



Cross-sectional Analysis of 6 European Living Labs

July 2025

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Abbreviations

BRT	Bus Rapid Transit
DRT	Demand Responsive Transport
KPI	Key Performance Indicator
POI	Point of Interest
P&R	Park and Ride
SUMP	Sustainable Urbain Mobility Plan
TOD	Transit Oriented Development
ULLs	Urban Living Labs
WP	Work Package

History

Date	Version	Submitted by	Reviewed by
31/07/2025	01	EUR	SZTAKI, ITU
18/08/2025	02	EUR	UPM
01/10/2025	Final	EUR	

Introduction

Background

FORTHCOMING (FOsteRing THE City Of proximity through Maas InteGration) aims to draw insights from successful 15-minute strategies deployed in central urban areas and adapt them to suburban contexts with a specific focus on digital solutions and tools. Ultimately, the goal is to facilitate the transfer of effective central city practices to the suburbs, thus supporting the development of climate-neutral, liveable, and inclusive suburban areas.

The project is based on evidence from **six European Urban Living Labs (ULLs)**, selected according to the following logic: a core city where 15-minute city measures have been implemented and a suburban city/area within the metropolitan region requiring improvement, where the ULLs have been set up. The project will conduct an impact assessment of the ULLs and develop a methodology to replicate interventions relevant to the 15-minute city model from central areas to suburbs which will feed into a dedicated implementation guidebook for suburban areas.

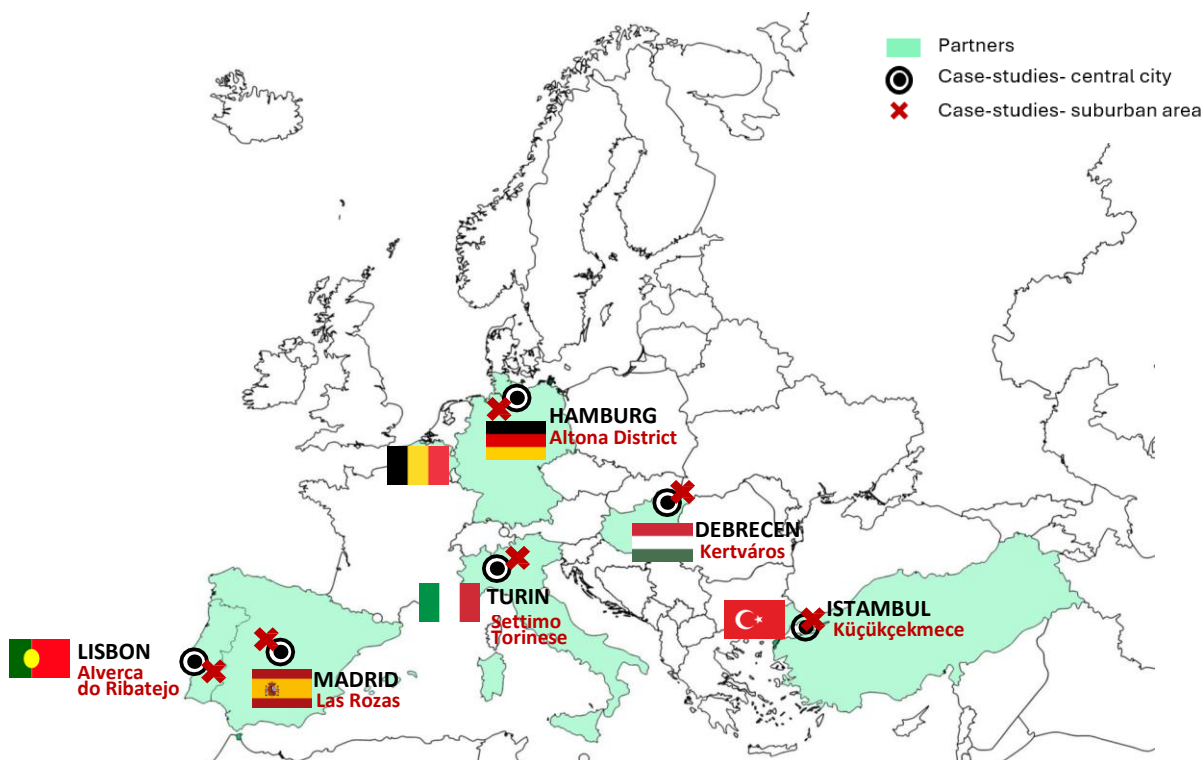


Figure 1: Overview of partners and urban living labs in FORTHCOMING

Objectives of the deliverable

This report presents a **cross-sectional analysis** of the six ULLs, identifying the common contextual characteristics and challenges between them as well as the specific challenges they faced. The aim of the

report is to identify patterns and areas of comparison between ULLs as well as to identify outliers with regards to specific aspects (i.e. geography, city typology, demographics, historical development, socioeconomics, etc.). The results of the analysis will also identify the potential for each ULL to come closer to the 15-minute city model as defined in the project (see Appendix 1: Dimensions of 15mC, adapted for FORTHCOMING).

The cross-sectional analysis has been developed under Work Package 4 led by UPM and builds on the work and data collected under WP3 and WP4. This includes:

- the screening of 15-minute strategies in the six case-studies led by IST and the assessment (SWOT analysis) of these strategies against the four dimensions of the 15-minute city (i.e. proximity, density, diversity and digitalization) during focus groups with local stakeholders (see D3.1 SWOT Analysis of 15min-C Strategies, lead: SZTAKI)
- the development of relevant common and specific 15-minute city indicators for the ULLs (see D3.2 Definition of the Key Performance Indicators, lead: HCU)
- the characteristics identified for each ULL (D4.1 Report on the Set-up of 6 European Living Labs, lead: UPM)
- the data collected during the screening of the four dimensions of the 15-minute city in each ULL (Task 4.2, lead HCU)

The analysis will feed into the transfer methodology developed in WP5 and the multi-stakeholder impact Assessment conducted in WP6. Altogether, this will form the basis of the main legacy report of the project: *'15minute City Implementation Guidebook for Suburban Areas'* (Deliverable 6.2).

Methodology

The aim of this deliverable is to identify patterns and areas of comparison between ULLs as well as to identify outliers with regards to specific aspects (i.e. geography, city typology, demographics, historical development, socioeconomics, etc.). The results of the analysis will also identify the potential for each ULL to come closer to the 15-minute city model.

Thus, the analysis has been guided by several key questions: What similarities and differences exist among the six Urban Living Labs (ULLs)? What gaps or opportunities have been identified in relation to the 15-minute city (15mC) dimensions within each ULL's local strategy and current conditions? And finally, what specific focus areas or approaches are being pursued within each ULL to advance the principles of the 15mC?

To address these questions, we developed a mixed-method and cross-sectional methodology based on quantitative and qualitative data collected as part of WP3 and WP4. Cross sectional studies are 'observational studies that analyse data from a population at a single point in time' (Wang & Cheng, 2020, p.65). In our case, the focus is on the ULLs. A cross-sectional analysis is particularly valuable to generate a comprehensive initial snapshot and has the advantage of being inexpensive (ibid, see also Cummings, 2018; Maier, 2023). This approach aligned well the project's objectives to identify patterns and assess different factors and variables between ULLs as well as its limited budget.

Scope	Type of data	Relevant tasks
Characteristics of ULLs	Demographic and socioeconomic characteristics: Total population, Age distribution, Foreign born population, Mean disposable income, Gini coefficient, Unemployment rate, Dominant industries. Urban planning and land use: Area, Density, Land cover distribution, Total built-up area ratio, Built-up area (m2/capita), green space (m2/ capita), Average population exposure to NO2, Average exposure to fine particulate matters Proximity: Walking /biking access to: Green, Blue and Public spaces Walking/ biking access to POIs Walking/ biking access to public transportation Mobility: Public transport and shared mobility offer (e.g. urban buses, commuter trains, DRT, BRT, Shared mobility options available), Modal split, Motorisation rate, Number of trips on a workday, percentage of trips within the municipality and with origin or destination in another municipality, Cycling infrastructure, Pedestrian zones. Digitalisation: Integration of Mobility as a Service offer, Availability of public transport card that combines all PT modes, digitalised card for public transport, availability of MaaS application	T3.2. Key Performance Indicators for 15minC Strategies T4.1 Setting of ULLs T4.2: Screening 15m dimensions
Strategical context of ULLs	List of local strategies in case-studies (i.e. core cities) and ULLs Governance structure and policy frameworks (i.e. relevant urban planning frameworks, SUMP & aligned strategies)	T3.1. Successful 15minC Strategies in the 6 Case Studies T4.1 Setting of ULLs

Identification of priorities & proposed measures	Results of SWOT analysis of local strategies in each ULL Specific measures proposed for each ULL following the set-up of the ULLs	T3.3. Focus Groups I: SWOT Analysis of 15minC Strategies and KPIs by Local Experts One-to-one follow-ups with representatives of ULLs to clarify their approaches
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Table 1: Overview data for cross-sectional analysis

We carried out several steps. First, we conducted a basic quantitative comparative analysis (Clifton et al 2008) on the socio-demographics, land-use and mobility profiles of the ULLs (see Table 1). Appendix 3 provides an overview of the quantitative data collected from each ULL, and the different sources used.

The basic quantitative analysis was complemented with the proximity analysis of each of the ULLs conducted as part of Task 4.2. In a nutshell, the proximity analysis assessed the percentages of each ULL that were accessible within a 15-minute walk or cycle ride to the following selected categories of destinations, or Points of Interest (POIs):

1. Green, Blue, and Public Spaces
2. Points of Interests based on the functions of 15minC¹: Getting supplies; Enjoying; Learning; Caring / being healthy
3. Public Transport

The proximity analysis methodology developed by the project partner HCU (task 4.2) combines open geospatial data, isochrone mapping, and coverage computation. POIs used for the analysis are based on thematic filters, corresponding to different urban functions (e.g., working, learning, caring) as established by Moreno et al., 2023. The process was automated through a simple, custom-developed Python script (for a more detailed overview, see in Appendix 4). Figure 2 shows screen captures from open source geoinformatics software QGIS illustrating the results of the coverage analysis for different ULL areas, evaluating their proximity to different POIs.

We completed the comparative analysis of the six ULLs with in-depth contextual information provided by each ULL representative (Task 4.1) and qualitative insights gathered during the first round of focus groups (Krueger & Casey, 2000) with local stakeholders (Task 3.3) (see Table 1 for an overview of the data used). We also contextualised the analysis with a short description of the governance structures in which each ULL is embedded as well as the key priorities that they have set out for the common years.

Additionally, we conducted one-on-one follow-up discussions with ULL representatives to clarify specific issues that emerged from the data and explored the types of measures that could be put in place to adapt the 15-minute city model to the specific contexts of each ULL. Finally, the results of the cross-sectional analysis were presented and validated by the project partners and external experts from the ULLs during the consortium meeting held in Istanbul in July 2025.

¹ The sixth function in Moreno's framework, 'living', was not included as a Point of Interest in the proximity analysis, as we interpreted it as a conceptual starting point rather than a spatial element.

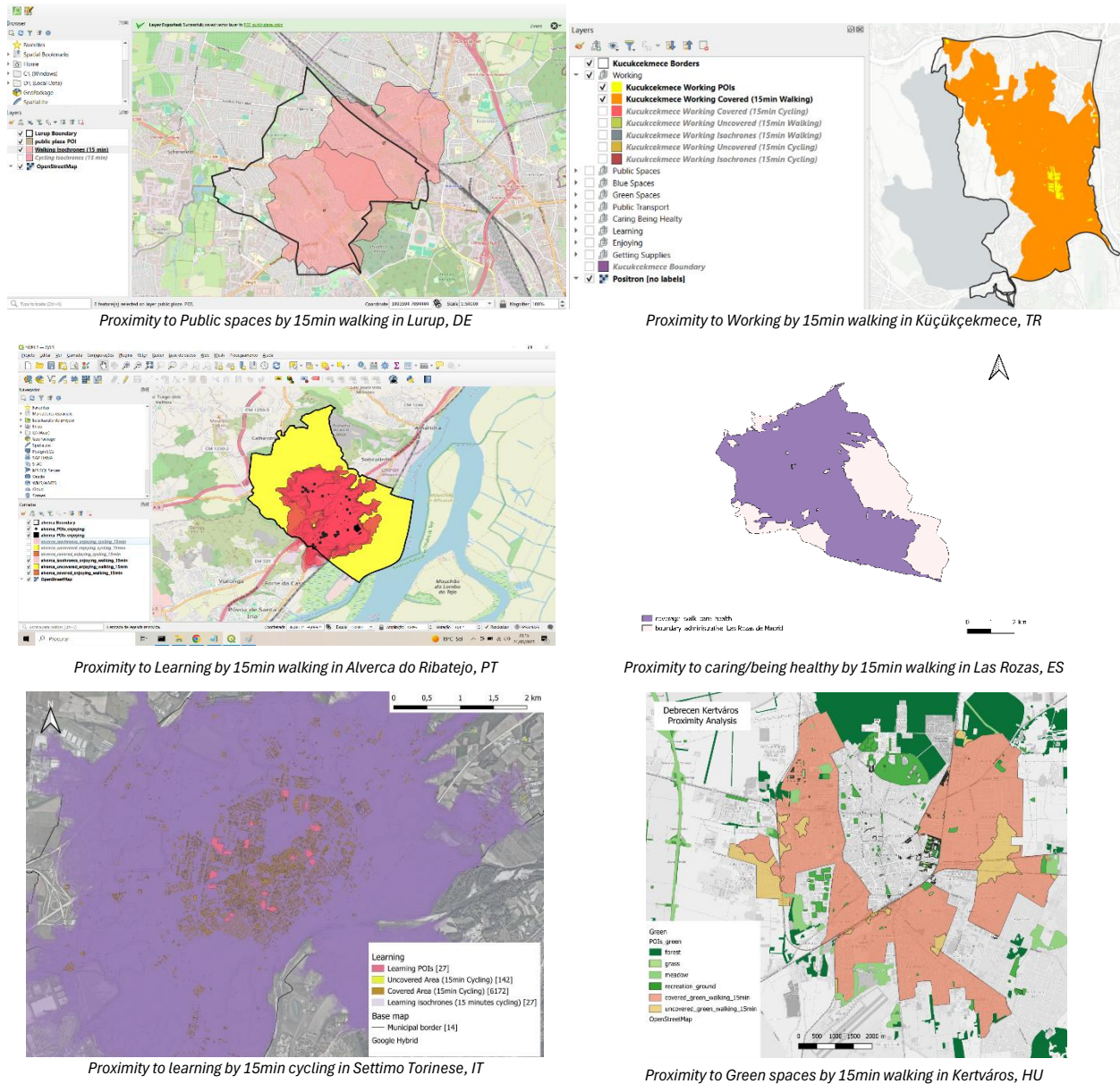


Figure 2: Screenshots showing the results of the proximity analysis in each ULL.

Limitations

Cross sectional studies provide only a limited snapshot at a point x and cannot capture trends and changes over time. One of the key challenges here lies in the heterogeneity of urban contexts. In this study, the ULLs differ substantially in governance structures, socio-economic conditions, and historical trajectories, complicating efforts to draw meaningful comparisons (Ward, 2008; Robinson, 2016). In addition, the administrative and spatial scales of the ULLs and their respective core cities—whether at the sub-district, municipal, or metropolitan level—have shaped both the process of data collection and the outcomes of the analysis. Finally, reliance on district-level averages risks obscuring significant intra-urban inequalities, as

aggregated data may conceal disparities in access to services, infrastructure, and opportunities within neighborhoods.

The proximity analysis methodology was developed and selected as it offered a user-friendly and semi-automated approach that eliminated the need for labour-intensive GIS work and did not require expert technical skills from all project partners. Thus, it had the advantage to accommodate existing project constraints related to time, capacity, and skillset. However, the proximity analysis methodology also has several limitations which affected the results. Firstly, significant variations in ULL sizes, topography, and density led to results that may not always be comparable or meaningful. For example, the analysis displayed high levels of proximity to all POIs in Lurup, largely due to its small ULL size, whereas in Las Rozas— which has the largest surface area among all ULLs— the results were comparatively lower.

The methodology also relies on POIs extracted from OpenStreetMap (OSM) using specific combinations of tags and categories. While OSM provides a rich and freely accessible dataset, its completeness and accurate categorisation of amenities varied by location. As a result, the POI selection does not fully capture all relevant services or destinations, especially in cases where local amenities are missing, misclassified, or differ from those listed in municipal planning documents or national geospatial portals, as that was the case reported for Alverca do Ribatejo. This limitation is also concurrent with prior research assessing city performance by measuring x-minute walk or bike proximity to urban amenities within defined catchment areas (see Sdoukopoulos et al., 2024, for a comprehensive review). The classification and aggregation of essential amenities vary significantly in research. More broadly, the sole emphasis on quantifying proximity risks reducing urban life to data points, neglecting the quality of services, infrastructure, and their alignment with local needs and preferences (Marchigiani & Bonfantini, 2022; Mouratidis, 2024).

Another limitation emerged from the isochrone generation via the Mapbox Isochrone API, which models travel time using internal routing engines (e.g., OSRM or Valhalla). These models use average walking (5.1 km/h) and cycling (16 km/h) speeds that are on the higher end of the spectrum and do not account for demographic differences, such as older adults or individuals with mobility limitations. Additionally, the isochrones assume flat, uninterrupted terrain and overlook real-world impediments such as elevation changes, traffic lights, congestion, and construction. Consequently, these assumptions may have led to overestimations of accessible areas. Overall, the analysis is based on the latest available data at the time of execution, but data quality varies across different ULLs, impacting the comparability and accuracy of results.

To mitigate the above limitations, a mixed-method approach that integrates quantitative and qualitative data was adopted.

Findings

Local contexts, challenges and opportunities

1. Debrecen ULL: Kertváros

Kertváros is a green belt surrounding the historic centre of Debrecen (dark yellow in Figure 2). It is home to about 70,000 residents and functions mainly as a residential area consisting of single-family homes, with some high-rise housing estates. The economic activities of Kertváros are predominantly concentrated in retail trade.

In terms of mobility, cycling has become increasingly popular in Debrecen in recent years. Significant efforts have also been made to enhance pedestrian safety through the introduction of traffic calming measures, the establishment of residential and recreational zones, and the implementation of 30 km/h speed limits in several areas.

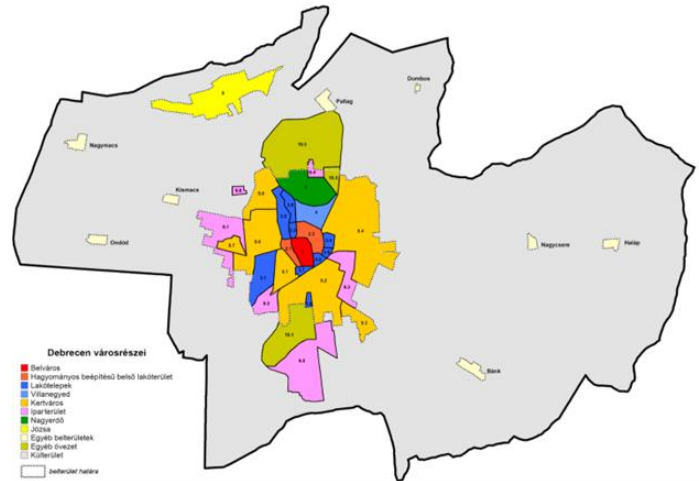


Figure 3: Debrecen municipal boundaries with Kertváros in dark yellow

Identified challenges:

- Lack of decentralization and insufficient services coverage with many services available only in Debrecen and not in Kertváros
- Limited job opportunities (most jobs and services are located in West Debrecen, while the eastern part of the city is mainly residential)
- Low density which leads to long walking distances
- Lack of facilities supporting last mile mobility
- Limited economic viability of shared mobility hubs due to low density population
- Increasing trend of motorisation
- Housing affordability

Identified opportunities:

- ✓ Recent improvements in the cycle path network: Debrecen's cycling infrastructure has expanded in recent years, with 108 km by the beginning of 2023 due to ongoing developments (SUMP 2024), 21.6 km of which in Kertváros.
- ✓ Current strategic objectives and plans of the city authorities supporting this use case
- ✓ Relatively low vehicle traffic
- ✓ The urban development strategy of the city uses the "principle of small distances" (closely connected to the 15-minute city concept) and aims at creating compact urban fabric to manage resources efficiently and fight urban sprawl.

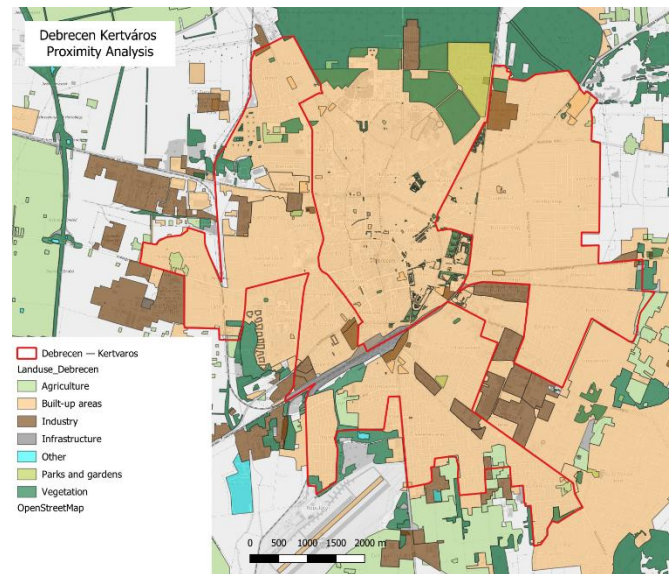


Figure 4: Land use in Kertváros

Proximity analysis results
• Very high walking proximity (above 90%) to Getting supplies, Enjoying, and Caring / being healthy • Relatively lower walking proximity to Working (77%) and Learning (72%) POIs • Low walking proximity to public spaces (35%), tram stops (15%) and train stations (23%)

Public transportation & mobility offers
• Train services with limited coverage in Kertváros: Debrecen (main station), Debrecen-Csapókert (north-east) with mainly local train lines, Debrecen-Szabadságtételep (east) minor line towards Romania, mostly local trains with a few international ones; Tócsóvölgy (west): common station of two local lines towards Füzesabony and Tiszaölök • Two tram routes with limited availability in Kertváros • Three trolleybuses • Approximately 40 bus routes

The main challenges highlighted in the proximity analysis include limited walking access to key transport infrastructures, especially tram stops (15%, Figure 5), train stations (23%), as well as public spaces (35%). The analysis also shows good walking accessibility to essential services. This can be explained by the POIs considered in the GIS analysis where all service types within the main categories were evenly weighted. However, it is important to remember that residents often have more specific needs. For example, although dentists, pharmacies, and fitness centers all fall under *Caring / Being Healthy*, they are not interchangeable, and the coverage for such subcategories is much lower. A clear case is the *Getting Supplies* category where much of the coverage is provided by drinking water POIs. Furthermore, in a similarly sized city it can be more appropriate to ensure accessibility to basic services within walking distance shorter than the 15-minute benchmark.

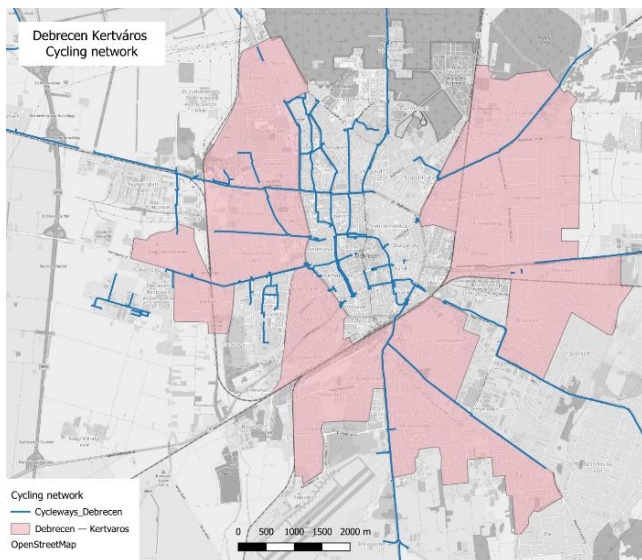


Figure 5: Kertváros- Cycling network

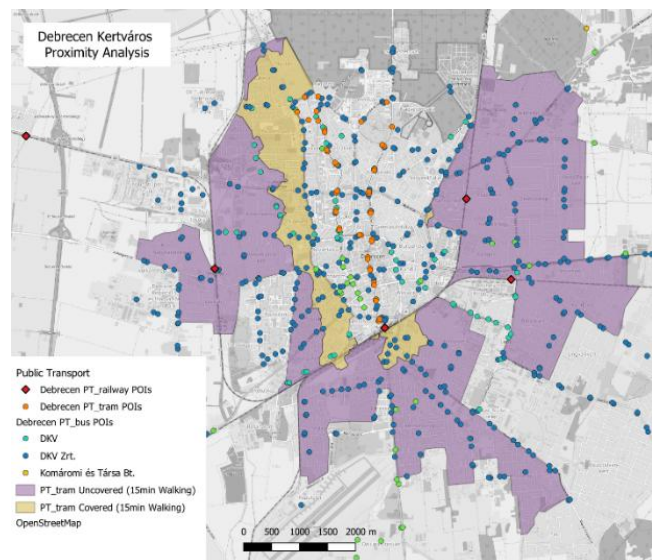


Figure 6: Kertváros- Proximity by walking: Trams

2. Hamburg ULL: Lurup

Lurup is a residential sub-district located in the northwest of Hamburg's Altona district, bordering Schleswig-Holstein. It faces challenges stemming from its industrial legacy, including aging infrastructure and limited integration into the city's broader urban fabric. Lurup is experiencing population growth, driven by ongoing urban development and Hamburg's wider expansion. The area features a mix of urban forms, with a predominance of single-family homes and mid-rise apartment buildings, complemented by quiet streets, local shops, and recreational spaces. Lurup's public transport options remain limited while major roads such as the A7 motorway, Elbgaustraße/Rugenbarg, Luruper Hauptstraße, and Farnhornweg traverse the area and carry heavy traffic volumes, contributing to accessibility challenges.



Figure 7: Lurup's urban fabric

Identified challenges:

- Limited walking access to public transport and limited services (indirect access to S-bahn and no access to U-bahn).
- Spatial and visual barriers created by road infrastructure and railway to the northeast of Lurup.
- Limited cycling infrastructure, the area is also underserved by city bike stations
- Regulatory obstacles, and fragmented planning hinder the implementation of inclusive and sustainable urban planning
- Risk of gentrification as the district is increasingly becoming a significant neighbourhood for those seeking affordable housing with access to urban amenities



Figure 8: Lurup within Altona District

Identified opportunities

- ✓ Development is underway to increase housing supply and public amenities. Newer developments providing mid-rise residential buildings with improved transport links start to rise in the neighborhood, alongside urban development strategies for its main roads.

- ✓ Opportunity to build on European project MOVE21 which was conducted in North Altona and piloted a multifunctional neighbourhood hub in Holstenstraße. The hub combined social and logistics services, including a social kiosk offering food, clothing, and hygiene items to those in need, and a consultancy kiosk providing advice—especially for young migrants. It also featured a Deutsche Bahn micro-depot for last-mile parcel delivery via e-cargo bikes

Proximity analysis results	Public transportation & mobility offers
• Very high walking proximity to most POIs (above 90%) • Relatively lower walking proximity to public spaces (81%) and getting supplies (84%)	• Two stations serve as hubs providing access to multiple S-Bahn lines, ensuring longer-distance connectivity • 12 bus lines with bus stops typically spaced 15min walking distance apart. Southern parts of district not well-served by buses. • Bike-sharing schemes (e.g. City of Hamburg StadtRAD), shared scooters (e.g. Bolt, Tier, Voi) • Car sharing scheme (Moia) • P&R scheme (Hamburg City) • DRT (HVV hop, loki Hamburg)

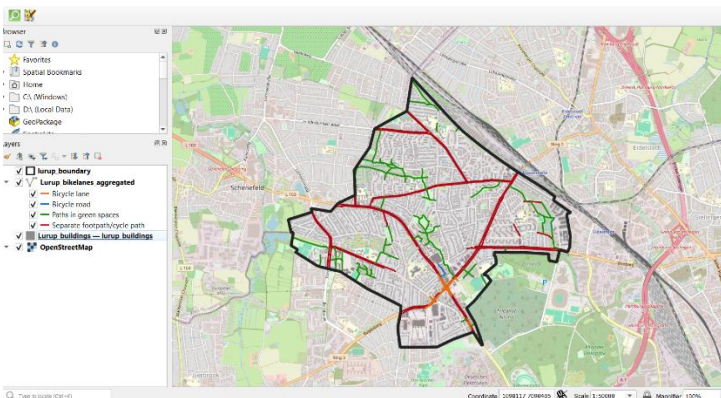


Figure 10: Lurup's cycling infrastructures

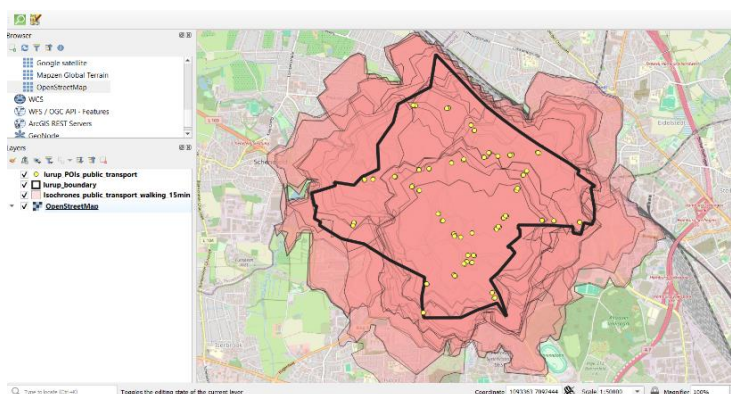


Figure 9: Lurup - Proximity by walking: Public Transport

Lurup's high proximity score can be attributed to its small size (6.3km²) and compact urban form—characterised by high population density and extensive built-up areas—compared to other ULLs. However, the area still faces challenges related to walkability, cycling (Figure 8), and perceived accessibility. For example, Luruper Hauptstraße was highlighted as a major concern by stakeholders. Characterised by heavy traffic, including buses and trucks, and car-centric intersections, the street is seen as a “physical and visual barrier” that divides the northwestern and southeastern parts of Lurup. This division also affects the concentration of POIs (e.g., community school and centre - LURUM, schools, churches, etc) which are located on either side of the traffic corridor. Public transport access remains relatively limited (Figure 9). The bus lines also tend to prioritise the urban centre of Altona before serving the sub-districts of Altona, such as Lurup, therefore prolonging waiting times.

3. Istanbul ULL: Küçükçekmece

Küçükçekmece is a densely populated district on the European side of Istanbul, located about 15 km from the city's historic centre. Anchored by the Küçükçekmece Lake, it features a mix of residential neighbourhoods, commercial areas, and mass housing projects, especially in Atakent, Halkalı Center, and İstasyon. Urban development dominates land use—93% of the district is residential, with minimal natural areas. Its strategic location near major highways (E-5, TEM, Basın Ekspres), railways, and airport makes it a key logistics and transport hub.



Figure 11: Küçükçekmece urban landscape

Identified challenges:

- High levels of traffic and traffic congestion (incl. due to logistics flows)
- Limited and poor-quality pedestrian infrastructures (e.g. quality of sidewalks, pedestrian crossings, etc)
- Very limited cycling infrastructures
- Pressure on infrastructure and services due to very high density
- Scarcity of greenery in densely built-up areas
- Social inequalities and spatial segregation

Identified opportunities:

- ✓ Well-connected with good transportation facilities serving the district (see box below)
- ✓ Promoting a cycling culture by developing cycling infrastructure along the seaside.
- ✓ Creation of new green public spaces along the seaside.
- ✓ Collaboration with stakeholders to promote zero-emission urban freight and last-mile delivery solutions.
- ✓ Possibility of incorporating the intervention with 3D Istanbul Project



Figure 12: Major logistics, transportation, and industrial areas of Küçükçekmece

Proximity analysis results

- **High** walking proximity (above 75%) to green spaces, learning, caring/being healthy and enjoying.
- Relatively **lower** walking proximity (above 50%) to public transport (66.8%), working (58.1%) and getting supplies (62.4%, Figure 13) POIs
- **Very low** walking proximity to public spaces (16.8%, Figure 12)

Public transportation & mobility offers

- The Marmaray light rail system spans approximately 5 kilometers within this district, providing efficient access to key destinations.
- Metro access (Halkalı Caddesi; Atatürk Mahallesi; Bahariye stations) and plan for metro service extension in the area
- Extensive bus system with 440 stops and 566 routes including a BRT (metrobus) system which operates on dedicated lanes, significantly reducing travel time and connecting the European and Asian sides of Istanbul.
- Public Bike-sharing (ISBIKE) and private shared scooters schemes (BinBin, Martı, and hop)
- Car sharing (Garenta, TikTak, Zipcar, YOYO, GetirAraç)

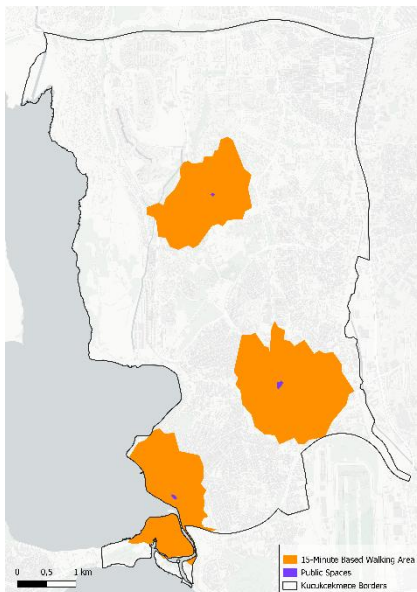


Figure 14: Küçükçekmece- Proximity by walking: Public Spaces

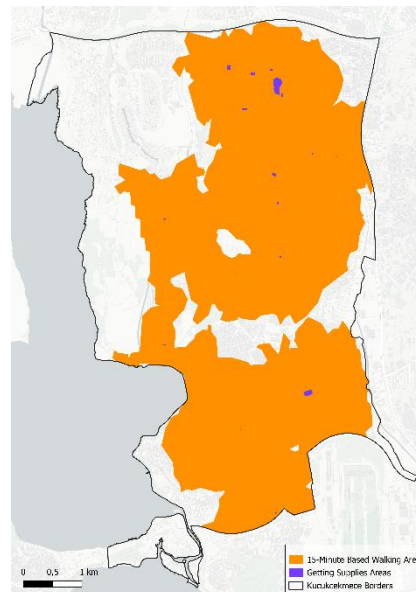


Figure 13: Küçükçekmece- Proximity by walking: Getting supplies

Küçükçekmece is officially made up of 21 neighborhoods, showcasing a diverse urban landscape. Central hubs like Halkalı Merkez and İstasyon are prominent, while older residential areas can be found on the southern side of the district, including Kanarya, Cennet, Yenimahalle, and Sultan Murat. In contrast, the northern side features modern housing developments and recreational spaces, particularly in neighborhoods like Atakent. Therefore, it is expected that access to points of interest varies significantly across neighborhoods (e.g. getting

supplies appears very limited in the lakeside districts). Overall, the analysis shows high walking proximity to leisure, healthcare, and education facilities as well as relatively high proximity to public transport, working facilities and getting supplies reflecting the dense urban fabric of Küçükçekmece as well as its dense public transportation network. Proximity to green spaces is high which is explained by the presence of large recreational parks such as Lagün Park, Göl Sahil Park, and Şeyh Şamil Park and local parks such as Begonya, Günışığı, Rıza Bayat, Cihan Caddesi Park, Ulubatlı Hasan or Nehir. However, greenery and green spaces are very scarce in the built environment. Access to public spaces is also very low (14.5%), demonstrating gaps in accessibility.

4. Lisbon ULL: Alverca do Ribatejo

The Portuguese Living Lab is located in the Union of Parishes of Alverca do Ribatejo, part of Vila Franca de Xira near Lisbon. Alverca do Ribatejo has residential, commercial and industrial areas linked by transport corridors. The national A1 highway crosses the municipality and divides the residential area. The side closer to the river is characterized by a higher concentration of industrial zones, while the opposite side presents more agricultural areas. The main services concentrate in two different urban areas, where previously there were two different parishes. The area is characterised by different urban patterns from mid-density (small apartment block) to low-density developments (detached and semi-detached housing).



Figure 15: Alverca do Ribatejo urban landscape

Identified challenges:

- Spatial segregation along railway and road infrastructures
- Limited internal mobility within the municipality, lack of connections between commuter rail stations and residential areas
- Limited access to services due to concentration in two different urban areas which used to be two different parishes
- Limited active mobility infrastructure

Identified opportunities:

- ✓ Political interest in sustainable mobility and community well-being.
- ✓ The municipality is currently working on regeneration projects in key areas, including the riverfront and the town centre, and is considering measures to improve the quality of public spaces and transport accessibility, particularly for young people and vulnerable groups.

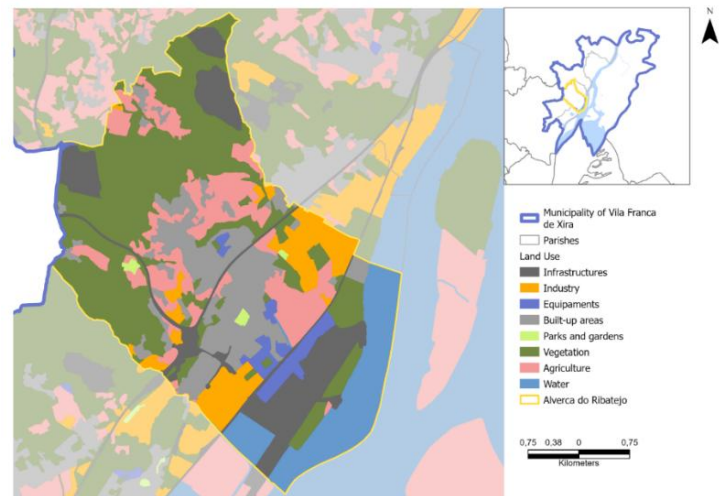


Figure 16: Union of Parishes of Alverca do Ribatejo and Sobralinho's Land Use

Proximity analysis results

- **Relatively low** walking access to public transport (57%)
- **Low** walking proximity access (below 50%) to all POIs (figures 16 & 17 below, 'Getting supplies': 26.8%; 'Enjoying': 42%), to public spaces and green spaces

Public transportation & mobility offers

- Two main train stations (Alverca and Vila Franca de Xira) are particularly important transport hubs. Three lines provide connections to Lisbon and other municipalities in the metropolitan area of Lisbon.
- Intercity and urban bus services: 16 lines in operation including 2 intra-parish, 4 intra-municipality and 10 inter-municipality lines.
- Private scooters-sharing scheme (BIRD)

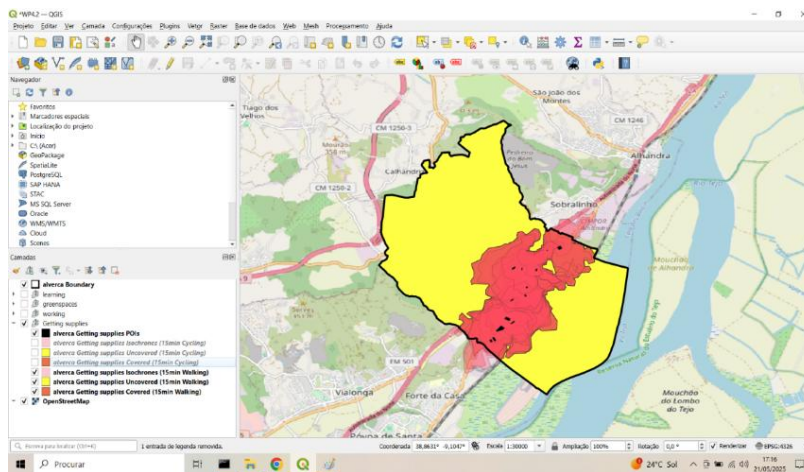


Figure 17: Alverca do Ribatejo - Proximity by walking: Getting supplies

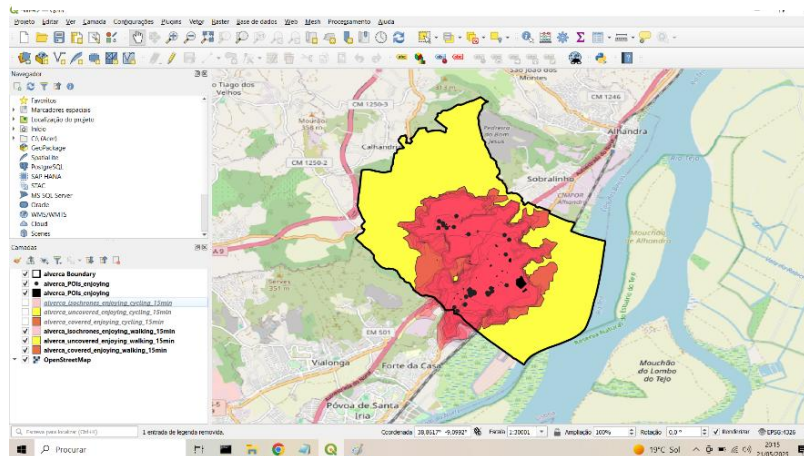


Figure 18: Alverca do Ribatejo - Proximity by walking: Enjoying

The proximity analysis shows less than 50% walking proximity to all points of interest, to public spaces, and green areas. And only 57 % to public transport (bus stops and train stations). This can be partly attributed to the ULL's topography and historical development. Alverca includes a large, forested area without road access, which likely contributes to the low proximity access percentages, as calculations are based on the total area. Additionally, the presence of a major spatial barrier, the A1 motorway cutting through the residential zone—and the division of services between two formerly separate parishes further limit accessibility.

5. Madrid ULL: Las Rozas

Las Rozas is a low- to mid-density municipality located 20 km northwest of Madrid, with around 98,590 residents. It has grown through car-dependent urban sprawl and features major commercial hubs as well as a business park. The Living Lab area includes the historic centre and two newer residential zones—Burgo-Centro/Cornisa/Yucatán and La Marazuela—separated by highways and railway lines.

Las Rozas has a higher income (on average) than in the metropolitan area and has experienced a quick increase in population and a rapid sprawl-like expansion in recent years. In terms of mobility, many trips are done to/from other municipalities like Madrid or other neighbouring ones. At the same time, the serious spatial barriers caused by transport infrastructure in addition to the long distances caused by the low-density development in the newer areas act as a barrier for sustainable mobility.



Figure 19: Las Rozas urban streetscapes

Identified challenges:

- Spatial barriers and segregation aggravated by 3 main highways running through Las Rozas
- Limited active mobility infrastructure
- Rapid population growth and urban expansion
- Limited walking access to train stations
- Threats posed by actual car-use, such as high speed of cars deterring people from cycling. Heavy traffic in places causes delays in public transport service and complicates the implementation of sustainable modes like BRTs to improve accessibility.
- Possible backlash/resistance to traffic calming/ pedestrianisation from local retailers as fears of lower profit

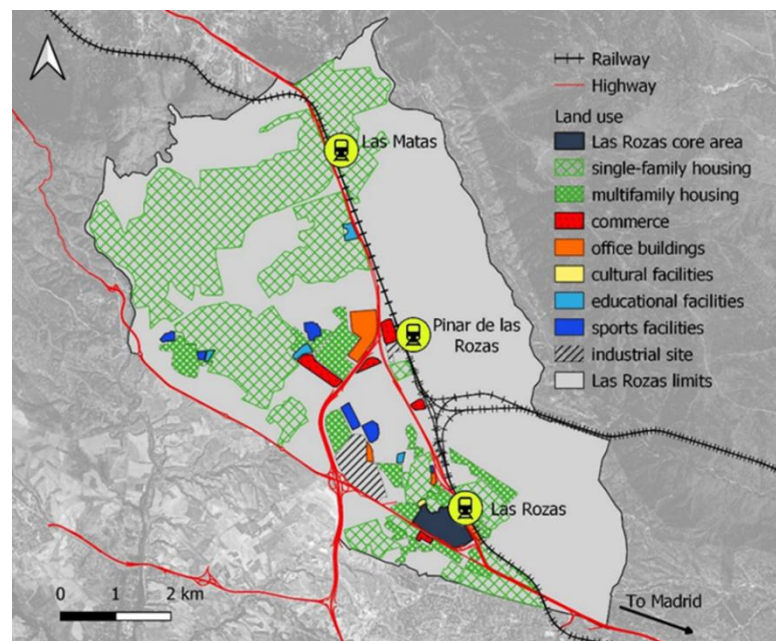


Figure 20: Las Rozas' land use

Identified opportunities:

- ✓ Existing pedestrian areas and new cycling lanes
- ✓ Anticipated positive impact of the existing pedestrian area on commerce
- ✓ Wide range of public transport options
- ✓ Free space which could be reconverted, for example in unused carparks
- ✓ Current LEZ regulation in Madrid and Las Rozas allows work vehicles to enter whatever their label, to impact on workers less negatively

Proximity analysis results	Public transportation & mobility offers
• High walking proximity to green spaces (78%) • Relatively high walking proximity (above 50%) to enjoying, caring/being healthy and learning POIs • Low walking proximity to train stations (11%), public spaces (8.6 %, Figure 21) working (37%) and getting supplies (35%, Figure 20) POIs	• 3 commuter rail stations with four lines that provide connections to Madrid and other municipalities in the Community of Madrid. • 15 intercity bus lines, most of which provide a connection to Madrid, and 2 others to the hospital in Majadahonda and Pozuelo. • 24 other layover lines that pass through Las Rozas • Nighttime bus service • Car sharing services (Car2Go and Zity)

The proximity analysis shows good walking proximity to green spaces (78%) and relatively good access to leisure, healthcare, and educational facilities. However, Las Rozas faces significant accessibility gaps to train stations (11%), public spaces (8.6%), workplaces (37%), and supply-related services (35%). The proximity results reflect the urban development pattern of Las Rozas, where services and amenities are primarily concentrated in the more compact historic centres, marked by a mix of housing, local shops, and public services. In contrast, further out, areas like Monterrozas and Punta Galea consist mainly of residential developments with lesser accessibility to key POIs due to long distances resulting from low density and the presence of spatial barriers.

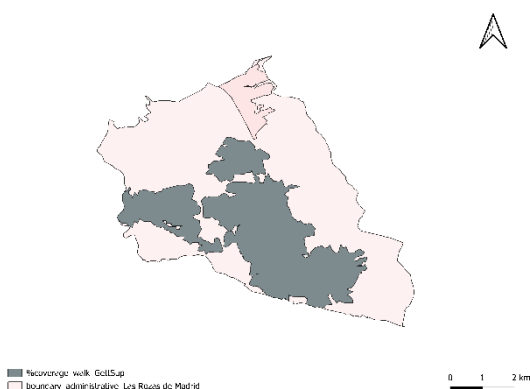


Figure 21: Las Rozas- Proximity by walking: Getting supplies

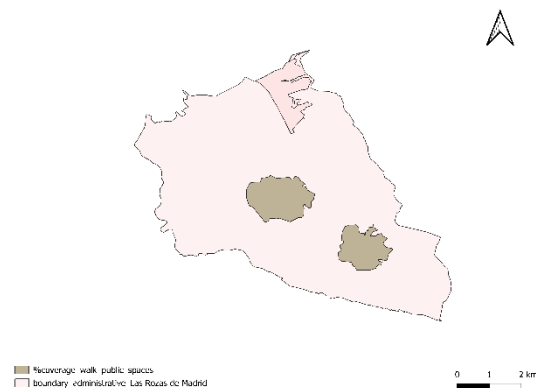


Figure 22: Las Rozas - Proximity by walking: Public Spaces

6. Turin ULL: Settimo Torinese

Settimo Torinese, located about 10 km northwest of Turin, is the third largest municipality in the Turin Metropolitan Area. Spanning 35.6 km², it has a mixed economy based on industry, logistics, and retail, and has become a major shopping destination. Settimo Torinese's historic centre retains traditional street patterns and a mix of residential and commercial spaces, while the surrounding areas consist of planned residential developments and green spaces. The town also has designated commercial and industrial zones, mainly concentrated along major transport corridors, providing employment opportunities and contributing to the local economy.

Settimo Torinese is well connected to Turin via a highway and a regional rail line. A significant number of trips are made between Settimo and surrounding municipalities, especially Turin. However, the heavy reliance on road transport has led to challenges related to traffic congestion.



Figure 23: Settimo Torinese's historical centre and industrial zone

Identified challenges:

- Presence of spatial barriers, such as the highway A4 and railway to the north, the beltway A55 to the southwest, an extensive industrial area and SP11 and Po River to the southeast
- Lack of public transport policy integration (no metro line, no further development of train linkage)
- Traffic congestion due to reliance on cars
- Limited cycling infrastructure and poor last-mile connections with industrial areas where people go to work to (i.e. limited segregated cycling lanes, poor connection with transport hubs)
- Bottlenecks due to multi-level governance and limited funding for local authorities
- Insufficient public expenditure on maintenance of facilities
- Fragmented planning and challenges in terms of integrating proposals into broader urban planning
- Risk of lack of consensus and polarisation with regard to possible interventions

Identified opportunities

- ✓ Optimal number and spatial distribution of schools in the ULL (possible anchor points for multi-functional neighbourhood hubs)
- ✓ Possibility of creating a consensus on the positive impacts of intervention on the environment and health to support other similar projects in the future
- ✓ Existing public consultation processes (12 consultations/forum open to all citizens, discussions with associations (e.g., elderly people), 3 days/year consultations with young people below 25 years old)

Proximity analysis results	Public transportation & mobility offers
• Very high walking (above 85%) proximity to all POIs • Relatively lower walking proximity to public transport (79%, Figure 24) and public space (63%, Figure 23)	• One regional railway line (Stazione di Settimo Torinese) with high frequency (7h/ all directions) • One urban bus line (Urbanino) which operates on weekdays from Monday to Saturday and covers the city centre. The service is managed by GTT and free for users, thanks to funding from the municipality. • Several intercity bus lines link Settimo Torinese with neighbouring municipalities (with reduced service on some lines for the winter) • Bus connection to Torino Caselle Airport. • Car sharing system (CinQue) • DRT systems: Settibus, MeBUS

The analysis for the ULL in Settimo Torinese demonstrates high walking accessibility to all key points of interest. However, it shows relatively lower access to public transport and public spaces (see figures 22 & 23). The relatively high results can be partly attributed to the analysis being based on the built-up area rather than the official boundaries of ULL. While walking accessibility to most POIs is generally high, the data collected does not capture the quality of pedestrian infrastructure - such as sidewalk width, pedestrian crossings, or accessibility features - nor the overall walking experience. One of the priorities of ULL is to ensure walkability, especially as part of new public space and urban renewal projects. Furthermore, the cycling network remains underdeveloped, with only 16.4 km of infrastructure, highlighting the need for expansion, particularly along provincial roads. Last-mile connectivity to key employment areas, including industrial zones, is also insufficient, due to the lack of segregated bike lanes and poor integration with train stations.

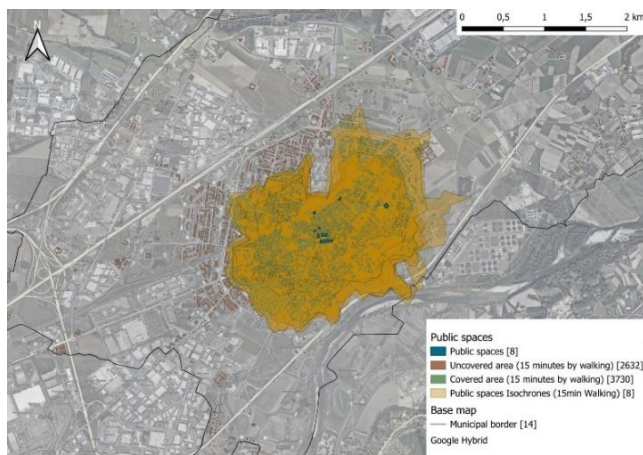


Figure 24: Proximity to public spaces by walking in Settimo Torinese

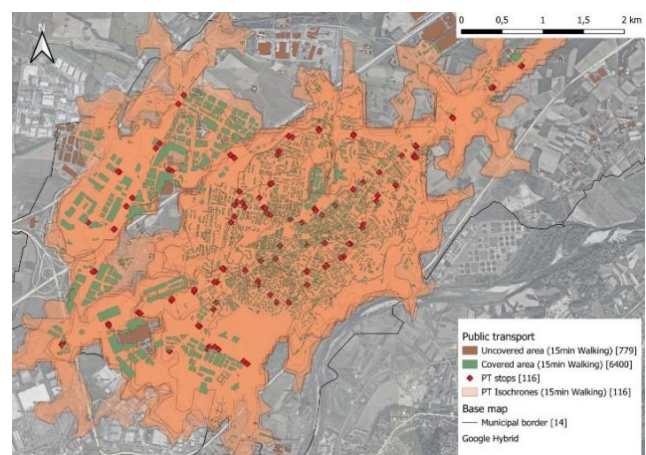


Figure 25: Proximity to public transport by walking in Settimo Torinese

Cross sectional analysis

The heatmap below offers a concise overview of the information presented in the previous sections, covering demographic, land use, socio-economic and mobility indicators². It uses a colour scale (light blue for the lowest values and dark blue for the highest) to compare ULLs within each category, illustrating their relative position in each indicator. It highlights significant differences in population, density, green space, transport mode share, and socio-economic factors, illustrating the diversity of urban living lab profiles within FORTHCOMING and thus the difficulties of drawing meaningful comparisons across the six locations. The next sections will discuss the different indicators in more depth.

	Popula- tion	Surface area	Density	Land cover: Built-up area	Land cover: Forest or semi- natural	Land cover: Crop- land	Land cover: Water & wetland	Built up surface per capita	Green space per capita	Residential built-up surface growth	Non- residential built-up surface growth	Unem- ployment rate (15- 64)	Foreign born population	Motori- sation rate	Share of car traffic in modal split	Share of public transport in modal split	Share of active modes in modal split
Kertváros																	
Lurup																	
Küçükçek mece																	
Alverca do Ribatejo																	
Las Rozas																	
Settimo Torinese																	

Figure 26: Heatmap of ULLs by key dimensions of analysis

² The data used for the cross-sectional analysis varies according to availability and the administrative level of the ULLs. Please note that for the categories:

- Land cover, built-up/green space per capita, unemployment, foreign-born population: Hungarian data refers to Debrecen as a whole.
- Residential and non-residential built-up surface growth: Hungarian, German and Portuguese data cover respectively Debrecen, Hamburg and Vila Franca de Xira.
- Motorisation rate: Portuguese data refers to Vila Franca de Xira.
- Modal split: Hungarian data refers to Debrecen; German data covers Altona District as a whole.

Otherwise, the figures are based on the geographical boundaries of the ULLs.

Governance & key objectives of ULLs

To begin with and to contextualise the comparative analysis, this first sub-section highlights the administrative and governance structures within which the six ULLs in FORTHCOMING operate as well as their common and differing strategic priorities.

Firstly, it is important to note that each ULL is embedded within a distinct and often complex governance structure, which in turn shape funding allocation, policy priorities, decision-making processes, as well as the implementation of urban initiatives on the ground.

ULLs		Administrative level	Relevant authorities
Kertváros	Sub-district (neighbourhood) of the city of Debrecen	- Hajdú-Bihar County - Debrecen City (with county rights) - Neighbourhoods (no political or administrative powers)	Ministry of Construction and Transport, Hajdú-Bihar County DKV Debrecen Transport Ltd City of Debrecen
Lurup	Sub-district (quarter) of Altona District which is itself an urban borough of Hamburg	- City state of Hamburg 7 Urban boroughs 104 quarters (no political or administrative powers)	Federal Ministry for Housing, Urban Development and Building (BMWSB) Federal Ministry for Digital and Transport (BMDV) Urban Development & Housing Hamburg (BSW) Hamburg Authority for Transport and Mobility Transition (BVM) District Office of Altona
Küçükçekmece	Municipality (Küçükçekmece Municipality) and district of the Istanbul Province	- Istanbul Province 39 District Municipalities	Ministry of Environment, Urbanization, and Climate Change Ministry of Transport and Infrastructure Turkish State Railways (TCDD) Istanbul Metropolitan Municipality (IMM) Küçükçekmece Municipality (Planning and Implementation Departments)
Alverca do Ribatejo	Sub-district (civil parish) in the municipality of Vila Franca de Xira which itself is a city in the Lisbon District	- Lisbon metropolitan area (AML) - Lisbon District 18 municipalities 118 civil parishes	Ministry of Infrastructure and Housing Ministry of Environment and Climate Action Lisbon Metropolitan Area Vila Franca de Xira City Council
Las Rozas	Municipality (Las Rozas City Council), part of the autonomous community of Madrid	- Autonomous community of Madrid 40 municipalities	Ministry of Housing and Urban Agenda Ministry of Transport, Mobility, and Urban Agenda Community of Madrid Madrid Regional Transport Consortium (CRTM) Las Rozas Innova (Public Innovation Company) Las Rozas City Council
Settimo Torinese	Municipality (Settimo Torinese City Council), part of the Metropolitan City of Turin	- Piedmont Region - Metropolitan City of Turin (former province of Turin) 118 communes	Ministry of Infrastructure and Transport Ministry of Ecological Transition Ministry of Culture Agenzia della Mobilità Piemontese (AMP) Piedmont Region Settimo Torinese City Council

Table 2: Administrative levels and relevant authorities per ULL

Table 2 highlights the administrative levels and governance structures of the six ULLs, reflecting their differing positions within national and regional systems. Küçükçekmece, Las Rozas, and Settimo Torinese function as

municipalities of their own, a priori granting them greater autonomy and control through city councils. In contrast, Kertváros, Lurup, and Alverca do Ribatejo are sub-districts within larger cities or municipalities, meaning that they operate with more limited or no administrative powers and depend on higher levels of governance for decision-making. The types of authorities involved in terms of urban planning and mobility related decisions also vary between ULLs, involving multiple authorities at city, regional, and national levels.

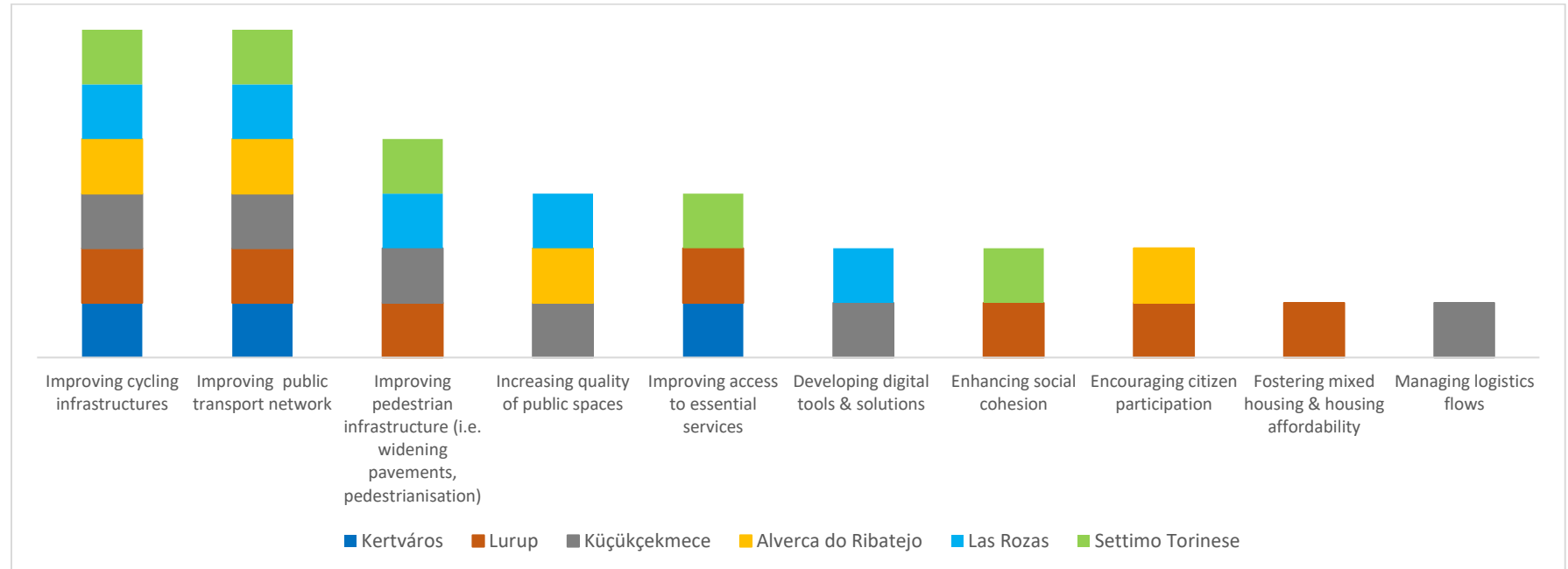


Figure 27: Key strategic objectives per ULL.

While the six ULLs share key strategic objectives to foster sustainable and active mobility in their territory, they approach it with varying emphases (see Figure 25 and Appendix 2). For instance, Kertváros places a strong focus on cycling, with plans to expand the network and introduce a shared bike system, while Settimo Torinese puts pedestrians at the heart of its urban planning by making walkability the top priority in public space and renewal projects. Objectives to improve multimodality are shared across the board but particularly evident in Kertváros, Küçükçekmece, and Las Rozas, where better integration between different transport modes is a key goal. Improving public transport connections both within and beyond the local area is another common objective: Lurup aims to strengthen links between its sub-districts and key services, while Las Rozas focuses on improving access to neighboring municipalities. Finally, improving urban space quality is another shared goal across the six ULLs—with a stronger emphasis in Las Rozas

and Küçükçekmece, where improvements to urban spaces and more specifically lighting, greenery, and pedestrian zones are explicitly mentioned in their local strategies.

Some ULLs bring in additional dimensions to their strategic objectives. Alverca do Ribatejo explicitly mentions public consultations and citizen engagement in its objectives. Lurup and Settimo Torinese place a significant emphasis on social cohesion and inclusive urban development, such as promoting mixed housing, social services, and neighbourhood cohesion. Küçükçekmece and Las Rozas have a stronger emphasis on digital innovation and technologies, referring to tools like digital twins, MaaS and real-time transport information systems to manage mobility flows more efficiently. Küçükçekmece's strategic objectives also explicitly highlight logistics and the use of digital technologies to manage traffic flows related to goods and services.

Socio-demographics and land use characteristics

This section will outline and compare the socio-demographic profiles and land use features of the six ULLs in FORTHCOMING.

Table 3 provides an overview of the population size, surface area, and population density for each of the six ULLs. Küçükçekmece is a clear outlier with by far the largest population (792,030) and the highest density (17,977 inhab/km²), indicating intense urban development, with expected pressure on infrastructure, and limited open spaces and greenery in the built environment. Lurup is the smallest in size (6.3 km²) but has the second-highest density (5,952 inhab/km²), suggesting a dense inner-city neighbourhood. Alverca do Ribatejo, Las Rozas, and Settimo Torinese are more moderately populated and less densely built (under 1,700 inhab/km²), indicating a more suburban fabric. Kertváros sits in between in terms of population (70,000) and density (2,539 inhab/km²). Finally, Las Rozas has the largest area (58.4 km²) among all ULLs.

Urban Living Lab	Total Population (inhabitants)	Area (km ²)	Density (inhab/km ²)
Kertváros	70,000	27.6	2,539
Lurup	37,451	6.3	5,952
Küçükçekmece	792,030	37.7	17,977
Alverca do Ribatejo	32,273	19.4	1,668
Las Rozas	98,590	58.4	1,639
Settimo Torinese	45,693	31.5	1,464

Table 3: Population, Area and Density per ULL

This introductory overview is largely supported by the indicators related to land cover distribution (Figure 26), built-up surface per capita (Figure 27), and green area per capita (Figure 28).

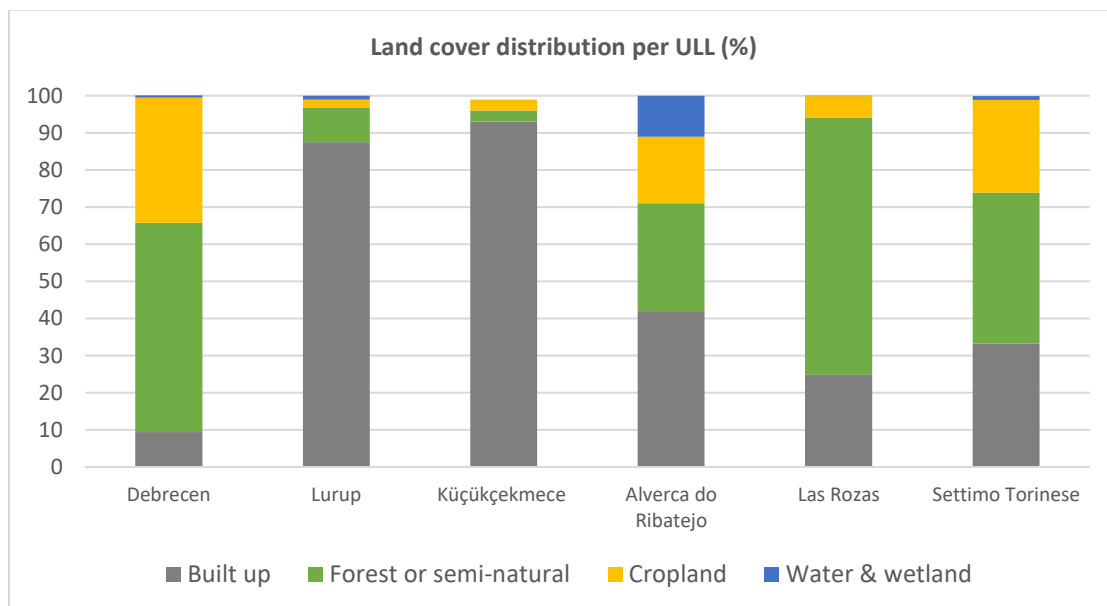


Figure 28: Land cover distribution per ULL.

Both Lurup and Küçükçekmece are highly urbanised. Lurup, a district in Hamburg, is 87.5% built-up, with minimal forest (9.2%) and almost no cropland. Küçükçekmece, a district in Istanbul, is even more urban, with

93% residential land use and very limited natural or agricultural land remaining (6% of forest, agriculture, and green areas).

Las Rozas and Settimo Torinese present moderate built-up ratios (24.8% and 33.3%), combining built space with significant green or agricultural zones (e.g. the forested Natural Area of Lazarejo for Las Rozas, Parco del Po Piemontese for Settimo Torinese). Alverca do Ribatejo shows a balanced ratio (42%), mixing urban, natural, and wetland areas. Additionally, water and wetlands account for 11%, the highest among all locations which is explained by the presence of Tagus Estuary Nature Reserve, within the municipality's boundaries.

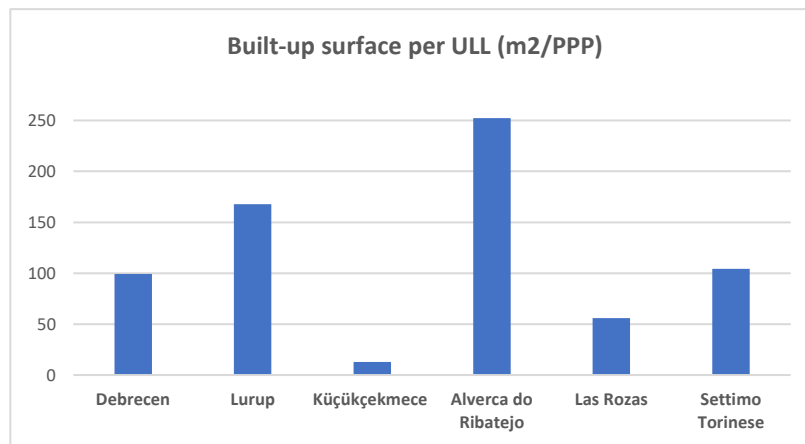


Figure 29: Built-up surface per ULL (m²/PPP)

Alverca do Ribatejo offers the most generous space per person (252.4 m²/PPP), reflecting spacious development and low urban density. Lurup and Settimo Torinese follow, with 167.9 and 104.3 m²/PPP, respectively. Debrecen (99.2 m²/PPP) and Las Rozas (56 m²/PPP) fall in the mid-range. By contrast, Küçükçekmece has only 13 m²/PPP, the lowest, confirming high urban compaction and very limited space per person in the built environment.

Alverca do Ribatejo, Las Rozas, and Settimo Torinese offer significantly more green space per capita than their core cities, reflecting the more spacious, lower-density character of their suburban environments. Lurup, however, shows the opposite trend, with the core city offering more green area per capita (268.9 m²) than the ULL (31.8 m²). Istanbul and Küçükçekmece present an overall deficit in green spaces in both core and ULL. In Küçükçekmece, this is mitigated by the presence of large recreational parks such as Lagoon Park, Göl Sahil Park, and Şeyh Şamil Park and local parks such as Begonya, Günişiği, Rıza Bayat, Cihan Caddesi, Ulubatlı Hasan or Nehir.

Debrecen, which includes Kertváros, is characterized by a predominantly natural landscape, with forest or semi-natural areas covering 56.4% and cropland at 33.7%, making it the most rural in profile among the six. It also stands out with a very high amount of green space per capital (1,302 m²/capita). This is largely explained by the fact that the data for all three indicators (land distribution, built up area and green area) encompasses the whole city i.e. a large area of approximately 460 square kilometres which contains vast uninhabited land around the core area. More precisely, it is only known that Kertváros forms a green belt around the central area of Debrecen, and, except for its northern section, is in proximity to the Great Forest (Nagyerdő) suggesting good access to natural areas and green spaces.

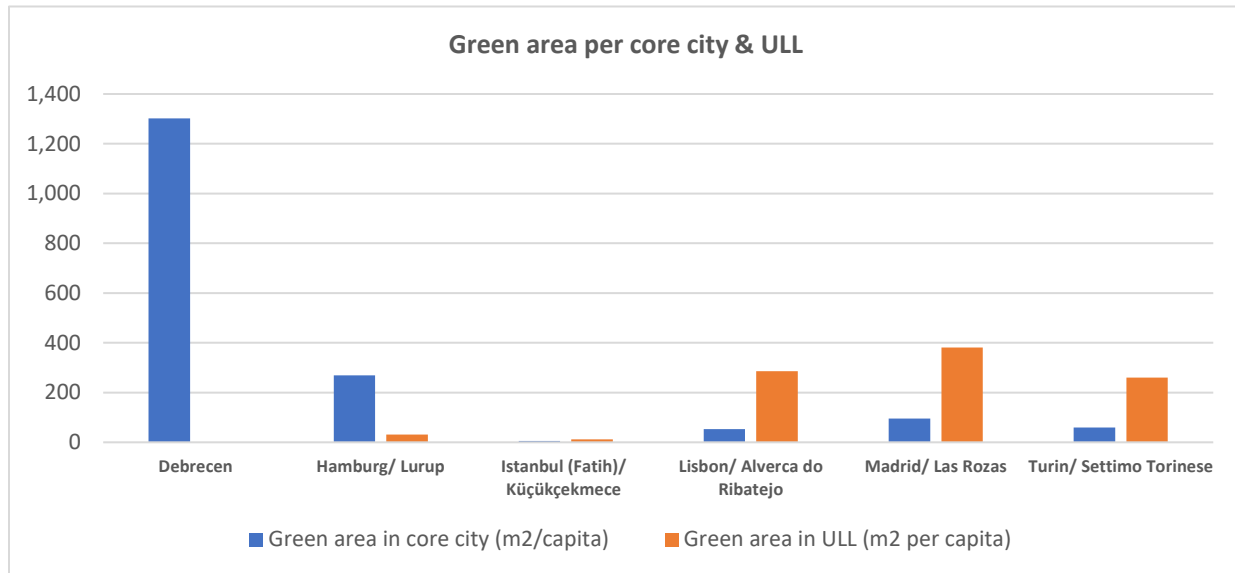


Figure 30: Green area per core city & ULL

Figure 29 shows the residential and non-residential growth from 2010 to 2020 for each ULL, or for the core city when specific ULL data is unavailable. Las Rozas (ULL) leads in residential growth (10.2%) among all ULLs, with also significant non-residential growth (7.3%), indicating a dynamic suburban development pattern. Las Rozas has experienced rapid growth, more than doubling its population since 1996 (a 117% increase) and expanding its population by 2.6% in the last five years. This population growth, combined with the presence of business and industrial parks accommodating offices, technology firms, and light industries in Európolis and Pinar de Las Rozas explain the municipality's notable urban development.

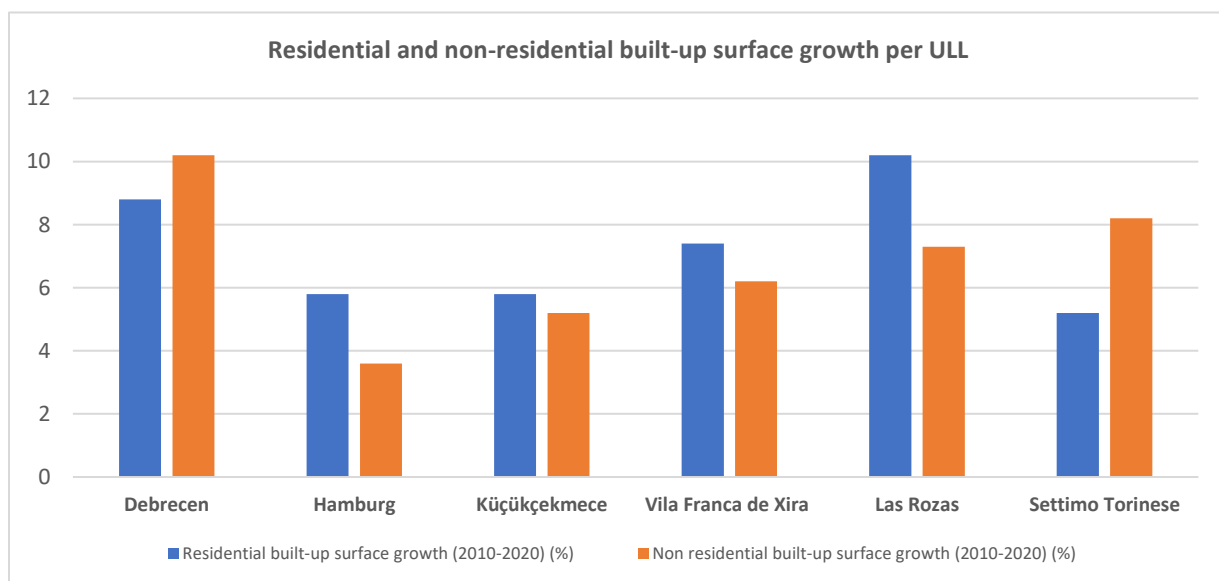


Figure 31: Residential and non-residential built-up surface growth per ULL

Settimo Torinese shows the highest non-residential growth among ULLs (8.2%), while residential growth is lower (5.2%). In recent years, the municipality has seen significant urban expansion, marked by both residential growth and an increase in industrial and commercial activities. Hosting several factories, logistics hubs, and retail centers, Settimo Torinese has established itself as a significant employment hub within the metropolitan area and has recently emerged as a prominent shopping destination. This development trajectory is consistent with its strong non-residential growth.

Alverca do Ribatejo shows relatively balanced growth—7.4% residential and 6.2% non-residential, suggesting a controlled yet dynamic urban development. This can be explained by political decisions and reflected in the local urban strategic plan ‘The Municipal Master Plan of Vila Franca de Xira,’ approved in 2024, which places significant emphasis on sustainable territorial management and on seeking a balance between urban growth and environmental preservation.

Küçükçekmece presents slightly lower growth (5.8% residential, 5.2% non-residential) than other ULLs, reflecting its existing highly built and dense urban environment. Küçükçekmece’s growth is characterized by a rapid increase in population, the construction of new residential areas and housing projects (e.g. Halkalı Housing Project), and the development of industrial zones facilities (e.g. İkitelli Organized Industrial Zone).

Finally, concerning core cities (when data is not available for ULLs), Debrecen shows the highest overall growth in both residential (8.8%) and non-residential (10.2%) areas. This is explained by significant population growth in the past years as well as the development of education and industrial sectors— including the new factories of BMW and CATL on the peripheries. In contrast, Hamburg’s shows more modest growth, particularly in non-residential areas (3.6%), suggesting a more controlled urban development.

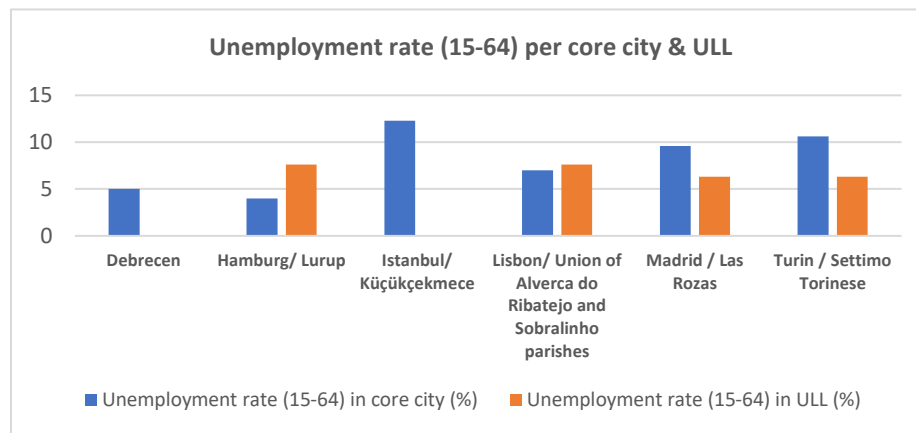


Figure 32: Unemployment rate per core city & ULL

With regards to socio-economic indicators, Figure 30 shows the unemployment rates for individuals aged 15-64 in each core city and their respective ULL. Debrecen and Hamburg’s core cities have relatively low unemployment rates, at 5% and 4% respectively, indicating stronger labour market conditions than in

other case-studies. However, Hamburg’s ULL, Lurup, has a substantially higher unemployment rate (7.6%), suggesting disparities between the central city and the ULL. Lisbon and its ULL areas have similar unemployment rates around 7%, indicating a more homogenous labour market. Madrid and Turin both show higher unemployment rates in their core cities (9.6% and 10.6%, respectively) compared to their ULLs (6.3% for both), highlighting better employment opportunities outside the central city areas. In both Settimo Torinese and Las Rozas, the median disposable income is higher than in the core cities with a very significant difference in Las Rozas which has a median disposable income substantially higher (51 484 USD PPP) than

in Madrid (34,966). Finally, Istanbul's core city is an outlier with the highest unemployment rate at 12.3%, reflecting more significant employment challenges.

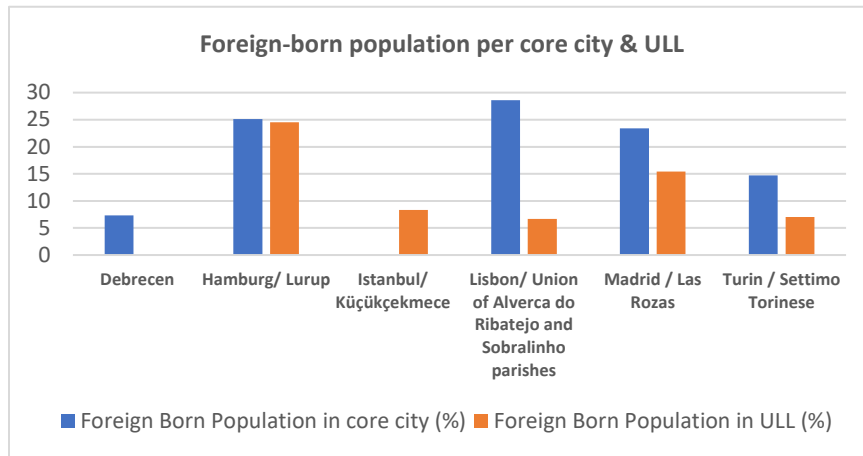


Figure 33: Foreign-born population per core city & ULL

Lastly, Figure 31 compares the percentage of foreign-born population in the core cities and their respective ULLs. In Hamburg and Lurup, the foreign-born population is relatively high which suggests that both the core city and its ULL have a diverse demographic profile, with a significant proportion of residents born outside the country. Furthermore, Lurup, when compared to other

districts in Altona, portrays a rather distinct demographic profile, with a larger population of children and foreigners, lower income, and a younger population.

In Lisbon/Alverca do Ribatejo, there is a significant gap between the foreign-born population in the ULL compared to the core city, indicating a higher concentration of foreign-born residents in central urban areas. Turin/Settimo Torinese and Madrid/Las Rozas show a more moderate gap.

Finally, according to an analysis conducted between 2018 and 2019, Küçükçekmece is home to 66,801 foreign-born people, which constitutes 8.33% of the total population in the area. No specific data is available for Kertváros; however, Debrecen stands out for having notably low levels of foreign-born population as a core city.

Mobility & Public Transport Infrastructure

This section provides an overview of the mobility patterns and public transport infrastructures in each ULL.

Figure 30³ presents the modal split for each core city and its corresponding ULL. Modal split refers to the percentage distribution of trips made using different types of modes (i.e. using private vehicles, walking, cycling, using public transportation) within a given area and period.

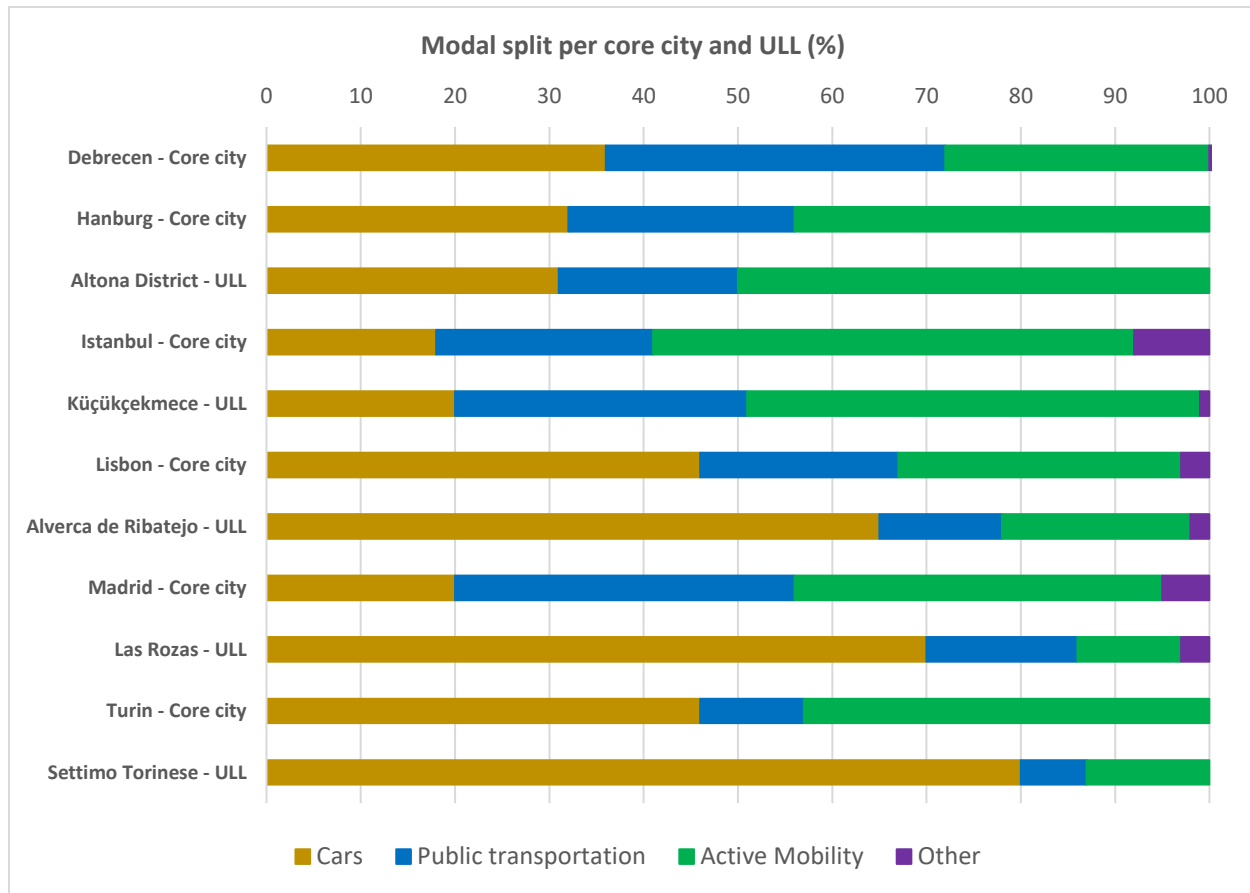


Figure 34: Modal split per core city & ULL

In Madrid, Turin, and Lisbon, the shift between the core city and ULL is particularly stark: car usage jumps from 20% to 70% in Las Rozas, 46% to 80% in Settimo Torinese, and 46% to 65% in Vila Franca de Xira (the broader parish of Alverca Do Ribatejo), indicating high car dependency. This is confirmed by the high motorization rates observed in these ULLs—650 vehicles per 1,000 people in Settimo Torinese, 609 in Vila

³ The scope of *active mobility* data varies across ULLs. In Debrecen, it includes both walking and cycling (not distinguished in the SUMP), while in Küçükçekmece, Alverca do Ribatejo, and Las Rozas it covers only walking, with cycling listed as *other*. Altona and Settimo Torinese report separate figures: 28% walking and 22% cycling in Altona, and 10% walking and 3% cycling in Settimo Torinese.

Franca de Xira, and 537 in Las Rozas, respectively. Correspondingly, public transport and active mobility see significant declines in these ULLs.

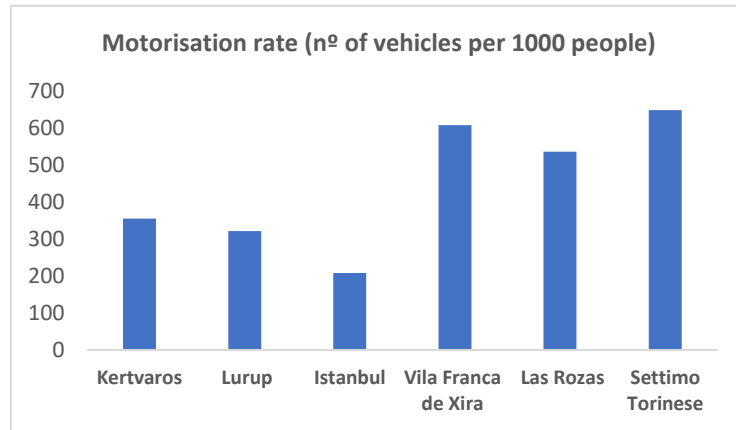


Figure 35: Motorisation rate per ULL

Hamburg and the broad area of the ULL (i.e. District Altona) have a high share of their modal split dedicated to active and sustainable mobility. In the core city, active mobility (walking and cycling) makes up 44% of trips, rising to 50% in Lurup. Meanwhile, car use remains low, at 32% in the core and 31% in the ULL, indicating limited car dependency. Public transport, while still relevant, accounts for a smaller share in the ULL (19%) compared to the core (24%), likely due to

fewer transit connections. This is also reflected in the low motorisation rate (the lower of all ULLs) of Lurup (322 vehicles per 1,000 people) likely due to relatively good public transit and to the compact urban design of the neighbourhood.

Car use in Istanbul is relatively low (18%) and only slightly increases in the ULL (20%). It is worth keeping in mind that the motorisation rate in Istanbul is low (209 vehicles per 1,000 people) compared to Western European countries². Furthermore, public transportation is more prominent (31%) Küçükçekmece likely due to the presence of major transit corridors like the Metrobus line.

Debrecen has a balanced modal split, with equal reliance on cars and public transport, and active mobility. The data on the modal split for Kertváros is not available. Kertváros has a relatively low motorisation rate (356 vehicles per 1,000 people) in comparison to other ULLs, in line with Hungary's overall lower motorisation trend in the EU⁴. However, it is important to note that Debrecen has shown dynamic growth of private car traffic in recent years, with the number of vehicles per thousand inhabitants reaching 419.5 in 2022 with an increase of 75 cars per thousand inhabitants in five years and is expected to further grow.

None of the six ULLs currently offer a fully integrated MaaS application—that is, a digital platform that combines all mobility services, including public transport, micromobility, car-sharing, and ride-hailing, into a single interface that enables users to plan, book, and pay for multimodal journeys. Lurup has a relatively well integrated application (i.e. [HVV Switch app](#)) providing integrated ticketing for all public transport services except privately operated schemes (micro-mobility and car sharing). In Küçükçekmece, the [İstanbulKart app](#) allows users to pay for public transport, while in Alverca do Ribatejo and Las Rozas, tickets for all public transport modes can be purchased through the [CARRISway](#) and [My Transport](#) apps, respectively. Settimo Torinese offers an app with integrated access, but it primarily redirects users to third-party operator apps rather than delivering full integration. Debrecen, by contrast, does not currently provide an integrated app, however all public transport providers offer digital passes, and regional providers also have digital tickets.

⁴ <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240506-2>

Proposed measures

After the set-up of the ULLs (D4.1), representatives of each ULL proposed a set of measures to test and replicate in order to adapt the 15-minute city model to the unique local contexts and challenges of their ULLs which were described in detail in the previous sections. These measures will undergo a replicability assessment in WP5 and will be evaluated by relevant local stakeholders, including citizens, in WP6.

Kertváros		1. Extension of cycling network and enhancement of safety of existing infrastructure. The current bicycle network consists mainly of single radial tracks. The aim of the measure would be to connect them and provide connectivity between Kertváros and the city center as well as to provide a safe and suitable environment for cyclists with dedicated bike lanes and signs. 2. Deployment of shared micro mobility systems (e.g. shared bikes). The planned bike-sharing system would be station based with mostly traditional bikes. It will be tried first in a small area first covering the city center and the borders of Kertváros (including a train station).
Lurup		1. Deployment of one or several multifunctional neighbourhood hubs which include other social services 2. Educational ribbon: connecting the local educational facilities with each other and with the transportation network via green, safe and attractive routes – focused on active mobility 3. Strengthen multimodal transport links between sub-district centres by connecting mobility hubs through efficient and reliable public transport/ active mobility services and via green, safe and attractive routes. 4. Improvement of public transportation connections with neighbouring municipalities with a focus on new bus lanes/ stops, higher frequency of services, prioritisation of public transport (e.g. segregated lanes, smart traffic lights)

Küçükçekmece		1. Planning logistics flows: The focus will be on identifying inefficiencies or gaps in last-mile delivery. This includes mapping delivery hotspots, traffic congestion caused by freight vehicles, and existing infrastructure for logistics. The analysis will explore the potential for micro-consolidation centres and low-emission delivery alternatives by evaluating spatial, economic, and regulatory constraints. 2. Analysing existing pedestrian infrastructures and conditions particularly in suburban or underserved areas of Küçükçekmece. This includes mapping sidewalk widths, pedestrian crossings, accessibility features, and walkability indicators as well as collecting citizen feedback through participatory mapping and mobility surveys to identify barriers and prioritise areas for improvement.
Alverca do Ribatejo		1. Redesign of public squares (Adaptation of a 'Square in Every Neighbourhood' initiative) including creating microcentres that concentrate activities, work and social interaction, prioritising soft modes of transport (pedestrians, bicycles) and public transport, restricting car traffic and reorganising parking.
Las Rozas		1. Improvement of public transportation connections with neighbouring municipalities with a focus on new bus lanes/ stops, higher frequency of services, prioritisation of public transport (e.g. segregated lanes, smart traffic lights) 2. Pedestrianisation of historical centre: reclaiming public space for community, active modes and greenery. 3. Development of educational campaigns in favour of modal shifts from cars to public transport

**Settimo
Torinese**



1. Deployment of **multifunctional neighbourhood hubs** with integrated services including social services
2. Focusing on **pedestrians** first

Table 4: Proposed measures per ULL

Conclusions

The six ULLs within the FORTHCOMING project were selected for their shared suburban characteristics including urban sprawl, car-oriented development, high car dependency, and strong economic linkages to their urban cores. The comparative spatial and demographic analysis of the ULLs highlights these commonalities, particularly the prevalence of car-oriented urban form, while at the same time emphasising their highly diverse urban profiles.

Küçükçekmece and Lurup emerge as the most compact and densely built environments while Las Rozas, Alverca do Ribatejo, and Settimo Torinese benefit from lower densities, greater per capita space, and more balanced integration of natural and built environments. Kertváros occupies a unique position as a green belt around the core area of Debrecen. Urban growth trajectories further differentiate the ULLs: while Las Rozas and Settimo Torinese show strong residential and non-residential expansion linked to economic development, Küçükçekmece and Lurup experience more incremental growth within already saturated built environment. Socio-economic conditions also vary considerably, with disparities in income, unemployment, and the distribution of foreign-born populations adding further complexity to local urban dynamics.

The mobility patterns across the six ULLs reveal marked differences in levels of car dependency and the maturity of sustainable transport systems. In Las Rozas, Alverca do Ribatejo, and Settimo Torinese the high share of their modal split dedicated to car usage—paired with high motorisation rates—reflects a strong reliance on private vehicles and limited alternatives in peripheral areas. In contrast, Lurup and Küçükçekmece stand out for having a relatively low car usage and more balanced modal splits, supported by their compact urban design and developed public transport networks. Debrecen also demonstrates a relatively balanced mobility profile, although rising car ownership trends indicate growing pressure on sustainability goals. Across the six locations, limited infrastructure for walking and cycling is a recurring issue, making active mobility unattractive, unsafe and/or inaccessible. Physical barriers created by highways, railways, and industrial zones further disconnect communities in Lurup, Alverca do Ribatejo, Las Rozas, and Settimo Torinese. Finally, despite efforts in digital mobility, none of the ULLs has yet achieved a fully integrated MaaS (Mobility-as-a-Service) platform, highlighting a significant gap in delivering seamless multimodal travel experiences.

The strategic objectives of the six ULLs reflect a shared ambition to foster more sustainable and active mobility, yet each ULL tailors its approach to local priorities, spatial contexts, and community needs. Unsurprisingly, goals such as improving multimodality, enhancing public transport connectivity, and upgrading urban space quality are broadly aligned. Specific emphasis is put on cycling infrastructures in Kertváros, pedestrian infrastructures in Settimo Torinese and Küçükçekmece, or urban design and public spaces in Las Rozas and Alverca do Ribatejo or on social inclusion and services in Lurup and Settimo Torinese, revealing different local vision toward more livable urban environments.

Across the six locations, significant opportunities have been identified on which ULLs could build to advance measures to come closer to 15min cities. Kertváros can build on recent cycling infrastructure expansion, low traffic levels, and its commitment to the “small distances” principle. Lurup benefits from ongoing housing and transport improvements and can draw on lessons from the MOVE21 multifunctional hub model. Küçükçekmece has strong transportation network and plans to enhance seaside cycling routes and green public spaces, while also exploring zero-emission logistics through stakeholder collaboration. Alverca do Ribatejo can draw on political commitment to sustainable mobility, with ongoing regeneration projects on the riverfront and town centre aimed at improving public spaces and accessibility for vulnerable groups. Las Rozas can expand its pedestrian areas and cycling network and leverage its extensive public transport system. Finally, Settimo Torinese has well-distributed schools as potential anchors for multifunctional hubs,

and active public consultation processes providing opportunities to build consensus around the environmental and health benefits of interventions.

The analysis presented in this deliverable underlines the diversity of urban living lab profiles within FORTHCOMING, emphasising the importance of place-sensitive approaches when adapting, replicating, and evaluating urban mobility and sustainability strategies aligned with the goals of the 15-minute city across the different ULLs. These findings will contribute both to the transfer methodology developed in WP5 and to the multi-stakeholder impact assessment carried out in WP6. Together, these elements will lay the foundation for the project's main legacy report: *15minute City Implementation Guidebook for Suburban Areas*' (Deliverable 6.2).

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Appendices

Appendix 1: Dimensions of 15mC, adapted for FORTHCOMING

Proximity refers to the spatial and temporal accessibility to opportunities related to transportation, employment, healthcare, education, entertainment, access to green spaces, and retail for every resident through active or sustainable transportation modes. These opportunities are associated with various catchment areas, which include various types of amenities, each with a hierarchy and a level of relevance based on the user's preferences, and the scale can vary, encompassing neighbourhood, city, or metropolitan levels.

Inclusiveness refers to addressing everyone's needs and experiences in relation to the opportunities offered by the 15mC, regardless of economic means, age, gender, disability, diversity, race, or ethnicity. Mobility justice, accessibility, social cohesion, and participatory decision-making are at the heart of inclusiveness as well as assessing cautiously the risks of exclusion and gentrification.

Density & land-use are viewed in terms of mixed land use in a built environment (e.g., retail, residential, offices, leisure & green spaces, etc.), where the number of people in a given area can comfortably sustain the urban service delivery, opportunities, and resources. In the context of FORTHCOMING which focuses on urban outskirts, density is the most difficult pillar to achieve and leverage.

Digitalisation refers to the enabling of the proximity, diversity, and density's dimensions using digital technology (such as smart city management tools, digital twins, end-user applications). Digitalization should facilitate and ensure equal access for all individuals while considering privacy concerns.

Appendix 2: ULL relevant local strategies

ULLs	Local strategies
Kertváros	Expanding cycling networks and enhancing safety of existing infrastructure Developing shared micromobility systems Improving public transport speed and comfort, improving intermodality of transport Creating decentralized urban centres
Lurup	Traffic calming, noise reduction, street redesign for active mobility, and traffic modal-filter to improve residential life quality and increase the modal share of active and public transportation. Encourage mixed housing types and social balance in housing development to promote inclusive neighbourhoods and affordable housing. Expanding public and active transportation network to strengthen the link between sub-districts, schools, and essential services Creation of social, sports, and cultural focus points to strengthen social cohesion, cultural integration, and participation and promote inclusive neighbourhoods. Improving cycling infrastructure, reducing car dependency, and promoting cycling Enhancing walking infrastructure, reducing travel distances
Küçükçekmece	Establishing new cycling routes, increasing the bicycle network (10 km proposed), establishing bicycle parking areas within educational facilities. Widening pedestrian routes, pedestrianization, constructing “prestige roads” to include different types of transportation modes. Optimisation of public transport stations, transportation hub renovation, New metro/bus/sea transportation lines. Create a higher quality and more accessible urban space: widen sidewalks, incorporate green areas, more lighting, etc. Promoting pedestrianization and creating new squares. Feasibility analysis of digital twins. Analysing MaaS applications for multimodal transportation. Intermodal logistics applications within 15-minute area.
Alverca do Ribatejo	Incentivize public transport and active modes Expanding the public transport infrastructure Enhancing cycling infrastructure and redesigning urban space Public consultations and inquiries Urban regeneration
Las Rozas	Improve the quality and accessibility of urban public space (widen the sidewalks, add green areas, better lighting) Improve cycling infrastructure (cycle lanes & bike parking) Improve bus stops (rain/sun protection, seats, real-time info) Create a multimodal transport station to facilitate interchange between modes. Create a travel app integrating all available transport modes and providing real-time info about public transport Collaborative initiatives to manage kids’ mobility (shared trips by walking/cycling) Improve the connection by public transport with neighbouring municipalities Improve the connection by public transport with Madrid
Settimo Torinese	Put pedestrians first: the walkability of the city as the top priority of any public space and urban renewal project. Building cycling infrastructure along provincial roads Operate the DRT service with rental services with driver The multi-functionalisation of public buildings (schools, sport facilities, etc.) as the hubs of social services and engines of urban regeneration

Table 5: ULL relevant local strategies

Appendix 3: Detailed overview of data collected

Theme	Data	Units	Sources ²
Demographic & socioeconomic characteristics	Total population	Inhabitants	National Institute for Statistics 2024 ¹ , Statistik Nord 2023 ² , BGRI 2021 ³ , ISTAT 2024 ⁴ , Endeksa 2025 ⁵ , Debrecen Integrated Urban Development Strategy ⁶
	Median Age	Years	National Institute for Statistics 2024 ¹ , Statistik Nord 2023 ² , ISTAT 2024 ⁴ , Endeksa, 2025 ⁵
	Age distribution	Percentage	OECD Local Profile Database ^{1,3,6} , Statistik Nord 2023 ² , ISTAT 2024 ⁴ , Endeksa 2025 ⁵
	Sex ratio	Number of males per 100 females	OECD Local Profile Database ^{1,5,6} , Statistik Nord 2023 ² , BGRI 2021 ³ , ISTAT 2024 ⁴
	Foreign born population	Percentage	OECD Local Profile Database ^{1,6} , Statistik Nord 2023 ² , INE 2021 ³
	Mean disposable income	USD/PPP	OECD Local Profile Database ^{1,5} , ISTAT 2023 ⁴ , OECD Data Explorer ⁶
	Social Inequality	Gini Coefficient	OECD Local Profile Database ¹ , ISTAT 2023 ⁴ , Turkish Standards Institute 2024 ⁵ , World Population Review ⁶
	Unemployment rate	Percentage	OECD Local Profile Database ¹ , Statistik Nord 2023 ² , INE 2021 ³ , Hungarian Statistical Office ⁶
Urban planning & land use	Area	Km ²	OECD Local Profile Database ^{1,4,6} , Statistik Nord 2023 ² , BGRI 2021 ³ , Istanbul Municipality ⁵
	Density	Inhab/km ²	OECD Local Profile Database ^{1,2,4,6} , BGRI 2021 ³ , Endeksa 2025 ⁵
	Land cover distribution	Percentage	OECD Local Profile Database ^{1,4,6} , Esri Living Atlas 2024 ² , COS 2018 ³ , Land Cover Analysis ⁵
	Total built-up area ratio	Ratio of the total built-up area (residential, commercial, industrial, etc.) to the total land area, expressed as a percentage	OECD Local Profile Database ^{1,4,6} , Esri Living Atlas ² , COS 2018 ³
	Built-up area	m ² /capita	OECD Local Profile Database ^{1,4,5,6} , Aino ² , COS 2018 ³
	Residential and non-residential built-up surface growth	Built-up surface growth is computed by comparing the surface of the local area that in 2020 and in 2000 (in %)	OECD Local Profile Database ^{1,3,4,5}
	Green area	m ² /capita	OECD Local Profile Database ^{1,4,5,6} , Aino ² , COS 2018 ³
Proximity & mobility infrastructures	Cycling infrastructure	Km	Las Rozas SUMP ¹ , Geodata analysis on Geoportal Hamburg ² , Vila Franca de Xira City Council ³ , Geodata analysis on OSM ⁴ , Geodata analysis on ULASAV ⁵ , Sustainable Urban Mobility Plan 2024 ⁶
	Pedestrian infrastructure	km	Geodata analysis on OSM ^{1,2,4} , Sustainable Urban Mobility Plan 2024 ⁶
	Walking and biking access to public transport	15min at average speed of walking 5.1 km/h and cycling 16 km/h speed	MapBox API* Geodata analysis based on Open Streets Map database ^{1,2,3,4,6}
	Walking and biking access to Green spaces; Blue spaces; Public spaces		*Python script developed for MapBox API by HCU for KPIs calculation

	Walking and biking access to Points of Interest		
	Modal share	Percentage	Las Rozas SUMP ¹ , Geoportal Hamburg ² , Mobility Survey in the Metropolitan Areas of Porto and Lisbon 2017 ³ , IMM ⁵ , Sustainable City Development Strategy 2023 ⁶
	Motorization rate	number of vehicles per 1000 people	OECD Local Profile Database ^{1,6} , Statistik Nord 2023 ² , National Institute of Statistics 2021 ³ , IMM ⁵

Table 6: Overview of data collected for WP4.

¹ Las Rozas

² Lurup

³ Alverca do Ribatejo

⁴ Settimo Torinese

⁵ Küçükçekmece

⁶ Kertváros

Appendix 4: Explanation of Python Script & POI for Proximity KPIs Calculation

Step-by-step explanation of the python script used for the proximity analysis:

In Step 1, the script retrieves the spatial boundary of a specified ULL area (in the exemplar case, the sub-district of Lurup in Hamburg-Altona) using OpenStreetMap (OSM) data accessed through the OSMnx library. It then downloads relevant Points of Interest (POIs) based on thematic filters pre-defined by the project partner HCU corresponding to different urban functions (e.g., working, learning, caring) as established by Moreno et al., 2023, accessible in the table below. These POIs serve as origin points for the isochrone generation in the next step.

POI	Python Script
Green spaces	Park; garden; grass; forest; meadow; recreation ground; wood' grassland national park
Blue spaces	Water; wetland; bay; river; stream; canal; reservoir; basin; marina
Public spaces	Square
Working	Company; office; electronics; factory; coworking space; lawyer; industrial; it; commercial; plumber; warehouse
Supplying	Supermarket; convenience; hardware; general variety store; wholesale; second-hand; chemist; department store; mall; bakery; butcher; deli; kiosk; marketplace; fuel; foodbank; distribution centre; distribution of food; hygiene items; drinking water; food court; vending machine
Caring/Being healthy	Pharmacy; hospital; doctors; clinic; dentist; fitness centre; sports centre; swimming pool; sports pitch; yoga; climbing; recreation ground; meditation; health insurance; child protection
Learning	Kindergarten; school; college; university; language school; library; community centre; arts centre; driving school; facility for training; facility for training for disabled people; vocational training; hackerspace; book club;
Enjoying	Theatre; cinema; arts centre; community centre; museum; artwork; playground; sports centre; fitness centre; climbing; bowling alley; miniature golf; escape room; amusement arcade; café; bar; pub; restaurant; ice cream; beer garden
Public Transport	Stop position; platform; station; stop area; stop area group

Table 7: POIs used for proximity analysis.

In Step 2 (*Step2_Generate Isochrones.py*), the script generates 15-minute walking or cycling isochrones around each POI using the Mapbox Isochrone API. For areas such as green spaces, blue spaces, and public areas, the centroid of each area is used as the reference point. For every POI, the script computes a polygon that represents the area reachable within the selected travel time and mode. These individual isochrones are collected and saved as GeoJSON files, forming the basis for spatial coverage evaluation. Any POIs for which isochrone generation fails (e.g., due to API errors or data limitations) are logged for transparency.

In Step 3 (*Step3_Coverage Analysis.py*), the script merges all isochrones into a single unified area using spatial union operations. This area is then clipped to the ULL boundary to ensure relevance to the defined study zone. The script calculates the spatial area covered versus uncovered and derives the percentage of the total ULL area that falls within the specified proximity threshold. These calculations are repeated for different themes (e.g., green/public spaces, services, transport) and modes (walking and cycling), allowing for KPI reporting across multiple categories.