 0.97 g far below the national average (2013: 136.4 grams of CO₂ per kilometer) of private motor vehicles. The Grow Smarter industry partner cambio car sharing has won the municipal tender for this service four times in a row.

Capacity and fleet are correspondingly large: All day used by institutions and companies, evenings and weekends by private car sharing member, station-bounded car sharing daily reaches occupancy rates of more than 10 hours. Because of this availability and the appropriate different car models station-bounded car sharing leads to a car replacement rate of 1:10 (Source: Federal Association car sharing). In Cologne and in the urban agglomerations a station bounded car sharing car with a correspondingly high station density replaces 12 private cars (Source: cambio Cologne). In combination with public transport and bicycle station-bounded car sharing results as part of modal split in a substantial reduction of MIV (motorized individual traffic). Users of car sharing drive, experience had shown, less than if they have a permanent private car at the door.

For the Free-Floater systems which are relatively new on the market first studies in the cities of Berlin and Munich (WiMobil) assume a car replacement rate with a factor of 1:3. The vehicles of these systems are 100% in public space and offer sometimes only a single vehicle model.

For a reasonable operation of electric vehicles currently only station-bounded car sharing is possible; because a car park is always kept free at the reserved charging station.

In the areas where car sharing is offered, thus reducing both the volume of traffic flowing as well as parked vehicles, the needed public place is reducing itself.

2.4.3. Station-bounded (E-)Bike-Sharing (Project partner KVB AG)

The KVB rental bike system is designed both for the flexible operation (to find and park in public space) as well as for the station bounded operation (fixed installations). Both types of operation can be managed at the same time in one single system. The users of the system thereby obtain maximum freedom of choice (flexible) and reliable allocation at defined points (station).

The offer can be adjusted quickly and in accordance with local conditions. Stations are possible in the form of fixed installations (fixed positions and info and rental terminal) and "virtual" stations. Virtual stations are fixed points at which a certain number of bicycles are provided in a loose series lineup.

Fixed installations are independent of supply circuits (except e-bikes) and solid basements (are pegged to the solid surface), enlargement and reduction of parking spaces is comparatively simple.

The integration of all VRS e-tickets was decided on 22.01.2015 in the VRS advisory board.

Thereby all VRS regular customers (subscription, job and semester ticket) get 30 minutes free ride for each borrowing with their ticket and without extra charge. The flexible operations started on 8 May 2015 by the KVB.

2.4.4. Electro charging infrastructure (Project partner RheinEnergie AG)

For the electric vehicles a charging infrastructure has to be set up by the utilities company RheinEnergie AG.

Besides the possibility of an already underground laid power line at the exact selection of sites, one has to consider the proximity to, inter alia, trees to avoid root damage.

For motor vehicles normally a fuel hose from the charging station will be required to the vehicle, here possible stumbling hazards must be eliminated.

At a conventional AC charger site two electric vehicles can be charged simultaneously. By an opposite arrangement, if the location permits this, the number of associated parking lots is doubled. The charging points (Type2 plug) are locked and free of tension for protection against vandalism and electrical safety until authorization by a user. The electric vehicles will be connected with a charging cable, which the driver has to bring along, to the charging station. This is the established process for more than 5,000 publicly accessible AC charging points in Germany.

In public streets the charging station, as a rule, takes its power from the existing electricity grid, therefore cable relocations are necessary, as required by the power company or its subcontractor.

For the establishment of charging infrastructure in public space precondition is a reservation of the associated parking spaces for electric vehicles while charging with proper legal action against illegal parking. This and the optional reduction of parking fees for electric vehicles allow since 12/06/2015 the law "prerogative the use of electric vehicles" (short EmoG).

2.4.5. Further modules

Although initially only one partner launches a mobility station, one should not forget that in the medium term more mobility options should be combined. Here compromises must be made due to local circumstances.

Possible additional modules are features such as electric taxis, call taxis and shuttle services.

2.4.6. Operating and maintenance of mobility stations

Basically, each partner is responsible for his station respectively for the vehicles and has got a legal duty to maintain safety. Regular maintenance intervals are also necessary in case of maintenance; for instance replacement vehicles for customers must be provided by the operator.

The acceptance of customers is given only in a well maintained station, therefore a continuous maintenance, includes naturally winter maintenance, is necessary and must be organized and financed by the operator.

3. Selection of sites

Overall, the search for suitable sites is extremely difficult for both mobility hubs as well as for mobility points, considering all the factors objectively

3.1. Requirements

After legal review special use permits cannot be granted to all shown modules of a mobility hub due to the current legislation in public space. Discussions are currently ongoing with the upper road authority (Bezirksregierung Köln) to be able to possibly effectuate an exception.

Therefore, not to jeopardize the project, replacement sites were searched which are not under public law. It formally deals with private plots which are both belonging to the city as well as property of third persons.

In its session on 3rd September, 2015, in agenda item 4.1. car sharing parking spaces in public space, 0087/2015, and the amendment tabled by the party Die Linke from 3rd March, 2015, AN / 0402/2015 the Transport Committee decided the following text for station-based car sharing :

"In order to promote the positive effects of the station-based car sharing in terms of less congestion in Cologne, the Transport Committee decided to recast the criteria on the number of vehicles on stations in public space. The previous criterion to the total number of parking spaces for station-based car sharing vehicles in public streets of the city of Cologne will be increased from 10% of the total number of vehicles of a car sharing company to 15% of the total.

In providing station-bounded spaces for car sharing in public space the traffic-related aspects should be taken more into account. In future as a priority car sharing parking spaces are to be set up where the public transport network ends, or has gaps. "

In order to achieve a CO2 reduction of 60 percent in the overall project, it is necessary to increase the density of car sharing stations in the project area. As this within the 15 -% arrangements for the project is only achievable by waiving car sharing stations in other districts, the 15 % arrangement has to be overridden for the project.

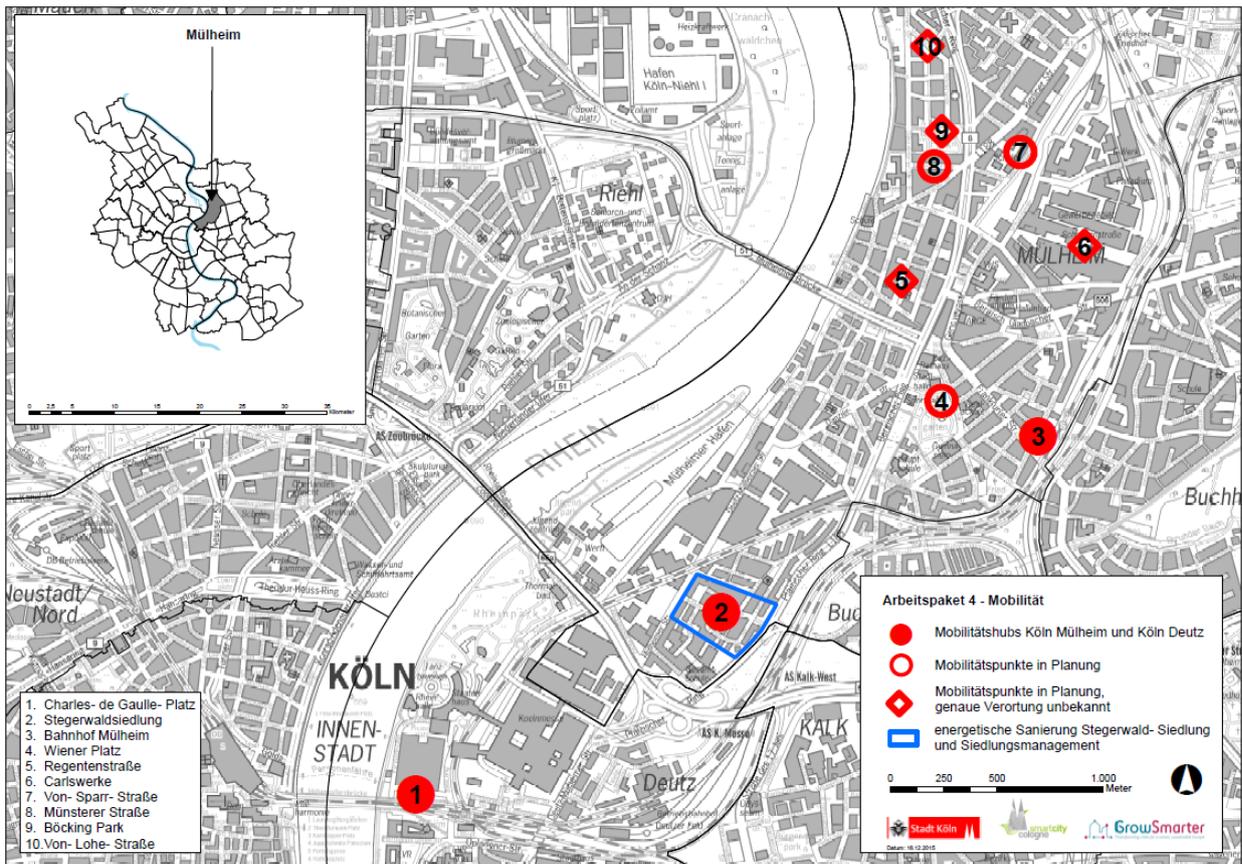
The acquisition of a maximum of 20 electric vehicles will be subsidized. The company cambio Cologne will offer 2 electric vehicles per location at the respective mobility points. In order to make the shift possible from private transport to modal split for the citizens, additional conventional vehicles for long haul trips will be offered. Therefore vehicles are used with particularly low CO2 emissions.

Decisive for achieving the goals is not only the exclusive use of electric vehicles, but the fact that the road user abolishes the traditional mode of transport using private cars and

switches to alternative offers. It is scientifically proven that enormous improvements could be reached especially as regards climate protection, so for example in the project wimobil in Berlin and in Munich.

3.2. General overview

As Stegerwaldsiedlung directly borders on urban district 1, downtown, a connection of several mobility points from Deutz station to the north was built. Being mobile means also to consider source and target traffic.



Übersichtsplan

3.2.1. Charles-de-Gaulle-Place

The Charles-de-Gaulle Square is located north of the DB station Cologne / Messe-Deutz between Auenweg and Rhine, which has next to connection with trams and regional trains also an ICE connection and is therefore connected to the long-distance traffic, too.

East of the well, the parking lots are currently rented out privately; west the area is used as a parking lot and managed by the city.

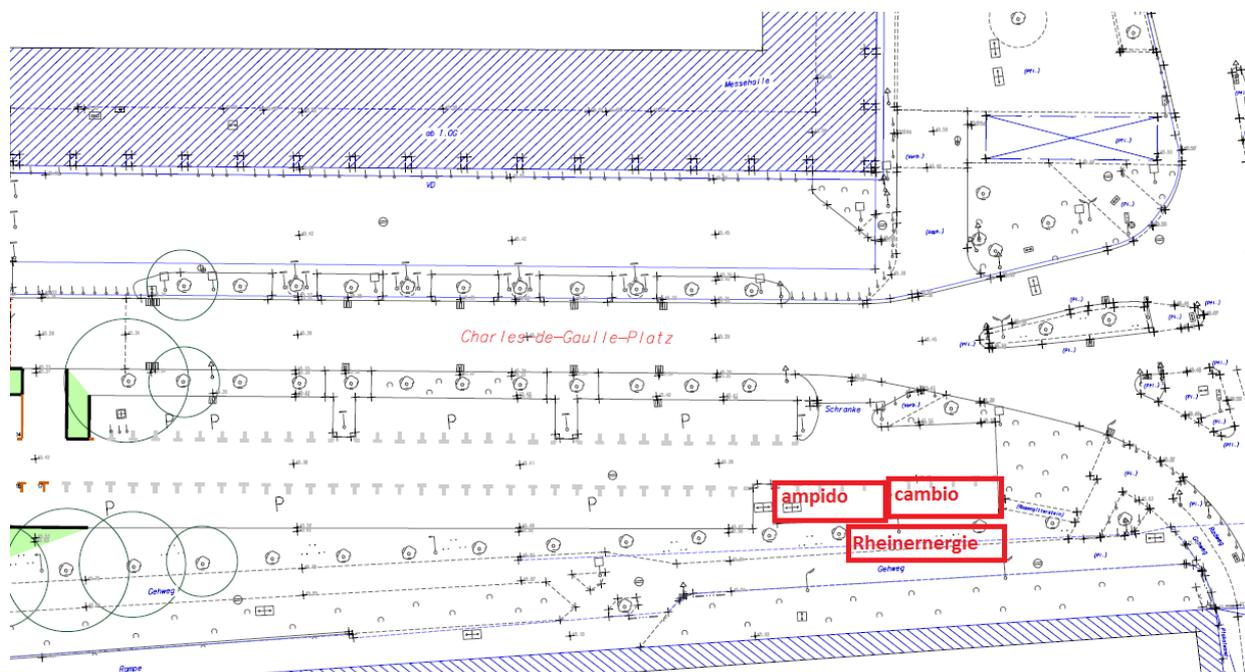
It is a so-called fiscal space, which is not under public law, and provides enough space for all modules of mobility hubs.

The industrial partners have submitted applications with the administration for the provision of space in the project under the date of 10.02.2016 (ampido) and of 05.01.2016 (cambio Cologne). It is envisaged that ampido manages a total of 5 parking lots with the online management of parking space. Cambio Cologne will additionally also require a total of 5 plots, 2 for electric vehicles and 3 for conventional vehicles. It is also envisaged to set up a public electric charging station for 2 electric vehicles.

The applications were reviewed by the relevant departments of the administration and were looked upon favorably subject to conditions.

The requirements are essentially design aspects.

KVB AG intends to install a bike rental station in the immediate environment where station-bounded bike sharing should take place both with electric bicycles as well as with conventional bicycles. The exact location has yet to be determined.



Location plan

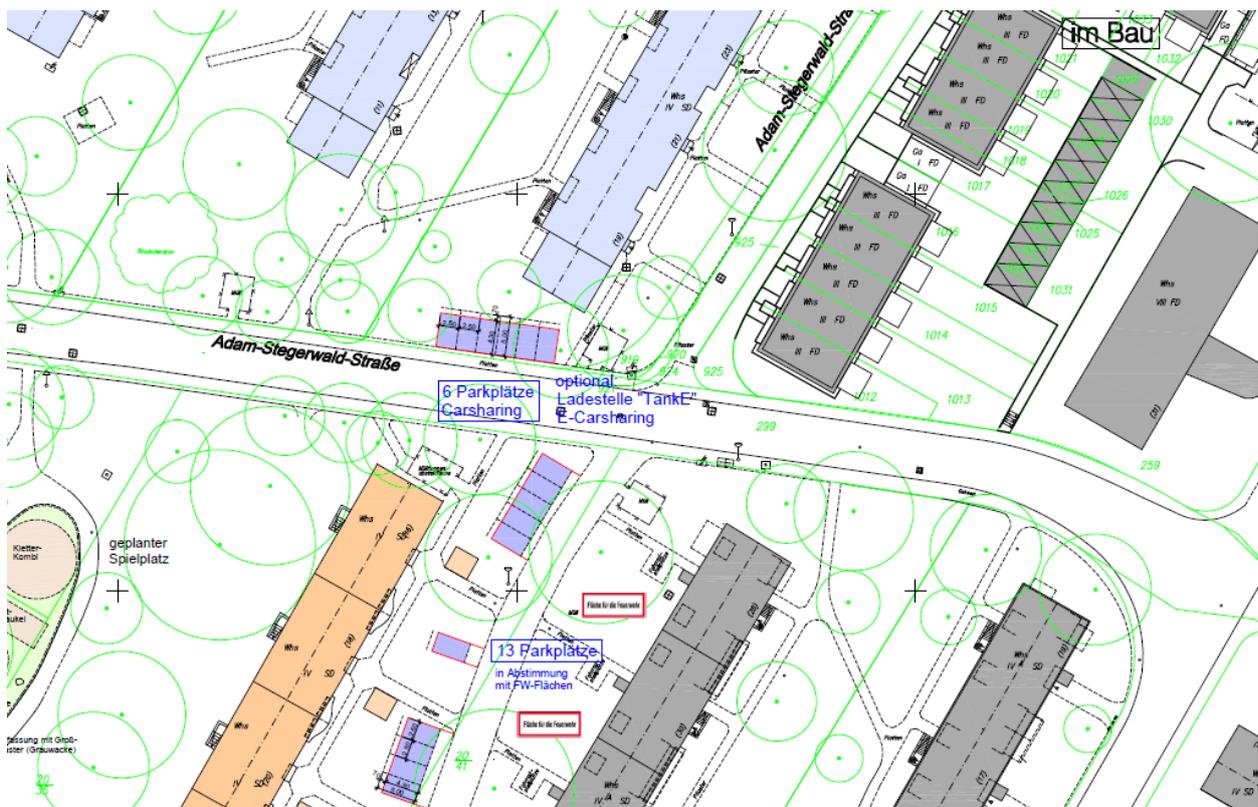
3.2.2. Stegerwaldsiedlung

At present it is envisaged to build the mobility hub on private property of DEWOG at Stegerwaldsiedlung territory which is also an industrial partner within the project. Generally, there is enough space for all mobility partners. However, the hub has to be straightened due to local circumstances. The KVB-metro station stop Stegerwaldsiedlung is used as a connection with the public transport system.

The corresponding arrangements respectively contracts for the installation of the mobility hub will be concluded between DEWOG and the other partners. DEWOG has already signalled its consent.

Currently superstructure operations are running for energetic building renovation at Stegerwaldsiedlung, hence the outside facilities will be partly needed for the building site. Therefore, implementation depends on these renovating activities.

The current planning is shown in the attached layout. The exact allocation of the industrial partners is still not fixed.



Lageplan

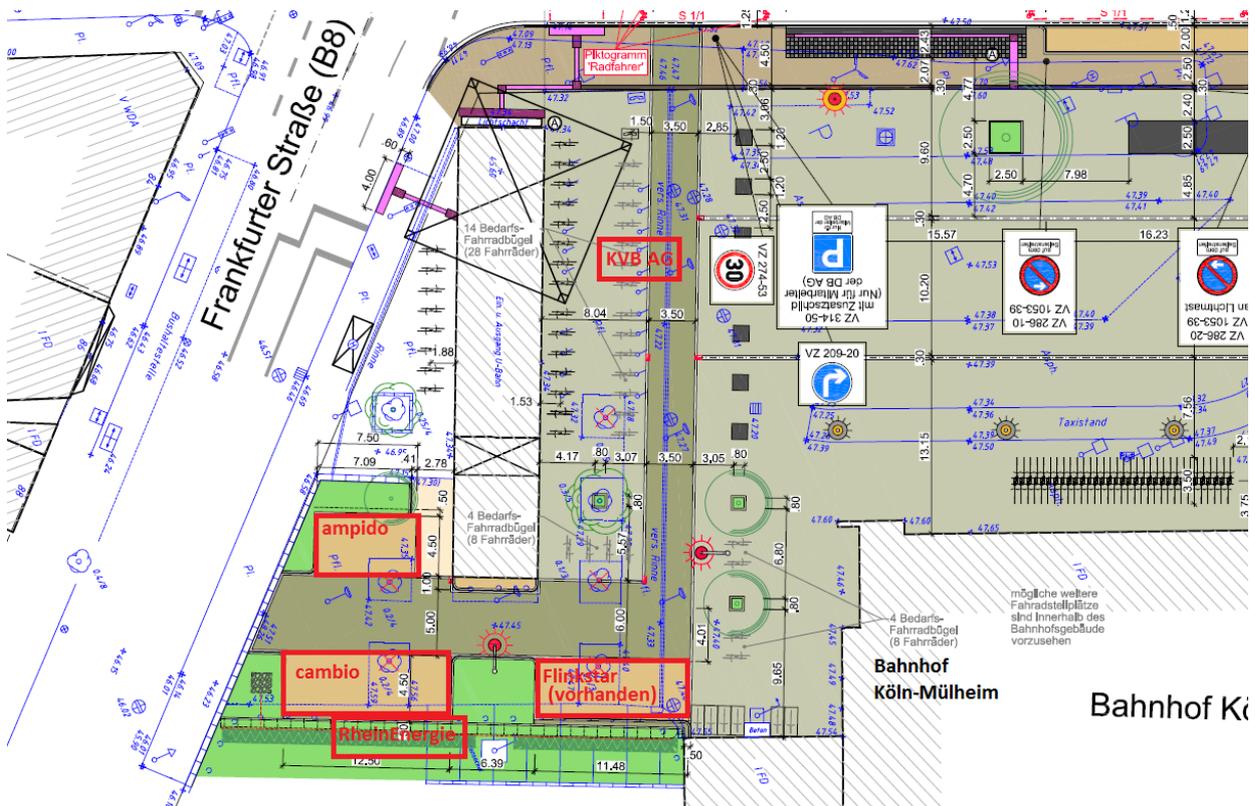
3.2.3. Forecourt of the station Köln-Mülheim

Here it is intended to build the mobility hub on the forecourt of the station Mülheim. The area is not governed by public law, it is private property of Deutsche Bahn AG. The car park is managed by a subcontracting of DB AG, currently the car-sharing corporation named FlinkStar is already on-site. Thus, enough space is available for all industrial partners.

In the course of the "Mülheim 2020-project being co-financed by FEDER the station forecourt has been renewed in the year 2013.

Besides the offer of public transport of KVB (city railway and bus), it also exists the possibility to change trains to the regional passenger rail (commuter railway system and secondary lines).

Based on the licensing agreement concluded between Deutsche Bahn AG and the city of Cologne, DB AG has assented to the use of (each with) 2 parking spaces for ampido and cambio Cologne on 12/2/2016. The exact allocation has still to be agreed upon with DB AG.



Lageplan

3.2.4. Mobility hubs in planning stage

At the mobility points (No. 4 to 10) that are diagrammed in the layout will be investigated in detail whether e-pillars can also be disposed on the given positions, in particular with regard to the tree population. Here only the car-sharing provider cambio Cologne will be stationed at first, if possible as well as each with a public electrical charging point.

As a rule public space is governed by public law where extent and manner of mobility hubs still need to be clarified case by case (cf. to this legal opinion).

The industrial partners already hold conversations with owners of private property about mobility points on their premises.

If in individual cases it is not possible to build a mobility point on the given positions, alternative positions will be searched for.

Taking Wiener Platz as an example, concretely at the forecourt of town hall Mülheim, it becomes clear that a mobility point makes no sense in the course of this project because of the locally upcoming construction works Wiener Platz will not be available during the entire project period.

4. Measure and time-table planning

After the City Council resolution it is foreseen and necessary to build the mobility hubs immediately.

Time is running short due to the fact that not later than the beginning of the second half of the year the evaluation already has to get started to fulfil the guidelines of the European Commission and the contractual commitments. Thus, there is a priority given concerning the resolution!

For the electrical charging point and the electric vehicles one can emanate from a delivery time of 3 months. Therefore, it is not everywhere possible to install all of the modules at the same time.

After implementation the evaluation will get started.

5. Outlook/Visions

Not only electrical mobility will increase clearly especially in the urban area, but also the change of transport behaviour will lead to a reduction of the needed parking space with the result that these districts will be returned to other use.

The idea of an online management of parking space could be a solution in the future. However, then legal requirements have to be adapted.

If the results of the project are positive, the system could constitute a city-wide solution and will serve as a blueprint for the whole of Europe.

About GrowSmarter

GrowSmarter (www.grow-smarter.eu) brings together cities and industry to integrate, demonstrate and stimulate the uptake of '12 smart city solutions' in energy, infrastructure and transport, to provide other European cities with insights and create a ready market to support the transition to a smart, sustainable Europe.

1. GrowSmarter project partners



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