Project number: F-DUT-2022-0088

Driving Equitable and Accessible 15 Minute Neighbourhood Transformations

WP5. Living Labs

T5.1. Setup of Living Labs

Deliverable D 5.1

Setup of Living Labs (Brussels, Budapest, Munich, Paris, Utrecht, Vienna)

Version: 1.7

Date: 30.07.2025.

Responsible partner: BME

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The DUT Partnership is supported by the European Commission and funded under the Horizon Europe co-funded Partnership scheme (Topic HORIZON-CL5-2021-D2-01-16).

DOCUMENT CHANGE RECORD

Version	Date	Status	Author	Description
0.1	02/04/2024	Template	Domokos Esztergár-Kiss, Attila Aba, Tamás Soltész, Miklós Kózel	
1.0	11/04/2025	First draft	LL leaders	
1.1	23/04/2025	Consolidated version	Domokos Esztergár-Kiss, Attila Aba, Tamás Soltész, Miklós Kózel	
1.2	12/05/2025	Revision	UT	
1.3	20/05/2025	Extended version	Domokos Esztergár-Kiss, Attila Aba, Tamás Soltész, Miklós Kózel	
1.4	24/06/2025	Revision	UT	
1.5	14/07/2025	Extended version	Domokos Esztergár-Kiss, Attila Aba, Tamás Soltész, Miklós Kózel	
1.6	16/07/2025	Revision	TUM	
1.7	30/07/2025	Extended version	Domokos Esztergár-Kiss, Attila Aba, Tamás Soltész, Miklós Kózel	

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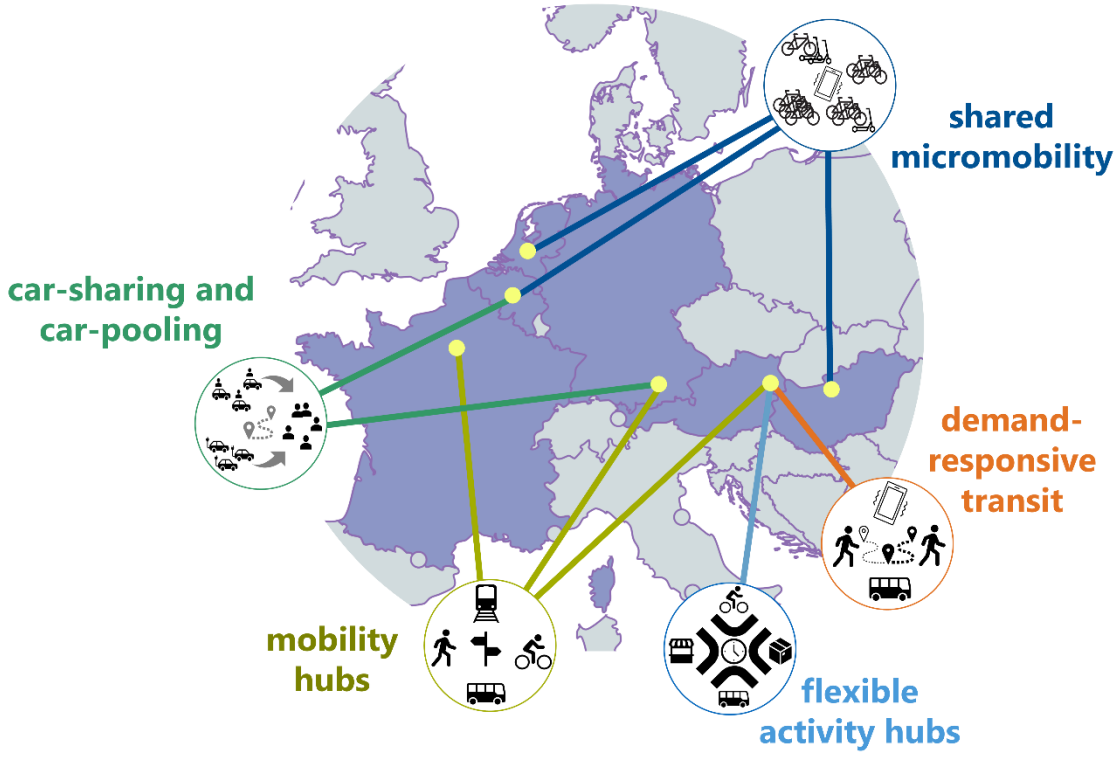
1. INTRODUCTION

The DREAMS project aims to examine how co-created and user-centric mobility services, mobility and flexible activity hubs can contribute to accessible, sustainable and inclusive 15mC neighbourhoods in urban outskirts in European cities and regions. This deliverable provides a comprehensive overview of research and development activities on sustainable urban mobility in the selected living lab areas of the DREAMS cities of Brussels, Budapest, Munich, Utrecht, Paris and Vienna. Considering the 15mC concept, the aim is to demonstrate the local socio-demographic profile, built environment characteristics and transport networks of these living labs to identify current urban mobility challenges, focusing on in the outskirts.

The document continues by identifying specific living lab targets, examining existing business models and identifying appropriate pricing strategies. The planned activities of the Living Lab will also be detailed, highlighting stakeholder engagement, target groups and data needs for practical analysis and development of local pilots. In six Living Labs, five topics will be tested (1. Figure): mobility hubs, flexible activity hubs, demand-responsive services, car-sharing and car-pooling and shared mobility.



1. Figure Tested topics and living lab locations schematic map

In the **Brussels** Living Lab, the exploration of shared mobility's potential in reducing car dependency is conducted through three services: cambio, cargo bike sharing; Mobitwin's volunteer-based transport for less mobile citizens; and Cozywheels for vehicle sharing. It aims to assess market viability, user experience, and operational integration in urban outskirts.

The **Budapest** Living Lab promotes sustainable transportation in Rákosmente, an outer district of Budapest, by working to reduce car reliance through the introduction of a public bike-sharing system. New micromobility stations will facilitate the efficient use of shared transport options, complementing existing services.

Munich's Living Lab focuses on improving accessibility to essential services in outer neighbourhoods, particularly for socially disadvantaged populations like migrants and older residents. By exploring mobility hubs and shared transport options, the project seeks to reduce car dependency and promote sustainable travel, ultimately developing scalable 15-minute city models for urban development.

The **Paris** Living Lab research aims to enhance accessibility to the tram stations and the surrounding services by optimizing feeder services and improving active transport access. Key focuses include designing stations as mobility hubs, assessing public space quality, exploring shared mobility, and addressing governance impacts on planning for disadvantaged neighbourhoods.

The **Utrecht** Living Lab seeks to understand how social business models can boost shared e-bike usage among low-income populations. Key research questions include mobility choices, trade-offs, and the impact of business models. A proposed model involves micro-incentives to lower prices in targeted areas, with ongoing discussions with authorities and stakeholders.

In the **Vienna** Living Lab the focus is on mobility hubs, flexible pop-up activity hubs, and demand-responsive services. The lab aims to improve accessibility with virtual bike-sharing stations and activate vacant spaces through community involvement. The goal is to assess how these hubs influence mobility behavior and create sustainable, long-lasting community spaces.

2. BRUSSELS LIVING LAB

2.1. Introduction of Brussels Living Lab area

The Brussels Capital Region[1] is one of the three Regions of Belgium, together with Dutch-speaking Flanders and French-speaking Wallonia. It is Belgium's political decision-making centre, being the home to the Belgian national parliament, the Flemish parliament, the parliament of the French-speaking community, the Brussels regional parliament and of course the European Parliament and NATO. Most of the national administrative bodies have their seats in Brussels, and the city hosts the head offices of numerous national and international enterprises and NGO's. Estimates show that some 60.000 diplomats, international and consular officials, staff members and their families live and work in the Belgian capital (Federal Public Service, 2022).

Brussels comprises 19 municipalities and counts over 1.2 million inhabitants on a surface of 150km. The average population density in 2023 stood at 7 642 inhabitants per km^2, with huge disparities between very densely populated areas such as the districts around the Midi railway station – with peaks up to 34 762 inhabitants per km^2 for the Bosnie district – and the districts further away from the city centre, with averages ranging of 6000 inhabitants per km^2 or even less).

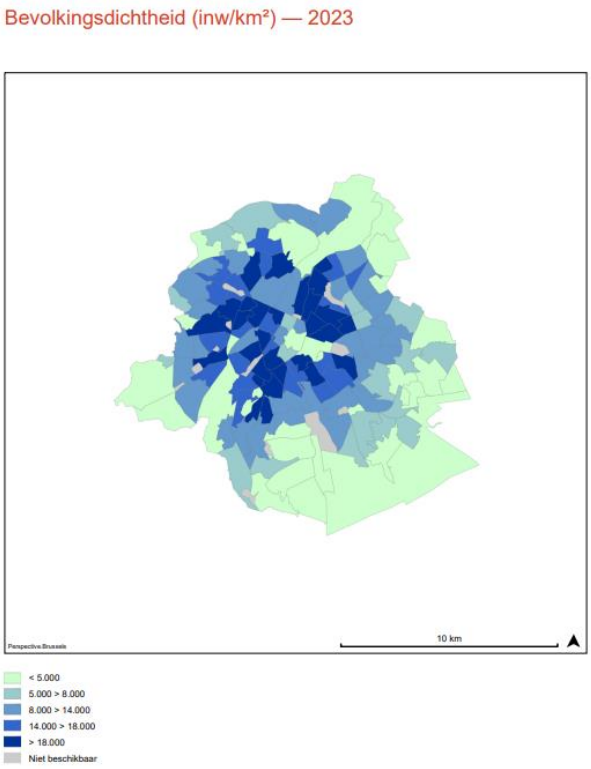


Figure 2 Average population density per km^2 in Brussels, per neighbourhood, in 2023. The more densely populated

Brussels' role as an international political and economic centre, Belgium's colonial history in the 19th and first half of the 20th century, and the country's labour migration since the 1960s, make Brussels multicultural melting pot: research shows that more than one-third of the population does not have Belgian nationality , making it the second most multicultural city worldwide after Dubai. To give just a few figures based on the Wijkmonitoring data from 2023:

[1] Note that we will use the terminology 'Brussels Capital Region' and 'Brussels' interchangeably.

- 15.88 % of Brussels' inhabitants have the nationality of one of the EU-15 countries (without Belgium). They predominantly live in the south-west of the city, mostly in proximity of the EU institutions.
- 7.30 % are nationals from the countries that joined the EU between 2004 and 2013 and live around the EU institutions and in the north of the capital.
- 3.24 % have a North-African nationality and live predominantly in the poor canal zone (see further).
- 2.23 % have the nationality of a Sub-Sahara African country and also live predominantly in the poor canal zone (see further).

In terms of average household wealth, vast disparities are observed in the capital, with most wealth and the highest employment rates being concentrated in the southeastern part of the Brussels Capital Region, while the municipalities along the canal, crossing the capital from south-west to north-east, are much poorer, have higher unemployment rates and are characterized by a higher percentage of non-European natives. Locally, this axis is described as the "croissant pauvre" (see Figure below).

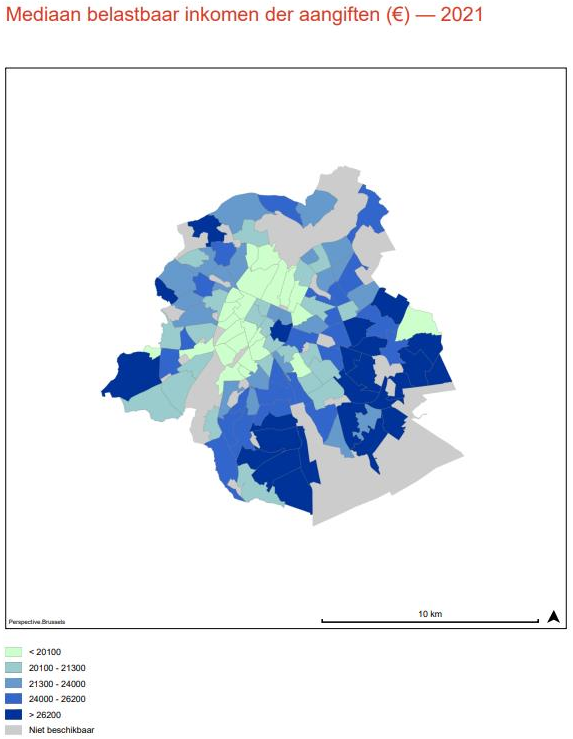


Figure 3 Median taxable income per household, per neighbourhood, in 2021 in Brussels. The more pronounced blue indicates higher taxable income, and vice versa

The median taxable income per households stands at 21 800 € at a regional average level. This is considerably lower in neighbourhoods such as Curgehem, close to the Midi station (being around 17 000 €) and considerably higher in the neighbourhoods around the EU institutions (around 27 to 28 000 €) or in the southernmost parts of the city, with peaks up to 35 000 €. These figures show, once again, the Brussels is a city of contrasts.

2.1.1. Transport network

Brussels is situated at the heart of the Belgian transport network, with numerous highways and railways, conceived in a radial fashion, linking the capital with the Flemish and Walloon provinces and neighbouring countries. International connectivity is ensured through a well developed HST-network, offering multiple daily connections to London, Amsterdam, Frankfurt, the German Rühr area, Paris and numerous French cities. Belgium's largest airport, Zaventem, is situated at a 15-minute drive north-west of the city (in Flanders). Brussels has an inland harbour for freight as well, situated on the Antwerp – Brussels - Charleroi canal.

The most recent mobility survey provides us with an overview of mobility within the Brussels-Capital Region. It shows that 36% of Brussels' residents travel mostly by foot, 9% by bicycle, 22% by tram, bus and metro, and 27% by car (driver and passenger combined). Car ownership is declining, with 46% of the Brussels' residents owning a (company) car. No less than 70% of the participants in the research has a STIB-MIVB regional public transport subscription, and 47% of households owns at least one bike.

Public transport is thus an important mode of transport in the Belgian capital. Public transport, excluding train travel, has been regionalized in 1980, meaning that Brussels, Flanders and Wallonia each have their own public transport provider. In Brussels, STIB-MIVB operates a dense network of metro, tram and bus lines. The metro forms the backbone of the STIB-MIVB's network, consisting of high-frequency 'circular' line around the hypercentre, two lines going (roughly) in a south-west to north-east and a north-west to south-east direction. An underground high-frequency tramline connects the south with the north of the city. A part of this line is currently being upgraded to a metro and will be extended to the NATO offices in the north-east (metro 3). During day-times, the STIB-MIVB offers a high interval service on its tram and bus lines as well.

De Lijn, the Flemish public transport provider, is active in Brussels as well, connecting the capital to the Flemish towns and villages that surround Brussels with the capital. TEC, the Walloon provider, operates a few lines to Wallonia and is the smallest public transport provider in the Brussels-Capital Region.

The national railway company SNCB-NMBS, which is managed by the federal (national) level, has as a main function to bring commuters from the cities and towns in the provinces to the capital via an extensive network of intercity and local trains. Within the Brussels-Capital Region, SNCB-NMBS has an extensive network of 34 railway stations, connected via 12 suburban lines (S-trains) offering crossing the city. Yet, research shows that on an average day, the train accounts for only 1.6% of the movements of Brussels residents. Put differently, the S-network is currently underused. Given that most of the S-train are situated outside the hypercentre, it certainly has potential to be developed further to connect the more peripheral areas of the capital.

Next to its extensive public transport network, Brussels also has a well-developed shared mobility offer consisting of car, e-scooter, bike, moped and cargo bike sharing. Depending on the provider, these modes are offered on a station-based, free floating or peer2peer basis.

2.1.2. Carsharing

Cambio is the largest car sharing provider in the Brussels Capital Region. It was launched more than 20 years ago by cambio Germany, Mpact and the Belgian transport providers. The company has grown slowly but structurally all across Belgium and has more than 70.000 website.

Cambio offers a station-based fleet in which cars should be returned to the station of origin. The operator provides three subscription formulas:

- Start: you drive one or twice, or on average 50km a month;
- Bonus: you drive between 50 and 300km a month;
- Comfort: you drive frequently and cover easily 300km a month or more.

Every user pays a one-time-only adherence cost as well as a deposit. The 'Start' formula has the lowest monthly fee (€4), the comfort formula the highest (€22). Yet, prices per hour and per kilometre are lower. The exact pricing depends on the type of vehicle, ranging from small city cars to light vans. The hourly price at night is cheaper than during day time. The price per kilometre is lower when you travel more than 100 km. Interestingly, cambio cars can be booked via both an application and a call centre.

Poppy is a Belgian app-based free floating car sharing provider which is active in Brussels, Antwerp and Liège. They cover most of the capital, except for some zones in the urban outskirts. There are no subscription fees. When using a car or a van, an unlock fee of € 1 has to be paid. For the journey itself, users pay per kilometre or per minute. An additional €0.30/minute is counted during stopovers. For regular users, Poppy proposes a wide variety of passes that can reduce the price of your journey by up to 40%.

MILES, which has its origins in Germany, entered the Brussels car sharing market in 2023. They have a free floating model and are entirely app-based. Users pay a € 1 unlock fee, a price per kilometre and a stopover price. The exact prices depend on the type of vehicle used. Similar to Poppy, MILES also proposes specific purchase-in-advance schemes to reduce the average cost of your journey.

Cozywheels (by Mpact) provides a peer-to-peer solution for car sharing in Brussels and Belgium as a whole. In this model, a car owner shares its vehicle with his/her neighbours via closed groups, thus enhancing social control. Both owners and users pay a yearly subscription fee to access the Cozywheels platform (which includes a reservation agenda, a cost calculation and invoicing tool,…). Users pay a fixed price per kilometre to the vehicle's owner. This amount covers the costs of using the vehicle (gasoline, insurance, maintenance) and currently stands at around €0.40/km. Interestingly, Cozywheels also offers cars (and bikes, see further) for people with physical disability.

2.1.3. Bike sharing

Villo! is the station-based bike sharing system of the Brussels-Capital Region. Via a tender, this service was outsourced to JC Deceaux. It offers 360 bike sharing stations in a back-to-many system. Villo! proposes daily passes, monthly subscriptions, as well as formulas for enterprises. The first 30 minutes of usage are always free of charge. For each new half hour that is started, an amount is charged. The pricing scheme is developed in such a way that the system is used for short distances.

This contrasts with BlueBike, that station-based bikes that are usually situated at the railway stations. In this back-to-one system, users pay an annual subscription fee of €12 and a fixed price for the first 24 hours of rental. This price is maximum €3.50. Yet, some cities subsidize this system by means of discounts: by consequence, the price in most cities is €2.50, and the system is even entirely free in three (Flemish) municipalities. In Brussels, the €3.50 daily rate applies.

Free floating bike sharing in Brussels is strictly regulated since early 2024: only 3 providers are entitled to operate 2 500 free floating shared bikes each. Via a tendering process, VOI, Bolt and Dott were selected. Each of the providers offer a pay-as-you-go formula, consisting of an unlocking fee and a price per minute. The three providers also offer passes with a certain amount of free minutes and without unlocking fee. The exact pricing for the pay-as-you go offer as well as the passes is shown in the apps.

Cozywheels offers some shared e-bikes on a peer-to-peer basis in Brussels. Users pay the yearly subscription rate (see earlier) and a price, determined by the owner of the e-bike, that ranges between €3 and € 10 per half day.

2.1.4. E-scooter sharing

Free floating e-scooter sharing in Brussels is more strictly regulated since early 2024: only 2 providers are entitled to operate 4 000 free floating shared e-scooters each. Via a tendering process, Bolt and Dott were selected. Yet, after a legal complaint, VOI deployed their e-scooter fleet and will do so until their initial permit ends in the course of 2024.

Each of the providers offer a pay-as-you-go formula, consisting of an unlocking fee and a price per minute. They also provide passes with a certain amount of free minutes and without unlocking fee. The exact pricing for the pay-as-you go offer as well as the passes is shown in the apps.

2.1.5. Moped sharing

Free floating moped sharing in Brussels is more strictly regulated since early 2024: only 2 providers are entitled to operate 300 free floating shared mopeds each. Via a tendering process, Felyx and GO Sharing were selected. Felyx proposes a pay-as-you-go formula, consisting of an unlocking fee, a price per minute while driving and a price per minute while pausing your ride. GO Sharing proposes a similar formula with an unlock fee and a price per minute, and some additional features such as reserving the scooter or insurance. The two providers also offer prepaid packages and day passes. The exact pricing for the pay-as-you-go offer as well as the passes can be consulted on the websites of Felyx and GO Sharing. At the moment of writing, GO Sharing had not yet deployed its vehicles in Brussels.

2.1.6. Cargo bike sharing

Cargo bikes in Brussels are more strictly regulated since early 2024: only 2 providers are entitled to operate 150 shared cargo bikes each. Via a tendering process, TIER Mobility and pony were selected. At the moment of writing, both providers had not yet deployed their vehicles in Brussels.

Some providers offer shared cargo bikes that are not located on the public domain. Cambio for instance offers a small fleet of station-based shared cargo bikes to its members. The bikes are situated at four stations, two at a supermarket, and two on the underground network. Users pay an hourly rate of 3.5 € / h. Another small provider of cargo bikes, is Monkey Donkey. They rely on a network of local partners, such as (organic) supermarkets, where you can rent the bikes for 3.5 € / h. Daily passes are available as well.

Finally, Cozywheels offers some shared cargo bikes on a peer-to-peer basis in Brussels. Users pay the yearly subscription rate (see earlier) and a price, determined by the owner of the cargo bike, that ranges between €3 and € 10 per half day.

2.1.7. Governance arrangements

The responsible body for mobility in Brussels is 'Brussel Mobiliteit – Bruxelles Mobilité'. In the realm of shared mobility, they are in charge of – without being exhaustive – developing and executing the region's mobility policy 'Good Move' (see further), tendering processes, building the region's twenty first mobility hubs, installing drop zones for micro mobility, developing and promoting the local MaaS app 'Floya', etcetera. Yet, the influence of the 19 municipalities that constitute the Brussels-Capital Region should not be underestimated. For instance, for developing hubs and drop zones on part of the public domain that are owned by the municipality, the Region is depending on the goodwill of the municipalities to develop this infrastructure.

For a detailed description of the policy and governance arrangements in place in Brussels, we refer to SmartHubs deliverable 2.3, 'Governance frameworks for mobility hubs in the SmartHubs Living Labs'.

2.1.8. Case study locations

The DREAMS Living Labs are situated in two peripheral neighbourhoods in the northern part of the Brussels-Capital Region, namely Neder-over-Heembeek and Haren. Administratively, they are a part of the City of Brussels proper, but are situated outside the hyper centre in the northern part of the Region.

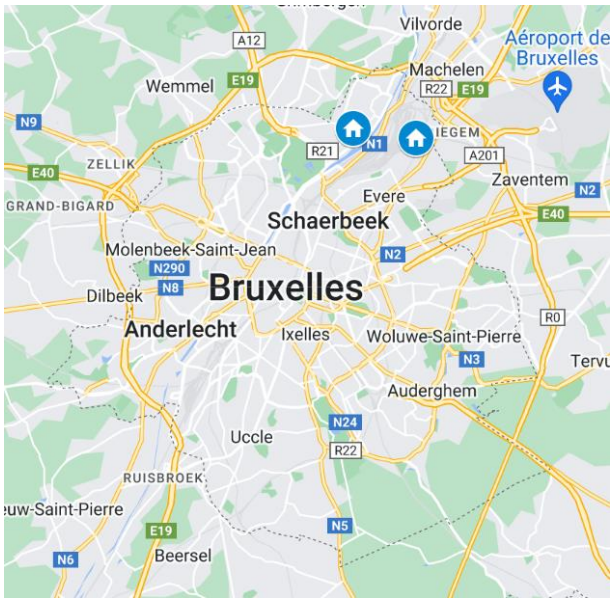


Figure 4 Map of Brussels

	Neder-o.-H.	Haren	BCR
Number of inhabitants (2023)	16 324	6 650	1 237 536
Population density (inh./km², 2023)	8 434	3 432	7 642
Nationals from			
• **EU15-states ex. Belgium (%, 2023)**	6.43	6.41	15.88
• **States joining EU in 2003-2007-2013**	3.34	3.14	7.30
• **North-Africa**	3.79	1.88	3.24
• **Sub-Sahara Africa**	2.23	1.97	1.88
Median taxable wealth per household (€, 2021)	22 174	24 503	21 870
65 years or older (%, 2023)	10.88	6.72	9.29

Table 1 Key socio-economic data for Neder-over-Heembeek and Haren

Neder-over-Heembeek, situated in the northernmost part of Brussels and squeezed between the Parc of Laeken, the railway and the Brussels' Ring Road, is the most urbanised of the two Living Lab locations and has a higher-than-average population density (8 434 inhabitants per km² compared to 7 642 for the Region as a whole). It has significantly fewer inhabitants from EU15-states (excluding Belgium) and nationals from countries joining the EU between 2003 and 2013 than the Region as a whole. The numbers of inhabitants from North and Sub-Sahara Africa are somewhat higher, but not significantly. Neder-over-Heembeek is a bit wealthier than the Region as a whole, but cannot be considered as an outlier in this respect. The population of Heembeek is somewhat older than the Regional average and is considerably older than the population living in the hypercentre of Brussels and the European Quarter.

Haren has somewhat more 'village' or 'small town vibes'. Geographically, it is situated in the northeastern corner of the Capital, squeezed within two railway lines and the Ring Road, and in proximity of the Airport. It has only around 3 500 inhabitants, is considerably less densely populated than the regional average, and less ethnically drivers: it has only half the share of foreigners than the national average, except for nations from states in Sub Sahara Africa, which is more or less in line with the regional average. Haren is considerably wealthier than the Region as a whole and has a significantly younger population.

Within Brussels, both Neder-over-Heembeek and Laken are considered as part of the town that are somewhat 'hard to reach'. This is confirmed by an analysis of the Brussels Capital Region, which has measured the average travel times by public transport within the Region. This was calculated by the Brussels authorities as the average time to reach the nearest one million people by public transport. On the map below, the darker blue, the shorter the travel times are, indicating that, as a rule, the further one lives from the city centre, the longer the travel times are.

While the average travel times are lowest in the hypercentre, they are much higher in the periphery: in Neder-over-Heembeek, the average travel time by public transport within Brussels is 47 minutes, in Haren 43 minutes, compared to an average 36 minutes for the Region as a whole. It should be noted, however, that the travel times to and from Neder-over-Heembeek will decrease due to the opening of the new tram line 10 to the city centre of Brussels in the Autumn of 2024.

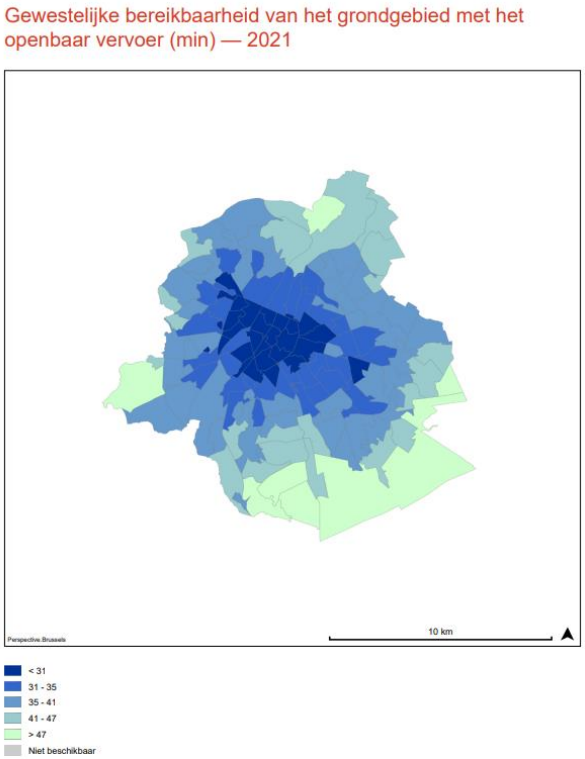


Figure 5 Average travel times in the Brussels Capital Region. The greener, the longer the average travel time

What do the public transport and shared mobility offer in the two Brussels' Living Lab locations look like? Despite their peripheral location, both Neder-over-Heembeek and Haren are served by multiple public transport lines, mostly buses.

In Neder-over-Heembeek:

- Bus lines 53, 56 and 83 pass through the main squares and connect to interchanges such as De Wand and Docxk Bruxsel within a 10 to 15 minute travel time (depending on traffic), from where connections with multiple tram lines are available.
- Bus lines 47 and 57 follow, in part, the Canal and connect with the interchange at Dockx Bruxel (47) or connect Neder-over-Heembeek with the Brussels North Station (57). The latter route takes around 36 minutes, but travel times will decrease as soon as the new tram line 10 opens.

Haren is served by:

- Bus lines 65 and 80, both connect to the interchange at Bordet Railway Station, within a travel time of approximately 10 minutes, from where it is possible to connect to other bus lines and the S-network.
- The Haren and Haren-Sud S-rail stations are within walking distance of Haren's central square. Yet, the currently offer is suboptimal with only 2 hourly connections to the hypercentre (North-Central-Midi stations) from Haren-Sud and one hourly connection to Brussels-Luxembourg (the European Quarter) from Haren.

Although being relatively close and well connected to different S-stations, the potential of the S-network remains unexploited and, in practice, most of the people living in Brussels are not making use of it. As pointed out earlier, research shows that the S-network is used by only 1.6% by the Brussels residents as the main mode of transport for trips within the city (Onderzoek Verplaatsingsgedrag 6). This is probably due to a general lack of knowledge among the Brussels' population about the possibilities the S-network offers, a lack of ticket integration between (STIB-MIVB and SNCB-NMBS), and the still limited frequency of the S-network offer.

Regarding shared mobility, we observe that not all of the car and micro mobility sharing operators present in the Brussels-Capital Region are currently active in our two Living Lab locations. The following table gives an overview of the situation at the moment of writing (July 2024):

		Neder-over-Heembeek	Haren
Carsharing	Cambio	X	X
	Poppy	X	X
	Miles		
	Cozywheels (P2P)		
Bike sharing	Villo!	X	
	Blue-Bike		
	Bolt		
	Dott	X	X
	Cozywheels (P2P)		
Scooter sharing	Bolt	X	X
	Dott	X	X
	VOI	X	X
Moped Sharing	Felyx		
Cargo bike sharing	Cambio		
	Cozywheels (P2P)		

Table 2 Shared mobility providers active in Neder-over-Heembeek and Haren. Based on observations made by the authors (in place and via the provider's apps)

The table above shows that the largest station-based car sharing provider (cambio) and one of the free-floating providers (Poppy) have cars available in both Neder-over-Heembeek and Haren. The bike sharing supply is more limited: station-based provider Villo! is only active in Neder-over-Heembeek, but free-floating bikes from Dott can be found in both the Living Lab Locations. By contrast, all of the main e-scooter providers in the Brussels Capital Region have scooters available at both locations. At the moment of writing, no providers of shared mopeds, shared cargo bikes or peer-to-peer vehicle sharing solutions are active in Neder-over-Heembeek and Haren.

2.2. Challenges and policy background

2.2.1. Good Move (2020-2023)

In recent years, the Brussels Capital Region has attempted to implement a new set of mobility plans, known under the name 'Good Move' since 2020.This plan provides the main policy guidelines for the city's mobility up to 2030, following the regional mobility plans Iris I (1998) and Iris II (2010) that were

deemed moderately successful (Brussel Mobiliteit, n.d.) While the plan itself has been drawn up and approved by the Brussels Government, it is up to the different municipalities to create tailored measurements for their own area. As such, the measures and implementation can differ between the various municipalities, but in general, the main elements of the plan involve the following 6 dimensions:

1) Good Neighbourhood
    - Goal: to supervise neighbourhood mobility and to improve the quality of life on the neighbourhood level.
    - Main elements: traffic calming and re-directing, reduction of on-street parking, renovation of public space and co-creation of new spaces.
2) Good Network
    - Goal: to organize transport networks and to ensure efficient services.
    - Main elements: redevelopment of roads to give pedestrians and cyclists more road space, traffic flow optimization through automatization of traffic lights, creation of pedestrian networks to connect busy transit hubs in the city, development of a regional cycling network and linking this with Flanders and Wallonia, enhancing the punctuality of surface public transport lines (bus and tram), maintenance of the urban infrastructure and creation of heavy-vehicle routes.
3) Good Service
    - Goal: to improve the integrated services to the Region by developing the region's MaaS (Mobility as a Service) platform.
    - Main elements: expansion of bicycle and e-scooter services (sharing systems, parking and repairs), creating synergies in parking management between different modes of transportation, improvement of access to STIB-MIVB vehicles and stops for people with reduced mobility, extension of the offer of alternatives modes to the car, development of stations and hubs to enhance intermodal travel, promotion of car-pooling and transfer stations outside of the urban areas, combining different mobility services on neighbourhood level.
4) Good Choice
    - Goal: to guide individual and collective choices, without harming individual freedom through changing and challenging mobility behavior.
    - Main elements: linking urban developments with the mobility offer, development of smart parking tools to alleviate the parking pressure on the public space, reformation of automobile taxation systems, supporting the 'mobility budget'2 for businesses, development of road transport tariffs, anticipating on a ban on combustion-engine vehicles by 2030 (diesel) and 2035 (petrol), extension of electric vehicle charging infrastructure, carrying out awareness campaigns to promote multimodality, traffic courtesy and road safety, encouragement of delivery optimalisation for businesses by promoting waterway transport and circularity.
5) Good Partner
    - Goal: to ensure partnership governance of the mobility plan between the BCR and federal governments, municipalities and local stakeholders.
    - Main elements: strengthening the role of the BCR as organizing authority, establishment of a partnership with the 19 municipalities, including municipal mobility plans, imagining

mobility and public space projects with citizens and local stakeholders, strengthening control towards zero tolerance for road safety.

6) Good Knowledge

- Goal: to update mobility data and regularly assess the Good Move plan (evaluation).
- Main elements: evaluation of the regional mobility policy through regular monitoring of the implementation and review the allocation of budgets, acquiring and sharing mobility data for impact assessment, conducting satisfaction surveys with the local population, creation of a mobility knowledge centre, development of a strategic vision on autonomous vehicles.

The European Commission rewarded the plan with the Safe Walking and Cycling award, part of the Award for Sustainable Urban Mobility Planning (SUMP), which aims to encourage the adoption of SUMPs by local and regional European authorities and reward outstanding achievements. The plan has also been met with considerable critique. This has focused primarily on policies having measures related to the first dimension, Good Neighbourhood. Such measures involve traffic calming by reducing the speed limit to 30 kilometres per hour and creating more one-way streets for cars and reducing on-street parking. These measures led to violent protests in the municipalities of Schaarbeek (Chini, 2023; Mabrouk, 2022), Anderlecht, specifically in the neighbourhood of Kuregem, which was the first neighbourhood to implement a Good Move plan in 2021(Bruzz, 2023). In both of these municipalities, the mobility plans were altered or paused due to the intensity of the backlash they received (Van den Panhuyzen, 2022).

2.2.2. Smart City: the '10-minute city' (2023)

While an official policy plan has not yet been created, the municipality of Brussels (the municipality containing the city centre, not to be confused with the entire Brussels-Capital Region) has started the development of their '10-minute city' concept through various research projects in the scope of their 'Smart City' vision (BSI, 2023). This concept entails that inhabitants have access to essential goods and services within 10 minutes walking or cycling. Such services entail, among others3:

- Places for citizen interaction: schools, sports facilities, cultural venues, medical centres, social services.
- Residential economic services: specialized or general food stores, non-food shops (pharmacies, post offices, cash machines, etc.).
- Places that improve the (living) environment: green spaces, playgrounds, recycling centres, etc.
- Mobility infrastructures: railway stations, public transport stations, car or bicycle sharing stations, bicycle parking, etc.

The municipality is currently developing cartographic tools to give insight into distribution of access to such services per neighbourhood, which will be publicly available in the latter half of 2024. As for writing, no other municipality has created a policy plan regarding 15-minute city concepts.

2.2.3. Regional vision on mobility hubs (2023)

The BCR created a vision strategy on mobility hubs, based on a study from November 2022 to March 2023. The objectives of this vision are based on those of the Good Move policy, especially the 3rd dimension (Good Service). This entails the following main points:

1) Guiding the development of MaaS
2) Creating information desks for mobility services
3) Developing services for electric bikes and scooters
4) Providing services at and close to public car parks
5) Improving the accessibility of STIB-MIVB's network and services for people with reduced mobility as well as that of taxis
6) Making the public transport offer more comprehensible
7) Establishing and renovating stations and transfer hubs
8) Building an international bus station

In this vision document, mobility hubs are defined as "a mix of co-located transport options, usually focused on the interface between mass public transport and 'last mile' mobility solutions. These inter-modal transfer stations are then supported by information resources and associated services, such as bike services and coffee shops - with the exact make-up depending on scale and local context." (Brussels Mobility et al., 2023, p.7).

Additionally, what is added in the specific Brussels context are the following key features:

- Appearance: mobility hubs in the BCR need to be recognizable and accessible for users.
- Mobility services: they need to facilitate easy access to collective and shared mobility services, and well as providing easy transfers between modes.
- Additional services: the hub needs to offer additional services to customers that are oriented to increasing the comfort, accessibility and attractiveness of the hub.
- Information: all mobility hubs will be connected to a MaaS ecosystem. Physical information services are also available and are easy to use and interpret.

The exact use and lay-out of the mobility hub will depend on its exact location, as it will be tailored to the needs of the local population and the built environment. In order to classify the mobility hubs, five different categories were created:

1) Neighbourhood hub
2) District hub
3) Inter-district hub
4) Intraregional hub
5) Interregional hub

Within this vision, special attention is paid to mobility hubs that can reduce car traffic coming from commuters. Many commuters come from outside of the BCR and as such need to connect to the local PT offer if not coming by bike or car. Additionally, there is a focus on tourists and visitors of the Region. Both of these groups need a connection point to the BCR transportation lines, which mobility hubs (especially type 4) can offer. For all types of mobility hubs, special attention is paid to the needs of users with reduced mobility, underprivileged people, elderly people, young people, and young parents.

2.3. Living Lab aim and scope

In the Brussels Living Lab, we investigate the role of shared mobility in reducing car dependency and ownership in urban outskirts for activities that are not possible to fulfil within 15 minutes of walking or cycling. We focus on trips within the urban periphery as well as trips to and/or from the case study locations by looking into three services: cambio cargo bike sharing, Mobitwin's volunteer-based demand responsive transport solution for less mobile citizens, and Cozywheels, a platform for sharing vehicles.

Firstly, cambio, the largest car sharing operator in the capital region, investigates whether there is a market potential for roundtrips via electric cargo bikes in the outskirts of Brussels. The operator already proposes a small fleet of cargo bikes for roundtrips from four locations in the more densely populated quarters of Brussels, two at metro stations (Beurs-Bourse, De Brouckere) and two at supermarkets

(Colruyt) in Jette. Whether there is a demand for such a service at more peripheral locations, and whether it would be economically viable, remains an unanswered question. Therefore, as a part of the DREAMS project, cambio plans to deploy a pop-up round-trip station at a community center in Neder-over-Heembeek, GC Nohva, between March and May 2025. As a part of the test, rides will be offered free of charge. In return, participants complete a user experience survey and communicate how much they would be willing to pay for the trip they made. This allows getting insights into the operational aspects of the proposed service (what works, what should be improved), assessing the typical user's willingness-to-pay for using the service, and analyzing whether the price expectations can cover the total cost of operating the cargo bike service. Testers will make use of a closed platform, ShareABike, via which they can reserve rides, open, and lock the cargo bike. For the test itself, participants will take part in a small intake to get an insight into their motivations for using the service, show them how the bike and app work, and register them on the platform. Afterwards, they participate in a post-test evaluation of the tested service (as outlined earlier).

The second intervention is related to Mobitwin (operated by Mpact), which is a network of volunteer drivers who transport less mobile citizens to care-related and daily activities, for instance doctors' appointments, grocery shopping, visiting relatives or friends, etc. Mpact developed this service in the 1980s and currently has around 3.500 volunteer drivers serving approximately 40.000 clients making use of the service nationwide. In Brussels, Mpact is responsible for the entire management of the service, including dispatching the rides.[2] Mobitwin is highly dependent on drivers that use their private vehicles for their volunteer work. This poses a challenge in urban contexts such as Brussels, where car ownership is decreasing. We will therefore test a new operational model in which a part of the Mobitwin rides are done via cambio shared cars instead of privately owned vehicles. Our test will focus on operational elements such as integrating cambio vehicles into the Mobitwin booking and payment procedures and software, the economic viability of using shared vehicles for Mobitwin rides given the different pricing structure of Mobitwin (per kilometre) and cambio (per hour and kilometre), and the impact of using shared vehicles on the customer experience, especially regarding potential changes to the payment procedure. We will assess the impact of this test by analyzing operational problems and potential solutions, measuring the price difference between 'traditional' Mobitwin rides and rides done via cambio shared cars over similar distance and time, and through interviews with clients having tested the integrated service.

Thirdly, we analyze the potential of vehicle sharing between organizations and neighbours via the Cozywheels platform (operated by Mpact). Cozywheels is a platform for sharing privately owned cars, cargo-bikes, vans, adapted vehicles, etc. The current business model focuses on, firstly, vehicle sharing between neighbours and, secondly, between organizations, for instance as a tool for internal fleet management. In the context of outskirts such as Neder-over-Heembeek and Haren, which are areas characterized by combined residential and industrial/commercial functions, Mpact explores the market potential for a new model in which local enterprises or organizations share vehicles with residents living nearby. The idea for this test stems from the observation on the terrain that many company-owned vehicles are not or under-utilized after 5PM or during weekends. Simultaneously, these are exactly the timeframes during which local residents need a transport solution, for instance to take children to leisure activities or to do grocery shopping. While there seems to be a *theoretical* match between supply (company vehicles standing idly at parking lots) and demand (locals needing a transport solution), it is

[2] Note that in most cases, the municipality is dispatching the rides. Mpact is in charge of the back-office, i.e. maintaining and further developing the dispatching software, an app, following-up on accidents and providing insurances, communication, political networking and innovation via projects such as DREAMS.

not sure whether there is *in practice* any market potential for a peer-to-peer vehicle sharing between organizations and the local community. We will analyze the potential for such a business model by prospecting small and medium enterprises in Neder-over-Heembeek and Haren and asking their input on the proposed model in order to get an adequate understanding of the drivers and barriers for sharing (or not sharing) vehicles with the neighbourhood. Instead of a pilot implemented in the field, we opt for a report analysing the business case, its potential and pitfalls.

For operational reasons, we will focus on one pilot or service at the time between March 2025 and March 2026. The planned Living Lab activities and target groups are detailed in the section below.

2.4. Planned Living Lab activities

2.4.1. Tested service: cambio cargo bike

- Timeframe: March-May 2025
- Activities: On-site testing with a closed group of testers. They enroll, use the service free of charge, and provide feedback.
- Location: GC Nohva, a neighbourhood centre and library at the central square in Neder-over-Heembeek. Potentially, a second location is added to the tests, namely the highly frequented urban farm 'Nos Pilifs'.
- Stakeholders: cambio, Mpact, Vrije Universiteit Brussel, Brussels Mobility
- Target group(s): people shopping locally, families with children
- Data collection: qualitative through feedback on the proposed service and pricing. Data on the number of rides, destinations, duration, etc. are available as well.
- Output: Analysis on the business case and economic viability of cargo bike sharing, insights into potential improvements into the ShareABike app, and insights on how to enhance user experience.

2.4.2. Tested service: Mobitwin via cambio vehicles

- Timeframe: to be determined, most likely from Summer 2025 onwards
- Activities: On-demand. When getting a request for ride, we will try to carry it out using a cambio vehicle
- Location: Any starting or arrival point in Neder-over-Heembeek or Haren.
- Stakeholders: cambio, Mpact, Vrije Universiteit Brussel, Brussels Mobility
- Target group(s): There are two criteria to make use of the Mobitwin service, namely being 'less mobile' and 'having limited revenues'. In practice, most of our clients are older ladies (70-ish). Volunteers are a target group as well. They are usually younger (60-ish) and male.
- Data collection: Mpact collects data on rides, origin, destination, distance, price, reasons for travel, physical/mental condition. Data are anonymized when communicating outside the Mpact ecosystem. Together with VUB (WP6), we will conduct interviews with testers (i.e. volunteers and clients alike) to collect feedback on the proposed service. We target carrying out 20 rides to/from Neder-over-Heembeek and Haren via the integrated cambio-Mobitwin pilot.
- Output: An understanding of the operational flows, its problems and potential solutions for integrating shared vehicles into the Mobitwin service; an analysis of the economic feasibility of the proposed concept; and recommendations regarding the user experience.

2.4.3. Tested service: Cozywheels

- Timeframe: Between Autumn 2024 and late Winter 2025

- Activities: Analysis of market potential through prospects and interviews with potential customers
- Location: Neder-over-Heembeek and Haren
- Stakeholders: Mpact, local businesses, Vrije Universiteit Brussel, Brussels Mobility
- Target group(s): Small and Medium Enterprises and local organizations – attracting people or organizations willing to share their vehicles is the most complicated part of running a vehicle-sharing platform. As soon as a potential 'sharer' is found, users of this vehicle do flock in automatically.
- Data collection: Qualitative data collected via interviews. It remains to be seen whether the list of prospected can be shared (privacy protection)
- Output: report on the feasibility of vehicle sharing between organizations and neighbours, focusing on potential as well as operational and fiscal barriers.

3. BUDAPEST LIVING LAB

3.1.Introduction of Budapest Living Lab area

Budapest is located in Central Hungary on the two sides of the River Danube, which separates it to the hilly Buda on the western side and the flat Pest on the eastern. The population of Budapest is 1.685 million (according to the 2022 census), which has decreased in the past decades (7% loss in the last ten years). The city covers an area of about 525 square kilometres, so the population density is around 3,210 people per square kilometre. The Budapest metropolitan area, including the surrounding towns and urban communities, has an opposite tendency with a growing population. In 2023, it is home to around 2.58 million people. Nearly 70% of the population in Hungary lives in towns and urban communities, with Budapest and its agglomeration being a significant part of that, more than 25% share.

Budapest has a diverse and rich architectural heritage, with a mix of historic and modern buildings. Most of the central parts were built in the late 19th and early 20th century, originally surrounded by an industrial zone, which is now transforming into residential and business areas. Most outer districts have large quarters consisting of detached houses and also some large housing estates.

Budapest has an efficient, diverse, and low-cost network of public transport. The public transport options include buses, trams, metro (4 lines, 40 km network), trolleybuses, and suburban railway lines (called HÉV). The daily ridership is approximately 3.2 million, peak hour headways vary between around 1.5 and 15 minutes. The public transport network covers almost the whole city area, except for only the uninhabited parts.

The city's 4500 km road network has a structure mainly based on circular and radial elements, with 3 main and some further partial boulevards. This structure only partially appears on the Buda side because of the terrain. Around the city, the M0 motorway bypasses the city, which forms a ¾ circle (in addition to city boulevards).

Budapest has shared mobility solutions for convenient transportation, mainly within the city centre. There are 3 main Carsharing companies (GreenGo, Wigo and Mol Limo) with a total of 1500 vehicles (with a high share of electric vehicles) and 100,000 registered clients. At some operators, freight vehicles are also available. Pricing is based on pay-per-minute fares (covering rental, fuel, parking, and sometimes also motorway tolls), with a base fee in most cases, but there are also options for daily rental. Monthly passes are also available at all companies which provide a discount on minute fares.

Bike-sharing is dominated by Mol Bubi operated by local transport authority BKK, with approx. 1,850 conventional bicycles, but there are also some smaller private companies (e.g., Donkey Republic). Bubi's pricing is also based on pay-per-minute fares like car-sharing, but the discount provided by monthly passes is different. With a pass (approx. 2.5 EUR/month), frequent users can use bicycles free for the first 30 minutes of each rental. Most scooters are operated by international company Lime, supplemented by some smaller companies. According to regulations, shared micro-mobility vehicles can only be accessed and left at designated mobility points (there are about 800 of such points). Despite the various shared mobility options, their service area covers only the inner parts of the city, they are hardly accessible on the outskirts.

The Municipality of Budapest has officially appointed the Centre for Budapest Transport (BKK) as the integrated transport-organizing authority. BKK is responsible for coordinating and regulating public transport services (including taxis and micro-mobility services, as well) and supervising service providers in Budapest. BKK's responsibilities cover the regulation of service locations, ensuring that transport services are strategically located to serve the needs of the city's residents and visitors. The development and maintenance of all transport-related long-term policies and strategies, as well as the management of development projects and infrastructure planning also belong to BKK's responsibilities.

The governance system in Budapest operates at three levels: the national level (Ministry of Construction and Transport), the urban level (Mayor's Office), and the district level (23 district municipalities). The Ministry oversees the national transport policies and regulations for the entire country and is the organizing authority for long-distance and regional transport services. As Budapest is not only the

capital of Hungary but also the centre of the Hungarian transport network, the operation and development of national infrastructure and long-distance services are deeply connected to the transport system of Budapest. In addition, the increasing population of the agglomeration highlights the importance of regional transport, which is also organized by the Ministry. The urban level's responsibilities cover the administration of city-wide transport services (e.g. public transport, taxis, mobility providers) – organized by BKK – and the maintenance of main roads within the city, as well. The lower level of governance is district municipalities within Budapest, which have limited responsibilities in terms of transport; their main duties are related to the maintenance of minor roads.

3.2. Challenges and policy background

The 2023 Budapest Mobility Plan – which serves as the city's Sustainable Urban Mobility Plan (SUMP) – identifies 8 key problems:

1) Excessive private car traffic volumes and deteriorating modal shares:
   After a slight improvement in the 2010s, the use of private cars has increased again to a 35% share – enhanced by the effects of the pandemic.
2) Increasing road traffic from the agglomeration, separated systems for urban and regional transport:
   The increasing population of the agglomeration boosts private car traffic through the city limits. Suburban public transport service quality is often low, with missing connections.
3) Distorted use of urban space and unfriendly public places:
   Despite the improvements in the last decades, many urban spaces are still optimized for road transport, which results in distorted shares in urban space utilization.
4) Accessibility and equality problems:
   Lack of full physical and digital accessibility prevents equal access to public transport. There is also a difference in the level of service between the city centre and the outskirts: the latter's coverage and accessibility are significantly lower in most cases.
5) Challenges in maintenance and operation, obsolete infrastructure and vehicle stock:
   Operation problems are mostly caused by financial problems and inefficiency, which can endanger the sustainability of the level of service. A connecting problem is the constant dependence of public transport on fossil fuels.
6) Network structure deficiencies:
   Radial transport network development has enjoyed a long-term advantage over transversal development in both public and private transport. This resulted in a highly centralized network and traffic structure and many missing connections.
7) Challenges in cooperation, fragmented and obsolete regulations:
   Coordination between urban and regional levels is inefficient, mainly because of the legal, governance and regulatory background. This impends comprehensive solutions and causes parallel services within the city.
8) Unsatisfactory and unpredictable financing:
   In the Hungarian transport system, financing is often insufficient for the long-term sustainability of the level of service, and the availability of funds is uncertain in many cases. These problems were also sharpened by the geopolitical situation and the energy crisis.

The three key objectives of the Budapest Mobility Plan are:

1) Serving the mobility needs of the climate-neutral and resilient city: transport development integrated into urban development by influencing transport needs and mode choice, reducing environmental impact – through targeted climate-friendly developments, as well – and strengthening equal opportunities.
2) Safe, accessible and integrated transport: joint development of accessible transport modes through efficient organization, stable financing and target-oriented development.
3) Open, cooperative regional connections: regional integration of Budapest with the help of a transport system that supports regional cooperation and strengthens economic competitiveness.

The main focus of accessibility objectives is the improvement of the public transport fleet (with new accessible vehicles) and transport network (public transport infrastructure and pedestrian connections). Proximity is aimed to develop through the improvement of network connections. Shared mobility has a large emphasis in the plan; it is intended to be supported by redesigning urban spaces and creating intermodal nodes. Another objective is the introduction of Mobility-as-a-Service (MaaS), which could facilitate the spread of shared mobility solutions by integrating them with each other and also with conventional modes.

The 15-Minute-City concept is one of the general principles mentioned in the plan. However, only a few specific actions have been named. The main tools supporting the concept are network connections (e.g. improving the accessibility of local centres), intermodal nodes and the reform of the governance system (better coordination with agglomeration municipalities, aiming for decentralization).

Beyond the city level, there are two specific projects, according to 15-Minute-City: the Margit district Program in middle Buda and the Bartók cultural district in southern Buda; both are historic neighbourhoods close to the city centre. Their aim is to create an ecosystem where the network of quality service providers, social and cultural spaces and initiatives come together to form a livelier, more sustainable and liveable quarter.

3.3. Living Lab aim and scope

The Rákosmente district of Budapest has one of the highest modal shares of private cars in the city (see SUMP key problem no. 1 mentioned in chapter 4.2.) and also faces high road traffic volumes traversing from the agglomeration (problem no. 2). Problems no. 4 and 6 also affect this area, as public transport service has a lower level of service than in the city centre, especially in transversal directions.

The Living Lab aims to provide an effective alternative to the reliance on private car usage and low-frequency public transport in the district. By encouraging more sustainable transport modes – according to SUMP objective no. 1 –, the living lab seeks to reduce the reliance on single-occupancy vehicles, thereby fostering a greener and more accessible urban environment. A further objective is to test an island-like bike-sharing operation, independent of the large inner-city service area. This experience is currently lacking, but similar areas to Rákosmente can be found in other outskirts of the city.

The Living Lab's core focus is strengthening connections within the Rákosmente district. Enhancing these connections facilitates better movement across neighbourhoods and promotes a sense of community among residents. With improved accessibility – according to the 15-Minute-City concept, as well –, residents are more likely to engage with local services, boosting the local economy and encouraging a vibrant neighbourhood atmosphere.

Introducing micromobility options is another pivotal element of the Budapest Living Lab. While private micromobility solutions, such as scooters and e-bikes, are already prevalent in some areas, the aim is to expand access by implementing a public shared bike system. This initiative represents a significant novelty in the urban landscape of Rákosmente, offering residents a reliable and flexible transport mode.

The first isolated operation area of Budapest's public bike-sharing system, known as MOL BuBi, is planned to be created in the living lab area. Until recently, the service area has developed organically, but only in densely populated areas around the inner districts of Budapest. In Rákosmente, the development focuses primarily on densely populated areas around the district centre. This approach not only maximizes the impact of micromobility initiatives but also ensures that they serve the residents who will benefit most from them, as the mobility needs of these areas fit well with such services (compared to lower-density areas like single-family housing).

To support this change, the living lab advocates for new micromobility stations as infrastructure development, enabling residents to efficiently access and utilize shared transport options. At the same time, the standardized Mobi stations will serve as convenient pick-up and drop-off points, making it easier for users to integrate micromobility into their everyday routines. This system is expected to complement existing transport solutions, enhancing overall mobility in the city. While the primary focus of this initiative is on the public bike-sharing system, it is important to recognize that other shared micromobility service providers can also provide significant benefits from the utilization of the stations.

3.4. Planned Living Lab activities

A series of structured activities are planned for the Budapest Living Lab, which can be divided into three main categories: service, stations, and pilot. Each category outlines specific timelines and involves stakeholders to ensure the efficient implementation and the achievement of project goals.

The service-related activities span from September 2024 to December 2025, focusing on legal requirements, planning, and finalizing contracts. The initial steps include establishing legal requirements for the service contract from September to November 2024, where the responsible partner is Hungarian Institute of Transport Science and Logistics (KTI). Following this, from October to November 2024, a coordinated service planning effort will involve Rákosmente Local Authority (RAK), Center for Budapest Transport (BKK) as the service provider of MOL BuBi, and local pilot supporters BME and KTI. In December 2024, BKK will integrate the pilot area into the Bubi 3.0 framework while preparing for the call for tenders for the update from Bubi 2.0. Additionally, from January to May 2025, the legal agreement for the service contract will be formalized, engaging KTI and BKK, where KTI is responsible for exploring the technical, economic and legal possibilities to define the appropriate parameters for the procurement of services. The finalization of the pilot area within the Bubi 3.0 framework is planned for June 2025, after which KTI and BKK will work together on service contract preparations from July to October 2025. The final step in this category will be signing the service contract in November and December 2025.

The station-related activities involve strategic planning and implementation, beginning with macro-level location planning from September to November 2024 (RAK, BME, BKK, KTI). This will be followed by the detailed micro-planning from December 2024 to February 2025. In March 2025, the station contract will be signed between RAK and Contractor 1, who will be the technical assistant for the civil engineering plans of the stations. April 2025 is designated for the permit and construction planning of Mobi stations by Contractor 1 in cooperation with RAK. The subsequent two months will focus on obtaining necessary authorizations for the Mobi stations from RAK, BKK, and Budapest Roads. From July to August 2025, preparations for station implementation contracts will occur, culminating in the contract signing in September with Contractor 2, where Contractor 2 is responsible for the construction of micromobility stations. Finally, the Mobi station implementation will occur from October to December 2025, carried out by Contractor 2 alongside RAK.

Activities regarding the pilot are set to commence in January 2026 and will continue through December 2026, involving fine-tuning, communication, and evaluation of the pilot program. Initial activities will include refining the pilot in collaboration with RAK, BKK, BME, and KTI in January, followed by communication efforts in February. From March to August 2026, the pilot running phase will be executed with the active participation of BKK, RAK, BME, and KTI. In September 2026, BME and KTI will evaluate the pilot. Subsequently, in October, BME will be responsible for writing the deliverables. The deliverable review process will engage all partners in November 2026, leading to the finalization in December 2026.

In addition to the DREAMS partners (BME, KTI, RAK, BKK), several other stakeholders can be identified: local council representatives, secondary education institutions, and for-profit e-scooter providers. Local council representatives can effectively facilitate communication between residents who are open to micromobility solutions and those who may have concerns about these services. Secondary education institutions could host micromobility stations near their entrances to encourage the use of active mobility modes among older students, considering the age restrictions outlined in the General Terms and Conditions of the service providers. The primary target group is local residents, as their first experience with shared micromobility is particularly important, but private e-scooter service providers also benefit from the visibility that these stations offer.

4. MUNICH LIVING LAB

4.1.Introduction of Munich Living Lab area

Munich is the capital of the Bavarian state in Germany, situated in the southern part of the country. The city is known for its economic strength in diverse fields (such as engineering, IT, education, and health) and for having a good quality of life (due to a combination of different factors, such as green spaces, availability of services, and highly connected mobility options). These characteristics establish the city as one of the preferred destinations in Germany and the world for tourism, businesses, companies, and people. Hence, Munich's metropolitan region accounted for a diverse population of 6.29 million people (with almost 30% of the inhabitants with foreign citizenship), distributed in an area of 25,548 square kilometers (City of Munich, 2022).

Regarding mobility, the Munich Transportation Corporation (MVG) operates the public transport network in partnership with the Munich Verkehrs- und Tarifverbund (MVV). The system is comprised of 444 km S-Bahn (with 8 lines running through the city), 95 km U-Bahn (with around 100 stations), 82km tram (with 13 lines), and 575 km inner-city bus network, accounting for 623 million passenger journeys undertaken in 2022 (City of Munich, 2022). According to the MVV (2024), the city also offers different active and shared mobility options, such as an expansion of the cycling infrastructure, bike-sharing (with MVG Rad), car-sharing (with around 22 companies), and scooter sharing (approximately 6 enterprises). The city is also developing its "Mobility Strategy 2035" to promote interconnected, greener, sustainable, and inclusive mobility services for all citizens (City of Munich, 2022).

Munich is an innovation and educational hub, hosting some of the best research institutions in Germany (accounting for almost 140,000 students) and different business initiatives, acting as a magnetic field for companies and highly skilled professionals and researchers (ibid). Due to this knowledge promotion environment, around 1,000 startups were founded in Munich over the last 20 years (ibid). Besides that, around 140 venture capital and private equity companies are in the region (such as BMW, MTU Aero Engines, Siemens, Knorr-Bremse, MAN, Google, Intel, IBM, Huawei, NTT Docomo, and Kraft Foods), strengthening the region's influence, attractiveness, and economic power.

Like many metropolitan areas, the Munich region also suffers from a housing shortage and high rent prices, which pushes part of the population to the urban fringes. Therefore, understanding the mobility dynamics/patterns/preferences of households living in the urban fringes is essential in promoting sustainable, equitable, and accessible cities. To better evaluate how we could implement the 15-minute city concept in the urban outskirts, the selection of the Municipalities for Munich's living lab was based on seven main criteria:

1) Mid-dense urban area.
2) Located in Munich's urban outskirts.
3) High concentration of migrants.
4) High car ownership.
5) Potential to implement car and bike-sharing services.
6) Potential to expand public transport and mobility services.
7) Less access to amenities if compared to Munich City.

Among the areas assessed, Geretsried and Wolfratshausen initially stood out the most based on the selection criteria abovementioned as critical areas. These municipalities, located in the southern part of Munich, are 43 kilometers and 38 kilometers from Munich's city center, respectively. Notably, despite evaluating seven selection criteria, the presence of migrants carried the most weight, making these two areas particularly prominent.

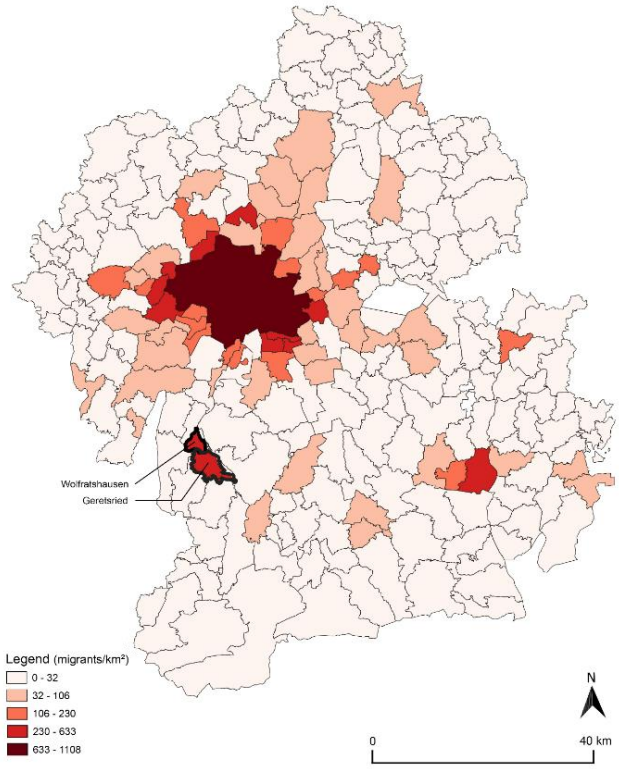


Figure 6 Migrants per square kilometer in Munich

When performing an initial accessibility analysis, we realized that both areas generally have good accessibility to amenities by walking, especially in the city center. However, further detailed assessments need to be developed to evaluate the quality of the amenities and if they fulfill the population's needs.

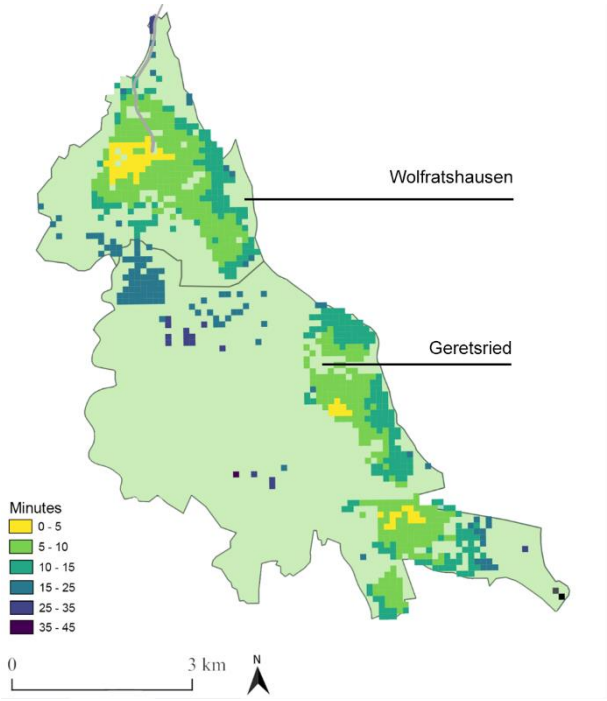


Figure 7 Accessibility to amenities by walking in Geretsried and Wolfratshausen.

4.1.1. Geretsried

Located 43 kilometers to the south of Munich, Geretsried is a mid-dense flat city in Bavaria, in the district of Bad Tölz-Wolfratshausen administrative region. It was founded in 1950 and received the elevation to city in 1970. Geretsried has a total population of 25,705 inhabitants distributed in 24.65 square kilometers, resulting in a density of 1,042.79 people per square kilometer. Initially, Geretsried was planned to host refugees and displaced people, which influenced its relatively orderly linear layout.

As observed in Table 3, Geretsried has a balanced gender distribution, with 50.47% of the population identifying as female and 49.53% as male. The city is primarily composed of German residents, who make up 80.77% of the population, while 19.23% are foreigners. Age-wise, 18.13% of residents are children and teenagers aged 0-18, with adults aged 19-39 forming 23.88% of the population. Seniors aged 60 and older are the largest age group (accounting for 29.31%), followed by those between 40-59 years, with 28.68%. Regarding civil status, most residents are married or in a partnership (44.94%), while 39.56% are single. Additionally, 8.26% of residents are divorced, and 6.77% are widowed, reflecting a diverse range of family and partnership statuses across the population.

Description	Categories	Number	Percentage of the total population
Gender	Male	12,732	49.53%
	Female	12,973	50.47%
Migration background	German	20,761	80.77%
	Foreigners	4,944	19.23%
Age	Below 3	708	2.75%
	Between 3-5	803	3.12%
	Between 6-9	975	3.79%
	Between 10-15	1,449	5.64%
	Between 16-18	727	2.83%
	Between 19-24	1,466	5.70%
	Between 25-39	4,672	18.18%
	Between 40-59	7,373	28.68%
	Between 60-66	2,346	9.13%
	Between 67-74	2,105	8.19%
	Above 75	3,081	11.99%
Civil status	Single	10,169	39.56%
	Married/ with a partner	11,552	44.94%
	Widowed	1,741	6.77%

Description	Categories	Number	Percentage of the total population
	Divorced	2,123	8.26%
	No answer	120	0.47%

Table 3 Demographic characteristics of Geretsried

Considering household characteristics (Table 4), household sizes and types show a range of living arrangements. The majority (41%) are single-person households, followed by two-person households at 30.48%. Three-person households comprise 13.34%, while four-person households account for 10.7%. Larger households with five members represent 2.94%, and those with six or more people comprise only 1.54%. Family structure varies, with 41% being single-person households and 25.03% composed of couples without children. Couples with children represent 24.24%, while single mothers and single fathers account for 6.11% and 1.26%, respectively. Additionally, 2.36% are multi-person households without a nuclear family. Senior households make up a significant portion, with 25.55% consisting solely of senior residents and 8.81% including both senior and younger members. The remaining 65.64% are households without any seniors.

Description	Categories	Number	Percentage of the total
Household size	1 person	4,874	41%
	2 persons	3,624	30.48%
	3 persons	1,586	13.34%
	4 persons	1,273	10.70%
	5 persons	350	2.94%
	Above 6 persons	182	1.54%
Type of household (by family)	Single person	4,874	41%
	Couples without kids	2,975	25.03%
	Couples with kids	2,881	24.24%
	Single mothers	726	6.11%
	Single fathers	150	1.26%
	Multi-person households without a nuclear family	281	2.36%
Senior citizen status of a household	Households with only senior citizens	3,039	25.55%
	Households with senior citizens and younger people	1,048	8.81%

Description	Categories	Number	Percentage of the total
	Households without senior citizens	7,809	65.64%

Table 4 Household characteristics of Geretsried

In Geretsried, employment status varies by gender. Employed men constitute 28.14% of the total population, while women comprise 26.13%. Unemployment rates are relatively low, with 1.09% of men and 1.77% of women currently unemployed. A notable portion of the population is non-employed, which includes 20.33% of men and 22.54% of women. This distribution highlights a slightly higher employment rate among men and a marginally higher unemployment and non-employment rate among women.

Description	Categories	Number	Percentage of the total
Employed persons	Men	6,990	28.14%
	Women	6,490	26.13%
Unemployed persons	Men	270	1.09%
	Women	440	1.77%
Non-employed	Men	5,050	20.33%
	Women	5,600	22.54%

Table 5 - Employment status in Geretsried

Geretsried's urban form is shaped by the Isar Valley and divided into three main areas. These areas are between the Bundesstraße 11 (B 11) road (which connects the area to bigger cities, such as Munich on the north and Bad Tölz on the south) and the Isar River. In the city´s urban form, it is possible to distinguish residential neighborhoods from commercial, institutional, and green spaces. Most of its areas are destined for residential purposes, characterized by a mix of single-family homes (usually two-story with a garden) and multi-family apartment buildings (of maximum 5 stories). While primarily residential, certain areas (especially along the main roads) have a mix of residential, commercial, and public services. However, field observations showed that these mixed-use areas could be further explored (by implementing active facades and urban furniture, for example), creating a more dynamic and live environment.

In detail, in Geretsried, most buildings are residential, comprising 96.84% of the total, with a small percentage of dormitories (0.09%) and other buildings with living spaces (3.07%). The construction years vary significantly, with the largest portions built between 1960 and 1969 (24.26%) and 1970 and 1979 (18.91%). Only 0.66% of buildings predate 1919, reflecting limited historical architecture, while more recent constructions (from 2010 onward) represent around 11%. Building sizes also differ, with most buildings containing a single apartment (66%), followed by smaller percentages with 2 to 12 apartments. Terraced houses, detached, and semi-detached are prevalent, making up 39.63%, 30.73%, and 24.24% of the building types (respectively), while other building types represent a small portion (5.40%).

Description	Categories	Number	Percentage of the total
Type of building	Residential buildings (excluding dormitories)	4,538	96.84%
	Dormitories	4	0.09%
	Other buildings with living space	144	3.07%
Construction year	Before 1919	31	0.66%
	Between 1919-1949	95	2.03%
	Between 1950-1959	340	7.26%
	Between 1960-1969	1,136	24.26%
	Between 1970-1979	886	18.91%
	Between 1980-1989	622	13.28%
	Between 1990-1999	529	11.30%
	Between 2000-2009	512	10.93%
	Between 2010-2015	285	6.09%
	After 2016	247	5.28%
Number of apartments in the building	1 apartment	3,096	66%
	2 apartments	499	10.64%
	3 - 6 apartments	619	13.20%
	7 - 12 apartments	375	7.99%
	More than 13 apartments	102	2.17%
Building type construction	Detached house	1,440	30.73%
	Semi-detached house	1,136	24.24%
	Terraced house	1,857	39.63%
	Other building type	253	5.40%

Table 6 Building characteristics of Geretsried

Regarding green and recreational spaces, Geretsried is surrounded by forests, open areas, and small playgrounds in residential areas. The city doesn´t have many public squares. However, the pedestrian street in Karl-Lederer-Platz hosts a local food market and is a good place for the community to meet. The main landmarks in Geretsried are related to the citizen´s daily activities, such as the town hall,

library, swimming pool, churches, and schools. These places were the most significant gathering points observed on the field trip. The Isar River and surrounding green spaces are also important in shaping the city´s identity, where outdoor activities are part of the community´s life.

Mobility-wise, although the city´s flat terrain and design make it easy to walk and cycle, its urban form is car-centric. Geretsried has many parking spaces, and its main roads provide easy vehicle access (increasing local and regional mobility). The city has eight regional bus lines and one express bus every 20 minutes. These lines are responsible for connecting the Municipality to the neighboring regions. Geretsried has no direct train connection to Munich. There is a planned extension project for the S7 line to the city, but it is still an ongoing discussion. Therefore, its residents need to commute to Wolfratshausen to access S7. Field observations showed that most of the population uses cars (especially older people), whereas buses are mainly used by kids, teenagers, and mothers with small children.

Cycling in Geretsried is facilitated by the flat terrain and two major cycling paths (which connect the northern part to the southern). The Municipality is interested in investing in cycling infrastructure and, so far, has installed 122 bike parking spaces and an e-bike charging station in the city center. As for walking, Geretsried has a pedestrian zone in Karl-Leder-Platz and Herrmann-Löns-Weg, comprising 132 linear meters dedicated to this mode. The Municipality is developing its Mobility Plan, having consulted with the population. Hence, we believe it would be an excellent opportunity to join forces with the local government and make the area our Living Lab for the project.

4.1.2. Wolfratshausen

Located 38 kilometers to the south of Munich, Wolfratshausen is also a mid-dense flat city in Bavaria, in the district of Bad Tölz-Wolfratshausen administrative region. Although the first documents mention the place dated 1,003, Wolfratshausen was elevated to city in 1961. The Municipality has a total population of 19,115 inhabitants distributed in 9.13 square kilometers, resulting in a density of 2,093.65 people per square kilometer.

As observed in Table 7, Wolfratshausen has a slightly higher female population (51.07%) than males (48.93%). Most residents (83.46%) are German, with foreigners comprising 16.54% of the population. Regarding age distribution, 18.32% of residents are 0-18 years old. Adults between 19-39 years make up 23.25% of the population, while the largest age group is 40-59 years, accounting for 29.79%. Seniors aged 60 and above represent 28.64% of the community, indicating a notable older population. Regarding civil status, 43.28% are married or in partnerships, 40.78% are single, 8.63% are divorced, and 6.82% are widowed.

Description	Categories	Number	Percentage of the total population
Gender	Male	9,353	48.93%
	Female	9,762	51.07%
Migration background	German	15,870	83.46%
	Foreigners	3,145	16.54%
Age	Below 3	528	2.76%
	Between 3-5	581	3.04%
	Between 6-9	744	3.89%
	Between 10-15	1,088	5.69%

Description	Categories	Number	Percentage of the total population
	Between 16-18	562	2.94%
	Between 19-24	1,085	5.68%
	Between 25-39	3,358	17.57%
	Between 40-59	5,692	29.79%
	Between 60-66	1,695	8.87%
	Between 67-74	1,379	7.22%
	Above 75	2,398	12.55%
Civil status	Single	7,795	40.78%
	Married/ with a partner	8,273	43.28%
	Widowed	1,303	6.82%
	Divorced	1,650	8.63%
	No answer	94	0.49%

Table 7 Demographic characteristics of Wolfratshausen

In Wolfratshausen, household sizes show diversity, with 41.5% being single-person households, making it the most common household type. Two-person households follow at 28.91%, while households with three and four people account for 13.7% and 11.33%, respectively. Larger households with five members comprise 3.03%, and those with six or more people represent only 1.53%. Family structures vary as well, with single-person households making up 41.5%. Couples without children constitute 23.91%, while couples with children are slightly higher at 24.71%. Single-parent households include 5.93% headed by mothers and 1.41% by fathers. Additionally, 2.54% of households have multi-person arrangements without a nuclear family. Households with only senior citizens account for 25.62%, while those with seniors and younger individuals make up 8.33%. The majority (66.05%) are households without any senior citizens.

Description	Categories	Number	Percentage of the total
Household size	1 person	3,737	41.50%
	2 persons	2,604	28.91%
	3 persons	1,234	13.70%
	4 persons	1,020	11.33%
	5 persons	273	3.03%
	Above 6 persons	138	1.53%
	Single person	3,737	41.50%

Description	Categories	Number	Percentage of the total
Type of household (by family)	Couples without kids	2,153	23.91%
	Couples with kids	2,225	24.71%
	Single mothers	534	5.93%
	Single fathers	127	1.41%
	Multi-person households without a nuclear family	229	2.54%
Senior citizen status of a household	Households with only senior citizens	2,307	25.62%
	Households with senior citizens and younger people	750	8.33%
	Households without senior citizens	5,947	66.05%

Table 8 Household characteristics of Wolfratshausen

In Wolfratshausen, employment status shows a balanced distribution between men and women, with employed men representing 29.11% of the total population and women 27.24%. Unemployment rates are relatively low, with 1.18% of men and 2.3% of women currently unemployed. A significant portion of the population is non-employed, comprising 18.59% of men and 21.58% of women, which may include retirees and students. Overall, the employment landscape reveals a higher employment rate among men and a slightly higher proportion of non-employed and unemployed women.

Description	Categories	Number	Percentage of the total
Employed persons	Men	5,450	29.11%
	Women	5,100	27.24%
Unemployed persons	Men	220	1.18%
	Women	430	2.30%
Non-employed	Men	3,480	18.59%
	Women	4,040	21.58%

Table 9 Employment status in Wolfratshausen

As observed in Table 10, the building landscape of Wolfratshausen is predominantly residential, with a significant 97.18% of residential buildings. A small percentage comprises dormitories (0.07%) and other structures with living spaces (2.75%). The architectural timeline reveals a wide range of construction periods, with many buildings dating back to the mid-20th century; 19.8% of buildings were constructed in the 1960s, and another 15.2% in the 1970s. Meanwhile, more recent construction (post-

2000) makes up approximately 20.77% of the total. Most of these buildings (72.24%) are single-apartment homes, followed by those with three to six apartments (9.88%), while only a small fraction features higher-density configurations. Detached houses (35.83%) and terraced houses (39.65%) are the most common building types, with semi-detached houses making up 19.98% of the landscape. This composition reflects a balanced blend of low- to medium-density housing, providing insight into Wolfratshausen's architectural and residential structure.

Description	Categories	Number	Percentage of the total
Type of building	Residential buildings (excluding dormitories)	4,029	97.18%
	Dormitories	3	0.07%
	Other buildings with living space	114	2.75%
Construction year	Before 1919	225	5.44%
	Between 1919-1949	451	10.90%
	Between 1950-1959	241	5.83%
	Between 1960-1969	819	19.8%
	Between 1970-1979	629	15.20%
	Between 1980-1989	444	10.74%
	Between 1990-1999	468	11.32%
	Between 2000-2009	452	10.93%
	Between 2010-2015	230	5.56%
	After 2016	177	4.28%
Number of apartments in the building	1 apartment	2,990	72.24%
	2 apartments	371	8.96%
	3 - 6 apartments	409	9.88%
	7 - 12 apartments	277	6.69%
	More than 13 apartments	92	2.23%
Building type construction	Detached house	1,483	35.83%
	Semi-detached house	827	19.98%
	Terraced house	1,641	39.65%

Description	Categories	Number	Percentage of the total
	Other building type	188	4.54%

Table 10 Building characteristics of Wolfratshausen

Wolfratshausen has a distinct urban form shaped by its rich history, geographical location near the Isar River, and its development as both a historic and modern settlement. The city's urban form is centered around its historic town center, which features a more traditional, organic layout typical of older European towns. Narrow, winding streets and irregular plots of land reflect their medieval origins. The areas surrounding the historic core have a more planned and organized layout, with wider streets and distinct zoning for different land uses. These newer parts have a more suburban character with single-family homes, schools, and parks. Wolfratshausen's overall urban density is moderate, with denser housing and commercial areas in the town center and lower-density residential areas as you move outward. Wolfratshausen has well-defined residential zones outside the town center consisting primarily of single-family houses, row houses, and some apartment buildings, reflecting a suburban style of living.

Wolfratshausen is surrounded by forests, and there are several parks and green spaces within the urban fabric, such as Loisach Park (which offers recreational opportunities and scenic views). The city's proximity to the Isar and Loisach Rivers is a significant aspect of its urban form. The rivers serve as natural boundaries, provide recreational spaces, and are integrated into the city's green infrastructure. Public squares serve as social and commercial hubs in its center, where markets, festivals, and public gatherings are often held. These squares contribute to the town's communal atmosphere.

Mobility-wise, the city´s flat terrain and design make it easy to walk and cycle, especially in the historic core, where narrow streets and pedestrian areas make walking the most convenient mode of transport. Sidewalks and pedestrian paths are common throughout the town, particularly along the river and parks. Similarly to Geretsried, Wolfratshausen has two major cycling paths connecting north to south. The Municipality also invests in cycling infrastructure, with 482 bike parking spaces and an e-bike charging station in Loisachhalle.

Considering public transport, Wolfratshausen has thirteen regional bus lines and two express buses every 20 minutes. These lines are responsible for connecting the Municipality to the neighboring regions. Besides, commuting to Munich is possible due to the S7 train line. Citizens over 65 years of age in Wolfratshausen have the opportunity to receive free short-distance single tickets for journeys within the city.

Even though the city's efforts to promote sustainable and active mobility, its urban form is car centric. Wolfratshausen has a well-developed road network, with the B11 road as the main artery through the town (connecting it to Munich and other nearby cities). The town's streets are a mix of narrow, medieval lanes in the old city and wider, modern streets in the newer urban fabric.

Wolfratshausen has shared-mobility operators for e-cars (EOberland GmbH) and for e-cargo bikes (Sigo Green GmbH). The prices for EOberland are €7.90 per hour, including 20 km. The daily rate is €69.00, including 200 km. Each kilometer driven beyond this is charged at €0.24. The prices for Sigo Green cargo bikes cost between €1.00 and €3.50 per hour, €3.50 to €5.50 for two hours, and a maximum of €19.50 for the whole day.

In 2016, the Municipality conducted a traffic behavior survey among its residents. The key findings are summarized and presented below:

1) Types of modes used: on survey day, Wolfratshausen residents made approximately 70,000 trips, with cars being the primary mode of transport, which was used in 50% of trips (42.3% as drivers and 7.5% as passengers). Walking and cycling also played significant roles, making up 18% and 24% of trips, respectively, while public transport accounted for 8%. Within the city limits, non-motorized transport was even more dominant: 60% of internal trips were by walking or cycling, with bicycles used for 34% and walking for 26%. Car usage for internal trips dropped to 32%, while public transport was used for only 2% of these shorter, local trips.

2) Trip purposes: the primary reasons for travel among Wolfratshausen residents were commuting to work or school, shopping and running errands, leisure activities, and returning home. Most work or school trips occurred in the early morning, with peak travel times between 6:00 a.m. and 8:00 a.m., while shopping trips were distributed throughout the day, with noticeable peaks in the morning and late afternoon.
3) Traffic problems and issues: the survey highlighted several issues within Wolfratshausen's transportation network, including overcrowding and heavy traffic, particularly on roads like Sauerlacher Straße, Königsdorfer Straße, and Schießstättstraße. High speeds and non-compliance with traffic regulations were also identified as concerns, alongside poor road conditions and a lack of alternative routes to ease congestion. Furthermore, insufficient parking spaces and challenges with parking management were noted, as well as limited cycling infrastructure, raising safety concerns for cyclists and pedestrians.
4) Public transport: public transport usage was limited, and many residents mentioned insufficient connections, long intervals between services, and a lack of coverage at night and at weekends.

4.2. Challenges and policy background

Munich's Living Lab is an initiative designed to examine and develop strategies aligned with the 15-minute city concept, focusing on creating neighborhoods where essential services and needs are accessible within a 15-minute walk or bike ride. This approach specifically addresses the outskirts of Munich, which has a significant population of migrants and older residents. These groups are often at a higher risk of social exclusion, especially when housing market prices push them towards peripheral areas where access to essential services and mobility options can be limited.

Migrants and older adults may face several barriers to effective integration into urban life. Many encounter difficulties navigating and adopting shared mobility systems due to language or cultural differences, or they may have limited digital literacy, impacting their ability to use app-based services. Additionally, they often experience physical and infrastructure-related cycling and walking challenges, limiting their transportation options. These obstacles contribute to a reliance on private cars, which, in turn, can result in isolation, a diminished sense of community belonging, and environmental challenges from increased emissions.

To tackle these issues, Munich's Living Lab has identified several key mobility challenges and priorities:

1) Expand and better connect the cycling infrastructure: Enhancing the cycling network to ensure safe, continuous, and accessible routes is critical. Better cycling infrastructure is expected to encourage more people to adopt cycling as a viable mode of transport, reducing car dependency and promoting healthier, more sustainable mobility.
2) Develop mobility-shared services (bike and car): implementing shared mobility services—such as bike-sharing and car-sharing—must be done thoughtfully, ensuring that these systems are user-friendly and meet the specific needs of residents. By doing so, the living labs aim to foster community support and widespread adoption of these services, facilitating affordable and flexible transportation options.
3) Promote mixed land uses in the municipalities: encouraging diverse land use in these areas will help bring essential services, shops, and recreational spaces closer to residential neighborhoods. This mixed-use development can make the 15-minute city concept a reality by reducing the need for long-distance travel, supporting local businesses, and fostering a sense of community.
4) Expand public transport options: Increasing the availability and frequency of public transport in the Municipalities is another critical priority. Improved public transport can provide a convenient and sustainable alternative to private car use, making it easier for residents—especially those who cannot drive—to access jobs, healthcare, and other essential services.
5) Integrate land use and mobility planning: Coordinating land use planning with mobility planning will ensure that future developments are well-connected and accessible. By synchronizing these efforts, the lab aims to create walkable and transit-friendly neighborhoods, reducing the need for car travel and enhancing the overall quality of life.
6) Reduce dependency on private cars: The ultimate goal is to reduce the community's reliance on private cars, which often leads to congestion, pollution, and social isolation. This initiative aims

to create a culture shift where walking, cycling, and public transit become the preferred modes of transportation, helping to address issues of car addiction and foster a healthier, more inclusive urban environment.

Through these efforts, Munich's Living Lab seeks to create a more inclusive, accessible, and connected urban environment for marginalized populations. By addressing these challenges and fostering community support, the lab hopes to pave the way for a 15-minute neighborhood model that can be scaled up.

4.3. Living Lab aim and scope

In Munich's Living Lab, the project seeks to evaluate and enhance accessibility to basic services and amenities in Munich's outer neighborhoods, where access to these essentials is currently limited, and there is a high concentration of socially disadvantaged populations. This initiative focuses on mid-density urban areas within the Munich Transport and Tariff Association (MVV) catchment zone. These areas are home to a significant number of older people and migrants, as well as a high prevalence of car dependency. By centering on neighborhoods where residents face barriers to accessible and diverse transport options, the lab aims to mitigate inequalities by exploring the implementation of 15-minute city (15MC) principles in the context of Munich's outskirts.

A primary objective of this Living Lab is to develop a deeper understanding of how emerging mobility hubs—featuring micro-mobility options such as e-scooters, bike-sharing, and carpooling schemes—can facilitate better access to essential services and promote more sustainable transportation choices. With a specific focus on migrant and older populations, the project will identify how these residents' unique needs and preferences can be integrated into neighborhood designs that prioritize proximity to services and reduce dependence on private cars. To achieve these objectives, the Living Lab has set forth several key goals:

1) Understand commuting preferences of migrants and older residents on the urban outskirts: The lab will conduct studies to learn about the commuting patterns and preferences of these populations, particularly in terms of the modes of transport they prefer and the barriers they face. By gaining insight into these groups' travel habits, we can identify gaps in accessibility and areas where improvements are needed.
2) Identify links between commuting preferences, public transport availability, land use, and car dependency: The project will analyze how the current availability and configuration of public transportation options and local land use influence commuting choices and car reliance among residents. Understanding these interconnections will help pinpoint the factors that lead to high car usage and uncover opportunities to reduce dependency on private vehicles.
3) Explore how shared mobility services could encourage shifts in travel behavior according to 15mc principles: The Living Lab will assess the potential of shared mobility solutions—such as car-sharing, ridesharing, and bike-sharing—to encourage more sustainable travel behaviors. By integrating these options with 15MC strategies, the lab aims to create environments where shared mobility becomes a viable and attractive alternative to personal car use, especially for short-distance trips within the community.
4) Develop policy recommendations and business model concepts tailored to the living lab context: Based on the findings, the project will formulate actionable policy recommendations and explore business model ideas that align with the unique needs of the lab's target population. These recommendations will be designed to support the implementation of 15MC practices in a way that addresses local socioeconomic conditions and promotes sustainable, inclusive mobility options.

Through these goals, Munich's Living Lab seeks to create a framework that fosters equitable access to basic needs in Munich's outskirts while reducing car dependency. By implementing and refining these strategies, the project aspires to establish scalable models that could eventually serve as blueprints for similar 15MC initiatives in other urban areas, promoting sustainable and inclusive urban development on a broader scale.

4.4. Planned Living Lab activities

The TUM team brainstormed ideas for activities in Munich's Living Lab, outlined below. These concepts will be presented to local partners for review, where their feasibility and relevance will be carefully assessed.

1) Community-Based Micro-Mobility Hubs: establish small, decentralized mobility hubs with bike-sharing, e-scooters, e-bikes, and shared electric cars strategically placed to serve residents within walking distance. Equip these hubs with user-friendly, multi-lingual interfaces to cater to migrants and older adults with limited digital skills. Possible actions:
    - Implement a subscription model for regular users, providing discounts for low-income, migrants, or elderly residents.
    - Develop a pilot program with discounted rates and multilingual support. Offer incentives for non-car trips to local amenities within the 15-minute zone.
2) Local Mobility-on-Demand Service (MOD): ride-hailing service using small electric shuttles or shared autonomous vehicles to offer first-mile/last-mile connectivity to public transport nodes, especially for neighborhoods distant from bus lines or train stations. Possible actions:
    - Charge per ride with reduced fees for those in need or offer discounted memberships for regular users.
    - Collaborate with the MVV to integrate tickets into public transport fare systems, ensuring seamless connections.
    - Launch a pilot MOD service during peak commuting hours, targeting under-served residential areas and assessing demand.
3) Community Mobility Platform for Carpooling and Ridesharing: develop a multilingual community-based app that connects residents with similar commutes for carpooling or ridesharing, providing safe, affordable options for those with limited access to public transit.
4) Mobility Workshops and Events: organize events that encourage active mobility across generations, such as guided walks, cycling tours, or "Car-Free Day" festivals. These would bring awareness to sustainable mobility, especially for older residents and families with children. Possible actions:
    - Launch seasonal events highlight the accessibility of local parks, shops, and services via sustainable transport.
    - Offer introductory bike or walking tours, using different routes to showcase the ease and safety of accessing nearby amenities.
5) Flexible, Multi-Use Infrastructure for Active Mobility: expand pedestrian and cycling infrastructure with adaptable urban furniture and street elements, such as pop-up bike lanes or seasonal pedestrian-only areas. Design these spaces to encourage social gatherings and make streets more welcoming for non-car users. Possible actions:
    - Identify key routes for transforming into pedestrian or bike-friendly areas during weekends or peak hours.
    - Engage the community in "walk audits" to improve walkability and accessibility, especially for seniors and families.
6) Neighborhood Eco-Mobility Rewards Program: implement a points-based rewards program for residents who use eco-friendly transportation options, redeemable for local products or discounts on services. Possible actions:
    - Develop a digital platform that tracks trips made using sustainable modes; partner with shops and cafes to provide incentives.
    - Roll out as a pilot in high-density residential zones with limited parking, promoting it through local media and community centers.

	Living Lab activities	Expected contribution from TUM & local partners	Date
2024	Survey preparation	TUM: part of the survey team + attend the meetings and give feedback.	June - October 2024
	Survey discussion	TUM: part of the survey team + attend the meetings and give feedback.	October - November 2024
	Survey test and pilot	TUM: ask for feedback from the local partners.	December 2024 - February 2025
2025	Normative accessibility	TUM: calculate and interpret results.	April 2025
	Survey launch	TUM: disseminate.	March 2025
	Recruit respondents	TUM: disseminate the survey among residents. Recruit students to do on-site surveys for target groups. Municipalities: disseminate the survey among residents. Contact organizations relevant to the target groups. SIXT + E-OBERLAND + MVV: disseminate the survey on the mailing list to subscribers living in the study locations.	March 2025
	Data Collection - Survey	Feedback on the results of the survey.	March-May 2025
	Perceived accessibility	TUM: calculate and interpret results.	June 2025
	Workshop - User-optimized accessibility	TUM: calculate and interpret results.	June 2025
	Summary of accessibility challenges	TUM: calculate and interpret results and ask for the local partners´ feedback.	July 2025
	Summary of potential accessibility solutions and selection (feasibility) - (broad summary)	TUM: Plan and give ideas for the solutions. Municipalities + SIXT + E-OBERLAND + MVV: Help disseminate experiments to increase uptake, join efforts with other projects to increase the budget, and give ideas on which experiments to do.	October 2025 – December 2025
2026	Development of policies, business models, subsidy levels, pricing strategies, and goals + workshop with practitioners – (detailed summary)	TUM: design business models Municipalities + SIXT + E-OBERLAND + MVV: give feedback on its feasibility.	November 2025 - January 2026
	Workshops with the communities (evaluation)	TUM: Plan and give ideas for the workshops.	May 2026

Living Lab activities		Expected contribution from TUM & local partners	Date
		Municipalities + SIXT + E-OBERLAND + MVV: Help disseminate the workshop date and help mobilize the community and the workshop venues.	
	Strategic objectives and societal impacts	TUM: develop, calculate, and interpret results and ask for feedback from the local partners.	November 2025 – December 2026

Table 11 Expected Living Lab Activities for Munich

5. PARIS LIVING LAB

5.1.Introduction of Paris Living Lab area

The T12 Express line is a 20 km tram-train line linking Évry to Massy and serving ten communes in the Essonne department. These 10 municipalities have a population of 280,000. Massy is 15 km from the centre of Paris, and Évry 25 km.

Massy has a population of 51,000, and the town underwent major development in the 1960s with one of the first French large housing estates. It is a fairly densely populated town with 5,400 inhabitants per km^2 and has a TGV (high-speed train) station. Évry-Courcouronnes has a population of 66,000 and is one of the first new towns in the Île-de-France region, as well as being the prefecture of Essonne. It was also developed from the 1960s onwards, with slab and tower blocks, and today has 5,200 inhabitants per km^2. Both towns are connected to the RER (express regional train) network, have economic advantages and a large number of facilities and business parks, but they also have significant social disparities, with high unemployment rates (10% in Massy and 17% in Évry-Courcouronnes) and a high proportion of social housing (38% and 49%). With the exception of Champlan (population 2,600), the other municipalities have a population of between 10,000 and 30,000, with an average density of 4,000 inhabitants per km^2. They vary in the degree to which they are residential, but also include business parks, and some have a high concentration of economic problems (19% unemployment and 46% social housing in Grigny). In addition to the T12, Épinay-sur-Orge, Viry-Châtillon, Grigny and Ris-Orangis are also served by the RER.

The T12 is made up of the rail section of the former Massy-Palaiseau - Épinay-sur-Orge branch of the RER C and a new tramway-type infrastructure between Épinay-sur-Orge and Évry-Courcouronnes stations. Opening on 10 December 2023, it has eight stations on the rail section (including two new ones) and nine completely new stations on the tramway section. The journey time between Évry and Massy is 40 minutes.

The public transport system in the Paris region is highly developed, with 16 metro lines, 23 regional train lines, 14 tram lines and 1,500 bus lines. More than 9 million journeys are made on the network every day. The regional transport authority is Île-de-France Mobilités. The main public transport operators are RATP (metro, part of the RER network, most tram and bus lines) and SNCF (RER and regional trains). Other companies operate suburban bus networks. The gradual opening up of transport networks to competition could disrupt this historical distribution. Transport is funded 48% by a tax on companies, 33% by ticket sales and 18% by local authorities (the State, the region, the départements and the city of Paris), with the remaining 2% coming from fines, taxes and advertising. Fares are charged in the form of single tickets or the Navigo season ticket, which gives access to the entire network. Special fares apply for young people, senior citizens, people with reduced mobility and people on low incomes. The main form of transport is the Navigo pass, which can be used to load a season ticket or single tickets. There is also a ‘pay as you go’ pricing system called Liberté+.

There is the Vélib‘ self-service bicycle hire service in Paris and the inner suburbs, delegated by the Syndicat Autolib’ Vélib' Métropole to the private company Smovengo. One free-floating/long-term hybrid shared bike operator, Zoov, two free-floating bike and scooter operators, Tier and Lime, and two free-floating scooter operators, Yego and Cooltra, are present in the Paris region. These are private operators that do not receive any public support and charge mainly by the minute, sometimes with a subscription that allows a reduced rate. With the exception of Zoov, which includes Massy and Longjumeau in its long-term bike hire service, none of these services are available in the Living Lab area.

The motorways are operated by the State, the main road network by the Essonne department and the local road network by the communes.

5.2. Challenges and policy background

The major challenge in terms of mobility is to optimize access to the T12 stations by encouraging active modes of travel and local public transport. This involves improving pedestrian and cycle routes, calming traffic, developing high-quality, inclusive public spaces that are not car-centric, providing cycle parking at stations, improving bus services and optimizing inter-modality. The relevance of introducing car-pooling, car-sharing, transport-on-demand and shared micro-mobility services could be studied depending on the local context. In order to optimize user journeys, the suitability of additional services (parcel relay points, newspaper kiosks, snack bars, toilets, etc.) could also be studied.

The objectives of the SUMP for the Île-de-France region are to reduce travel-related greenhouse gas emissions by 25% to 30% by 2030 compared with 2019, and to reduce air pollutant emissions to meet regulatory thresholds (NO2, PM10 and PM2.5). The plan's actions include setting a new roadmap for the accessibility of the travel chain, making mobility services more inclusive, developing shared use of the car, developing multimodal interchanges to optimize intermodality, developing the Véligo bicycle hire service and developing efficient bus, express coach and transport-on-demand services for the suburbs and less densely populated areas.

The concept of the '20-minute region' is one of the basic principles of the new Regional Master Plan "SDRIF-E: Île-de-France 2040, a new balance". It is an adaptation of the 15-minute city concept on a regional scale. The aim is to develop the region so that all facilities are accessible in less than 20 minutes by any mode of transportation.

5.3. Living Lab aim and scope

The main objective of the research for the Paris Living Lab is to study how accessibility to T12 stations could be improved, and consequently accessibility to all services, facilities and shops served by the T12. We will be looking at the issue of feeder services to and from stations to optimize passenger journeys, as well as the presence of services and the functional mix in and around stations.

We will begin by looking at access to stations by active modes of transport, cycle parking at stations and feeder buses, with a view to designing stations as mobility hubs. The quality of public spaces will also be assessed, with a particular focus on their inclusiveness. The relevance of introducing shared mobility services (carpooling, car-sharing, micromobility), transport on demand and flexible hubs will also be studied. Issues of governance and regulation will be studied, as well as the effects of the interweaving of planning documents at different scales in the Île-de-France region, and the articulation of urban planning, social and transport policies. Furthermore, how can we improve access to this tramway for residents of disadvantaged neighborhoods that are somewhat isolated, and how can we improve feeder services to tramway stations?

5.4. Planned Living Lab activities

The improvement of active transport and bus connections to stations, as well as bicycle parking, will be considered in conjunction with the objectives and projects of regional and departmental planning and transport documents, as well as local urban planning and accessibility plans. Target groups of users of line T12 may be included in the activities of the Paris Living Lab, in order to improve their travel journeys and test mobility services. Travel data provided by Île-de-France Mobilités and the Institut National des Études Statistiques et des Études Économiques (INSEE) can be analyzed, as can (if available) data from mobility service providers. The Paris Region Institute will be able to cross-reference these data with the geographical, socio-economic and mobility data at its disposal in order to optimize the efficiency of these services. Once the various types of facilities or services that can improve accessibility have been identified, it may be worthwhile to consult with the various players responsible for the different levels (local authorities, transport authorities, public and private service operators, etc.) to validate their interest, and even start planning their implementation.

6. UTRECHT LIVING LAB

6.1.Introduction of Utrecht Living Lab area

Located in the Province of Utrecht (one of the 12 Dutch Provinces), the Municipality of Utrecht is currently home around 375 thousand inhabitants and has a population density of 3.857 people/km^2 (Gemeente Utrecht, 2024). It is the fourth most populated city in the Netherlands after Amsterdam, Rotterdam and The Hague. Utrecht is the first city in the Netherlands to express its ambitions to become a 10 min city, and a spatial strategy to develop Utrecht to a 10-minute city has been published (Gemeente Utrecht, 2021).

Utrecht has a relatively young and student-rich population. The population is composed of 18% children (less than 18), 17% of their twenties (18-26), 32% between 27-44, 21% between 45-64 and 12% with more than 65 years old (City of Utrecht, 2024). The city hosts around 36,000 students. The city has 39% of its residents with migration background. Regarding the job market, the city has 317,470 jobs with only 4% unemployment (business services are the sector that provides the largest employment with more than 56,000 workers). Low-income people represent 14% of the population with 7% that live on very poor income. Around 11% of the population (40,991) holds a U-Pass which is a free pass for people with a low income (social welfare level) that contains a budget that can be used for all kinds of activities and products, including public transport. Utrecht is very well connected by public transport, with direct connections to all major cities and towns in the country as well as Schiphol International airport. The city of Utrecht is well known as a cycling city due to the cycling-friendly infrastructure. Bikes are the predominant mode of transport with 55% of the share, followed by 21% who use public transport, 17% that walk, 5% who uses car and 1% using scooters/mopeds.

The DREAMS case study location currently considered is Overvecht.

Overvecht is a typical post WWII district. The district of Overvecht has about 35 thousand inhabitants. It is a migrant-rich and low-income district with a high share of people receiving social benefits (up to 24%) and living at welfare level (up to 18%). In Overvecht, the municipality and cycling union are running cycling promotion projects (Heel Overvecht Fietst), including a bicycle hub, cycling lessons and offering U-pass holders living in Overvecht the opportunity to buy refurbished secondhand bikes for 30 euro, including one year of maintenance.

Regarding existing business models for mobility services, governance and regulation we could advance:

- There is an ongoing MaaS pilot called GAIYO app. It is an information aggregation for bike-sharing, car-sharing, parking facilities and public transport. It has payment integration but no monthly mobility plans.
- The bike-sharing operator called TIER is running a pilot program offering shared bikes for free or at reduced cost in certain hub locations. One of those locations is Lage Weide, an industrial park in between the city center and Leidsche Rijn with blue-collar jobs. A pilot with free TIER e-bikes ended in May 2024 and replaced with a system of reduced fees (2 euro per trip).
- U-Pass holders have a 75% discount on TIER's bikes. They report that only a few hundred users among the 40.000 U-Pass holders use it.
- Ongoing cycling promotion initiatives from the Municipality and Province of Utrecht:
    - Subsidise shared bikes for worksite locations
    - 75% discount on cargo bikes
    - "ProbeerTeGoed" via GAIYO: this is a "trial credit" of 40 euros to try new shared services aimed at first timers (bikes, cargo bikes and shared cars) which can be found via especial organisations like community centres and food banks
    - Trainings to remove barriers, digital and how to cycle on an electric shared cargo bike
    - Transport poverty program ('Uitvoeringsprogramma Vervoersongelijkheid'), with also cycling related initiatives such offering cheap second-hand bikes.

- Sustainability Challenge Active Mobility in Overvecht (30 September – 4 October 2024), students (ROC, HU, ROC) and other stakeholders collaborate in developing interventions, supported by the municipality (focussed on encouraging cycling in general).

- Current cost of TIER around 1,30 euros per hour and entry fee of 1 euro. In the case of Cargoroo is 6 euros per hour and entry fee of 1 euro.

6.2. Challenges and policy background

Challenges on mobility include increasing the amount of low-income and migrants using bikes. Price is an important issue for the shared mobility services, as well as good parking policies for these shared vehicles.

The SUMP (Sustainable Urban Mobility Plan) aims to create a 10-minute city with amenities being close and connections being made by walking or cycling. The city has a Monitor regarding proximity indicators for the city which already is a demonstration of their interest in going in the path of 15minute cities.

6.3. Living Lab aim and scope

The goal of this living lab is to examine how social business models can increase the uptake of shared e-bikes by low-income population (low-income neighbourhood). Our questions of research are:

1) Why are these populations not using shared e bikes ?
2) What are the trade-offs they consider when choosing their mode of transport?
3) What is the most convenient business model to increase the bikes' uptake?
4) What is the potential impact of different business models for shared e-bikes?

We are visualizing to create a social business model in which the shared mobility operators could receive micro incentives from authorities to reduce prices at the targeted locations and population. This has been already working. Also, we have considered the possibility to increasing prices in the city centre in order to be able to reduce them in the targeted locations. These business models are still under discussion with the authorities and operators.

In terms of governance and timelines, the Utrecht living lab activities will have to be conducted earlier than expected as TIER's concession is ending on December 2025. Our stakeholders meeting has also discussed joining forces in budget related issues as there are many initiatives from the Province that could be very well aligned with the project (Intereg).

6.4. Planned Living Lab activities

So far, we have outlined the living lab activities and timeline as follows:

	Living lab activities	Leader	What to expect from other stakeholders	Date
2024	Survey preparation	UT	All: Give feedback	June-October 2024
	Survey Discussion	UT	Vienna Consortium Meeting All: Suggest changes if you think pertinent	October 2024
	Survey test	UT	All: give feedback	October 2024-February 2025
202	Survey Launch	UT	All: share link and disseminate	March 2025

	Living lab activities	Leader	What to expect from other stakeholders	Date
	Recruit respondents	HU-UT	UT-HU: disseminate the survey among HU students. Recruit students to do on-site surveys for target groups. TIER: disseminate survey on mailing list to subscribers. Disseminate especially on users in study locations and with target characteristics: low income (u-pass) and migrant background. Municipality: organise workshops with different organisations that could be relevant target groups for on-site surveys and interviews. Fietsersbond: disseminate survey among subscribers and recruit possible collaborators for on-site surveys.	March 2025
	Data Collection	UT	All: feedback on results	March-May 2025
	Experiments implementation	HU-UT-TIER	UT-HU: planning and giving ideas for experiments. TIER: executing experiments with e-bikes. Municipality: helping to disseminate experiments to increase uptake. Joining efforts with other projects to increase budget. Fietsersbond: disseminate the experiment to increase uptake. Giving ideas on which experiments to do.	June-August 2025
	Post survey preparation	UT	All: give feedback	June2024-september 2025
	Post survey test and launch	UT	All: give feedback and suggest changes if pertinent. Disseminate survey.	September 2025
	Data collection	UT	All: feedback on results	September-November 2025
	Results and report for TIER	UT	All: give feedback on results	November 2025
2026	Business models, subsidy levels, pricing strategies and goals	UT-TIER	UT: design business model TIER: give feedback on how feasible it is. Municipality: give feedback on how feasible it is. Fietsersbond: give feedback on how feasible it is.	November 2025 – December 2026

Table 12 Utrecht living lab activities and timeline

The target groups will be a low-income population, and it will be compared possible to a high-income population to see differences.

Data on the socio-demographics aspects of the living lab residents will be used, but also stated preferences from surveys and interviews. We may also do some workshops to extend on the factors that influence mode choice for the target population, especially if we do not get enough survey responses from our target group. We have discussed with the stakeholders' possible locations to conduct surveys where the targeted population tends to be concentrated (community groups, etc.).

7. VIENNA LIVING LAB

7.1.Introduction of Vienna Living Lab area

Vienna is the capital and one of nine federal states of Austria. Vienna has 2 Mio. inhabitants (Stand 1.1.2024, Statistik Austria) and almost 3 Mio. in the broader metropolitan area – almost one third of the country's population (stadtregion.at). There are 23 districts of Vienna ("Bezirke"), which are each governed by a District Office, known as "Bezirksamt" or "Magistratisches Bezirksamt." These offices oversee various administrative tasks within their respective districts, such as civil registration, building permits, social services, and local infrastructure maintenance. Each district has its own District Council, or "Bezirksvertretung," which consists of elected representatives responsible for addressing local issues, advocating for residents' needs, and managing district budgets.

The case study area is Wiener Flur and its surrounding neighbourhoods, situated in the 23rd District known as Liesing. Liesing is located in the southwest of Vienna and is the fifth largest district in terms of area, covering 32.29 km2. Since World War II, Liesing has experienced continuous population growth. Today, approximately 118,000 people reside in the district. Liesing is among the less densely populated districts of Vienna, with 3,677 inhabitants per square kilometer as of January 1, 2023. The 23rd District has a relatively high average age, which is steadily increasing, and compared to the city as a whole, it has lower educational levels but a higher average income (Stadt Wien -Liesing in Zahlen).

The Living Lab use case "Wiener Flur" is close to the border of the state of Lower Austria. It was constructed between 1978 and 1980, with a total of 1,355 apartments, the residential complex Wiener Flur is the largest public housing development in the former village of Siebenhirten in the 23rd District. U6 metro station Siebenhirten is within walking distance. The housing complex features a structure resembling a permeable perimeter block development. The originally planned communal areas are in a dilapidated state, leading to vacancies in the ground floor zone (Local Action Plan Vösendorf – Vienna Siebenhirten 2018).

It is surrounded by the old village of Siebenhirten, a commercial/industrial area, and single-family home areas.

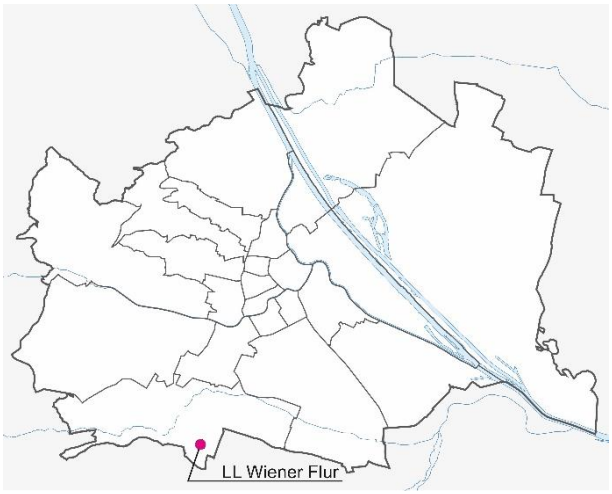


Figure 8 Location of the Vienna LL case study "Wiener Flur" (borders: OpenStreetMap, 2023)

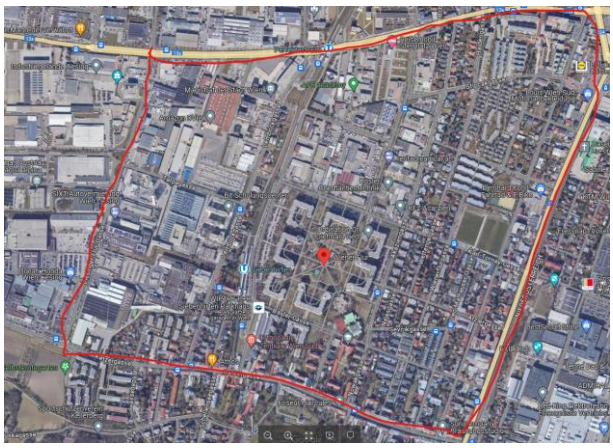


Figure 9 LL area with its surrounding

7.1.1. Transportation network overall Vienna

Regarding public transportation, the Vienna U-Bahn system consists of five lines (U1, U2, U3, U4, and U6) covering approximately 83 kilometers with around 109 stations. It is one of the most vital components of the city's public transportation network. The U-Bahn connects key areas of the city, including major residential, commercial, and cultural districts.

The S-Bahn network complements the U-Bahn by connecting Vienna with its suburbs and neighboring regions. It has several lines, with S1, S2, S3, S4, S7, S45, and others being the most prominent. The S-Bahn is crucial for commuters traveling from outer districts and nearby towns into the city center. The main hub for the S-Bahn is the Wien Hauptbahnhof (Vienna Central Station).

Vienna's tram network has 30 lines covering around 220 kilometers of track. Trams are a popular mode of transport for short to medium distances and provide connectivity within the city's districts. The city operates a bus network that covers areas not serviced by the U-Bahn or trams. There are regular daytime routes as well as night bus services. Buses serve both the city center and outlying districts, ensuring coverage.

Vienna is well-connected by national and international rail services. The Wien Hauptbahnhof (Vienna Central Station) is the primary railway hub, offering connections to major Austrian cities and numerous European destinations. Other significant stations include Wien Westbahnhof, Wien Meidling, and Wien Praterstern.

Vienna promotes cycling as a sustainable mode of transport. The city has a solide network of bike lanes and paths, bike-sharing programs, and ample bike parking facilities.

Vienna continues to invest in and expand its transportation infrastructure. Projects such as the U2/U5 expansion, additional tram lines, and improvements to cycling and pedestrian pathways are part of the city's strategy to enhance mobility and reduce environmental impact.

Regarding shared mobility, Share Now is a popular car-sharing service in Vienna, providing a fleet of vehicles that can be rented by the minute, hour, or day. Users can locate and unlock cars via a mobile app, offering flexibility for short trips or longer journeys.

Eloop is a car-sharing service focusing on electric vehicles.

WienMobil Rad is the city's public bike-sharing system, with numerous docking stations spread across Vienna. Users can rent bikes for short trips and return them to any station, making it a convenient option for quick and eco-friendly transportation.

WienMobil Station integrates public transport with shared mobility like car-sharing, e-scooter, bike sharing.

7.1.2. Transportation network and shared mobility services of the LL use case

The LL area is connected to subway line 6 (every 3-5 minutes) via the Siebenhirten station. It is frequently used by commuters from Vienna-Liesing and the surrounding communities. It is nestled between single-family housing estates and the Wiener Flur residential complex. In addition to the Badner Bahn (every 7 minutes), it forms an important mobility axis in the direction of Vienna city center and connects the area with the city center every 7-8 minutes (currently interrupted by construction work)

A P+R facility complements the public transport and motorized private transport infrastructure (Local Action Plan Vösendorf - Vienna Siebenhirten 2018).

The cycle path network is available on the main routes. There is a WienMobil bike- and carsharing station at the Siebenhirten subway station and a subway station before that called Perfektastraße. The LL location is not part of the business area of the free-floating provider Sharenow.

In terms of public transport, there is a lack of high-level public transport connections in the region in an east-west direction, which are currently served by bus lines 61A and 61B.

In Liesing, the WienMobil Hüpfer (small bus) is available on demand around the Alterlaa, Erlaaer Straße and Perfektastraße U6 stations. Since April 2, 2024, the Hüpfer has also covered the area around the Siebenhirten U6 station and the Vienna-Liesing and Atzgersdorf S-Bahn stations (Wiener Linien 2024).

There is no free-floating car-sharing service (e.g. shareNow) available in the LL location.

Business models in the context of shared mobility, there are Wienmobil Hüpfer as on-demand service and bike sharing (see above).

In terms of vacancy activation and pop up-activities planned in the LL location (see 8.3.), the Vienna Business Agency offers various funding programs aimed at revitalizing ground floor zones through entrepreneurial use, which can make a substantial contribution to center development. For example, the Business Agency pursues the following funding lines:

- Location Initiative: Funding for the establishment and expansion of business premises, local supply.
- Support for Viennese Micro-Enterprises: Revitalization of commercial spaces for new uses.
- Funding for Structural Investments: For small and medium-sized Viennese enterprises.
- Grants for business takeovers and continuations at the same location in the same industry.
- District Initiative Vienna: The funding supports micro and small enterprises, as well as startups, in offering goods and services for the daily needs of the people living in their district. Implemented so far in the 2nd, 16th, and 20th districts. This also holds potential for the LL Location and its local supply (Wirtschaftsagentur 2024)

Other initiatives:

- Vacancy Brokerage (Leerstandsvermittlung): Creative Spaces Vienna – the Office for Vacancy Activation has been dealing with vacancy activation and interim use through culture, social services, the creative economy, and community work on behalf of the City of Vienna since 2016 (Kreative Räume Wien, 2024).

Real Estate Concepts: These include flexible multipurpose buildings that combine different uses and concepts for non-commercial, social, or community uses on the ground floors and the floors above. (also sharing, concept for shared mobility).

7.2. Challenges and policy background

Key points from the STEP 2025 plan for Vienna's expected population growth and mobility challenges:

7.2.1. New STEP 2035 available in summer 2025

- The city is growing (also a result of its attractiveness, maintaining a high quality of life despite increasing land use intensity).
- Two main challenges in mobility:
    - enabling people to reach their destinations and
    - minimizing adverse effects of traffic, especially from motorized individual transport.
- Main challenges in supply.
- Climate change, increasing importance of public spaces; "efficient use of space, short distances and compact, urban structures with a wide range of services and attractive public spaces will become even more important in terms of resource conservation. Many strong centers help to reduce motorized private transport (MIV) and create the opportunity to run errands, commute to public offices or leisure activities in an environmentally friendly way" (STEP 2025.
- Demographic change, more older people, changing work patterns.
- Retail trade (online trade is increasing), purchasing power stagnating in Vienna, polarized development of retail trade in A-locations.
- On the outskirts: "Urban expansion is changing urban structures, new districts are emerging. The expansion of high-level public transport services facilitates their accessibility and creates the conditions for the development of new centers. Due to the lower population densities - compared to the inner districts - and the associated larger catchment areas in the outer districts, new centers will only be viable in the larger urban development areas" (STEP2025).

7.2.2. Goals of Step2025

- Enabling mobility without car ownership (Vienna has a declining motorization rate over the past decade).
- "80:20" modal split by 2025, with 80% of trips by public transport, bicycle, or walking, reducing motorized individual transport to 20%. (26 % in 2023, source Wiener Linien). This shift is crucial for sustaining urban quality of life and avoiding permanent road network congestion amid population growth.
- Fostering environmentally friendly modes of transport (walking, cycling, public transit) are space and energy efficient, with minimal emissions, contributing to public health.
- An integrated public transport system, with optimized intermodal connections and additional sustainable mobility options (e.g., mobility cards, bike-sharing, car-sharing), is pivotal for successful urban development.
- Compact, mixed-use neighborhoods with pedestrian and cyclist-friendly infrastructure and ample green spaces are essential for sustainable mobility, emphasizing the close relationship between urban development and mobility.

7.2.3. Structural and Mobility challenges for Liesing and the LL use case

- With the S-Bahn and U-Bahn, as well as major radial connections via Breitenfurter Straße and Triester Straße, central districts are easily accessible. However, there is a need for improved services for cross-district travel within the area (Werkstattbericht 153).
- The district Leasing there are 49 cars per 100 inhabitants (it is higher in comparison to overall Vienna with 39 cars/100 inhabitants) (Liesing in Zahlen, 2022); car is the most used means of transportation with 38% (Heller, H., 2021)
- Wiener Flur lacks local supply and has vacancies in the ground floor zone
- Town Center Siebenhirten servs as a local center and crucial junction: it connects Ketzergasse with the U-Bahn line to the north and the entrance to recreational areas in the south. However, the location along a busy thoroughfare and changes in the retail sector present significant challenges. “Design interventions and reorganization of street spaces,

along with active support for retail platforms, can help revitalize this historic anchor and landmark" (Werkstattbericht 153).

The LL location is at the border to Lower Austria. The cross-border collaboration with Vienna – Lower Austria is challenging.

7.3. Living Lab aim and scope

In the LL Vienna, we focus on three elements: (1) Mobility hubs, (2) flexible (pop-up) activity hubs and (3) demand-responsive services.

1) To enhance accessibility, a virtual bike sharing station should be established near the flexible activity hubs (see below). This virtual station will provide a designated area for bike sharing, accessible through the WienMobil App, eliminating the need for physical docking infrastructure. By positioning the station close to the activity areas, we can facilitate easy bike pick-up and drop-off, promoting sustainable and flexible urban transportation options.
2) To transform underutilized (ground floor) spaces, we plan flexible pop-up activity hubs through a co-creative approach. By reactivating vacant storefronts or open areas, these spaces can serve as dynamic hubs for (community) events, pop-up shops, or social gatherings etc. A co-creative setup encourages community input in designing and programming the space, ensuring it meets local needs and fosters engagement.
3) In the LL location, WienMobil Hüpfer offers a demand-responsive, on-demand bus service that adjusts to user needs in real time. It will be determined if the user data can be used to evaluate if the flexible hub has an impact on its operation. The introduction of flexible activity hubs in this area could further enhance the on-demand bus's effectiveness.

The flowing table gives an overview of the scope:

In the proposal	Resources	LL Experimentation
Mobility hubs	(Cargo-)Bike sharing virtual station	Implement virtual station close to activity hub
Flexible (pop-up) activity hubs	(Re-activated) vacant space	Co-creative set-up of the space
Demand-responsive services	On-demand bus operating in the LL location (WienMobil Hüpfer)	Use of data (?), reflecting operating area

Table 13 Overview scope of LL in Vienna

7.3.1. Research questions

What contributions do co-creative and flexible hubs make to the realization of the 15-minute city concept, particularly with regard to local space and mobility?

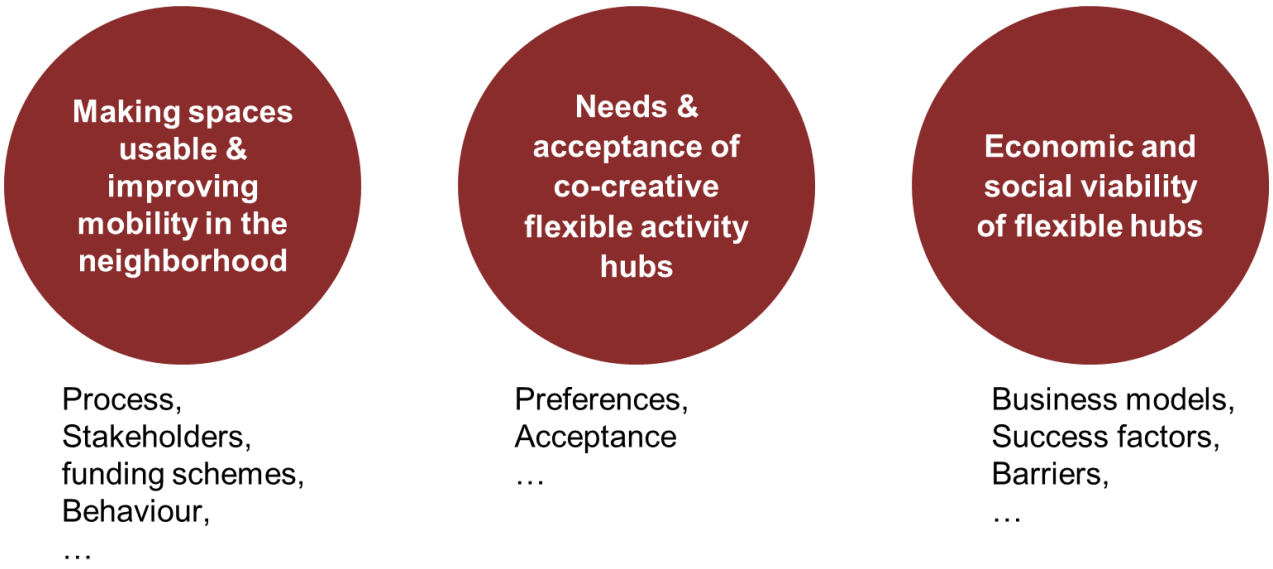


Figure 10 Research topics in Vienna

1) Making spaces usable and improving mobility in the neighborhood:
    - How can the activation of vacant spaces in urban peripheral areas be successfully organized through funding schemes (e.g. crowdfunding), local networks, cooperation (e.g. with the city, business agencies), etc.?
    - How can the low-threshold networking of local stakeholders be organized to sustainably revitalize spaces?
    - How can the development of a co-creative flexible hub in the neighbourhood be linked to mobility services (bike sharing and on-demand bus)?
    - To what extent does the use of a flexible hub in the neighbourhood influence the mobility behavior of residents?
2) Needs and acceptance of co-creative flexible hubs:
    - What needs and preferences do residents have regarding the (long-term) use of spaces in the neighbourhood?
    - What is the level of acceptance for different forms of use (e.g. flexible hub, bike sharing, on-demand bus)?
3) Economic and social viability of flexible hubs:
    - How can business models for flexible hubs (e.g. pop-up stores, local convenience stores) be developed on the outskirts of cities to be economically viable?
    - What factors influence the longevity and success conditions of flexible hubs?
    - What barriers and success factors exist for cooperation between different stakeholders in the development of flexible hubs?

7.3.2. Aims of the Living Lab Vienna

Aim	initiate networking and increase the visibility of local actors	support the utilization of vacant/unused spaces & establish additional functions and activities that are missing	test co-creative flexible hubs in combination with mobility offers	reflect on long-term perspectives for co-creative flexible hubs
strategic	Establish networks that enable local actors to better cooperate and make their offers visible.	Investigate the process by which residents and local initiatives are actively involved in the set-up of flexible hubs.	Assess the impact of flexible activity hubs on mobility patterns and life in the neighbourhood. Promoting the integration of spatial and mobility offers in terms of better accessibility and local supply.	Developing business models for sustainable space use that can continue to exist after the research projects have been completed.
operative	Organizing low-threshold workshops and networking meetings to promote cooperation and the development of ideas.	Create ideas/ concepts for activating vacant/ underutilized spaces that involves local actors and stakeholders.	Find interested "makers" and their (entrepreneurial) ideas via the imgrätzl platform, find suitable spaces, initiate events	Identification of financing options and incentives (e.g. rental subsidies) to enable long-term utilization.

Table 14 Aims of the Living Lab Vienna

Shifting from Pop-Up to a Long-Term Perspective: While pop-up solutions provide quick, flexible responses to community needs, a longer-term perspective aims to establish sustainable, enduring spaces that serve as permanent fixtures within the community. We focus on a long-term approach and creating lasting infrastructure, fostering consistent community engagement. .

7.4. Planned Living Lab activities

The following figure gives an overview of the Vienna LL cooperations.

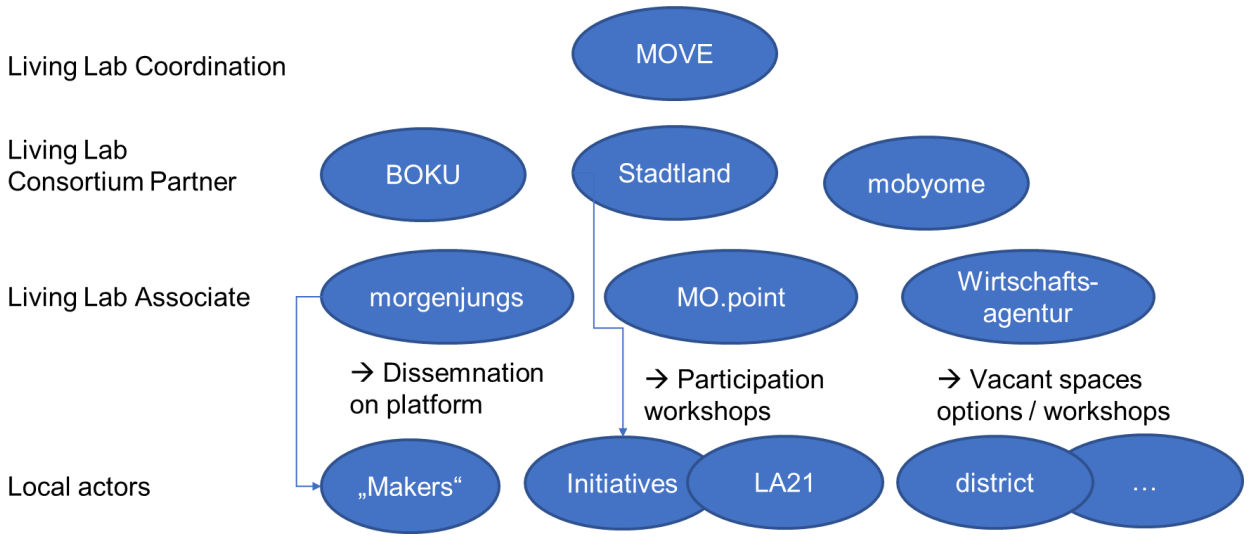


Figure 11 LL cooperations in Vienna

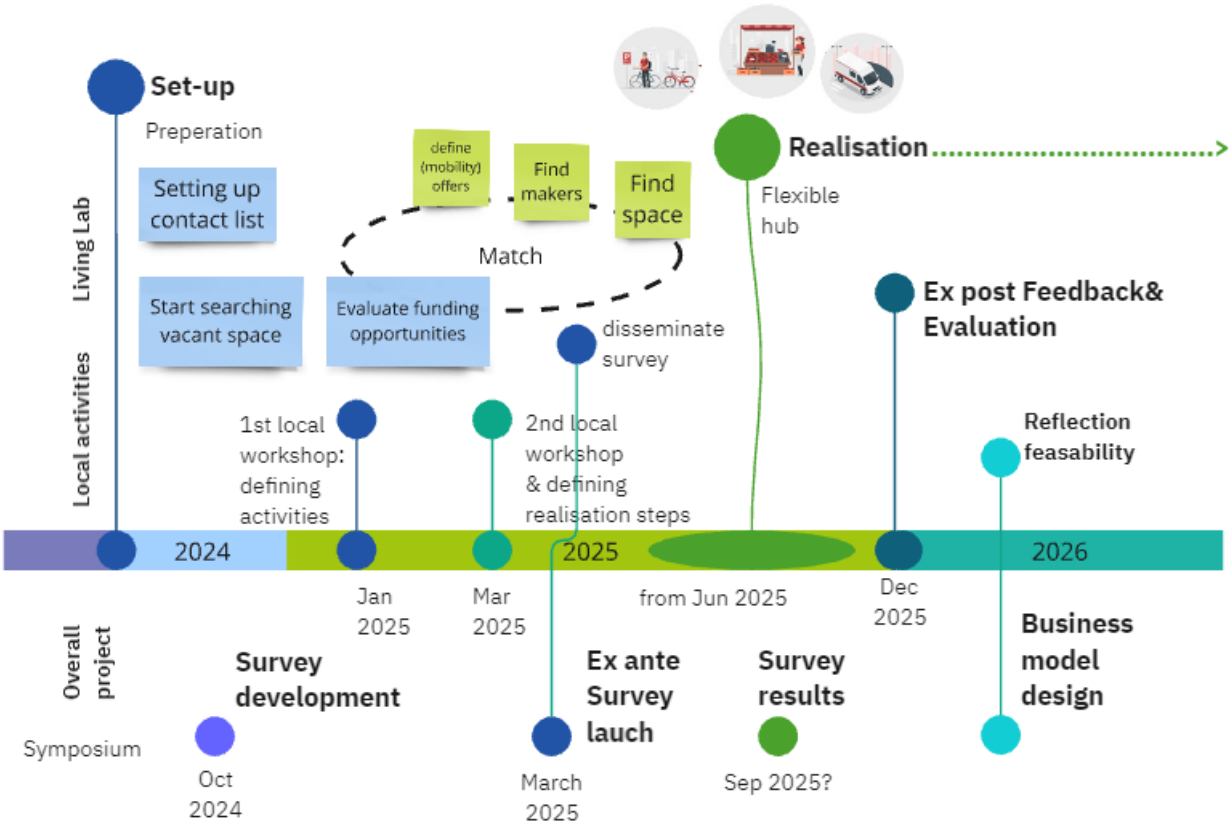


Figure 12 Timetable for LL activities in Vienna

Figure above depicts a timeline and workflow for setting up, realizing, and evaluating the LL Vienna focused on creating a flexible hub.

Set-up Phase (2024- April 2025):

- Preparation: Initial activities include:
  - Setting up contact lists to establish a network of relevant stakeholders.
  - Searching for vacant spaces that could serve as potential locations for the hub.
  - Evaluating funding opportunities to support the initiative.
  - Defining potential mobility offers and engaging "makers" (local creatives, service providers).
- Key Milestones LL Level:
  - 1st Workshop (January 2025): Focuses on defining activities for the hub and framework conditions (who, where, what?) and will center around identifying potential spaces and offers (such as local supply and cultural activities)
- Key Milestones on project level:
  - Survey Development: Initial survey work is planned for October 2024.

Realization Phase (summer 2025):

- Flexible Hub Establishment: By June 2025, the flexible hub is expected to be operational, serving as a focal point for community engagement and mobility
- Key milestone on LL level
  - 2nd Workshop (March 2025): Aims to define further realization steps, solidifying the hub's activities and operational processes.
- Key Milestones on project level:
  - Ex Ante Survey Launch (March 2025): Survey initiation aimed at gathering baseline data before the hub is operational.
  - Survey Results: Results anticipated around September 2025

Evaluation/ Impact assessment phase (October 2025 – end of 2026):

- Ex Post Feedback & Evaluation: Gathering feedback on the flexible hub’s performance and impact.
- Reflection on Feasibility: Assessing the project's long-term viability and determining whether adjustments are needed.
- Business Model Design

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