



## 3.2 Definition of the Key Performance Indicators (KPIs)

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# 1. Introduction

## 1.1 Context

The 15-minute city (15minC) model has emerged as a guiding framework for just and sustainable urban development, prioritizing proximity, connectivity, and diversity to enhance residents' quality of life. While widely applied in dense urban centres, its implementation in suburban areas faces challenges due to lower density and limited land-use diversity, which often characterize these areas. From a 15minC model perspective, this results in insufficient connectivity due to poorly integrated and inaccessible transportation networks, such as limited public transport options. This, in turn, leads to car dependency, negatively impacting residents' quality of life in terms of health, time, and financial costs.

To reduce suburban distances, promote accessibility, and achieve the 15minC goals in peripheral areas, this research contributes to the rethinking of distance as a function of time, and defines KPIs aligned with the principles of chrono-urbanism—emphasising faster and more cost-effective solutions (Moreno et al., 2023), such as the integration of mobility hubs and the promotion of public transport and active mobility modes. The 15minC model presents itself as a new urban vision (Moreno et al. 2023), as its guiding principles tend to remain aspirational and compass-driven, rather than process-oriented, with clear spatial planning methodologies, operational frameworks, and quantifiable indicators for measuring proximity and integration still to be enhanced. This report addresses both the aspirational aspect of 15minC mobility strategies and renders them measurable through relevant Key Performance Indicators (KPIs).

## 1.2 Purpose of the deliverable

This report defines Key Performance Indicators (KPIs) as a deliverable of WP3, “SWOT Analysis of 15-Minute City Strategies,” within the FORTHCOMING (FOsteRing THE City Of Proximity through MaaS Integration) project. It follows reports D2.1, *Portfolio of Successful 15-Minute City Strategies in Urban Areas* and D3.1, *SWOT Analysis of 15minC Strategies*. For a comprehensive understanding of the FORTHCOMING project's objectives and main Work Packages (WPs), please refer to report D2.1.

Building on these previous reports, this document aims to bridge existing research gaps in data-driven methodologies and analytical frameworks, by defining a comprehensive set of KPIs to assess how digitalization and integrated multimodal mobility strategies can support the principles of the 15minC in suburban contexts. To achieve this, six diverse case studies are examined across six European countries: Spain, Portugal, Hungary, Italy, Germany, and Türkiye.

## 2. Background

### 2.1. About Key Performance Indicators (KPIs)

Key Performance Indicators (KPIs) originated in business management to measure the success of specific activities against strategic objectives. In urban planning, KPIs similarly serve as tools to track the performance of key initiatives, aligning with broader goals such as sustainability, liveability, and inclusivity. They provide both quantitative and qualitative methods to assess the effectiveness of urban development strategies, particularly in emerging planning concepts like the 15-minute city concept explained in D2.1 *Portfolio of Successful 15minC Strategies in Urban Areas*. This urban model emphasizes proximity to essential services, aiming to create more accessible and sustainable neighborhoods. In this context, KPIs ensure that goals such as improved resource allocation, enhanced accessibility, and a better quality of life are met through data-driven planning (Pozoukidou & Chatziyiannaki, 2021).

The 15-minute city model represents a shift toward more localized urban planning, where essential services are reachable within a short radius—such as a 15-minute walk, bike ride or public transport trip. Essential services are in this project defined according to the High Quality of Societal Life (HQSL) index (Moreno et al, 2023), which categorizes essential services into six social functions: living, working, getting supplies, enjoying, learning, and caring/being healthy. KPIs are crucial in this framework, as they help measure factors such as proximity, walkability, and the effectiveness of public transport—elements vital to achieving strategic urban objectives like reducing carbon footprints (Moreno et al, 2023) and enhancing social equity (Pozoukidou & Angelidou, 2022). Unlike general urban indicators, KPIs in the 15-minute city model are specific and closely aligned with tangible outcomes, such as improving local economies and sustainability (Pozoukidou & Angelidou, 2022).

In the FORTHCOMING project, which spans case studies across six European countries, KPIs will guide the transfer of the 15-minute city mobility strategies to suburban areas, with a focus on digitalisation tools like Mobility as a Service (MaaS) and Logistics as a Service (Laas). This project aims to transfer successful city center strategies to suburban regions by emphasizing multimodal mobility, user-centric models, and digitalisation, all within the context of promoting public transportation—the backbone of FORTHCOMING project's approach to rethinking distance as a function of time. This aligns with chrono-urbanism principles and promote faster and more-effective solutions to reduce suburban distances.

Overall, the selected KPIs will serve as key criteria for assessing 15minC strategies, determining their effectiveness in suburban contexts. This approach bridges the gap between local planning strategies and their actual performance, providing measurable insights into their successes and failures.

## 2.2. Input, Process, Outputs KPIs

The KPIs are organized into three categories: Input, Process, and Output KPIs, with their definitions provided below (Table 1).

Input KPI	These indicators focus on <b>resources and planning efforts</b> essential for creating a 15-minute city. This includes investments in infrastructure, such as pedestrian pathways and cycling networks, as well as the availability of essential services within a 15-minute walk, bike ride or public transport trip. For example, a study on the urban layout in Barcelona emphasises the need for investment in diverse amenities to support walkable neighborhoods (Graells-Garrido et al., 2021).
Process KPI	These indicators measure <b>operational aspects</b> , such as the effectiveness of urban design in maintaining accessibility and reducing car dependency. For instance, models assessing accessibility in cities like Beijing and Barcelona evaluate how well services are distributed to ensure optimal reach by walking or cycling, indicating successful decentralisation (Yang, 2023).
Output KPI	These indicators evaluate the <b>impacts</b> of 15-minute city designs on quality of life, including reductions in commute times, improved air quality, and equitable access to services. For instance, studies on European cities show that effective 15-minute cities lead to measurable improvements in urban mobility and social equity, especially in low-income areas (Aristizábal et al., 2023).

*Table 1: Input, Process and Output KPIs Definitions*

## 3. Methods

This report’s methodology relies on three main phases: (1) collecting and consolidating local strategies across all six Case Studies and Urban Living Labs, (2) drafting an initial list of potential KPIs, and (3) defining a list of Common and Specific KPIs that respond to the collective and respective Case Studies and Urban Living Labs.

This section details the methods used and activities conducted to establish the Common and Specific KPIs. The content is developed, monitored, and iterated based on the following overview diagram.

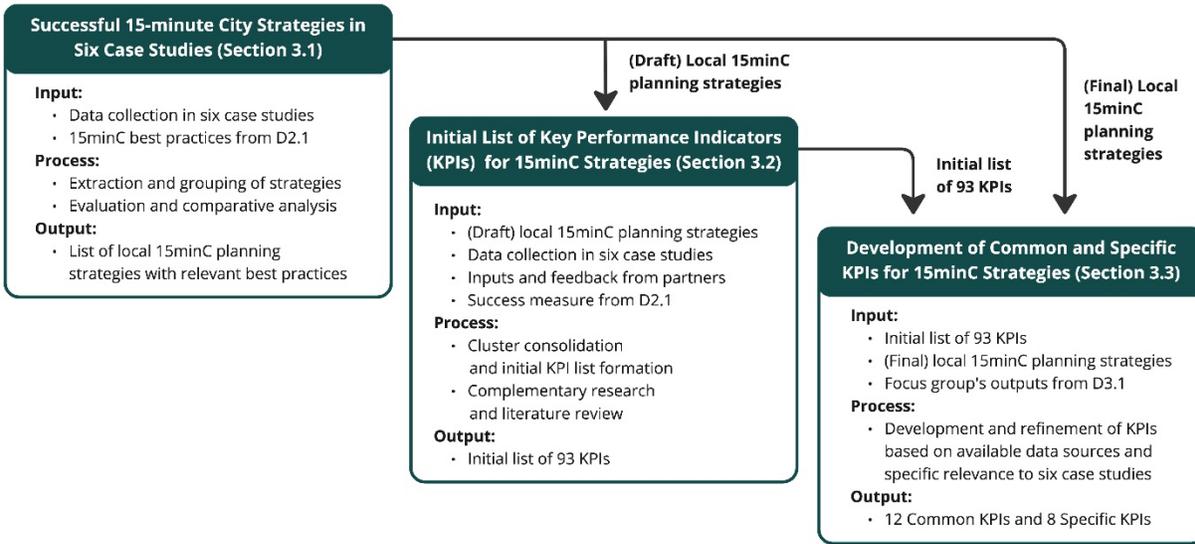


Figure 1: Overview Methodology Diagram

### 3.1. Successful 15-minute City Strategies in Six Case Studies

This task provides an initial assessment of local planning strategies, including Sustainable Urban Mobility Plans (SUMP) and other official documents or initiatives related to the 15minC concept across six case studies: Madrid, Lisbon, Hamburg, Turin, Debrecen and Istanbul. The assessment resulted in a list of strategies that enhance the 15minC model, unfolding in four main phases: 1) data collection, 2) extraction and grouping of strategies, 3) systematic evaluation, and 4) synthesis and documentation. Each phase encompasses several detailed steps to ensure a thorough and comparable analysis across all case studies and best practices.

#### 3.1.1. Questionnaire Development and Data Collection

A comprehensive questionnaire was designed and distributed to all case studies. Its primary aim was to gather detailed information on local planning strategies, particularly those relevant to the 15minC concept, and to examine their alignment with SUMP and other official documents or initiatives adopted by planning bodies and transport authorities.

The questionnaire encompassed the following thematic areas related the 15minC concept within local planning and strategy documents: 1) general information about the case studies, 2) understanding of the 15-Minute City concept, 3) local planning and strategy integration, 4) application of the 15-Minute City approach, 5) perception and public engagement, 6) progress and evaluation and 7) future directions and additional comments.

### 3.1.2. Extraction and Grouping of Strategies

#### *Consolidation of Data*

Upon collecting the responses, each case study's objectives, guiding principles, and strategies were compiled into a single Excel spreadsheet. This consolidation provided a clear, comparative overview of each case study's approach to the 15-Minute City concept.

#### *Key Areas of Action (DUT Framework)*

The extracted strategies were categorised according to the Key Areas of Action defined by DUT:

- **KA1:** Sustainable Urban Mobility
- **KA2:** People-Centered Urban Space & Planning
- **KA3:** Smart Urban Logistics, Production, and Service Sites
- **KA4:** Urban Governance for Mobility

Organising the data into these four categories ensured consistency across case studies and facilitated direct comparisons of how each city prioritises its 15-Minute City initiatives.

### 3.1.3. Systematic Evaluation Against Best Practices

#### *Portfolio of Successful 15-Minute City Strategies (D2.1)*

Concurrently, a separate task (T2.3) produced report D2.1, *Portfolio of Successful 15-Minute City Strategies in Urban Areas*. Each best practice's strategies were analysed based on three criteria:

- **Description:** Overview of the initiative and its context
- **Impact:** Measured or observed outcomes (e.g., improved accessibility, reduced carbon emissions)
- **Lessons Learned:** Success factors, potential barriers, and insights for replication

This task identified key measures for promoting 15-minute city strategies and assessed success criteria (see D2.1).

#### *Comparative Analysis*

To determine whether the cities in our study (six case studies) are implementing these best practices, we conducted a comparative analysis by:

- **Aligning Strategies:** Mapping both local strategies and best practices under the same Key Areas of Action (KA1–KA4).
- **Identifying Overlaps and Gaps:** Assessing whether each best practice is reflected in local planning documents and noting any strategies absent from local plans but potentially relevant or beneficial.

The comparisons were visually organised using Miro, enabling the team to quickly identify which best practices matched specific local strategies or objectives.

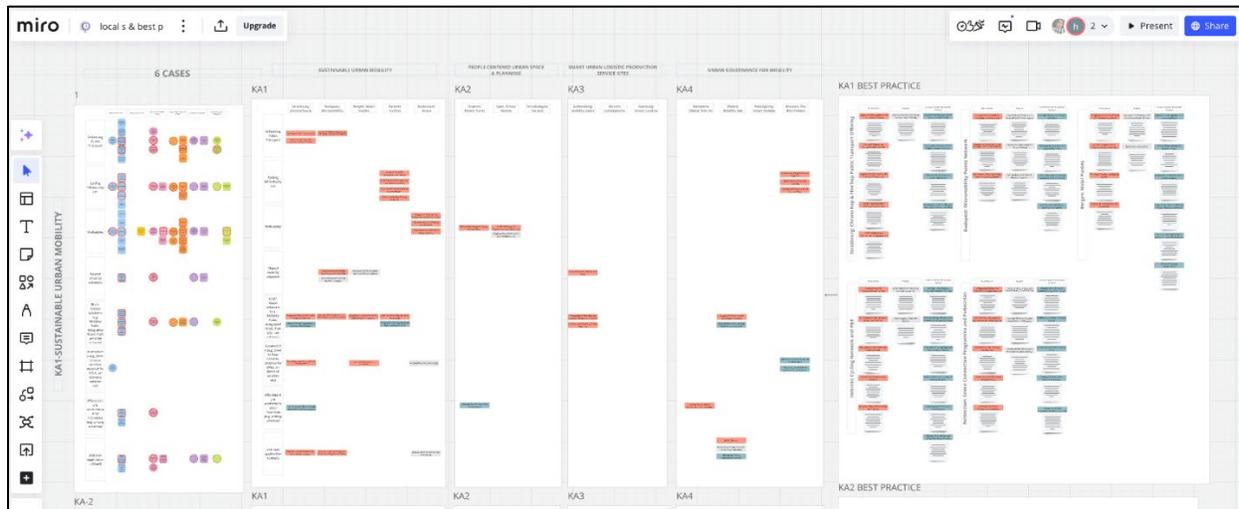


Figure 2: Example of MIRO Exercise KA1

It was observed that the strategies in the case studies are concentrated in KA1 and KA2. When best practices were examined, they were generally related to KA1, while their success factors were primarily concentrated in KA4.

### 3.1.4. Case-by-Case Synthesis and Documentation

Following the comparative analysis, a detailed review was conducted for each of the six cities to identify:

- **Shared Elements:** Best practices with strong alignment to the city’s existing strategies.

Based on these findings, a separate Word document was prepared for each case study area and is accessible in Appendix 1- *List of 15minC Strategies*. Each document was organized under the KA1–KA4 framework and included:

- **Local Strategies:** Detailed description of the city’s strategies.
- **Complementary Best Practices:** Relevant best practices from D2.1 that align with or enhance local strategies.

The following section summarizes the main strategies for each case study and their respective Urban Living Labs.

In **Debrecen** (see Appendix 1), local strategies aim to improve the speed and comfort of public transport, expand the bicycle network, improve pedestrian infrastructure, and develop shared micro-mobility systems. These measures closely reflect best practices observed in Strasbourg, Helsinki, Rotterdam and Budapest. While multimodal solutions are also highlighted, other areas such as accessibility and affordability remain underdeveloped.

**Istanbul & Küçükçekmece** (see Appendix 1) strategies follow similar best practices. For example, public transportation supply is optimized through station upgrades, hub renovations, and new metro, bus, and ferry routes - approaches that are reflected in examples from Madrid and Strasbourg. Cycling conditions are improved through the creation of new routes, extending the network by 10 km, and installing dedicated bicycle parking in educational facilities, similar to successful practices in Helsinki. Walkability is improved by widening pedestrian routes and creating "prestige streets" for multiple modes of transport, following

initiatives in Rotterdam. Shared mobility is promoted through micromobility projects, including the ISBIKE project and e-scooter services, similar to models in Budapest. Multimodal solutions are promoted through Park & Ride nodes, improved transit connectivity, and the use of MaaS applications, as seen in Helsinki and Madrid. The strategy also supports people-centered urban design, tactical urbanism, and the development of green spaces, with parallels to projects in cities such as Krakow and Bologna. In addition, smart urban logistics measures - such as the establishment of construction material consolidation centers and the use of ICT/IoT tools - reflect practices similar to those in Munich. Strong citizen engagement is promoted through workshops, surveys and digital platforms. A digital twin application further enhances urban planning.

**Lisbon & Vila Franca de Xira** (see appendix 1) strategies emphasize improving public transport and active travel by expanding infrastructure - an approach comparable to effective models in Strasbourg. For cycling, the plan focuses on improving infrastructure and redesigning urban spaces in a way that mirrors successful examples seen in Helsinki. For walkability, the strategy prioritizes the creation of pedestrian-friendly public spaces in every neighborhood, reflecting practices similar to those in Rotterdam. In addition, the strategy incorporates elements of people-centered urban design and tactical urbanism by promoting public space interventions in public squares, while citizen engagement is encouraged through public consultations and surveys, drawing on approaches from Rotterdam and Bergen. Many other areas - including shared mobility, multimodal solutions, accessibility, affordability, MaaS, diversity, mixed land use, greening, logistics, last-mile delivery, and digital innovation - are underdeveloped and offer clear opportunities for further intervention and improvement.

**Hamburg & Altona** (see appendix 1), strategy addresses several key areas with measures similar to proven international examples. It seeks to improve public transportation by increasing service frequency and modernizing rolling stock, similar to effective practices in Strasbourg. Efforts to promote cycling focus on expanding infrastructure and reducing car dependency, similar to approaches in Helsinki. Walkability is promoted by improving pedestrian routes and encouraging flexible use of public space, reflecting the models of Lyon and Rotterdam. Shared mobility is promoted by expanding the HVV app and creating additional transfer points, echoing initiatives in Budapest, while multimodal connectivity is strengthened by integrating different modes in a way that parallels practices in Bergen. The strategy also includes a digital mobility tool for MaaS, inspired by similar efforts in Madrid. People-centered urban design is pursued through the creation of public spaces, green areas, and multifunctional street furniture - approaches comparable to examples in Bologna, Krakow, and Lyon. Other measures include the enhancement of green spaces, the creation of intelligent loading zones for urban logistics, and the promotion of clean transport, with some measures reflecting strategies applied locally in Hamburg and in cities such as Rotterdam and Helsinki.

**Madrid & Las Rozas** (see appendix 1.x.) cover several dimensions of urban mobility. Public transportation will be improved through peak-hour express buses, zero-emission routes, fleet renewal, and on-demand services. Cycling initiatives include expanding BiciPark facilities, promoting e-bike sharing, and adding up to 250 km of bike lanes. Walkability will be improved by expanding pedestrian areas throughout the city, linking walking routes to zero-emission bus services, and implementing temporary pedestrianization. Shared mobility is promoted by offering shared scooters, cars, mopeds, and e-bikes, while multimodal integration is achieved by creating integrated transport hubs with secure bike parking, EV charging, and car-sharing stations. Madrid's MaaS pilot streamlines trip planning and payment. Human-centered design is promoted through school streets with reduced speed limits and tactical urbanism measures.

Environmental measures include the development of underground bike lanes, improved pedestrian connections, and extensive tree planting and vertical gardens. Urban logistics are addressed through the Madrid 360 Mobility Hubs, which use real-time monitoring and clean vehicles, and local economic support is promoted through the Las Rozas INNOVA Hub. Citizen engagement will be strengthened through participatory tools such as Decide Madrid and Proximity Councils.

**Torino & Settimo Torinese** (see appendix 1) strategies cover a wide range of urban mobility measures. It aims to improve public transport by increasing the frequency of services, modernizing rolling stock, and expanding intercity rail services - an approach similar to successful models in Strasbourg. The strategy also focuses on expanding cycling infrastructure and creating pedestrian areas, reflecting practices observed in Helsinki and Rotterdam. For shared mobility, it introduces free internal shuttles for students and the elderly, following examples from Budapest. A pay-as-you-go system is proposed for multimodal solutions, affordability and MaaS, although these areas need further development. People-centered urban design is promoted through the redevelopment of public spaces such as squares, gardens and streets, with approaches similar to Bologna, Krakow, Lyon and Rotterdam, while tactical urbanism is applied through the pedestrianization of Via Italia. Green initiatives include the expansion of natural green spaces and the integration of nature-oriented bicycle paths, following practices seen in Krakow. Traffic management is addressed through the creation of "zones 30" to moderate vehicle speeds, and urban space strategies focus on the redevelopment of brownfields and public spaces. Finally, a participatory approach is used to engage citizens in urban interventions, leaving opportunities for further work on accessibility, diversity, logistics and local economic support.

Across the case studies, urban mobility strategies converge on several key themes. Each case prioritizes improving public transport by increasing service frequency, expanding network coverage, upgrading rolling stock, and introducing new modes. Improving cycling infrastructure is emphasized through network expansion, safety improvements, and measures to reduce car dependency. Walkability is also a common focus, with efforts to improve sidewalks, create pedestrian zones, and develop inviting public spaces that encourage active travel. Shared mobility solutions are implemented through initiatives such as micro-mobility services or free shuttle systems, while multimodal integration is achieved through the creation of transport hubs, the implementation of park and ride schemes, and the use of digital tools to streamline connectivity between different modes. People-centered urban design and tactical urbanism feature prominently, with strategies aimed at redeveloping public spaces, creating safe urban environments, and facilitating community engagement through participatory processes. Other actions include environmental measures such as expanding green spaces and improving urban logistics through improved loading zones and real-time data applications.

## 3.2. Initial List of Key Performance Indicators for 15minC Strategies

### 3.2.1 Miro Exercise Development and Data Collection

Building on the work conducted in Section 3.1, during which local planning strategies and best practices related to the 15-Minute City (15minC) concept were consolidated, this phase aimed to establish a structured method for developing KPIs aligned with these strategies. To achieve this, we designed a Miro board exercise that incorporated outputs from the previous phase, including categorized strategies under

the DUT framework (KA1–KA4). In this Miro board exercise, we created dedicated questionnaire tables for each case city, structured into two sections.

**Section 1: 15minC related Strategies and Policies**

This section contained a pre-filled list of strategies and policies, derived from section 3.1, categorised under the relevant *Types of Intervention* aligning with the DUT framework’s Key Areas of Action (KA1–KA4). All case study partners were asked to review and refine these entries, ensuring completeness and accuracy based on their local contexts.

**Section 2: Key Performance Indicators (KPIs)**

To ensure that each strategy and policy had corresponding indicators for evaluation, all partners were asked to contribute relevant KPIs through the following three steps:

- **Step 1 - Naming the KPIs:** Partners provided up to three existing or desired KPIs per strategy, ensuring relevance, and added comments to clarify the meaning and applicability where necessary.
- **Step 2 - Spatial Dimensions:** Each KPI was assigned one or multiple spatial dimensions based on its applicability, selecting from predefined categories such as, Building / Block, Neighbourhood, District, Municipality / City, Metropolitan area.
- **Step 3 - Data Types & Sources:** Partners provided available data sources for each corresponding KPI when accessible, including URLs where applicable.

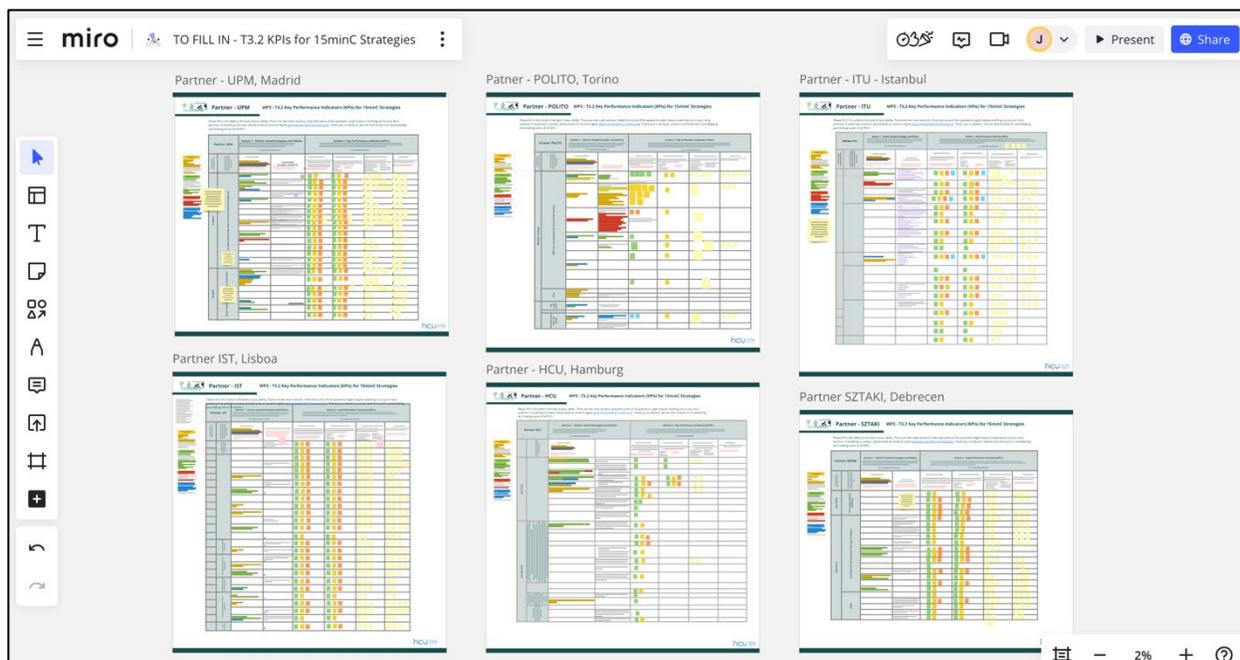


Figure 3: Miro Exercise for KPIs

**3.2.2. Cluster Consolidation and Initial KPI List Formation**

Once all partners had completed the questionnaire, the data was consolidated to form an initial list of KPIs. This list was further complemented by a literature review conducted to establish working definitions and

collect potential KPIs along with the success measures from D2.1, *Portfolio of Successful 15minC Strategies in Urban Areas*.

Throughout the process, representatives from the six case studies provided continuous input and feedback to ensure that the KPIs reflected contextualized realities. This resulted in eight clusters and sub-clusters, encompassing a total of 93 KPIs, serving as an initial foundation for further refinements and definitions.

### *Cluster Identification and Sources*

The KPIs were structured into eight clusters, each derived from established conceptual frameworks and sources:

- **Four clusters** correspond to an adaptation of Moreno’s dimensions of the 15-minute city concept; **Proximity, Inclusivity, Digitalisation, Density, and Land Use**. (See D2.1 for more details).
- **Two clusters—Governance and Modal Share**—originated from the FORTHCOMING project’s focus areas, reflecting its emphasis on policy frameworks and mobility distribution.
- **The remaining two clusters—Sustainability and Climate Action, and Economic Impact**—align with two of the three core pillars of sustainable development: Environmental Sustainability and Economic Sustainability.

### *Cluster Consolidation*

The 93 KPIs were organized into the following eight clusters:

1. Proximity
2. Inclusivity (Social Inclusion Equity)
3. Digitalization and Mobility-as-a-Service (MaaS)
4. Density and Land Use
5. Sustainability and Climate Action
6. Governance
7. Modal Share
8. Economic Impact

This initial list of 93 KPIs captured in greater detail all relevant inputs gathered, expanding on key elements while avoiding premature definitions of specific metrics and data sources. These early interim results allowed us to document all essential elements without unnecessary complexity, serving as a starting point for further refinements. This initial list of 93 KPIs is presented in Section 4.1.

## 3.3. Development of Common and Specific KPIs for 15minC Strategies

From the interim exhaustive list of KPIs, the following sub-phases were undertaken to define a refined list of Common KPIs—applicable and relevant to all Case Studies (CS) / Urban Living Labs (ULLs)—as well as Specific KPIs, which are tailored to particular CS/ULLs based on their local contexts.

### 3.3.1 Focus Group I - Outputs

Focus groups were conducted in each case study city, involving experts and local stakeholders, to rank and refine the initial KPI list derived from the eight clusters, based on relevance and feasibility. This process helped narrow down and refine the comprehensive KPI list.

The results of the KPI cluster rankings are as follow:

KPI cluster	Spain	Germany	Hungary	Italy	Portugal	Türkiye	All
1-Proximity	2	1	1	5	1	3	2
2- Inclusivity	6	3	8	1	7	4	5
3- Digitalization and MaaS	5	5	5	7	8	6	7
4- Density and Land use	3	3	4	6	5	2	3
5- Sustainability & climate action	4	7	3	2	4	5	4
6- Governance	7	6	6	4	6	6	6
7- Modal Share	1	2	1	3	2	1	1
8- Economic Impact	8	8	7	8	3	8	8

Table 2: Overview of KPIs ranking results by case studies

The following is an excerpt from D3.1, *SWOT Analysis of 15minC Strategies*, summarizing the KPI-cluster rankings:

*The Modal Share cluster ranks highest in importance across all countries, reflecting a strong focus on transportation mode distribution. Proximity and Density and Land Use follow in ranks 2 and 3, emphasizing accessibility and urban planning in mobility strategies. Sustainability and Climate Action hold a mid-level joint ranking of 4, highlighting varied national priorities in environmental policies. Governance and Inclusivity are ranked 6 and 5, respectively, indicating they are important but not the primary focus. Economic Impact has the lowest ranking at 8, suggesting that economic considerations may be less immediate than social, environmental, and infrastructural aspects.*

*The results indicate that Modal Share and Governance have the lowest variations, showing strong consistency. Digitalization and MaaS, as well as Density and Land Use, also exhibit stable importance across countries. Proximity, Sustainability, and Climate Action show moderate variations, while Economic Impact and Inclusivity have the highest deviations, indicating significant fluctuations in their rankings among different living labs. This suggests a general consensus on Modal Share and Governance, while Inclusivity and Economic Impact are more context-dependent. (p.4)*

The input from the CSs and ULLs representatives and focus groups ensured that the KPIs were both practical and adaptable to local contexts, aligning with the 15-Minute City concept. See report D3.1, *SWOT Analysis of 15minC Strategies*, for more details on the ranking results.

### 3.3.2 Updated List of Strategies and Data Availability.

Following the Focus Group ranking, KPI refinement was conducted in parallel with further development and iterations of the list of 15minC strategies, outlined in Section 3.1, while cross-examining data availability from Section 3.2.1 and additional research.

As a result, a final list of KPIs was created, categorized into:

- **Common KPIs** – applicable to all six case studies.
- **Specific KPIs** – relevant to one or more case studies based on their unique local contexts.

This final list of KPIs is presented in Section 4.2.

## 4. Definition of the Key Performance Indicators (KPIs)

### 4.1. Initial List of KPIs

The initial list of KPIs is categorised according to the eight previously defined clusters. The type and number of KPIs within each cluster vary based on the inputs collected in Sections 3.1 and 3.2, reflecting the diversity and complementarity of the six case studies. The following sections define each cluster and highlight the main KPIs within each cluster.

#### Cluster Proximity

The Proximity Cluster “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.” (as defined in D2.1) To highlight a few KPIs within this cluster:

- **Proximity to Essential Services** measures how well urban populations can access healthcare, education, and retail within a 15-minute distance by walking, biking or public transport.
- Active mobility and public space accessibility are addressed through **Walkability and Bikeability Accessibility Index**.
- **Proximity to Green, Blue, and Public Spaces**, and **Pedestrian-Friendly Squares Development** measure the availability and integration of these spaces within a 15-minute distance by walking, biking or public transport.

## Cluster Inclusivity (Social Inclusion Equity)

The Inclusivity (Social Inclusion Equity) Cluster “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.” (as defined in D2.1) To highlight a few KPIs within this cluster:

- **Inclusivity in Accessing Mobility Infrastructure** measures access to mobility infrastructure by walking or public transportation across vulnerable demographic groups
- Housing affordability is addressed by **New Affordable Housing Projects** and **Proportion of Affordable Housing Units in the 15-Minute City**, which track the development and distribution of affordable housing within proximity to essential services
- Socioeconomic equity is captured through the **Social Equity Index**, assessing disparities in resource access.
- **Environmental Equity Index** evaluates the fair distribution of green spaces, clean air, and other environmental resources.

## Cluster Digitalisation and MaaS

The Digitalisation and MaaS Cluster “refers to the enabling of the proximity, [inclusivity], and density’s dimensions using digital technology (such as Mobility-as-a-service MaaS, smart city management tools, digital twins, end-user applications,)” (as defined in D2.1) To highlight a few KPIs within this cluster:

- **Integration of Smart Technologies, Investment in Smart City Technologies, and Interoperability of Systems** track the adoption and coordination of digital infrastructure.
- **User Awareness of Data Privacy and Consent and Data Security and Privacy** ensure digital trust of users.
- **Availability of Multi-modal Mobility Services in MaaS Platforms** tracks the number and modal share of mobility services integrated into MaaS platforms.
- **Uptake of MaaS Services** measures the adoption and usage of MaaS services by users.
- **Fleet Utilization for Deliveries/Micromobility, Number of Shared Micromobility Devices, and Increase Access to Services** track efficiency in micromobility.

## Cluster Density and Land Use

The Density and Land Use Cluster “Density is 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.” (as defined in D2.1) To highlight a few KPIs within this cluster:

- **Land Use Density Around Transit Corridors** measures the density and diversity of land use around transit corridors while **Percentage of Mixed-Use Developments Connected to Public Transport**

evaluates the proportion of mixed-use developments that are well-connected to public transport modes.

- **Diversity of Land Use** and **Urban Density** track the proportion of mixed-use spaces and population density within a given area.
- Public space efficiency is measured through **Public Space Utilization**, reflecting public spaces that are actively used by the community.
- **Mixed-used Building** assesses the adaptability of structures for multiple functions, while **Redeveloped Brownfield Sites Ratio** indicates the percentage of previously contaminated or underutilized areas that are repurposed.
- **Traffic Calming Zones** quantify the roads with traffic-calming measures

## Cluster Sustainability and Climate Action

The Sustainability and Climate Action Cluster aims to reduce environmental impact by cutting carbon emissions, enhancing energy efficiency, promoting green spaces, and climate-conscious policies to mitigate climate change (Sahertian & Sari, 2024). To highlight a few KPIs within this cluster:

- **Carbon Emissions Reduction** is measured across logistics, public transport, and shared mobility services.
- **Green Space Ratio** quantifies the proportion of green areas in relation to urban land.
- **Air Quality Improvement** tracks pollution reduction metrics, while **Urban Heat Island Mitigation** measures temperature regulation strategies.
- **Energy Efficiency per Trip** evaluates the environmental impact of individual mobility choices.

## Cluster Governance

The Governance Cluster refers to transparent, accountable, and participatory urban management, ensuring that public policies align with local planning strategies and that citizens and stakeholders are actively involved in the decision-making process. To highlight a few KPIs within this cluster:

- **Citizen Participation in Urban Planning** and **Frequency and Reach of Public Consultations** measure civic engagement levels.
- **Transparency and Accountability in Governance** ensure oversight and trust, supported by **Data Collection on Impact of Interventions**.
- **Public-Private Partnership (PPP) Initiatives** track collaborations in sustainable mobility solutions, while **Grants, Subsidies, and Funding Impact** assess available funding schemes allocated to these solutions.

## Cluster Modal Share

The Modal Share Cluster refers to the distribution of various transportation modes (such as walking, cycling, public transit, and driving) used by residents within a short, easily accessible radius. To highlight a few KPIs within this cluster:

- **Active Mobility Infrastructure** and **Public Transport Ridership Growth** measure the importance of active and sustainable mobility.
- **Adoption of Shared Mobility** and **Integration of Shared Mobility with Public Transport** measure the connectivity of sustainable mobility.

## Cluster Economic Impact

The Economic Impact Cluster refers to the financial impact on local businesses, property values, and employment resulting from urban planning strategies that prioritize accessibility to essential services within a 15-minute walk or bike ride (Bartzokas-Tsiompras, 2022). To highlight a few KPIs within this cluster:

- **Local Business Revenue Growth** and **Employment Growth and Job Creation** evaluate the increased of local consumption, for example, within pedestrian-only zones.
- **Real Estate Value Growth in 15-minute Neighborhoods** illustrates the economic benefits of dense, well-connected urban environments on property values. However, the concentration of investments in specific areas can drive gentrification – an outcome that this KPI can help to partially detect (Eldér, 2024).

## 4.2. Final List of KPIs: Common and Specific KPIs

Based on the previously mentioned research and analysis conducted across the six case studies, we identified a selection of Key Performance Indicators (KPIs). These are categorised as follows: 1) Common KPIs – applicable across all six case studies and 2) Specific KPIs – relevant to one or more of the case studies

The KPIs outlined in the following sections represent a concise yet comprehensive baseline, developed within the resource and capacity boundaries of the FC project. We acknowledge that these indicators are not definitive, as further refinement and updates are expected in subsequent project phases, particularly during the data collection stage and the further development of the Urban Living Labs (ULLs) in suburban regions.

We defined both quantitative and qualitative KPIs. Notably, studies focusing on end-user KPIs remain relatively scarce in the urban field (Soriano-Gonzalez et al., 2023). As such, we prioritized indicators accessible from a “City Manager” perspective—more often quantitative—drawing on open-source and readily available datasets. This approach aligns with the practical limitations of the project, which does not include extensive surveying or in-depth user data collection. Nonetheless, qualitative indicators are also represented where they can be drawn from in situ observations, interviews, and exchanges with local stakeholders—documenting, for example, the presence or absence of specific spatial or service-oriented characteristics relevant to 15-minute city (15minC) mobility strategies.

### 4.2.1. Common KPIs

The following table provides an overview of nine Common KPIs, thematically clustered and ordered based on their relevance as determined through the focus group workshops. It is important to note the following:

- The KPIs vary in complexity, as reflected in their associated key metric(s). These differences will be further explored in later phases of the project.
- All KPIs will be gathered during the upcoming project phase. Consequently, the data release year will reflect the most recent available datasets and may vary slightly across case studies and individual KPIs due to differences in data availability.
- We acknowledge that KPIs should ideally be calculated over different time intervals to fully evaluate their performance. However, due to the limited duration of the project, the KPIs will be calculated specifically for low-density areas and subsequently cross-analysed both within and across the individual case studies.

Cluster	KPIs	Key Metrics Description	Unit
Modal Share	Active Mobility Infrastructure <sup>1</sup>	Percentage of the active road length with sidewalks, cycle paths, and pedestrian zones, relative to the total road length of the selected area	%
Proximity	Proximity to Green, Blue and Public Spaces <sup>2</sup>	Percentage-based estimate of the selected area that lies within a 15-minute walking or biking distance to green, blue, and public spaces such as parks, recreational areas, city waterfronts, ponds, lakes, and more. Breakdown as follows: • Walking access – Area within a 15-minute walk. • Biking access – Area within a 15-minute bike ride	%
	Proximity to Essential Services <sup>3</sup>	Percentage-based estimate of the selected area that lies within a 15-minute walking or biking distance of each of the six essential service categories (i.e., points of interest, POIs). Breakdown as follows: • Walking access – Area within a 15-minute walk for each category • Biking access – Area within a 15-minute bike ride for each category	%
	Proximity to Public Transport and Demand-Responsive Transport Services <sup>4</sup>	Percentage-based estimate of the selected area that lies within a 15-minute walking distance of fixed-route public transport and, if applicable, demand-responsive transport (DRT) services. Breakdown as follows: • Public transport access – Area within a 15-minute walk of a fixed-route public transport stop • (If applicable) DRT access – Area within a 15-minute walk of DRT service stops or operating zones	%
		<u>Service Frequency:</u> Average number of public transport vehicles (buses, trams, trains, etc.) arriving per hour at stops within the selected area. Include a breakdown by transport mode (e.g., inter-urban vs. intra-urban lines), peak vs. non-peak hours, and weekdays vs. weekends.	rides per hour

<sup>1</sup> Sources: Bartzokas-Tsiompras and Bakogiannis, 2023; Soriano-Gonzalez et al. 2023

<sup>2</sup> Source: Soriano-Gonzalez et al. 2023

<sup>3</sup> Sources: Zhang et al., 2022; Graells-Garrido et al., 2021

<sup>4</sup> Sources: Moreno et al., 2023

Density	Built-up Surface (Urban Density) <sup>5</sup>	<u>Built-up Surface:</u> Amount of built-up land area available per person in a selected area	m <sup>2</sup> /pp p
		<u>Total Built-Up Area Ratio:</u> Ratio of the total built-up area (including residential, commercial, industrial, etc.) to the total land area.	%
	Diversity of Land Use <sup>6</sup>	<u>Types of Mixed-Use Developments:</u> <sup>[1][2]</sup> Identification and counting of the different combinations of mixed-use developments <sup>7</sup> within the selected area.	count
		<u>Ratio of Key Land Uses to Total Area:</u> Ratio of key land uses (e.g., educational, residential, commercial, recreational, green spaces, etc.) to the total urbanised area <sup>[1][2][3][4]</sup> <sup>[5][6][7][8]</sup>	%
Inclusivity	Inclusivity in Accessing Mobility Infrastructure <sup>8</sup>	<u>Availability of Discounted Public Transport Ticket Types:</u> Types of discounted fare options available for different user groups (e.g. students, seniors, low-income individuals, people with disabilities, families, and more).	count
		<u>Quality of Barrier-Free Walking Infrastructure:</u> Existence and quality of inclusive and accessible pedestrian infrastructure based on predefined criteria (e.g. tactile paving, audible pedestrian signals, curb ramps at intersections, etc.)	count and rating
Governance	Citizen Participation in Urban Planning <sup>9</sup>	<u>Number of Public Consultations and Forums:</u> <sup>[1][2]</sup> Number of public consultations, forums, and public engagement events held. Include a breakdown by top-down and bottom-up process (if applicable).	count
		<u>Citizen Feedback on Public Consultations:</u> Quality of public consultations from the citizen perspective, based on available feedback (e.g. from municipality records or online platforms).	N/A
Digitalisation	Availability of Multi-modal Mobility Services <sup>10</sup>	<u>Availability of Mobility Service Types:</u> Availability of mobility services in the selected area, including public transport, shared mobility, and micro-mobility services.	count
		<u>Level of Integration Across Mobility Services</u> Degree of integration among various mobility services, focusing on shared travel planning, booking, and payment functions. (e.g. real-time route planning, ticketing integration, in-app payment, etc.)	N/A

Table 3 - Common KPIs

<sup>5</sup> Sources: Abbasov et al., 2022; Dutta et al. 2020

<sup>6</sup> Source: Carpio-Pinedo et al., 2021; Pozoukidou and Chatziyiannaki, 2021

<sup>7</sup> Developments refer to urban built and construction (e.g. existing and new buildings) and land-use changes (e.g. infrastructures such as roads, parks, public spaces)<sup>[1][2]</sup>

<sup>8</sup> Source: Bartzokas-Tsiompras and Stefanidas 2022

<sup>9</sup> Source: Belausteguioitia, 2021

<sup>10</sup> Source: Strommer et al., 2022; Kriswardhana and Esztergár-Kiss 2022; Narayanan and Antoniou 2023

## 4.2.2. Specific KPIs

Consistent with the common KPIs, the following table provides an overview of six specific KPIs, thematically clustered and ordered according to their relevance as determined through focus group workshops. It is important to note that not all case studies include the same number of specific KPIs; for example, in the case of Lisbon, no additional specific KPIs were required to capture local urban strategies and characteristics unique to that context.

Cluster	KPIs	Key Metrics Description	Units	Applicable Case Studies
Density	Traffic Calming Zones <sup>11</sup>	<u>Roads with Lower Speed Limits:</u> Percentage of total street kilometers in the selected area with speed limits of 20–30 km/h or lower.	%	Turin; Madrid
		<u>Car-free, pedestrian zones streets:</u> Percentage of total street kilometers in the specified area designated as pedestrian-only or car-free zones through traffic-calming measures.	%	
	Public Space Utilisation <sup>12</sup>	Percentage of public spaces (e.g., parks, plazas) actively used by residents, based on measured foot traffic. Breakdown by factors such as time of day and user demographics to be clarified.	%	Debrecen
	Land Use Density Around Transit Corridors <sup>13</sup>	<u>Land Use Density</u> Percentage-based estimate of the total built-up area (residential, commercial, industrial, etc.) within a specific radius (e.g., typically 400-800 m) from public transit stations or stops	%	
Average total floor area (FRA) of all (residential) buildings located within that specific radius		ratio	Istanbul; Hamburg	
Digitalisation	Investment in Smart City Technologies <sup>14</sup>	Total amount of (public) funds allocated for the development and implementation of Smart City technologies, including Digital Twins, within a specific year.	euro per year	Istanbul
	Parking Control Management <sup>15</sup>	<u>Average Parking Occupancy:</u> Percentage of parking spaces occupied or available during daily use. Breakdown by day of the week and time of the day.	% per day per time	Madrid
		<u>Parking Turnover Rate</u> Number of different vehicles that occupy a single parking space over a specified period of time (typically per day)	vehicles per space per day	

<sup>11</sup> Sources: Distefano and Leonardi, 2022; Bartzokas-Tsiompras, 2022; Salleh et al. 2020

<sup>12</sup> Source: Khoshkhah et al. 2022

<sup>13</sup> Sources: Carpio-Pinedo et al., 2021; Pozoukidou and Chatziyiannaki, 2021

<sup>14</sup> Sources: Boreham, 2024; Klimek, 2024

<sup>15</sup> Source: Jakob and Menendez 2020

Economic Impact	Pilots and Innovation Implementation <sup>16</sup>	Number of innovative mobility projects—such as carpooling systems, shared e-bike networks, or similar sustainable mobility initiatives—launched within a specific year.	count	Debrecen
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Table 4 - Specific KPIs

The list of Common and Specific KPIs, developed from general insights across the case studies, will be further refined during the next project phase through the establishment of urban living labs in the lower-density suburban areas. These living labs will be set up in collaboration with the local stakeholders identified in the focus groups workshops. Their role will be to contextualize the KPIs and to collect data necessary for calculating them, taking into account each area’s specific local characteristics—such as land-use structure, transport options and mobility patterns, as well as existing planning and mobility regulations.

## 5. Conclusions & Next Steps

This report presents a list of 9 Common KPIs and 6 Specific KPIs designed to assess the transfer of successful 15-minute mobility strategies from urban centres to suburban areas in the six case studies of the Forthcoming project.

The characteristics of the six case studies are complex and diverse, necessitating further refinement of the KPIs during the set-up of the urban living labs, the subsequent data collection phases, and the cross-sectoral analysis (WP4). Throughout these phases, further iterations of data collection will be explored, presented, and discussed among the various case study and urban living lab partners. It is important to consider that some KPIs are more complex than others, and simplifying their methodology may be necessary, considering the project’s time, resources, and capacity constraints.

For instance, the “Proximity to Essential Services” KPI poses significant complexity challenges. Several methodologies are available for calculating proximity (Büttner et al., 2024), including both commercial tools—some open-source and others paid (e.g., Aino.world and GOAT by Plan4Better). There is currently no consensus on a single best approach for this calculation. Therefore, a detailed method identified by Moreno et al. (2023) was reviewed and adapted, as presented in Appendix 2 - High Quality of Societal Life (HQSL) Index. This allows for a later decision in subsequent work packages regarding the most suitable approach to adopt.

Overall, the list of KPIs will inform the frameworks developed in WP5 (Transfer Methodology) and WP6 (Multi-Stakeholder Impact Assessment).

<sup>16</sup> Source: Aba and Estergár-Kiss 2024

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## Appendix 1 – List of 15minC Strategies

In the following tables, the cells highlighted in grey indicate strategies, while the unshaded cells represent actions. The last column lists best practices most relevant to the strategies presented in the table. These best practices were sourced from the WP 2.3 report.

Madrid & Las Rozas			
Key Area of Action	Strategies & Actions	Best Practice	
KA-1	Enhancing public transport	Implementing peak-hour express buses, establishing zero-emission routes, renewing the fleet, and offering on-demand services.	Strasbourg
	Cycling infrastructure	Increasing BiciPark facilities, expanding e-bike sharing, and adding new bike lanes (250 km by 2030).	Helsinki
	Walkability	Expanding pedestrian areas citywide, promoting walking through “Anda Madrid” (with six routes linked to zero-emission buses), and implementing temporary weekend pedestrianizations.	Rotterdam, Lyon
	Shared mobility solutions	Offering shared scooters, cars, mopeds, and e-bikes, providing a citywide public e-bike system, supporting car-pooling start-ups and private operators, and allocating dedicated shared-service parking.	Budapest
	Multi-modal solutions	Creating a multimodal area at a railway station by installing safe bike parking, EV charging points, car-sharing spots, interchange network, Park and Ride plan.	Bergen
	Accessibility	Enhancing pedestrian access to railway stations through overpasses and underpasses.	N/A
	Affordability	Subsidizing Public transport (currently 60%).	N/A
	MaaS	Implementing Madrid's regional MaaS pilot: led by CRTM, includes MadridMobility360 for seamless, sustainable journey planning, purchases, and payments.	Madrid
KA-2	People-centered urban design	Establishing school streets with 20 km/h speed limit.	Lyon
	Tactical Urbanism	Imposing temporary car restrictions in central streets for certain days.	Bologna
	Diversity and social cohesion	N/A	N/A
	Mixed Land Use	Mixed-use city.	N/A
	Greening and nature-based solutions	Developing the A5 underground project near the CBD by adding 3 km of bike lanes, improving pedestrian connections, and planting 1,278 trees; implementing Calle 30 Natura with 3,250 m <sup>2</sup> of vertical gardens on the M-30 to reduce heat, pollution, and noise.	Rotterdam
KA-3	Logistic Hubs	Building Madrid 360 Mobility Hubs: Three operational hubs (Canalejas 360, Recoletos 360, Artilleros 360) with 11 more planned. Plaza de España (2025), Orense, Colón, Pitis (2026), Jacinto Benavente, Plaza Mayor (2027).	Munich, Gotenburg
	Last mile delivery	Optimizing Last Mile Delivery under Madrid 360 by using real-time cargo monitoring, booking sensors, expanded zones/schedules, new signage, incident management, micro-hubs, night distribution, e-commerce lockers, eco-friendly vehicles, and a stakeholder-driven LDM forum.	Hamburg, Munich
	Technology for urban logistics	Providing real-time occupancy data for cargo areas via an app.	Hamburg, Munich

	Supporting local economies	Operating Las Rozas INNOVA (Madrid’s second-largest innovation hub) to support start-ups, and promoting local commerce through ‘Semana de Proximidad,’ small business aid, and EIFACH 2024–2027.	Gothenburg
KA-4	Citizen Engagement	Designing the City of the Future by introducing kids to the 15-minute city, implementing Decide Madrid for citizen proposals and participatory budgets, and establishing Proximity Councils for district improvements.	Krakow, Bergen, Lyon, Bologna, Budapest, Rotterdam
	Mobility campaigns	Promoting public transport through initiatives like the ‘Free Travel Campaign’ (since 2021), offering free EMT bus rides on high-mobility days (e.g., Black Friday).	N/A
	Mobility and traffic management	Optimization of mobility management with technology including parking control and logistics.	Barcelona, Madrid, Hmaburg, Munich
	Urban Space Strategies	N/A	
	Funding innovation	Implementing the EU-funded MOVES III Plan to support EV adoption and charging (continuing MOVES II), alongside regional and city programs incentivizing e-bikes, EVs, and sustainable mobility.	N/A
	Digital twins	Deploying an AI-powered Digital Twin to prioritize active mobility, enable dynamic LEZ monitoring, and support 3D mapping for urban planning.	Barcelona, Madrid

Lisbon & Vila Franca de Xira			
Key Area of Action		Strategies & Actions	Best Practice
KA-1	Enhancing public transport	Incentivize public transport and active modes	
		Expanding the infrastructure.	Strasbourg
	Cycling infrastructure	Enhancing infrastructure and redesigning urban space.	Helsinki
	Walkability	Uma Praça em cada Bairro: Pedestrian-friendly public squares in every neighborhood.	Rotterdam
	Shared mobility solutions	N/A	N/A
	Multi-modal solutions	N/A	N/A
	Accessibility	N/A	N/A
	Affordability	N/A	N/A
KA-2	MaaS	N/A	N/A
	People-centered urban design	Uma Praça em cada Bairro: Pedestrian-friendly public squares in every neighborhood.	N/A
	Tactical Urbanism	N/A	N/A
	Diversity and social cohesion	N/A	N/A
	Mixed Land Use	N/A	N/A
KA-3	Greening and nature-based solutions	N/A	N/A
	Logistic Hubs	N/A	N/A
	Last mile delivery	N/A	N/A
	Technology for urban logistics	N/A	N/A
KA-4	Supporting local economies	N/A	N/A
	Citizen Engagement	Public consultations and inquiries.	Rotterdam, Bergen

	Mobility campaigns	N/A	N/A
	Mobility and traffic management	N/A	N/A
	Urban Space Strategies	Urban regeneration.	N/A
	Funding innovation	N/A	N/A
	Digital twins	N/A	N/A

Debrecen			
Key Area of Action		Strategies & Actions	Best Practice
KA-1	Enhancing public transport	Improving public transport speed and comfort.	Strasbourg
	Cycling infrastructure	Expanding cycling networks, improving paths to outskirts, and enhancing safety of existing infrastructure.	Helsinki
	Walkability	Enhancing pedestrian infrastructure and safety measures.	Rotterdam
	Shared mobility solutions	Developing shared micromobility systems.	Budapest
	Multi-modal solutions	Improving intermodality and decentralisation of transport.	N/A
	Accessibility	N/A	N/A
	Affordability	N/A	N/A
	MaaS	N/A	N/A
KA-2	People-centered urban design	N/A	N/A
	Tactical Urbanism	N/A	N/A
	Diversity and social cohesion	N/A	N/A
	Mixed Land Use	Creating decentralized urban centers.	N/A
	Greening and nature-based solutions	N/A	N/A
KA-3	Logistic Hubs	N/A	N/A
	Last mile delivery	N/A	N/A
	Technology for urban logistics	N/A	N/A
	Supporting local economies	N/A	N/A
KA-4	Citizen Engagement	N/A	N/A
	Mobility campaigns	N/A	N/A
	Mobility and traffic management	N/A	N/A
	Urban Space Strategies	N/A	N/A
	Funding innovation	N/A	N/A
	Digital twins	N/A	N/A

Hamburg & Altona			
Key Area of Action		Strategies & Actions	Best Practice
KA-1	Enhancing public transport	Increasing PT supply (both temporally and spatially) and new rolling stock.	Strasbourg

	Cycling infrastructure	Improving cycling infrastructure, reducing car dependency, and promoting cycling.	Helsinki
	Walkability	Enhancing walking infrastructure, reducing travel distances, promoting flexible space use, and minimizing car dependency.	Lyon, Rotterdam
	Shared mobility solutions	Expanding HVV app and switch points to integrate more shared mobility services.	Budapest
	Multi-modal solutions	Integrating various transport modes, expanding HVV app and switch points for public transport connectivity.	Bergen
	Accessibility	Ensuring accessible, barrier-free / universal design connections across public transportation.	N/A
	Affordability	Reducing PT fares.	N/A
	MaaS	Implementing the HVV app (as a digital mobility tool).	Madrid
KA-2	People-centered urban design	Designing and creating public spaces and green areas, creating spaces for relaxation, sports, other leisure activities and community interaction.	Bologna, Krakow, Lyon
	Tactical Urbanism	Installing green and multifunctional seating in street space.	Bologna
	Diversity and social cohesion	Promoting inclusive neighborhoods and affordable housing creates spaces for community interaction.	N/A
	Mixed Land Use	Establishing mixed-use neighborhoods and decentralizing centers.	N/A
	Greening and nature-based solutions	Improving and connecting green spaces, Protecting green spaces.	Rotterdam
KA-3	Logistic Hubs	Establishing smart loading zones across Hamburg for goods, delivery transport.	Hamburg
	Last mile delivery	Piloting sustainable inner-city delivery solutions, including micro-hubs and smart technologies, to reduce traffic and emissions.	N/A
	Technology for urban logistics	Promoting the local economy and services and reactivation of local markets and district squares.	N/A
	Supporting local economies	N/A	N/A
KA-4	Citizen Engagement	Community engagement, involvement, and participation.	Bergen, Rotterdam
	Mobility campaigns	Creating of car-free zones	Bologna
	Mobility and traffic management	Strengthen environmentally friendly transportation, non-motorized mobility. Strengthening environmentally friendly and non-motorized mobility.	Helsinki
	Urban Space Strategies	Developing flexible spaces for relaxation, leisure, and community interaction.	Bergen, Gothenburg, Munich
	Funding innovation	N/A	N/A
	Digital twins	Digitalizing and enhancing the Hamburg geoportal (e.g., HVV switch app, barrier-free services).	Barcelona

Istanbul & Küçükçekmece				
Key Area of Action		Strategies & Actions	Best Practice	
KA-1	Enhancing public transport	Optimizing of public transport stations, transportation hub renovation, New metro/bus/sea transportation lines.	Madrid, Strasbourg	
	Cycling infrastructure	Establishing new cycling routes, increasing the bicycle network (10 km proposed), establishing bicycle parking areas within educational facilities.	Helsinki	
	Walkability	Widening pedestrian routes, pedestrianization, constructing “prestige roads” to include different types of transportation modes.	Rotterdam	
	Shared mobility solutions	Conducting via micro-mobility companies, ISBIKE project, e-scooters from different companies, integrated public transportation (i.e., bus-Marmaray).	Budapest	
	Multi-modal solutions	Implementing Park & Ride nodes, constructing prestige roads (walking, cycling, car networks), creating new parking areas, and establishing bicycle parking in Marmaray (Commuter Rail) and Metrobus (BRT) stations.	Helsinki, Madrid	
	Accessibility	Conducting studies to improve accessible transportation to major attraction points.	Providing accessible and continuous healthcare facilities	Madrid
	Affordability	Reducing PT fares, providing transportation discounts for students, teachers, and other specific groups, free transportation smart cards for elderly people (65+) and mothers with children aged 0-4.	N/A	
MaaS	Implementing MaaS applications.	Budapest, Madrid		
KA-2	People-centered urban design	Constructing new social residential areas and social facilities, arranging sports organizations, and cultural activities.	Krakow	
	Tactical Urbanism	Game Street (for children – by Maltepe Municipality).	Bologna	
	Diversity and social cohesion	Construction of cultural and religious areas near Küçükçekmece Lake, cultural and art centers, nursing homes, accommodation buildings, youth educational activities and cultural trips, child universities, traffic education park.	N/A	
	Mixed Land Use	Creation of shopping malls, marketplaces, parks, and sports areas.	N/A	
	Greening and nature-based solutions	Developing accessible and reliable playgrounds, renovating sports areas, creating new green spaces, and engaging in planting activities.	Lyon	
KA-3	Logistic Hubs	Construction Materials Consolidation Centers (CMC) to store and consolidate materials before delivery to construction sites, providing environmentally friendly and efficient construction supply chain solutions.	Munich	
	Last mile delivery	Conducting a smart cities study to improve last-mile delivery logistics.	Munich	
	Technology for urban logistics	Implementing ICT and IoT tools in urban logistics while employing green transportation vehicles.	Munich	
	Supporting local economies	Organizing events in Hünerli Eller Çarşısı, providing entrepreneurship and vocational training courses for women.	N/A	
KA-4	Citizen Engagement	Holding workshops, surveys (online & face-to-face), digital platforms, participatory planning, pilot projects, and public awareness campaigns.	Bergen, Krakow, Lyon, Rotterdam	
	Mobility campaigns	Hosting marathon Istanbul, Semi-Marathon Istanbul, cycling competitions, Bosphorus Cross Continental Swim, Sail Türkiye Racing, IDO Sailing Cup.	N/A	
	Mobility and traffic management	Expanding active transportation modes, Park & Ride, parking management strategies, new transport networks and hubs, interchange areas, sea transportation, smart transport, cycling networks, and parking areas.	Budapest, Madrid	
	Urban Space Strategies	Promoting pedestrianization and creating new squares.	N/A	
	Funding innovation	Istanbul Metropolitan Municipality and Küçükçekmece Municipality Strategic Action Plan for 2025-2029 allocating budget	N/A	
	Digital twins	3D Istanbul ProjectA	Barcelona	

Torino & Settimo Torines			
Key Area of Action	Strategies & Actions	Best Practice	
KA-1	Enhancing public transport	Increasing public transport supply (both temporally and spatially) and introducing new rolling stock, expanding supra-local railway services.	Strasbourg
	Cycling infrastructure	Expanding cycling infrastructure.	Helsinki
	Walkability	Creating pedestrianized areas.	Rotterdam
	Shared mobility solutions	Implementing free internal shuttles with limited ridership, primarily for students and the elderly.	Budapest
	Multi-modal solutions	"Pay as you go" system.	N/A
	Accessibility	N/A	N/A
	Affordability	"Pay as you go" system.	N/A
KA-2	MaaS	"Pay as you go" system.	N/A
	People-centered urban design	Redeveloping squares, gardens, and streets to create safe and active public spaces.	Bologna, Krakow, Lyon, Rotterdam
	Tactical Urbanism	Pedestrianization of Via Italia, making the city center street accessible only to pedestrians through a tactical urbanism intervention.	Bologna
	Diversity and social cohesion	N/A	N/A
	Mixed Land Use	Redevelopment of brownfields and public spaces.	N/A
KA-3	Greening and nature-based solutions	Expanding green spaces, including constructing bicycle lanes in natural environments and integrating nature-oriented cycle paths.	Krakow
	Logistic Hubs	N/A	N/A
	Last mile delivery	N/A	N/A
	Technology for urban logistics	N/A	N/A
KA-4	Supporting local economies	N/A	N/A
	Citizen Engagement	Applying a participatory approach to urban interventions, as used in the pedestrianization of Via Italia.	Bergen, Krakow, Lyon, Rotterdam
	Mobility campaigns	N/A	N/A
	Mobility and traffic management	Establishing "Zones 30" for traffic moderation	Lyon
	Urban Space Strategies	Implementing pedestrianization projects, along with the recovery and redevelopment of brownfields.	Bologna
	Funding innovation	N/A	N/A
Digital twins	N/A	N/A	

## Appendix 2 – High Quality of Societal Life (HQSL) Index

The High Quality of Societal Life (HQSL) index is defined by the “accessibility, either immediate, or at least optimised in the space/time” (Moreno et al, 2023) of the functional and social mix of essential services in the territory – categorized into six social functions\*: (1) Living, (2) working, (3) getting supplies, (4) enjoying, (5) learning, and (6) caring/being healthy.

Living	Working	Getting supplies	Enjoying	Learning	Caring/ being healthy
Housing	Environment	Food	Holidays	Access	Access to care
Energy	Access	Non-food related	Culture	Availability	Prevention
Waste management	Diversity	consumption	Leisure	Performance	Emergency
Transportation	Services	Public services	Association	Guide	Living environment
Service/ Infrastructure					Wellness
					Sport
					Pollution

Table: HQSL elements integrated into the six social functions. Source: Moreno et al, 2023.

\* In the “Proximity to Green, Blue and Public Spaces” KPI, green, blue, and public spaces are considered as one category, eliminating the need for a criteria index.

The assessment of proximity in the 15-minute city concept can be conducted using various methods. Two relevant approaches for developing the C1-Proximity common KPIs are the isochrone and isodistance methods. The isochrone method measures the area that can be reached within a given time frame (e.g., 15 minutes), while the isodistance method measures the area that can be reached within a fixed distance (Florid-Benitez, 2024). In this study, the isochrone method defines the area accessible within 15 minutes from a specific point, whereas the isodistance method delineates the maximum reachable distance in 15 minutes based on travel speed and measured as a Euclidean distance (straight-line distance), rather than accounting for real-world travel.

For every social function, the area within a 15-minute travel from a given element is mapped according to the mode of transportation—using either the isochrone method (for walking and biking) or the isodistance method (for buses, trams, and trains). Walking and biking accessibility are assessed via the isochrone method, based on their respective average speeds of 5.1 km/h and 18 km/h (Moreno et al., 2023). In contrast, public transport accessibility is better evaluated using the isodistance method for comparative purposes. This approach calculates the population within the area defined by the maximum reachable distance at public transport speed (Florid-Benitez, 2024). A breakdown by transport mode—bus, tram, and train—should be included, using standardized average speeds of 20 km/h, 25 km/h, and 75 km/h, respectively.

In the example below (figure 4), the isodistance method is used to observe the maximum area reached within 15 minutes at bus speed (i.e., 20km/h) from every learning element (e.g., schools, libraries) in the area. By considering the intersecting areas (A) only once and ignoring what is not within the urbanized area (B), the total area, reachable within a 15-minute bus ride, out of the total urbanized area can be calculated.

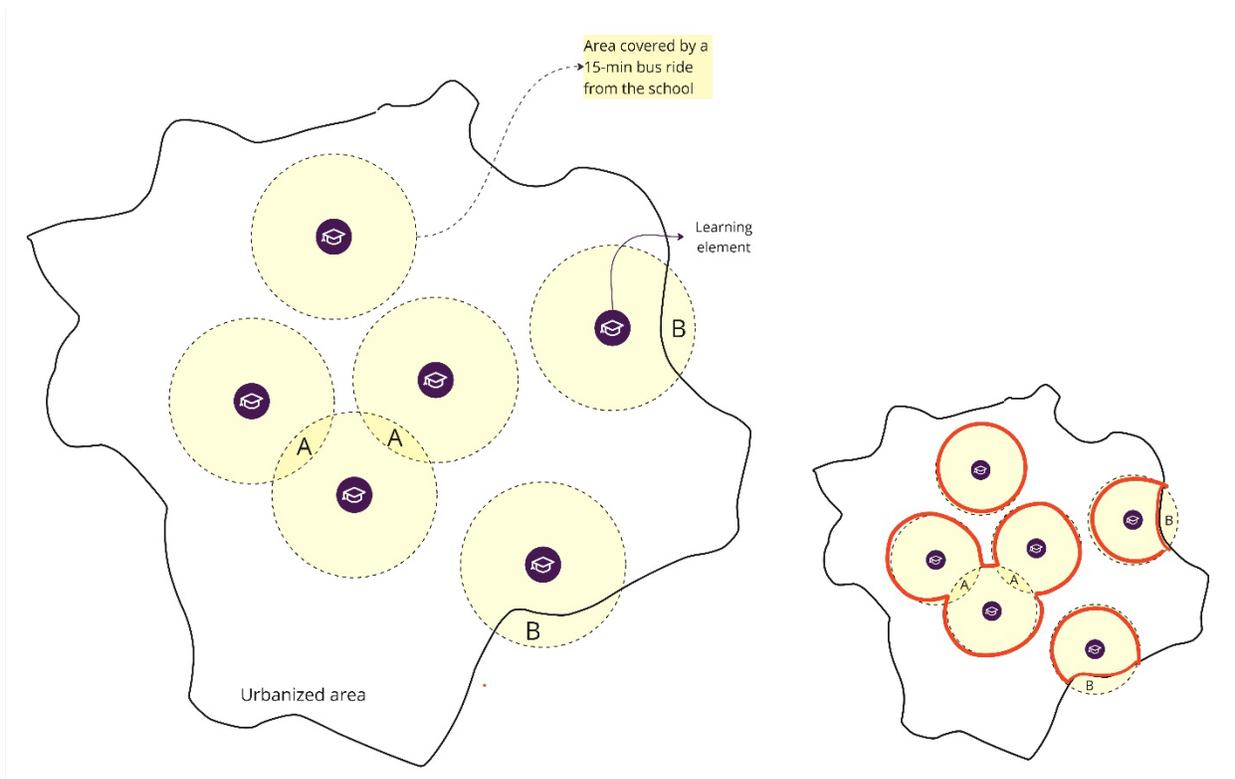


Figure: Selected area for the calculation of the proximity index. Source: Authors, 2025.

The percentage of the total population living within the resulting 15-minute area can, subsequently, be calculated (Guzman et al, 2024). The result—for example, 40 percent—equals to the Learning index, by bus ride. The same process is applied to the six social functions and to the multiple modes of transportation. The index for each mode of transportation—that compose the key metrics of the “**Proximity to Essential Services**” KPI—can then be described by the sum of all the social functions’ indexes for that mode. An illustration of the result can be found below.

Mode	H	T	S	E	A	D	Index (H+T+S+E+A+D)*
Walking	0.21	0.22	0.25	0.19	0.15	0.29	Walking index: <b>1.31</b>
Biking	0.33	0.35	0.32	0.37	0.30	0.31	Biking index: <b>1.98</b>
PT: Bus	0.75	0.52	0.60	0.59	<b>0.40</b>	0.35	Bus: 3.21
PT: Tram	0.20	0.25	0.30	0.19	0.21	0.22	Tram: 1.37
PT: Train	0.55	0.60	0.41	0.60	0.35	0.40	Train: 2.91
							Public transport (PT) index (Bus+Tram+Train): <b>7.49</b>

Table 5: Proximity to Essential Services KPI - Key Metrics

\* Where H: Living, T: Working, S: Getting supplies, E: Caring / Being healthy, A: Learning, D: Enjoying.

Each social function has the tendency of having a different priority and relevance depending on the case study and the demographics. To provide more adaptability to the metric, the KPI metrics can also be calculated based on a composite index (Moreno et al, 2023), with variables for different weighting of the social functions (shown below). The weight of the social functions should be defined according to