



## **Smart Mobility Hubs in Peripheral Areas: The Case of the Systems implemented in Vienna and Munich**

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## **SMART MOBILITY HUBS IN PERIPHERAL AREAS: THE CASE OF THE SYSTEMS IMPLEMENTED IN VIENNA AND MUNICH**

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### **ABSTRACT**

With an increasing urban population and urban problems arising from this unplanned growth, several projects aiming at promoting sustainable urban development have emerged. Smart mobility strategies, such as shared mobility and mobility hubs, represent some of the solutions to promote changes in travel behavior. In this context, the Smarter Together, a joint research and innovation project funded through the European Union program H2020, was implemented. The project selected three lighthouse cities to test and upscale innovative solutions. Vienna and Munich implemented mobility hubs in the scope of the project and in both cities the project area is located in the outskirts, which is an unusual approach for smart city projects. This paper presents the main characteristics of the mobility hubs implemented in Vienna and Munich in the scope of the project Smarter Together, it presents an analysis regarding their location in the peripheral areas of the cities.

### **1 INTRODUCTION**

Among many urban problems arising from unplanned growth, cities worldwide are dealing with the lack of space within their city centers as well as with the resulting traffic congestions. In this scenario, smart mobility strategies have been adopted worldwide to promote changes in travel behavior. Among smart mobility strategies, there is shared mobility and the implementation of mobility hubs.

Mobility hubs are places or locations where different mobility offers and services are available. They usually include a shared mobility alternative, such as shared bikes, scooters, and cars, and they aim at promoting the integration between those and the public transport to change travel patterns.

The Smarter Together is a joint project funded through the European Union program H2020 and it aims to improve cities' capacity to implement smart city solutions through networking. The program selected three lighthouse cities – Munich, Lyon, and Vienna, which are supposed to implement activities and upscale solutions, inspiring other cities in Europe to develop similar projects. Those three cities implemented different activities in specific districts and monitored the results to upscale solutions at the city level. Mobility hubs were implemented in the scope of the Smarter Together both in Vienna and Munich. Lyon implemented an electric car sharing system as well as charging stations for electric vehicles but did not define them as mobility hubs. Besides the three lighthouse cities, the Smarter Together selected three follower cities – Santiago de Compostela, Sofia and Venice, which

will replicate the key findings from the lighthouse cities, implementing them in different urban and institutional environments. Venice, as a follower city, already plans to replicate the experience of mobility hubs. (Smarter Together, n.d.)

This paper presents the main characteristics of the mobility hubs implemented in the scope of the project Smarter Together in the cities of Vienna and Munich. Its main goal is to present a discussion on their location in the outskirts of the cities.

## **2 SHARED MOBILITY AND MOBILITY HUBS: STATE OF THE ART**

This part of the paper presents the state of the art of a few concepts deriving from the term smart cities - such as smart mobility, shared mobility, and mobility hubs.

### **2.1 Smart Mobility**

According to Albino et al. (2015, p. 2) and Papa and Lauwers (2015, p. 545), the terms smart mobility and smart cities appeared both at the beginning of the Nineties. At that time, the name stated a city with systems dependent on technology and on innovation. Nowadays, within the “smart city”, studies have defined it in many other different ways, considering it as a strategy to promote better cities.

According to Albino et al. (2015, p. 9), smart mobility “refers to the use of ICT in modern transport technologies to improve urban traffic.” Benevolo et al. (2016, p. 24) states that the ICT applications are “an attractive solution to many of the problems of the transport sector”. Though ICT plays a central role in smart mobility, it is important consider the citizens in its planning. Albino et al. (2015, p. 6) affirms that some authors criticize smart mobility, because corporate-designed cities “eschew actual knowledge about how cities function and represent empty spaces that disregard the value of complexity, unplanned scenarios, and the mixed uses of urban spaces”. In this sense, the author affirms that “the smart city concept is no longer limited to the diffusion of ICT, but it looks at people and community needs.” (Albino et al., 2015, p. 3)

### **2.2 Shared Mobility**

One of the smart mobility strategies is shared mobility, which includes sharing bicycles, automobiles, scooters, among others. According to Cohen and Shaheen (2016, p. 4) “it is an innovative transportation strategy that enables users to have short-term access to a mode of transportation on an as-needed basis”. These systems bring several advantages to its users, among them the discouragement of car ownership and the incentive to the use of sustainable modes of transportation. However, with its emergence, city planners are now facing new challenges. These systems require decisions on “locating stations, choosing the number of vehicles per station, moving vehicles between stations, inciting users to change their destination” (Laporte et al., 2015, p. 342). Several cities already suffer from the massive implementation of these models and policies. Some cities have banned or strictly regulated such sharing systems, once they can cause various disorders to the population, such as incorrect parking and sidewalk obstruction, mainly due to the lack of information to users and of places for adequate parking.

Castro Fernández (2011, p. 200) points out the main benefits that can be achieved through the use of bike-sharing: “1) making intermodal trips with public transport more attractive, 2)

increasing bicycle use and 3) increasing traffic safety.” Concerning the increase in bike use, bike-sharing can serve as the gateway to the adoption of more sustainable modes of transport. Fulton et al. (2017, p. 13) affirm that these systems can “introduce many new people to urban cycling, who eventually acquire their own bicycle”. Some municipalities consider the implementation of bike-sharing systems as a strategy to reduce car traffic and congestion. However, as stated by Castro Fernández (2011, p. 197) the impact of bike-sharing to this goal is, actually, low. On the other hand, the influence of bike-sharing reducing public transport vehicle occupancy seems to be more significant. According to Castro Fernández (2011, p. 197), though only a few trips were transferred from public transport to bike-sharing, “a synergy with public transport through intermodality has been observed.” Castro Fernández (2011, p. 198) also affirms that “intermodality between bike-sharing and public transport is one the main potentials” of bike-sharing to improve mobility.

Concerning car-sharing systems, its primary benefit is the more efficient vehicle use. Moreover, “environmental benefits can be achieved if the car share vehicles on average have lower emissions by being of the newer model year” (Fulton et al, 2017, p. 13) or even if the fleet is composed of electric vehicles, as in many cities worldwide.

### **2.3 Mobility Hubs and similar concepts**

A mobility hub is a place or a location where different mobility offers, and services are available. They usually include at least one shared mobility alternative, enabling intermodality and multimodality. While in North America the most used term is mobility hubs, they are often also referred to as mobility points, especially in Austria, and as mobility stations, especially in Germany. (Miramontes, 2018, p. 55)

## **3 CASE STUDY: THE SMARTER TOGETHER IN VIENNA AND MUNICH**

In 2015, the cities of Lyon, Munich, and Vienna were selected for the EU-funded program Smarter Together. Different smart solutions were planned for the housing development chosen areas. Among those, mobility hubs were implemented in the scope of the project by the cities of Munich and Vienna.

### **3.1 The Smarter Together project**

The Smarter Together is a joint project in which the cities of Lyon, Munich, and Vienna – denominated as lighthouse cities – together with 28 partners from research and industry were awarded 25 million euros for the implementation of smart actions. Besides, cooperation with three follower cities – Santiago de Compostela, Sofia, and Venice – is planned. The project aims at implementing and testing sustainable and innovative solutions in housing development areas, improving the quality of life in the neighborhoods. The lighthouse cities received the funds in September 2015, while the projects were implemented in the timeframe of three years, between 2016 and 2018. Later, during 2019 and 2020, the actions performed in the scope of the project should be monitored and evaluated. This project is funded within the EU program Horizon 2020. (Neumann et al., 2016, p. 965)

Horizon 2020 is a collaborative program for research and innovation in the timeframe from 2014 to 2020. It is the most significant EU Research and Innovation program, with approximately 80 billion euros of funding. In addition to the direct public funding, the projects implemented in the scope of this program also attract private investment. The main

priorities of the Horizon 2020 regarding transport are: make it more sustainable; make it seamless by providing better mobility, less congestion, more safety, and security; keep it competitive by maintaining Europe as a global leader in the transport industry; and, make it research responsive by supporting policy-making and by targeting socio-economic and behavioral research. (Fabián and Křištofová, 2015, p. 1, p. 3)

Regarding the project areas, the three lighthouse cities have chosen neighborhoods within their urban perimeter to implement the Smarter Together project. As for Vienna, the neighborhood chosen was Simmering, which is “a worker’s district with large housing estates.” (Neumann et al., 2016, p. 967-970) As stated by Wendt and Dübner (2017, p.103), “even though the three lighthouse cities seem to be very different, they do face very comparable challenges and problems.”

In Munich, the Smarter Together was implemented in two neighborhoods bordering each other: Neuaubing-Westkreuz, “a district in need of redevelopment”, and Freiham, a new district that was “still under construction.” There are approximately 23,000 residents in the project area, which “is part of what is geographically the largest but also the most thinly populated urban district of Munich” as well as the “largest redevelopment area in Germany”. Freiham is estimated to have 28,000 residents by 2041. (Landeshauptstadt München, 2019, p. 8, p. 11)

In Vienna, the Smarter Together project was implemented in the 11th District of Vienna, which is also known as Simmering. There are approximately 21,000 residents in the project area. Besides the mobility hub, several other projects were implemented in the area, such as housing refurbishment and school constructions, all of them targeting smart city strategies. The 11th district is in a peripheral location and it is “characterized by its working-class history, a diverse building stock with a high share of municipal and subsidized housing.” (Magistrat der Stadt Wien, 2019b, p. 11) The population density is 44.3 inhabitants/ hectare, which is below the average for Vienna. Concerning the motorization rate, there are 363.1 automobiles/1,000 inhabitants. This rate is also below the average for the City of Vienna, in which there are 373.8 automobiles/1,000 inhabitants. (Magistrat der Stadt Wien, 2019c, p. 302)

### **3.2 Munich**

Munich is Bavaria’s capital and most populous city. It is located in the south of Germany, and with about 1,559,354 inhabitants, it is the third-largest city in the country. (München Stadtportal, 2020)

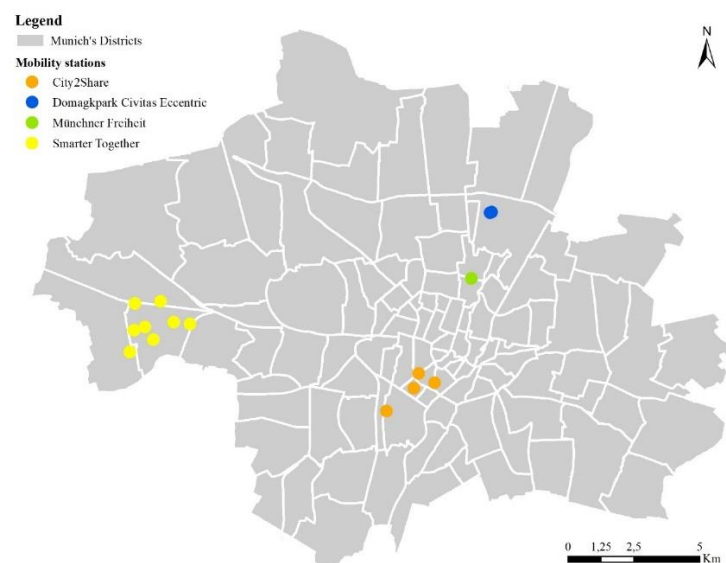
In 2008, the modal split in Munich would show that the share of public transport was only 21%, whereas by car 37%. Concerning the non-motorized modes, the modal split share of walking was 28% and by cycling 14%. In comparison with other major cities in Germany, such as Berlin and Frankfurt, the modal split share of public transport in Munich is considered low. In contrast, the share of the automobile is deemed to be high. (EPOMM, 2008; Ahrens, 2015, p. 86) Concerning the motorization rate, between 2006 and 2016, the number of automobiles has increased more than the population. The current motorization rate in Munich is 454 automobiles/ 1,000 inhabitants. Moreover, in 2013, 43% of city residents owned public transport pass and about 80% of the Munich population held at least one functioning bike in 2008. (Landeshauptstadt München, infas, as cited in Miramontes, 2018, p. 110-111)

There are currently 14 public mobility hubs in Munich, among which eight were implemented in the Neuaubing-Westkreuz and in the scope of the Smarter Together. It should be noted that the mobility hubs in Munich, although from different projects and funding, have systems operated by the same operators and are integrated with each other, as well as with other bike sharing hubs and existing car sharing systems, which are spread throughout the city of Munich.

Among the eight mobility hubs in the neighborhoods Neuaubing-Westkreuz and Freiham, four were implemented in July 2018, and the other half in December 2018 and January 2019. The budget needed for the project was approximately €120,000-180,000 for each mobility hub, which varies according to the components and equipment available. Regarding the timeframe, the implementation lasted approximately 6 months after the planning documents were concluded. (Smarter Together, 2019a, p. 6, 2019b, p. 43)

The primary operator of the mobility hubs in Munich is MVG, the public transport company operating in the city. All mobility hubs have the similar infrastructure and provide the following services: MVG Rad bike sharing, MVG eRad pedelecs, MVG e-trikes cargo tricycle sharing, SWM charging stations for electric vehicles, and STATTAUTO station-based car sharing. Furthermore, all of the eight mobility hubs provide public wireless internet and all of them have a digital information board, which provides information on the mobility options available. Besides, two of the mobility hubs (Westkreuz and Freienfelsstraße) offer parcel lockers, which are named as Quartierbox and are operated by SWM and MVG in cooperation with Getnow. The MVG e-trike system and the Quartierbox are novelties implemented in the Smarter Together and, so far, are present exclusively in the project area.

The Quartierboxes are available for 24 hours every day. Currently, it is possible to use them in different ways: one is by placing an order through the Getnow delivery company's website or application. Another way is to use the boxes to store personal items or leave deliveries for neighbors to pick up. In this sense, local businesses can also take the initiative to leave their products in the boxes to be picked up by customers at any time. Both refrigerated and room temperature compartments are offered.



**Fig. 1. Location of the existing mobility stations in Munich**  
Source: own illustration; districts retrieved from OpenStreetMap (2020).

The mobility hubs implemented in the scope of the Smarter Together are very similar to the other ones in different neighborhoods in Munich, which demonstrates the intention to create a single and broad network for the whole city. However, it is essential to highlight that cars and bicycles use the corporate design from the Smarter Together program.

Regarding the location of the mobility hubs at the neighborhood level, mobility hubs were set up nearby all the existing five suburban railway (S-bahn) stations located in the project area. The other three mobility hubs were placed spread in the district, aiming at creating a network. Most of the mobility hubs are in public spaces. However, one mobility hub is situated on private ground, though it is still accessible and available for everyone.

### **3.3 Vienna**

Vienna is Austria's capital and most populous city, with about 1,897,491 inhabitants. It has an average population density of 46 people per hectare. In 2018, the modal split would show that the share of public transport was 38%, whereas by car only 29%. Concerning the non-motorized modes, the modal split share of walking was 26% and by cycling 7%. Regarding the year of 1993, the modal split share of public transport has risen by nine percentage points and the share of cycling has increased by four percentage points. In comparison with other major cities in Germany and Austria, the modal split share of public transport is significantly higher. (Magistrat der Stadt Wien, 2019a; Ahrens, 2015, p. 86; BMVIT, 2016, p. 101)

The numbers above demonstrate the results of several policies that have prioritized public transport and cycling during the last years in the City of Vienna. Offering an annual public transport pass for €365, the number of passes issued in 2018 was 822,174, which represents 43% of the city population. The bike sharing system Citybike Wien has over 120 stations and offers free rides (for the first-hour ride) with only a single subscription fee of €1. (Magistrat der Stadt Wien, 2019a; Citybike Wien, n.d.)

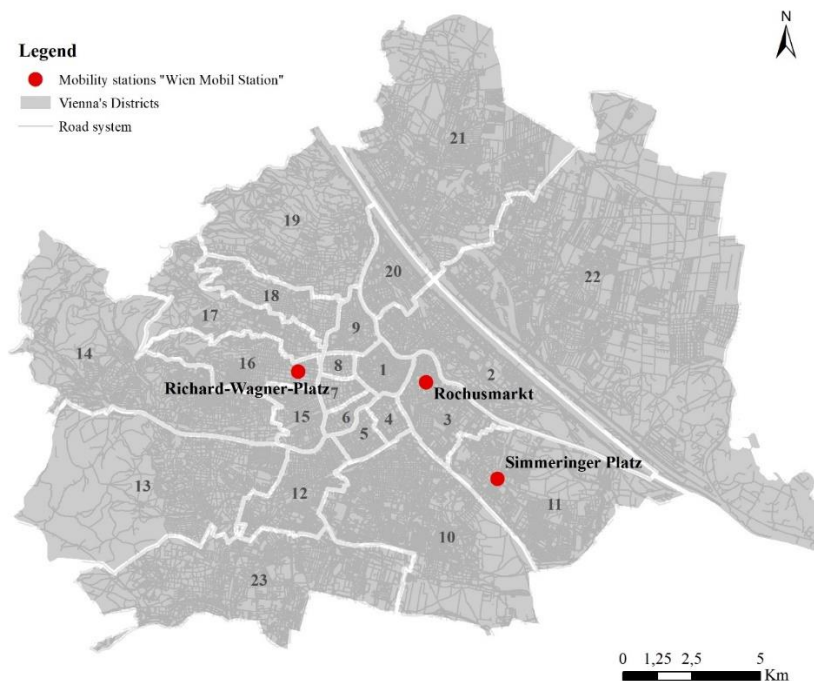
There are currently three mobility hubs composing the Wien Mobil Station system. In September 2018, the first public mobility hub was implemented at Simmeringer Platz as a result of the EU-funded project Smarter together. Later, in 2019, two other mobility hubs were implemented: one at Rochusmarkt and another in Richard-Wagner-Platz. (Smarter Together, 2019c) The mobility hubs are located in different neighborhoods and the infrastructure and the services available vary.

Among the three existing public mobility hubs in Vienna, only one was implemented in the scope of the Smarter Together and inside the project area, which is the 11th district. This single hub was implemented in September 2018 as the first public mobility hub in Vienna. The preparation and planning phases lasted from one to two years, while the installation took two months. Regarding the budget, around €550,000 and €600,000 were needed for this mobility hub, including conceptualization, design, planning, and implementation. (Smarter Together, 2019b, p. 16, 2019d, p. 24)

Wiener Linien is the main operator of the mobility hub and it is responsible for planning and managing, as well as general maintenance (e.g. winter maintenance), the operation of the digital information board, and the maintenance of the public bicycle pump. Wiener Linien is also responsible for dealing with approvals, constructions, and electric connections. The company works in cooperation with several services providers. The mobility hub at

Simmeringer Platz is co-operated with four different sub-operators, which are responsible for the operation and their specific infrastructure. The sub-operators are Stadttauto, the e-car sharing provider; Sim Bike, the e-bike sharing provider; Safety Dock, the operator of the lockable bicycle boxes; and, Wien Energie, the provider of the charging stations for electric vehicles. Unfortunately, there is no interoperability between services and it is not possible to register for all of them at once, meaning that each service requires its own app. (Magistrat der Stadt Wien, 2019a, p. 31; Smarter Together, 2019d, p. 25; Neumayer, 2019)

Currently, the mobility hub at Simmering offers six station-based e-bike sharing, one station-based e-cargo bike sharing, three lockable bike boxes with electricity, electric car charging station with two parking spots, one station-based car sharing, a digital information board, an air pump, and a public bench. Parcel lockers were originally planned for this mobility hub, however, for strategic reasons and with a view to neutrality concerning different postal services it was decided to take them out of the scope of the project. (Smarter Together, 2019d, p. 26)



**Fig. 2. Location of the existing public mobility stations in Vienna**

Source: own illustration, 2020; districts and streets retrieved from, respectively, Open Data Österreich (2019) and OpenStreetMap (2020).

The mobility hub Simmeringer Platz is located near the last subway station of the line U3, also named as Simmering, and has tram connections. The neighborhood was defined by the project Smarter Together and the decision on where to place the mobility hub on a microlevel was done considering space available nearby public transport connections. (Neumayer, 2019)

#### 4 DISCUSSION ON THE PERIPHERAL LOCATIONS

As previously presented, the project areas defined by the Smarter Together both in Munich and in Vienna are on the outskirts of the municipalities. This demonstrates an intention to cover peripheral areas and to better distribute the supply of urban infrastructure in the



municipalities. Furthermore, from the urban mobility perspective, the implementation of mobility hubs in areas that do not offer as good public transport connections as the central areas is an outstanding initiative as an alternative for the first and last mile. However, despite the undeniable benefits associated with this good intention, the location choice imposed many challenges on the project. Moreover, it is one of the reasons for the underutilization of the cities, as can be seen in Silva and Uhlmann (2020).

After analyzing the experiences held in both cities, it was possible to realize that, although they faced similar challenges concerning the locations, they have decided to approach them differently. While Munich integrated the project area to the existing mobility offers of the city, expanding the existing network, Vienna decided to implement a new bike sharing system in the project area. Both decisions were challenging, and both would require a greater investment, either by expanding an existing network or by creating a new and dense network for the project area and its surroundings.

The issue that should be highlighted here is that when deciding to create a new system, Vienna should also have been concerned with strengthening it, giving the necessary conditions for it to grow and consolidate in the project area. On the contrary, only one mobility hub was deployed, as well as only a second bike sharing station, 3.5 km away. Besides, considering that after one year two new mobility hubs were implemented in the municipality, but in other neighborhoods and following a different logic (taking advantage of the existing infrastructure and mobility offers), it seems that the municipality gave up the initial idea and, in a way, abandoned *Simmering* and the *Smarter Together* project, at least from the mobility hubs perspective.

According to interviews conducted in the scope of this thesis, although *Citybike Wien* is a consolidated bike sharing system in Vienna, with an increasing number of members and users, it could not be implemented at the mobility hub at *Simmeringer Platz* because the existing network currently does not reach the area and creating more stations would be out of the scope of the project. There are no plans and no budget at the moment for expanding the *Citybike Wien* system. (Neumayer, 2019; Dechant, 2020)

The fact that there is only one bike-sharing station in the project area and the only other station in the system is relatively distant are the main negative points of the mobility hub in Vienna. There is no network and, therefore, the users have no real alternatives for first or last-mile transportation, which, after all, are the main objectives that one has in mind when installing mobility hubs in the periphery of the city. Moreover, a single mobility hub, as the one being offered, provides no network and it results in a system used mostly for leisure and very specific purposes. Moreover, it does not make the system attractive as an intermodal mobility provider.

It is important to clarify and point out, however, that originally two mobility hubs were planned for the project area in Vienna, one being the existing one at *Simmeringer Platz* and the other being at *Hauffgasse*. The sites were chosen considering the proximity to public transport, the public space available, and even the integration of shared mobility services. However, the *Hauffgasse* mobility hub was canceled at the beginning of 2017 due to technical factors, since a pipeline was identified at the site. At that time, the team even evaluated another location on the same street, but it was assessed that it would not offer adequate visibility, neither the proper connection with public transportation. (*Smarter Together*, 2019d, p. 13-16) It is indeed strange that in such a large project area, with active

commercial areas and another subway station (Enkplatz), no other possible location could have been found for the deployment of at least one other mobility hub. If the lack of suitable locations was the main reason for the decision to implement a single mobility hub, it is essential to highlight the importance of a political will to allocate certain public spaces to serve the purpose of the mobility hub.

In Munich, MVG Rad currently offers almost 300 bike sharing stations and the company is working on a concept to build more stations in the outskirts of the city, to enable a better transition between Munich and the surrounding cities, which are also provided with the service. (Götz, 2020) Although the project area did not offer any bike sharing station previous from the implementation of the project, the decision was to provide the neighborhood with a network of mobility hubs, all offering bike sharing: a total of eight stations, four implemented in 2018, and other four in 2019.

To expand the bike-sharing system to the project area Neuaubing-Westkreuz/ Freiham, bicycle stands and bikes which are compatible with the existing bike-sharing system have been commissioned and IT implementation processes have been carried out. (...) After all requirements were defined and described, a call for tender has been executed. The compatibility of e-bikes to the already existing bike-sharing system was one of the main requirements. (Smarter Together, 2019a, p. 13-14)

This was a completely different approach than in Vienna and much more inclusive. Although Götz (2020) mentioned the location in the peripheral area as one of the reasons for the lower utilization rate in comparison to Munich's central areas, it is still positive that the residents are now provided with the same system offered in the whole city. Moreover, the number and distribution of stations enable real intermodality and multimodality, as well as serves for first and last-mile transportation.

Furthermore, the project areas were not only challenging from the mobility services network perspective but also due to the estimated low demand and consequent lack of interest from possible operators.

In the case of Munich, the interview with Götz (2020) also demonstrated that the location of the mobility hubs in peripheral neighborhoods is also a challenge for the operators there. Götz (2020) affirmed that the utilization rates of the mobility hubs in the project area are lower than the rates of the other hubs in Munich. He points out the distance from the city center as one of the reasons for this scenario. However, in Munich, the companies operating almost all services in the mobility hubs are owned by the municipality (which is the case for MVG and SWM), which directly affects decision making and facilitates the implementation and operation of projects despite low revenue forecasts.

## **5 CONCLUSIONS**

The experiences evaluated demonstrated quite different approaches to deal with the issue of deploying mobility hubs in areas previously lacking infrastructure. Although both municipalities were facing a very similar scenario, each decided to act differently. Of course, there were justifications for such decisions, such as that the existing system did not cover the region where the mobility hub was installed, requiring the deployment of many other stations to operate. In any case, it is undeniable that the decision to implement a new system

represents a greater challenge since it requires a high investment in advertising, as well as in a network of stations.

Another distinction between the projects is that, while Munich has deployed eight mobility hubs in the project area, Vienna has opted for only one. Considering that the main objective of the mobility hubs is to allow intermodality and multimodality, it is essential to provide the project area with a dense network of stations.

It is important to note that Munich has already been gaining experience and making partnerships for the deployment of mobility hubs since 2014 when the Münchner Freiheit mobility hub was deployed. Vienna, on the other hand, had its first public mobility hub implemented with incentives from the Smarter Together project in 2018. It is therefore understandable that the city still has a long way to go, either through a better understanding of the citizens' needs or by building a strong network of partners.

Further investigation on different aspects of the mobility hubs implemented under the scope of the Smarter Together project in Vienna and Munich are being developed as part of this study.

The analysis presented in this paper demonstrates that no change can be made without the political will to face possible conflicts of interest that will arise from the implementation of certain infrastructures in the urban space. However, future actions will determine whether this was indeed a good project, or just a project full of good intentions and a disappointing outcome. There is still time to learn from mistakes and act to solve problems and promote improvements.

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